Kangkong (Ipomoea, Convolvulaceae) and the geographies of interstitial urban spaces in Southeast Asia

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Kangkong (*Ipomoea, Convolvulaceae*) and the geographies of interstitial urban spaces in Southeast Asia

A thesis submitted for the degree
Doctor of Philosophy

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Albert M Salamanca

One Volume

Department of Geography
Durham University
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2008

15 MAY 2008
Declaration

I hereby declare that this thesis has been composed by myself. The work presented in this thesis has not previously been submitted for any other degree or qualification. The nature and extent of my work is carried out by, or in conjunction with others, has been specifically acknowledged by reference.

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Albert M Salamanca
This work is dedicated to my family in Bilar (Bohol, Philippines).
Abstract

This is a study of the life and heritage of a plant and the people involved in the production of kangkong, Ipomoea aquatica Forskal within dynamic peri-urban spaces in mainland Southeast Asia. Kangkong has a distinction of being both a food in much of Asia and a weed in other parts of the world. It has become an important vegetable in Cambodia, Thailand, and Viet Nam. The production of this vegetable largely occurs around cities. In Hanoi and Phnom Penh, the use of wastewater is an important aspect of its production while in Bangkok, though wastewater is not used, kangkong has become a commercial vegetable replacing rice production in some areas. Such disparate trajectories offer insights into the households involved in its production and the spaces upon which it thrives so that opportunities for understanding the desakota characteristics of spatial change in mainland Southeast Asia can be made.

In understanding desakota geographies, this study looks at the key factors that explain livelihood dependence through the use of survey data and sequential regression. Then their geographical underpinnings are fleshed out. The results showed that, in Bangkok, the occupational multiplicity of the wife explains dependence while it is the performance of kangkong production by both the husband and the wife in Hanoi. In Phnom Penh, it was shown that it is the occupational multiplicity of the husband that explains a household’s dependence on kangkong production. All these results point to the underlying livelihood strategy of the households of income and labour diversification. The high involvement of women is made possible by the tight connection between household-domestic and production spaces as well as the lesser work intensities involved in kangkong production compared with other agricultural activities. The different levels of involvement in kangkong production give rise to different kinds of producers, which are characterised as the agricultural entrepreneurs, quasi-peasants, and peasants. These producers, respectively, pursue a strategy of accumulation (Bangkok), consolidation (Hanoi), and survival (Phnom Penh). The differences in strategies among these cities reflect their social, environmental, and spatial endowments.

Thus, by looking at the different spaces (i.e., social, cultural, economic, spatial and environmental) through which kangkong spreads, the geographies of interstitial urban spaces is illuminated. Kangkong has been shown to embody the key characteristics of desakota spatial change especially with respect to the involvement of women in the production system and the intense juxtaposition of agricultural and non-agricultural land uses in or around the production areas. As a result, issues of turbulence and ambiguities are imprinted on kangkong livelihoods, the households involved in kangkong production and the landscape where they are located.
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Acronyms and Abbreviations

Amphoe  District
BCE    Boeung Cheung Ek
CDI    City Development Index
Changwats Province
CV     coefficient of variation
EBMR   Extended Bangkok Metropolitan Region
EMR    Extended Metropolitan Region
FDI    foreign direct investment
g      grams
GRUMP  Global Rural Urban Mapping Project
ha     hectare
HH     household
HHH    household head
HIC    Highly indebted countries
IMF    International Monetary Fund
LAC    Latin American and Caribbean
m      metre
M1     Monitoring 1
M2     Monitoring 2
M3     Monitoring 3
Masl   meters above sea level
MCAR   missing cases at random
NPN    Nong Pao Ngai
ns     not significant
OHM    Other household members
PAPUSSA Production in aquatic peri-urban systems in Southeast Asia
PCA    participatory community appraisal
PRA    participatory rural appraisal
PRK    People’s Republic of Kampuchea
PUAFPS Peri-urban aquatic food production system
QCA    qualitative comparative analysis
SoS    State of the System
SPSS   Statistical Packages for the Social Sciences
Tambon sub-district (Commune)
ThC    Thermotolerant coliform
UNPD   United Nations Population Division
UNTAC  United Nations Transitional Army of Cambodia
USD    US dollar
VAC    stands for the Vietnamese terms vuon, ao, and chuong which means garden, pond, and livestock.
VHLSS  Viet Nam Household Living Standard Survey
VLSS   Viet Nam Living Standard Survey
yr     year

List of units used

1 sao = 360 m² (for North Vietnam)
1 rai = 400 talang wah
1 rai = 4 ngan
1 rai = 0.0016 km²
1 rai = 0.16 ha
1 rai = 1600 m²
26.67 damlung = 1 kg (Cambodia)
1 damlung = 514 dollars (Gold price Cambodia, 16 May 2005)
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Chapter 1

Introduction

Early each morning in Hanoi, Mrs Vu prepares her small boat, small enough to take only herself or occasionally one of her sons or daughters. It is actually more of a floating platform than a boat except that it has a prow-like front. She collects her sickle and sometimes dons her improvised cloth stockings to stay warm and protect herself from prolong immersion in the water. Together with her sister and sometimes her husband, Mrs Vu sets out to harvest what in their language is called rau muong. It is their favourite vegetable, a staple in their diet.

From six-o'clock in the morning, they toil despite rain and nippy weather during Hanoi’s winter season. The whirr of cranes and the pealing of bells to command workers to assemble in a construction site for new apartment blocks signal that it is about eight in the morning. One more hour and they have enough bundles of rau muong to send to the market or for the middleman to collect. They then head back home for breakfast and for Mrs Vu to begin her other domestic tasks.

More than 500 miles away, across several mountains and rivers is Mrs Siv, a farmer from Boueng Cheung Ek. She has a bagful of history behind her. Pol Pot drove her out of her home somewhere in Phnom Penh, killed her husband, brothers and father, and left her with four children to take care. She only returned in the early 1980s when the United Nations pacified Cambodia and Mrs Siv settled in the lake because it was the only available place for her. Like Mrs Vu, she begins her day early to tend and harvest her trnkuon fields. Buyers from other provinces arrive by seven in the morning and she has to be ready for them. Sometimes her granddaughters help her, but often, she works alone. Mrs Siv lines up her bundles by the roadside so that buyers can easily load them into their trucks. When the lake is dry in summer, trucks cross the lake and load the harvest directly from her fields. Much of her harvest ends up as feeds for pigs. Those she sends for the market as vegetables are properly collected and neatly arranged. Her two granddaughters then carry them on their heads on aluminium basins to the market across the dike.
Since the former dirt track was surfaced in 200+, Mrs Siv’s life has become less certain. She has heard from other members in her village that real estate agents, land speculators, politicians, land developers, and squatters suddenly are interested in the unowned lands in the lake. It seems the road changes life in the village. Everyone is worried that they will lose their lands and livelihoods if buyers or squatters succeed in claiming the land.

Across, in Thailand’s Chao Phraya Plains, Mr Wichai also harvests his phak boong¹ early in the morning with help of hired labour in the village and his wife. His plot covers more than a hectare, significantly larger than Mrs Vu or Mrs Siv’s landholdings. Mr Wichai was previously a rice farmer who shifted to phak boong when the market was good, but he tends his fields with the same attention he previously applied to his rice fields. He used fertilisers, pesticides, and other various chemicals to ensure a good harvest. In his work shed near the garage of his pick up truck, he arranges his phak boong in bunches of around 3 kilos each and nearly a meter in length. They are then nicely wrapped in cellophane bags to keep them fresh. When he finishes at ten in the morning, rows of evergreen bags occupy more than two-thirds of the shed.

Mr Wichai rests until lunch time and resumes work around one. The phak boong bags are loaded into his two-year old blue Isuzu pick-up truck. Then with his wife, who handles the transactions with buyers, they head to the Don Muang Wholesale Market across well-paved roads and four-lane highways. Alongside other phak boong sellers, he parks his truck in the market and removes the tarpaulin that protects his goods from the sun. He will remain on top of the vehicle while the selling continues so that he can pass to the buyers the bags they require. His wife stands by the side of the truck to process orders. If buying is brisk, their day ends at five o’clock in the afternoon; otherwise it would be an hour or two later.

This gives them some time to drop by Tesco Lotus or Future Park to buy some groceries and pick up pieces of freshly baked roti boy, a coffee-butter flavoured Mexican bun with a flaky and crispy coating originally popular in Indonesia, Malaysia and Singapore but now a new craze in Thailand.

In the quest to subsist, thrive, and survive, people build livelihoods as a way of generating income at a most basic level, and also meeting certain culturally determined objectives which contribute to quality of life. A livelihood is composed of “… the capac-

¹ This is a phonetic spelling. Others also spell it as pak bung.
bilities, assets (including both material and social resources) and activities required for a means of living" (Carney 1998:4) and "build their [people's] worlds" (Whitehead 2002:577). Pursuing livelihoods imply finding opportunities where, most obviously, one can earn an income or generate goods for consumption and also develop oneself along the way.

In the human geography of Southeast Asia, the issue of livelihoods (especially those dependent on the region's natural endowments) achieves particular salience in areas where the metropolitan zones and their corresponding activities have infiltrated rural areas leading to multiple ambiguities in their physical, social, economic, and institutional geographies. These areas are neither rural nor urban, by definition. They are, accordingly, dynamic spaces so that there is a presumption that such ambiguity leads to turbulence or instability for the households who live there. Yet a number of households in these spaces are involved in livelihoods which are agricultural in nature and typically associated with the 'rural'. At the same time, while the source of income for these households is 'agricultural', other aspects of their lives are intimately linked with the rhythms and flows of the city. In fact, agricultural production, or the factors that lead to the practise of livelihoods which are agricultural in nature, has been driven in large part by the consumption demands of the city. By concentrating patterns of demand and markets, cities facilitate the process of commoditisation of certain activities and resources. Edible plants that were naturally abundant, commonplace, and wild become cultivated for the market. Intricate agronomic practices are introduced to ensure that the supply to the market is uninterrupted.

Turbulence is further seen institutionally where aspects of governance become problematic in light of existing bureaucratic arrangements that segment and categorise governance by commodity, resource sector, or geography (i.e., urban or rural). In certain countries in the region, agriculture is always associated with rural development so that we have government departments that are called departments of 'Agriculture and Rural Development'. At the opposite extreme are departments or bureaus of urban affairs whose remit is, as the name suggests, urban but sans agriculture. Concerns for agricul-
ture in urban areas are a matter for national agriculture departments but are usually only treated tangentially. As such, urban agriculture (Photo 1-1) is considered a temporary and marginal activity (UNDP 1996). Agencies concerned with urban affairs do not include urban agriculture in their mandate. As a result, the planning and development of interventions to enhance this sector are either nonexistent or severely limited.

In terms of land use planning, the lands in these areas, which are currently used for agriculture, are also the main sources of land to meet the demand for housing, recreation, and industry (Greenberg 1994; Kelly 1998, 1999a; Leaf 1999). All across Southeast Asia, rural lands adjacent to metropolitan cores are being progressively encroached upon and occupied by manufacturing industries, housing estates, golf courses, and shopping malls. This is especially the case on lands along major road networks in cities such as Hanoi, Ho Chi Minh City, Bangkok, Manila, and Phnom Penh. The end result is escalating land prices and land conversion from agricultural use to other, more economically ‘efficient’ uses. This adds another layer of turbulence to the households still involved in agriculture.

The process of infiltration of urban activities into rural areas may be broadly subsumed within what is called periurbanisation. In Southeast Asia, periurbanisation is a current – and an evolving – phenomenon. According to Webster (2002b:8), a peri-

Photo 1-1 Urban agriculture in Thanh Tri District, Hanoi. (Photo by: Author)
urban area is characterised by (i) a changing local economic structure, encompassing a
shift from an agriculturally based to a manufacturing-dominated economy; (ii) changing
employment structure, shifting from agriculture to manufacturing; (iii) rapid population
growth and urbanisation; and (iv) changing spatial development patterns and rising
land costs. Periurbanisation and the zone that it creates, the peri-urban, come in many
names and categories depending on which area they refer to, the uniqueness of the
places they describe, and who their proponents are. Terms include, for instance, 'dis-
persened metropolis', 'extended metropolitanisation', 'metropolitan interlocking regions'
(Ginsburg 1991b: xvii), 'region-based urbanisation', 'mega-urban region', 'over-
urbanisation', 'dif fuse urbanisation', 'outer city production zone', 'ubiquitous urbanisa-
tion', 'extended urban field', 'exurbanisation', 'rurbanisation', 'edge city', 'suburban
sprawl', 'galactic urbanisation', 'stealth urbanisation' (Greenberg 1994: 277), and in situ
urbanisation (Douglass et al. 2002: 1-6). These names and categories are not necessarily
the same, but essentially refer to a phenomenon that embraces outward spatial expan-
sion of the city, increasing population density, and the changing nature of employment.

It is argued that in the mega-urban regions of Southeast Asia there emerged a
'distinctive' form of settlement transition known as desakota or extended metropolitani-
sation (McGee 1989; McGee 1991). Bangkok is the best example of the phenomenon.
However other countries in the region are also experiencing something similar as rates
of urbanisation accelerate. The operative terms for these characteristics are 'change' or
'shift'. The spaces upon and in which these processes operate are continually changing
or shifting. A condition of stasis is here not achieved. It is something on the move such
that the shift from agriculture to manufacturing does not imply that all activities have
already become totally manufacturing-based. There are remnant pockets or spaces of
agriculture in the landscape carved in interstitial spaces. These interstices may stand
out either as 'relics', so to speak, of the landscape's past history or a frontier, a site
where the urban will expand.

One artefact of the settlement transition and the creation of interstices is the cul-
tivation of plants and fish dependent on waste (i.e., wastewater, wet food, animal waste,
and human waste) generated by households. Due to the evolving demand among consumers in the urban marketplace coupled with an expanding population and increasing numbers of poor households, certain production systems are transformed from their traditional subsistence status to a commercial role, becoming lynchpins of the livelihoods in these ‘distinctive’ spaces. The cultivation of *kangkong*, *Ipomoea aquatica* Forsk in Southeast Asia, especially in the cities of Bangkok, Hanoi and Phnom Penh is one such case. *I. aquatica* is an aquatic and glabrous perennial plant with hollow stems creeping on mud or floating on pond, canals, or ditches and with alternate oblong-ovate or lanceolate leaves (Holm *et al.* 1997: 414). It belongs to the morning glory family, *Convolvulaceae*. How *kangkong* engages with the interstices to become a major livelihood and production system is a manifestation of the opportunities, character, and nature of the interstices. The ‘spatial identity’ that marks the relationship between *kangkong* and these interstices offer us an opportunity to understand the dynamics that households experience as they negotiate their presence (physically) and existence (experientially) in a changing social, economic, geographical, and institutional space. They will also tell us whether turbulence and ambiguity are important facets of livelihoods in changing spaces. “A spatial identity”, Winichakul (2003: 9) reminds us “is always a place – that is, a space loaded with values and meanings for those who identify with it. A spatial identity usually has its story, probably many stories, without which such a place or identity would be meaningless. In fact, a story anticipates a place and a spatial identity”.

The term *kangkong*, which may be Malay or Filipino in origin (Blust 2000: 119), is just one of the many names of *Ipomoea aquatica* Forskal (Photo 1-2). The Thais call it *phak boong*; the Vietnamese, *rau muong*; and the Khmers, *trarkoun*. In the English speaking world, it is called, variously, *kangkong*2, Chinese water spinach, water convolvulus, water spinach, swamp cabbage, swamp *kangkong*, and tropical spinach. Other names for this vegetable are listed in Table 1-1. It is easily grown, considered nutritious, and is found either as an aquatic or semi-aquatic perennial in tropical and subtropical

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2 This is the name used in this study, although not representative of the field sites in this study, because of its wider international usage in English (cf. Austin 2007: 131).
The cultivation of *kangkong* is argued in this study to be an exemplar of how households when confronted with changes in their social and natural environments exploits the opportunities that present given existing assets and contexts. Turning a lowly vegetable, *kangkong*, into an income earning opportunity and, more widely, a livelihood is one such case. It grows prolifically in water bodies such as canals, streams or lakes. It can be cultured with clean water or waste water. A high demand for the vegetable has led to its commercial production especially in Thailand, which is considered the major producer of *kangkong* in Southeast Asia (Ali 2000: 31). While it can also be grown naturally in rural areas, the commercial production of *kangkong* in the region has always been concentrated in the peri-urban lowlands (Ali 2000: 33) such that it is largely grown only in Phnom Penh in Cambodia (Sokhen, Kanika, and Moustier 2004: 19), certain parts of Hanoi (Mai Thi Phuong Anh *et al.* 2004: 19), and Nonthaburi and Samut Prakan in Thailand (Sootsukon, Dechates, and Wu 2000: 420). It is widely cultivated for human food, local medicine, and animal feed, especially for pigs. It is a versatile and ubiquitous vegetable that graces many cuisines. It can be eaten raw as an accompaniment.

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3 A detailed description of the ecology, agronomy, and life history of *kangkong* are provided in Chapter 9.
4 Between these two provinces, Nonthaburi is by far the largest *kangkong* producing province (Sootsukon, Dechates, and Wu 2000: 420).
to neutralise spicy dishes. It can be fried with garlic and oyster sauce or it can be mixed with fish and different meats or stirred into noodle soups. Every city in Southeast Asia has a unique way of preparing this vegetable. It is a staple in the Vietnamese diet. Its popularity also extends to South Asia and Hawaii where young leaves and shoots of *kangkong* are reportedly the most popular fresh cooking green (Adam 2005: 4). Hong Kong is reported to use three to five million kg/yr of *kangkong* (Holm et al. 1997: 417).

<table>
<thead>
<tr>
<th>Language</th>
<th>Common Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>tropical spinach, water ipomea, water spinach, water sweet potato, swamp cabbage, swamp morning glory, kangkong</td>
</tr>
<tr>
<td>Chinese</td>
<td>weng cai (pitcher vegetable), ong choi, ung choi (pitcher vegetable), tung tsoi (hollow vegetable), kong xin cai (empty heart or empty stem vegetable), ong tung tsoi</td>
</tr>
<tr>
<td>Danish</td>
<td>kangkong, bladgrøntsag</td>
</tr>
<tr>
<td>Dutch</td>
<td>kangkong</td>
</tr>
<tr>
<td>Filipino</td>
<td>kangkong, balangog, galatgat</td>
</tr>
<tr>
<td>French</td>
<td>liseron d'eau, patate aquatique</td>
</tr>
<tr>
<td>German</td>
<td>Sumpf-Trichterwinde</td>
</tr>
<tr>
<td>Hindi</td>
<td>kalmisag, karmi, patuasag</td>
</tr>
<tr>
<td>Italian</td>
<td>patate acquatica, villucchio d'acqua</td>
</tr>
<tr>
<td>Japanese</td>
<td>you-sai, en-sai, asagaona</td>
</tr>
<tr>
<td>Malay</td>
<td>kangkong</td>
</tr>
<tr>
<td>Portuguese</td>
<td>batata aquatica, cancon</td>
</tr>
<tr>
<td>Spanish</td>
<td>batatilla aquatica, boniato de agua, camotillo</td>
</tr>
<tr>
<td>Thai</td>
<td>white: paagboong, phak bung, pak boong chin</td>
</tr>
<tr>
<td></td>
<td>red: pak boong thai</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>rau muong</td>
</tr>
</tbody>
</table>

Table 1-1 Common names of *Ipomoea aquatica* Forsk. in different languages (Source: Department of Primary Industries 2007)
Kangkong's economic importance can be inferred from the area under cultivation in Cambodia, Thailand, and Viet Nam. Kangkong (Photo 1-3) is one of the two leafy vegetables (the other being shallot) that cover a sizeable cropping area in Thailand (Table 1-2). In Cambodia, commercial production of kangkong is only found in Phnom Penh where it is widely grown especially in the only sewage lake in the city (Moustier, Sokhen, and Sipana 2005: 4; Muong 2004). Around 2,000 tons of kangkong enter the major markets in Phnom Penh per year and because of its wide availability and comparatively cheaper price the consumption of this vegetable is important to the poor (Moustier, Sokhen, and Sipana 2005: 4). Although statistics on vegetable production such as area covered, yield, and price for the whole country are severely lacking (Abdullah, Srun Sokhom, and Farooq 2002: 32), recent surveys by the SUSPER project in Phnom Penh show that kangkong is among only a handful of vegetables sold in the market that are produced locally. Highly perishable vegetables tend to be locally produced and those that can be stored longer such as tomato, cabbage and Chinese cabbage are imported from Viet Nam (Sokhen, Kanika, and Moustier 2004: 32).

Photo 1-3 Bunches of kangkong (left and above right) in Phnom Penh awaiting wholesale buyers. Bags of kangkong (below right) being sold in Talaad Thai, Pathumthani, the largest fresh vegetable and fruit market in Thailand. (Photos by: Author)
Table 1-2 Number of holdings and area covered by different types of vegetables, crops and herbs in Thailand (Source: National Statistical Office 2003)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Number of holdings planted</th>
<th>Area (rai) planted</th>
<th>Harvested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sweet corn</td>
<td>32,501</td>
<td>200,057</td>
<td>194,784</td>
</tr>
<tr>
<td>2</td>
<td>Bird pepper</td>
<td>68,859</td>
<td>160,124</td>
<td>157,419</td>
</tr>
<tr>
<td>3</td>
<td>Baby corn</td>
<td>15,519</td>
<td>156,807</td>
<td>155,279</td>
</tr>
<tr>
<td>4</td>
<td>Chilli pepper</td>
<td>52,966</td>
<td>148,318</td>
<td>140,563</td>
</tr>
<tr>
<td>5</td>
<td>Shallot</td>
<td>26,625</td>
<td>83,181</td>
<td>80,013</td>
</tr>
<tr>
<td>6</td>
<td>Yard long bean</td>
<td>29,602</td>
<td>64,251</td>
<td>61,986</td>
</tr>
<tr>
<td>7</td>
<td>Garlic</td>
<td>21,740</td>
<td>61,557</td>
<td>60,478</td>
</tr>
<tr>
<td>8</td>
<td>Cucumber</td>
<td>20,231</td>
<td>50,313</td>
<td>48,751</td>
</tr>
<tr>
<td>9</td>
<td>Ginger</td>
<td>16,979</td>
<td>47,156</td>
<td>44,287</td>
</tr>
<tr>
<td>10</td>
<td>Spring onion</td>
<td>13,871</td>
<td>44,658</td>
<td>44,019</td>
</tr>
<tr>
<td>11</td>
<td>Brinjal</td>
<td>13,588</td>
<td>25,376</td>
<td>24,645</td>
</tr>
<tr>
<td>12</td>
<td>Coriander</td>
<td>13,512</td>
<td>30,352</td>
<td>29,174</td>
</tr>
<tr>
<td>13</td>
<td>Water morning glory</td>
<td>13,315</td>
<td>41,191</td>
<td>40,500</td>
</tr>
<tr>
<td>14</td>
<td>Chinese kale</td>
<td>13,290</td>
<td>51,396</td>
<td>50,363</td>
</tr>
<tr>
<td>15</td>
<td>Cabbage</td>
<td>12,088</td>
<td>55,898</td>
<td>54,883</td>
</tr>
<tr>
<td>16</td>
<td>Pakchoi</td>
<td>10,653</td>
<td>25,347</td>
<td>24,969</td>
</tr>
<tr>
<td>17</td>
<td>Pumpkin</td>
<td>9,550</td>
<td>47,181</td>
<td>44,730</td>
</tr>
<tr>
<td>18</td>
<td>Sweet/bell pepper</td>
<td>8,909</td>
<td>21,099</td>
<td>20,102</td>
</tr>
<tr>
<td>19</td>
<td>Fresher tomato</td>
<td>7,210</td>
<td>21,732</td>
<td>21,134</td>
</tr>
<tr>
<td>20</td>
<td>Sweet potato</td>
<td>4,096</td>
<td>29,177</td>
<td>27,142</td>
</tr>
</tbody>
</table>

Being a staple, it is also widely grown in Viet Nam especially in the northern uplands and Red River delta. The data in Table 1-3 are based on the 1998 Viet Nam Living Standards Survey, which is, as compared to the census data used in Table 1-2, a representative sample of 6,000 households across the country (Table 1-3).

Table 1-3 Percentage of rural households in Vietnam growing fruits and vegetables (Source: International Food Policy Research Institute 2002)
The prominence of *kangkong* is further reflected in its role in the Asian diet. In a study of 800 households covering Bangkok, Hanoi, Ho Chi Minh City, and Phnom Penh by PAPUSSA\(^6\), it was shown that *kangkong* is the most popularly consumed vegetable among peri-urban households (Figure 1-1), followed by water mimosa, *Neptunia oleracea* Lour., and lotus, *Nelumbo nucifera* Gaertn. The households involved in this survey are not only aquatic plant producers\(^7\) but also include fish seed producers, fish farmers, rice farmers, livestock growers, part-time farmers, local officials, professionals, fruit growers, cut flower producers, hired labourers, unskilled workers, and vegetable gardeners.

![Popularly consumed vegetables among peri-urban households in Bangkok, Hanoi, Ho Chi Minh City and Phnom Penh as surveyed by PAPUSSA (Source: PAPUSSA Data)](image)

In the launch of a book called *Cooking Stories*, O'Reilly (2005: 48) describes how, in another country and context, *kangkong*, or *rau muong* in this story, became the epitome of hope and simple pleasures among Vietnamese diasporic communities.

Hahn brought a single bunch of *rau muong* grass to the launch in a plastic bag. It is the central motif of his own story, a symbol of hope during the days in which his father, an ex-judge, pedaled a cyclo to provide for his family under the Communist regime. A bunch of *rau*

---

\(^6\) Respondents were asked to list the vegetables they consumed and rank them from 1 to 10, with 10 as the highest.

\(^7\) Producers and farmers are one and the same and thus, are used interchangeably in this study.
muong tied to his father’s cyclo at the end of a day’s work meant a good day for the family. Hahn told us that the grass serves him as a reminding measure of what little is needed to be happy. He passed a bunch around (“99 cents everybody”), his lone prop, while delivering one of the launch’s opening speeches... (O’Reilly 2005: 48).

*Kangkong offers memories of home. Food (Photo 1-4) is one aspect that connects the Vietnamese migrant with the ‘home’ they have left behind. And *kangkong* is a permanent fixture of this reminiscence, as the following quote published in a Vietnamese website, www.naungon.com, and loosely transliterated into English illustrates:

Morning glory is also delicious if some fish sauce is added, but it will become a vegetarian food with some bean curd. Unfortunately, it will taste less delicious without garlic. There are still more dishes served with morning glory; however, the more we tell about them the more we miss the morning glory of our homeland. Therefore, it is better to stop writing this essay now. Otherwise, we will miss it and think about it. And then we will feel very sad especially because we live far away from our homeland.

In today’s techno-savvy generation, the blogosphere is also witness to the popularity of *kangkong* as the sample of English blogs presented in Appendix 8 shows where it has become a fodder of discussion.

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The original Vietnamese version is:

"Rau muồng xào nêm nước mắm cừng ngon, mà nếu nêm bàng chao thì lại thành một món ăn chay cũng khá ngon miệng, chỉ thiếu là thiếu vị tỏi thì difícil rau sẽ kém vị ngon đi nhiều. Còn nhiều, nhiều nưa kể sao cho hết những món ăn dùng rau muồng nhi, và lại cứ càng kể thì lại càng thấy nhở như, và tiếc nuối những công rau xanh ngọt của quê nhà. Nên có lẽ cũng nên chậm hết bài viết này mới đây, kéo không hồn ců mãi thế trôi theo những dấu hoà rau muồng mầu tim nhất, mong manh theo gió thơm nhẹ nhẹ diễm tổ vẻ đẹp cho những bộ rau muống xanh ngọt, tươi mơn mởn đang bồng bế trong một vùng kỳ ức. Và rồi một nơi buồn da diet lại len lén trờ về triu nghĩa cả lòng của kẻ xa quê hương." (www.naungon.com 2007)
Because *kangkong* grows prolifically in different kinds of waterbodies, or interstitial spaces, even without any agronomic attention, its existence became commonplace and attained that status of a staple in the diet of most Southeast Asians. In the process, it has 'colonised' not only the landscape but also the mindscape so that in the Philippines' Tagalog region, *kangkungan*, derived from *kangkong*, became the word to refer to that muddy, smelly, and mosquito-infested place where the waste of the city flows and garbage is deposited. Its depraved nature reaches its pinnacle when politicians threatened to send criminals to the *kangkungan*. "*Pupulutin kayo sa kangkungan* (to the swamp you shall be found)" was Ex-Philippine President, Joseph Estrada's, battlecry during his inauguration speech, reminding criminals that they would be dealt with harshly by his administration.

As has been suggested previously, *kangkong*, in other parts of the world, has developed a different identity. It is a weed of more than 20 crops in 60 countries and major regions (Holm et al. 1997: 412). In western countries, especially Florida and other warmer states in the US, the vegetable is considered a noxious weed invading waterbodies, creating tangled masses of vines, covering water surfaces, displacing natural vegetation, and choking life underneath and around it. Its culture is considered illegal unless sanctioned with a permit and even transporting it needs permission (Natural Resources Conservation Service-US Department of Agriculture Website). It became an introduced species in the US through Asian shops who stocked *kangkong* for Asian migrant households or through these households themselves who cultured it as a pot herb (Langeland and Burks 1998). Its culture in these migrant households re-enacts ties with their homelands and evokes the sense of the familiar and the aroma of home. However, it escaped from migrant homes to colonise a new environment, in the process creating an entirely new set of relationship and becoming a menace and thereby ending up on the 'Federal Noxious Weeds List'.

Borrowing from Atkins and Bowler (2001:vii), the study of *kangkong* is "...like a 'barium meal' for X-raying social, political, economic and cultural issues, a kind of marker dye for broad structures and processes". In this sense, *kangkong* ... is "the
bearing of significance, as well as a material object of consumption”. This study, therefore, examines how Southeast Asian urbanism is reflected in a plant and how *kangkong* came to be where it is now as a plant, a dish, a crop, and a livelihood. I argue that in *kangkong* we see reflected the interplay of urbanism, opportunities, and livelihoods. This plant and the livelihoods that develop from it are a prism for the assessment of the extent of turbulence and ambiguity, if indeed they exist as assumed, which characterise the marginal, dynamic spaces of Southeast Asia’s peri-urban zones.

In short, this study seeks to understand a vegetable, the households involved in its production, the livelihoods that frame their relationships, and the social and spatial contexts within and across which they all circulate. *Kangkong* is used as a vehicle or a stage to pursue such interplay in a more grounded, contextualised way. My aim is to hazard an account of cities in mainland⁹ Southeast Asia (Map 1-1) that pays attention to the particularities and contextualities that define them and which privileges grounded perspectives. Thus, three general questions are pursued. First, what social, historical, economic, and geographical processes can be seen among *kangkong* households and inscribed in its production. Second, how can the understanding of these processes inform and invigorate our understanding of Southeast Asian urbanism (i.e. desakota) especially with respect to how the ‘urban’ and the ‘rural’ unfold and are subsequently lived. Finally, to what extent are turbulence and ambiguity defining characteristics of *kangkong* households. Or, putting it the other way around, how does the life and times of *kangkong* offer an alternative insight into the nature of Southeast Asian urbanism?

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⁹ Mainland Southeast Asia (Map 1-1) is only one of the ways to categorise countries in the region. Organizations such as the Asian Development Bank classify the region in terms of their main geographical feature such that the Mekong part covering Cambodia, Lao PDR, Myanmar, Thailand and Vietnam represents the countries in the Lower Mekong Basin while “Southeast Asia” is only limited to more archipelagic countries such as Indonesia, Malaysia, Philippines and Singapore. The progeny of the term ‘Southeast Asia’ itself is political, an offshoot of the Cold War (Tarling 2001: 3).
In response to these questions, the succeeding chapters are outlined as follows.

The first part of Chapter 2 explores the notion of urbanism, the process of urbanisation, and the state of urbanisation in mainland Southeast Asia. The geographies of interstitial spaces are outlined in this chapter. Using different data sources, this chapter describes the level of urbanisation by country. Then it segues into an introduction of the desakota model as a spatial anchor for our discussion. This chapter exposes how livelihoods and the nature of production systems are intimately linked with the geography of the interstitial spaces that surround a city. This chapter then leads us to the trilateral relationship linking urbanism, livelihoods and turbulence.

Chapter 3 discusses the key research questions of the study and the methods and research framework deployed to respond to these questions. It introduces the concept of a ‘household’ and how it is being defined and subsequently used in this study.
This chapter also describes how the data were collected (may be read as 'produced') and analysed. The analyses of this study are both qualitatively and quantitatively supported. Data from surveys are used in the quantitative analysis while interview data are employed for the qualitative analysis. The limitations of the approaches used and issues of reflexivities are also discussed. Finally, this chapter ends by considering how the domain of analyses is framed and how it will proceed forward. In relation to this chapter and to highlight my reflexivities, I have appended a section on the process of fieldwork and data collection in this study in Appendix 3.

Chapter 4 is the shortest chapter in this study and describes the field sites. It begins by drawing out the key characteristics of each city with the intention of giving those with limited exposure to these cities an appreciation of their uniqueness. The latter part of the chapter describes the field sites.

Chapter 5 unpicks the kangkong households. This chapter basically asks the question: who are the kangkong households? The demographic, social and economic characteristics of these households are provided. Other than the exploitation of kangkong, these households are not deemed to be essentially different from other Southeast Asian households. No particular social or cultural characteristic stands out. That is, kangkong production is not the domain of a particular set of households or social class. Instead, it has a wider remit. This chapter ends with a discussion on the income dependence of households on the production of kangkong. In Chapter 6, such dependence is unpacked. Why do these households consider themselves dependent on kangkong? What factors explain such dependence? Finding answers to these questions is the goal of the chapter and multiple regression is employed as a tool to find out the sets of factors or interactions that explain such dependence. This chapter, however, only describes the variables included in the analysis and the theoretical framework adopted to select them. Hypotheses contained in each variable are also laid out.

Chapter 7 describes the results of the regression. Issues relating to income diversification particularly stand out, which are in turn, discussed in Chapter 8. But before moving to Chapter 8, the notion of intact (or complete with both husband and wife
present) or mixed households (both complete and incomplete) is discussed and attention
is drawn to the results of their regression models. The underlying considerations for the
choice of households are shown later to have ramifications on the direction of the analy-
sis. This study has chosen to use the incomplete households because they represent the
real situation on the ground. In Chapter 8, occupational multiplicity and gender are
discussed. This chapter shows how households deployed occupational multiplicity as a
livelihood strategy. It is shown that households in the course of sustaining their in-
comes deploy key household members (i.e., the husband and the wife) in the production
of kangkong and the dependence on kangkong as a livelihood is explained largely by the
involvement of key household members. Since occupational multiplicity and gender
were crucial underpinnings in the regression results, Chapter 9 explains why this is the
case. It is shown that the role of occupational multiplicity and gender in kangkong pro-
duction is embedded in the botany, ecology, agronomy, and geographies of kangkong
production, but how households depend on such production is differentiated by con-
texts which this chapter highlights.

Chapter 10 describes the path dependence of kangkong livelihoods and the tur-
bulent spaces these livelihoods are located. The notion that these households are erst-
while rice producers is supported. Such previous engagement in rice production is ar-
gued to have provided a legacy upon which kangkong livelihoods have built on. This
chapter also discusses the different aspects of turbulence that imprint households in-
volved in the production of kangkong in Southeast Asian peri-urban spaces. Notions of
rurality, urbanity and ambivalence are also explored.

Chapter 11 brings together the disparate threads of discussions on kangkong
and the geographies of interstitial spaces by looking at the notion of restlessness and
hybridities. This chapter will synthesise what has been said about kangkong and theo-
rise about its evolution from the swamps to the table and what its dual personality
speaks about urbanism in Southeast Asia. This chapter returns to the main argument
of the thesis that, the spatial imprint of Southeast Asian urbanism provides for oppor-
tunities for households in peri-urban areas to develop livelihoods. The exploitation of
*kangkong* is one such example so that inscribed onto its vines and history are reflections of the history and geography of Southeast Asian cities. The concept of *desakota* and their types and characteristics are also discussed so as to anchor the primordial urbanism of Bangkok, Hanoi, and Phnom Penh. It is claimed here that Bangkok is the real *desakota* while Hanoi and Phnom Penh only exhibit characteristics of incipient *desakotas*. Although they are not fully *desakotas*, they are nonetheless important in our task of understanding the turbulence that attaches itself to households involved in livelihoods in dynamic urban spaces. A typology of households or producers involved in the production of *kangkong* is also made. It has been noted that each site portrays a unique type of household, a reflection of local contexts. Finally, this study concludes by returning to the objective of this study which is to understand the articulation of social and spatial spaces in the urbanism of mainland Southeast Asia as reflected in *kangkong* and its production.
Chapter 2

The geographies of interstitial spaces

Urbanisation implies an increase in size, in number of people, in the density of the built environment, in political boundaries, and in ecological footprints and impacts. Cities, like any organically alive object, grow because of the nutrients they receive. Cities are by any means not organic objects. They are diffuse yet nonetheless possess an organic character which makes them grow and release by-products. When we write about feeding cities, we are in one sense referring to feeding the city’s human inhabitants, but in another, of feeding the energy needs of its firms and enterprises. “[...] cities cannot exist without those inputs” claims Tarr (2002: 511) for “urbanites require clean air, water, food, fuel, and construction goods to subsist while urban industries need materials for production purposes”. In feeding cities, we invoke notions of metabolism (i.e., use and production of waste) and the creation of livelihoods. In the pursuit of this objective, suitable spaces are co-opted in the process. But due to the nature and intensity upon which built environment developed, what is left are interstitial spaces located at the margin of cities, in between built-up areas, and pockets of waterbodies. These spaces, therefore, become either relics or frontiers of urban expansion. Either they serve as artefacts of settlement transition or sources of new lands for urban land uses. These spaces, it follows, then become rich grounds through which histories and trajectories of change of urban spaces can be gleaned and whereupon we can read how settlement transition, spaces and livelihoods interact to define various ‘futures’ for embedded households. Thus, the geographies of interstitial urban spaces become an important domain of exploration.
The idea of *interstices* has seen a resurgence of interest in Southeast Asian historiography as a metaphorical and analytical device “to make fresh explorations into the past” (Abu Talib and Tan 2003: ix). Abu Talib and Tan (2003: xx) argue that

[...] the concept of interstices suggests focal points from which to track different kinds and levels of dynamic movements across space and time, providing the possibility of complex histories of social relations and cultural interchange that traverse or transcend political boundaries [...] Interstices can be found wherever encounters, translations, appropriations, and hybridization have occurred or are in process.

While taking a less evocative engagement with the past and a more social, spatial, and *de facto* focus, I argue that the *interstices* are also rich grounds for reading the future of on-going settlement transition in mainland Southeast Asia and its impact on livelihoods. That is to say, the *interstices* are sources of forward-looking images of urban spaces, in general, and peri-urban zones, in particular. These interstices are spaces located along margins associated to major land uses. I pursue this argument by looking at how a plant, *kangkong*, is being co-opted in and becoming an integral part of a livelihood shrouded in spatial, social, and environmental marginalities. I develop the notion of the geographies of interstitial urban spaces to explore this argument. Such geographies and the role of *kangkong*, may be illustrated in Figure 2-1.

![Figure 2-1 Geography of interstitial spaces (Source: Author)](image)

Below, I will describe each of the key aspects of these geographies. I will first start with urbanism to create a common understanding of this term because it is a key locus of the study. Then I will cover urbanisation in the region - mainland Southeast Asia - and then proceed to revive the notion of *desakota* urbanism which used to enliven the study of the urban geography of the region. Livelihoods and turbulence are frames upon which we reflect and imagine the dimensions, shapes, and trajectories of Southeast Asian cities and the households that co-opt, and are being co-
opted by, the process of change. *Kangkong* provides the connection, scaffold, or organising space.

An aspect of the geographies of interstitial spaces that is useful for building our case is the notion of flow, fluidities, circulating social materialities and the various subtexts that are being implicated such as impermanence, 'hermaphroditic landscape' (Davis 2004: 7), and, more importantly, the primordial assertion that cities are always in the process of becoming and that they are composed of a range (and dimensions) of external relations emanating from elsewhere. This is so because, "[c]ities are human creations, and they have always been centers of hope and inspiration: they are where the products of nature are used to create better qualities of life, and to facilitate cultural and intellectual achievements" (Piracha and Marcotullio 2003: 10). Thus, adds Ginsburg (1991a: 27), "[c]ities are cultural artifacts [...] [which reflect] the nature of the societies which have spawned them and which they serve".

Because the rural and urban boundaries of cities in mainland Southeast Asia, particularly in peri-urban areas, are increasingly being blurred by intensive rural-urban interaction and concomitant spatial, economic, demographic, and social changes, certain unique features of the landscape are created. These are the interstitial spaces located outside of the nucleus of the city and juxtaposed around or within industrial areas, housing subdivisions, and major road networks. Most of these spaces are physically linked with the city through sewerage networks, canals, and rivers that transport the city's metabolic outputs to production systems in the periphery. And so are the transport networks that convey various production inputs from the city or outputs from farms to markets. But more uniquely, some of these spaces are *de facto* places of habitation for the city's manual labourers. Certain landscape features such as the presence of a ready supply of water, waterlogged areas, depressions, water infrastructures such as canals and sewage networks, and proximity to major rivers enable these spaces to be amenable to certain forms of agriculture or aquaculture. In other words, these features lead to the development of unique livelihood opportunities.
2.1 Urbanism

Urbanism can be defined and understood in many ways such as interactional, normative, economic, and demographic. The interactional model emphasises the interaction of different aspects (i.e., social, political, institutional, and economic) of cities. The normative model treats urbanism as a way of life, while the economic model conceptualises urbanism in terms of the nature of the productive activities located in a particular space. Finally, the demographic model sees urbanism as an agglomeration of people (Wheatley 1979: 290). When all of these are considered, one can conceivably view the 'city as an organising principle' and therefore prefigures the notion that the city is the 'centre of dominance' (Wheatley 1979: 290). It is in this view that the notion that a city is a space through which lives and livelihoods circulate is privileged. Urbanism as used in this study follows closely the work of Cowgill (2004: 527) and is generally understood as the “prevalence of urban places in a society”. Furthermore, a city, which Cowgill (2004: 526) again provides a convenient definition, is taken to mean a “permanent settlement within the larger territory occupied by a society considered home by a significant number of residents whose activities, roles, practices, experiences, identities, and attitudes differ significantly from those of other members of the society who identify most closely with ‘rural’ lands outside such settlements”.

The aim of this chapter is to understand the nature of Southeast Asian urbanism in relation to livelihoods and food security. Such urbanism is likely to be differentiated when we look at the experiences of island and mainland Southeast Asia in greater depth. Some even argue that differentiation continues at a country to country level. Urbanisation/peri-urbanisation, or settlement transition in general is one of the constitutive processes that defines urbanism.

1 As opposed to urbanism in Southeast Asia because this does not assume that the phenomenon of urbanism is homogenous. This frame is influenced by Bunnell et al's (2002: 2) assertion of studying "the city in Southeast Asia rather than 'Southeast Asian city'".

2 The need to distinguish between 'mainland' and 'archipelagic' Southeast Asia is imperative from the point of view of this study as these two regions are characteristically different geographically (Hill 2002b). Such differences bring in different perspectives especially with respect to how these regions are to be understood or described. For example, archipelagic Southeast Asia as comprising of Malaysia, Indonesia, Philippines, Brunei, Singapore, and Timor Leste are essentially composed of islands. Glassman (2005) notes that there are two ways of seeing Southeast Asia as influenced by the Cold War: the environmental determinist or essentialist approach and the constructivist of pragmatist approach. This implies that the region as a whole means many things to many people depending on the facet of the region a person is exposed to (Ulack and Leinbach 2000: 3).
2.2 Urbanisation – grand narratives

Urbanisation, especially rapid urbanisation, is self-evidently an important backdrop for studies dealing with the state of the environment, and the social, demographic, and economic development of cities in the developing world. In the Millennium Ecosystem Review on Urban Systems, a global effort to assess important ecosystems, urbanisation has been pinpointed unequivocally as a major driver of change. The report makes the point that “urbanization and urban growth continue to be major demographic trends” (McGranahan et al. 2005: 797). And while it is not “[...] in itself inherently bad for ecosystems”, it does lead to, or complicate, various social, economic and environmental problems (McGranahan et al. 2005: 797).

Urbanisation has materialist, idealist and humanist connotations, making the term contentious and problematic (Knopp 1998: 150). The materialist explanation of urbanisation parallels Friedmann’s (2002: 3-4) demographic and economic meanings of the term. In this sense, urbanisation results from the increasing concentration of people in urban areas in densities and settlements higher than those around them. Furthermore, urban complexes as a whole are increasingly being sustained by less demographically dense areas and the urban core’s survival depends to a large extent on the dynamism of these surrounding areas (cf. Rees and Wackernagel 1996).

The economic meaning of the term is reflected in the high degree of non-agricultural employment (Jones 1997: 239) that urbanisation brings about largely in the manufacturing, construction, trades and services sectors. Primary activities such as agriculture, livestock, forestry, fisheries, and mining are regarded as the preserve of the rural economy (Friedmann 2002: 4). But bearing in mind the ‘ecological footprints’ (Rees and Wackernagel 1996) of urban cores and the increasing recognition of the interconnectedness of the core and peripheral regions (Friedmann 2002: 15) as well as the fluidity and interpenetration (Rigg 2001: 152) that continues to blur the rural-urban divide, these residual activities are the engines that support (e.g., as sources of food and mate-

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rial flows for the construction industry) the urban core.

The humanist perspective of urbanisation sees it as

[...] a diverse set of events, experiences, meanings, and artefacts and the various social processes that shape (and are in turn shaped by) them (Knopp 1998: 150).

Taking a cue from recent social theorists and the acceptance of space and place as defining human social moments, Knopp (1995: 151) argues that

Urban images and experiences are now seen as manipulated, struggled over and reformulated in ways which are every bit as important to the accumulation (or loss) of social power by different groups as more traditionally material concerns [...].

Thus, urbanisation is "both an ecological and a social phenomenon" (McIntyre, Knowles-Yánez, and Hope 2000: 6-7). The above-mentioned perspectives imply that there are different ways of seeing or reading the 'urban'. This study leans more towards the materialist one, although certain humanist elements are explored later in the urban experiences of *kangkong* farmers.

In order to understand better the process of urbanisation, we will begin by looking at what 'urban' means. It is defined differently - officially - for the three countries in this study, and also in the rest of the world. In their review of the definitions of 'urban' used in the natural and social sciences, McIntyre et al. (2000: 18) noticed that "Social scientists use the term to refer to areas with high human population density, whereas ecologists use the term more broadly to refer to areas under human influence" so that what emerges is a hodge-podge of definitions depending on the contexts in which the term is used and who uses it.

As a way out of this definitional conundrum, McIntyre et al. (2000: 18) recommend that a study provides "at least a working definition of the 'urban environment' [...] explicitly including baseline information on demography, physical geography, socio-economic, and cultural factors that can potentially explain existing urban structure and predict trajectories of urban growth". This study is not about the 'urban environment' *per se* but concerns the social, economic and historical geography of a marginal yet distinctive space in a unique and dynamic region (Southeast Asia). As explained further in

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4 It is accepted that in a real sense one cannot really separate these perspectives as how one views the landscape, or experiences the city, depends on, among other things, one's economic and social standing and the experiences that define oneself.
the methodology chapter, the focus is on key capital cities in Southeast Asia so that the issue of 'urban' definition becomes moot and academic because capital cities in the region are self-evidently urban. However at some points in this study, the use of the term 'urban' will be defined according to the context in which it is used as, for example, in the case of explaining the region's urbanisation rate, where the use of a statistical definition of 'urban' is instructive. Having said that, it bears mentioning how the 'urban' is generally understood in this study. Adopting Short’s (2006: 2) definition, the term 'urban' is used here to refer to

[...] cities in general but especially the large sort of cities that are commonly recognizable as more than simply large villages. The term applies across a band of different city sizes, but the emphasis is on places that are both quantitatively and qualitatively different from large rural villages.

As will be clear later, this understanding of 'urban' attunes well with the notions of peri-urbanisation and the geography of the peri-urban. In this study, urbanisation is understood as an increase in the proportion of a population living in urban areas (after McGranahan et al. 2005: 802).

However, an equally ubiquitous and ambiguous term exists for that which is not 'urban' – namely, rural. Rural areas are assumed to be predominantly agricultural or agrarian especially in Southeast Asia. Although these two terms are recognised by their differences from each other, it is increasingly recognised that between these polar opposites is a continuum marked by the proportional influence of one or the other. This continuum is illustrated in Table 2-1. Writing in 1994, Koppel and Hawkins (1994: 20) admit that “the concepts “rural” and “urban” do continue to be meaningful in some instances as descriptors of land use systems”. But they realised5,

[...] that these terms are becoming less meaningful in many parts of Asia in distinguishing different patterns of socioeconomic development. Socioeconomic change is not as neatly arranged along rural-urban lines (spatially or functionally) as previously thought. The impacts of transportation, communication, and energy infrastructure development; the rise and spread of the service economy; significant rates of mixed agricultural, industrial, and service land uses; the increasing incidence of household participation in both agrarian and non-agrarian labor and capital markets; and new processes of interlinkage and segmentation between labor and capital markets in rural areas are just a few illustrations of the blurring distinction between socioeconomic activities in many rural and urban Asian areas. Yet interpreting these blurring distinctions has proven to be a problem. (Koppel and Hawkins 1994: 20-1)

5 This realisation is shared by a number of scholars (e.g., Baker 1995; Douglass 1998; Hoang Xuan Thanh, Dang Nguyen Anh, and Tacoli 2005; Kelly 1998; Rigg 2003; Tacoli 1998; Zoomers and Kleinpenning 1996).
Rural | Urban
---|---
Livelihoods drawn from crop cultivation, livestock, forestry or fishing (i.e. key for livelihood access to natural capital) | Livelihoods drawn from labour markets within non-agricultural production or making/selling goods or services
Access to land for housing and building materials not generally a problem | Access to land for housing very difficult; housing and land markets highly commercialised
More distant from government as regulator and provider of services | More vulnerable to "bad" governance
Access to infrastructure and services limited (largely because of distance, low density and limited capacity to pay) | Access to infrastructure and services difficult for low-income groups because of high prices, illegal nature of their homes (for many) and poor governance
Fewer opportunities for earning cash; more of self-provisioning. Greater reliance on favourable weather conditions | Greater reliance on cash for access to food, water, sanitation, employment, garbage disposal
Access to natural capital as the key asset and basis for livelihood | Greater reliance on house as an economic resource (space for production, access to income-earning opportunities; asset and income-earner for owners-including de facto owners)

Table 2-1 The rural-urban continuum after Satterthwaite (2000) reproduced from Farrington (2002: 14)

2.3 Urbanisation in Southeast Asia

Rapid urban change in Southeast Asia dates from the 1950s as with the case of most countries in Asia, Africa and Latin America (McGranahan et al. 2005: 802). In order to understand this phenomenon as it affects the region, we need to look at urbanisation within a comparative perspective. However, such comparison shall be limited to the countries of interest in this study, namely, Thailand, Viet Nam, and Cambodia.

While comparison is the overall framework in the following discussion, it should be borne in mind the limitations that continue to litter the sources of data and analysis of urbanisation trends not only in the region but in other less developed countries as well (Cohen 2006: 65). One significant limitation is the use of administrative divisions as a key determinant of what is 'urban'. What might be urban in one place is not in another due simply to the difference in what constitutes an 'urban place'. The UN's Population Division is the main international body that collects comparative urbanisation data and publishes the *World Urbanisation Prospects* and *Demographic Yearbook*. Its...
time-series data start in 1950 and develop projections for countries and areas through to 2030 and for agglomerations to 2015. Two types of urbanisation measures are included in the publication: the urban and rural populations for countries and areas, and the populations of urban agglomerations (Champion 2004: 26). Champion (2004: 36) concluded after his review of the UN's work in this area that

[...] despite the effort that the UN has put into its international guidelines over the past half-century, there would appear to have been virtually no progress towards greater comparability. Just as in the the 1950s and 1960s, still today the variety of nomenclatures and criteria used to determine what constitutes 'urban places' is bewildering, and there remains widespread reliance on the administrative division of territory to establish their boundaries.

Another reminder of the state of data on urbanisation trends in Southeast Asia comes from Jones (2004: 114-5) who argues that there are four major issues to consider when looking at these trends. These are: (i) classifications of settlement are still based on an urban-rural dichotomy that does not take into account uniquely Southeast Asian urban forms; (ii) given such a dichotomy, the criteria used to identify the 'rural' and 'urban' are faulty; (iii) the application of the concept of 'building blocks' or areas where both the urban or rural are designated is too large and unclear; and, (iv) new settlement classifications amenable for the inclusion of extended metropolitan regions need to be added to capture what is prima facie happening in the region and for which the traditional dichotomy is inadequate. Despite these glaring difficulties which prevent a proper comparison, there is not much room to manoeuvre because of data limitations (i.e., data are collected with the dichotomy and administrative division in mind by statistical agencies) except to be transparent about its nature and the associated definitions upon which data are based and to introduce another data source to validate claims.

Thus, the first step is to extract definitions used to define the 'urban' in the cities in this study and in generating the data included in the World Urbanisation Prospects. Data from this publication will also be used in the first stage of the analysis. And then, new data sources are introduced as a form of cross-checking. This data comes from the Global Rural-Urban Mapping Project of the Center for International Earth Science Information Network. McGranahan et al. (2005: 798) claim that the latter source is better, despite being provisional, because of its international comparability and local verifiability. This source uses UN data for its population estimates, but has integrated spatial es-
estimates of urban extent using additional sources such as the amount of reflected night-light.

### Cambodia

**Sources of data on the urban population**


**Definition:** Municipalities of Phnom Penh, Bokor and Kep and 13 additional urban centres.

### Sources of data for estimates of urban agglomerations and capital cities

**Phnom Penh (Phnom Pehn) (capital)**


**Statistical concept:** Urban agglomeration.

### Thailand

**Sources of data on the urban population**


**Definition:** Municipalities. In 1999, 981 sanitary districts were reclassified as Tambon municipalities and data for proportion urban were adjusted retrospectively.

### Sources of data for estimates of urban agglomerations and capital cities

**Krung Thep (Bangkok) (capital)**


**Statistical concept:** Metropolitan area.

### Viet Nam

**Sources of data on the urban population**


**Definition:** Places with 4,000 inhabitants or more.

### Sources of data for estimates of urban agglomerations and capital cities

**Hà Noi (capital) and Thành Phố Hồ Chí Minh (Ho Chi Minh City)**

**Sources of data:** Estimates for 1948 and 1970; censuses of 1960, 1979 and 1989.

**Statistical concept:** Urban agglomeration.

**Hai Phòng**


**Statistical concept:** Urban agglomeration.

### Source


Table 2-2 presents the definitions and sources of data for estimates of urban population and urban agglomerations. For estimates of the latter, both Cambodia and Viet Nam use the UN prescription of urban agglomeration while Thailand uses the metropolitan area. These concepts are defined by *World Urbanisation Prospects: The 2005 Revision Population Database* as shown in Appendix 1. Specifically, an urban agglomeration with at least 750,000 inhabitants or more is defined in the database as the de
facto population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries. It usually incorporates the population in a city or town plus that in the sub-urban areas lying outside of but being adjacent to the city boundaries.

While a metropolitan area

Includes both the contiguous territory inhabited at urban levels of residential density and additional surrounding areas of lower settlement density that are also under the direct influence of the city (e.g., through frequent transport, road linkages, commuting facilities etc.).

Map 2-1 Bangkok and its surrounding provinces: the extended metropolitan region (Taken from: ThinkNet Co. Ltd. 2003)

There is only one urban agglomeration in Cambodia (Phnom Penh) and Thailand (Bangkok), but three for Viet Nam: Hanoi, Haiphong and Ho Chi Minh City. In making comparisons, we need to remember that Thailand uses the ‘metropolitan area’ as a basis for defining its urban places. The “metropolitan area” in Thailand is defined as the region covering the metropolitan core of Bangkok-Thonburi and the five surrounding provinces (changwats) of Nakorn Pathom, Nonthaburi, Pathumthani, Samut Prakarn, and Samut Sakhon.

6 In terms of urban agglomeration, national census bureaus provide data to the United Nation Population Division using statistical concepts employed at the time of the survey. The UNPD has supposedly corrected those that are not based on the concept of urban agglomeration (United Nations Population Division 2002: 15).
Samut Sakorn (Map 2-1). This region is known in planning terms as the Bangkok Metropolitan Region or BMR. Considering that extended metropolitanisation is a major characteristic of its urbanisation dynamics, Bangkok is spatially huge compared to Hanoi or Phnom Penh. Furthermore, some areas in Phnom Penh are noticeably rural while certain areas of Kandal, a province adjoining Phnom Penh, are built up, which for planning purposes should be considered part of Phnom Penh’s urban agglomeration (Jones 2004: 121).

Despite the limitation of the UN datasets, comparison involving a limited number of countries (i.e., three in our case here) is still plausible because the cities, or urban agglomerations we are interested in passed the selection requirement of having 750,000 inhabitants or more. This may be a problem in the case of large-scale comparisons because this requirement may not be met and yet a place can be still considered urban.

The rate of urbanisation is the growth rate of the percentage urban and is equal to the difference between the growth rate of the urban population and that of the total population (United Nations Population Division 2002: 25). The urbanisation levels of the three countries are shown in Table 2-3. This table shows that urbanisation is generally increasing with Thailand leading the pack. By 2015, Thailand is projected to have at least 36% of its total population in urban places. This is followed by Viet Nam at 32% and then Cambodia at 26%. As such, the future for these countries is inevitably urban. Appendix 2 further shows that the urban annual growth rate of Cambodia’s urban agglomerations exhibits a pattern reminiscent of Thailand before 1980. Interestingly, while the urban annual growth rate and annual rate of change of percentage urban for Cambodia and Viet Nam have shown similar trajectories of downward growth post-1990, Thailand, on the other hand, shows an increase7. Such a trend might mean that the population in its extended metropolitan region is increasing. But beyond these broad trends, we need to ask: what is the spatial extent of urbanisation in these countries?

7 Historical analyses of these data show that the trend is actually very erratic especially for the period before the 1990s and tend to coincide with the tumultuous period in each of Cambodia’s and Viet Nam’s histories. It is possible that there are data reliability issues involved, but it cannot be ascertained unless separate study is undertaken. For our purposes here, what matters is the overall urbanisation trend.
<table>
<thead>
<tr>
<th>Year</th>
<th>Cambodia (thousands)</th>
<th>Urban (thousands)</th>
<th>Percentage urban (%)</th>
<th>Thailand (thousands)</th>
<th>Urban (thousands)</th>
<th>Percentage urban (%)</th>
<th>Viet Nam (thousands)</th>
<th>Urban (thousands)</th>
<th>Percentage urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>4,346</td>
<td>443</td>
<td>10.2</td>
<td>19,626</td>
<td>3,234</td>
<td>16.5</td>
<td>27,387</td>
<td>3,186</td>
<td>11.6</td>
</tr>
<tr>
<td>1955</td>
<td>4,840</td>
<td>496</td>
<td>10.2</td>
<td>22,759</td>
<td>4,106</td>
<td>18.0</td>
<td>30,052</td>
<td>3,935</td>
<td>13.1</td>
</tr>
<tr>
<td>1960</td>
<td>5,433</td>
<td>559</td>
<td>10.3</td>
<td>26,603</td>
<td>5,233</td>
<td>19.7</td>
<td>33,648</td>
<td>4,946</td>
<td>14.7</td>
</tr>
<tr>
<td>1965</td>
<td>6,141</td>
<td>665</td>
<td>10.8</td>
<td>31,209</td>
<td>6,311</td>
<td>20.2</td>
<td>36,099</td>
<td>6,256</td>
<td>16.4</td>
</tr>
<tr>
<td>1970</td>
<td>6,938</td>
<td>812</td>
<td>11.7</td>
<td>36,257</td>
<td>7,574</td>
<td>20.9</td>
<td>42,898</td>
<td>7,850</td>
<td>18.3</td>
</tr>
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<td>1975</td>
<td>7,098</td>
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<td>9,810</td>
<td>23.8</td>
<td>47,974</td>
<td>9,011</td>
<td>18.8</td>
</tr>
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<td>1980</td>
<td>6,613</td>
<td>818</td>
<td>12.4</td>
<td>46,334</td>
<td>12,413</td>
<td>26.8</td>
<td>53,005</td>
<td>10,202</td>
<td>19.2</td>
</tr>
<tr>
<td>1985</td>
<td>8,101</td>
<td>1,021</td>
<td>12.6</td>
<td>50,812</td>
<td>14,220</td>
<td>28.1</td>
<td>59,136</td>
<td>11,568</td>
<td>19.6</td>
</tr>
<tr>
<td>1990</td>
<td>9,738</td>
<td>1,227</td>
<td>12.6</td>
<td>54,639</td>
<td>16,077</td>
<td>29.4</td>
<td>66,206</td>
<td>13,410</td>
<td>20.3</td>
</tr>
<tr>
<td>1995</td>
<td>11,368</td>
<td>1,609</td>
<td>14.2</td>
<td>58,336</td>
<td>17,662</td>
<td>30.3</td>
<td>73,163</td>
<td>16,248</td>
<td>22.2</td>
</tr>
<tr>
<td>2000</td>
<td>12,744</td>
<td>2,155</td>
<td>16.9</td>
<td>61,438</td>
<td>19,134</td>
<td>31.1</td>
<td>78,671</td>
<td>19,101</td>
<td>24.3</td>
</tr>
<tr>
<td>2005</td>
<td>14,071</td>
<td>2,775</td>
<td>19.7</td>
<td>64,233</td>
<td>20,749</td>
<td>32.3</td>
<td>84,238</td>
<td>22,246</td>
<td>26.4</td>
</tr>
<tr>
<td>2010</td>
<td>15,530</td>
<td>3,540</td>
<td>22.8</td>
<td>66,785</td>
<td>22,682</td>
<td>34.0</td>
<td>89,718</td>
<td>25,866</td>
<td>28.8</td>
</tr>
<tr>
<td>2015</td>
<td>17,066</td>
<td>4,453</td>
<td>26.1</td>
<td>69,064</td>
<td>24,970</td>
<td>36.2</td>
<td>95,029</td>
<td>30,004</td>
<td>31.6</td>
</tr>
</tbody>
</table>

Table 2-3 Total population, urban population, and percentage urban of the countries in this study (Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat 2005)

Based on data from the Global Rural Urban Mapping Project (GRUMP)\(^8\), which is derived from integrating census data with geospatial datasets, Table 2-4 shows the nature and characteristics of the urban extent of the countries in this study. In terms of land area, Thailand has, by far, the greatest urban area followed by Viet Nam and then Cambodia. It also has the largest settlement\(^9\) point by population and dwarfs both Cambodia and Viet Nam in a number of other respects: in having the largest spatial areas with 5,000 or more persons; and, the largest urban extent. The use of night-time lights\(^10\) as a proximate measure of the spatial extent of settlements shows that Thailand surpasses all the other countries in this study. The picture, however, changes when average density of urban settlements is the object of comparison. Viet Nam, in view of its dense settlement and high population growth, has the largest mean settlement point by population distribution (cf. mean extent in Table 2-4). This means that there are more

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\(^8\) This is a project produced by the Center for International Earth Science Information Network (CIESIN) of the Earth Institute at Columbia University together with the International Food Policy Research Institute (IFPRI), The World Bank, and Centro Internacional de Agricultura Tropical (CIAT). Output from GRUMP differs somewhat from the UN estimates because of the limitations of the latter’s data but it has build on this dataset to establish its own estimates by integrating census data with spatial datasets (e.g. nighttime lights) and the inclusion of more small settlements (Baik et al. 2004: 15). Whether the latter explains the differences in percentage urban in 2000 as reported in Table 2-3 based on the UNPD data and percent total population that is urban for the same year in Table 2-4 cannot be made. The provider of Table 2-4 claims that they use data from the UNPD.

\(^9\) A settlement is defined in the GRUMP as cities and towns of 1,000 persons or more (Baik et al. 2004: 6).

\(^10\) This could, however, be problematic because the intensity of its use could be a function of development level rather than population or urban densities.
Vietnamese per urban spatial area than Thais, despite the wide urban spatial coverage in Thailand in general.

In terms of Southeast Asia as a whole, two features may be generalised from the urban growth of each country in the region. These are the degree of urban primacy and the concentration of growth within large and complex urban centres. Urban primacy refers to the population size of one city or urban region in relation to another, usually a secondary one, in a country so that primacy indicators will tell us how much of the urban population is concentrated within the largest city. Both processes point to similarities in spatial manifestations. In Southeast Asia, the primary urban centres also tend to be where economic growth is largely concentrated so that the resulting development characteristic has been uneven (Dixon and Smith 1997). Recently, it has been shown that there is an increasing relationship between urban primacy and growth in developing countries but only up to a certain point before the negative externalities (e.g., congestion and pollution) of urban concentration set in (Bertinelli and Strobl 2007).

2.4 The desakota model redux

The desakota model was conceived by McGee (2003; 1989; 1991) with support from Ginsburg (1991a) after years of engagement and reflection with the geographies of Southeast Asia, in general, and settlement systems, in particular. This model was later expounded and applied in the works of McGee’s students, notably Greenberg (1994), Kelly (1998; 1999a; 1999b; 2000), and Leaf (1996; 1999; 2002), among others. An edited book by Ginsburg et al. (1991) provides an early attempt to grapple with the model and provide examples of its applications. Examples in this volume come from China (such as Lee 1991; Liu and Tsai 1991; Pannell and Veeck 1991; Veeck 1991; Whitney 1991; Yixing 1991), Japan (such as Latz 1991), India (such as Chakraborty 1991), and Indonesia (such as Douglass 1991 and Jamieson 1991). In addition, other researchers have also used the model in their work either as a framework of engagement or a backdrop underpinning settlement systems and processes (e.g., Firman 1992, 1996, 1997; Hugo, Champion, and Lattes 2003; Jones 1998b; Jones 1997; Jones 2004; Parnwell and Wongsuphasawat 1997; Sui and Zeng 2001; Xie et al. 2006; Zeng, Sui, and Li 2005).
In the process, it has gained wide currency and deepened the understanding of settlement transitions. It has also become an important model in understanding rural-urban interaction and the nature of the peri-urban interface and there is a confirmation that this model is useful in understanding extended metropolitanisation in Southeast Asia (Adell 1999: 21-2; Douglas 2005: 5-6, 11). Desakota is now part of the urban planning lexicon commonly referred to as extended metropolitanisation. Despite noteworthy criticisms from Dick and Rimmer (1998), demographers (e.g., Champion and Hugo 2004; Hugo, Champion, and Lattes 2003; Jones 1998b; Jones 1997; Jones 2001; Jones 2002, 2004) have highlighted the model's importance and rallied others to reflect it in population censuses and estimates. This only reinforces the model's utility and applicability to situations 'apparently unique' to the region. In early 1990s, the model was already dubbed as "a new spatial paradigm" (Ginsburg 1991a). This paradigm is a critique to what was perceived to be the inadequacy of the conventional, Western-dominated views of Southeast Asian settlement transitions. Quoting McGee (1991: 4),

[... in the Asian context the conventional view of the urban transition, which assumes that the widely accepted distinction between rural and urban will persist as the urbanization process advances, need to be re-evaluated. Distinctive areas of agricultural and non-agricultural activity are emerging adjacent to and between urban cores, which are a direct response to pre-existing conditions, time-space collapse, economic change, technological developments, and labor force change occurring in a different manner and mix from the operation of these factors in the Western industrialized countries in the nineteenth and early twentieth centuries.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Cambodia</th>
<th>Thailand</th>
<th>Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>179,492.12</td>
<td>513,617.52</td>
<td>328,534.61</td>
</tr>
<tr>
<td>Num Settlement Points</td>
<td>27</td>
<td>167</td>
<td>55</td>
</tr>
<tr>
<td>Smallest Point (pop)</td>
<td>2,831</td>
<td>4,796</td>
<td>27,310</td>
</tr>
<tr>
<td>Mean Point (pop)</td>
<td>80,575.85</td>
<td>87,551.82</td>
<td>187,603.84</td>
</tr>
<tr>
<td>Urban Criteria (UN)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Municipalities of Phnom Penh, Ream, Battambang and 13 additional urban centres.</td>
<td>Municipalities. Places with 4,000 inhabitants or more.</td>
<td></td>
</tr>
<tr>
<td>Num Urban Extents</td>
<td>22</td>
<td>116</td>
<td>52</td>
</tr>
<tr>
<td>Largest Extent (sq.km)</td>
<td>252</td>
<td>6,028</td>
<td>1,286</td>
</tr>
<tr>
<td>Smallest Extent (sq.km)</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Mean Extent (sq.km)</td>
<td>30.56</td>
<td>237.28</td>
<td>114.59</td>
</tr>
<tr>
<td>Sum-All Urban Extents (sq.km)</td>
<td>672</td>
<td>27,525</td>
<td>5,969</td>
</tr>
<tr>
<td>Largest Extent (pop)</td>
<td>1,269,355</td>
<td>11,274,980</td>
<td>5,834,918</td>
</tr>
<tr>
<td>Smallest Extent (pop)</td>
<td>5,578</td>
<td>5,843</td>
<td>5,388</td>
</tr>
<tr>
<td>Mean Extent (pop)</td>
<td>85,709</td>
<td>179,199</td>
<td>334,735</td>
</tr>
<tr>
<td>Sum-All Urban Extents (pop)</td>
<td>1,885,589</td>
<td>20,787,133</td>
<td>17,406,228</td>
</tr>
<tr>
<td>Pct Total Land Area in Urban Extents (sq.km)</td>
<td>0.37</td>
<td>5.36</td>
<td>1.81</td>
</tr>
<tr>
<td>Pct Total Population in Urban Extents (2000,NSO est.)</td>
<td>15.6</td>
<td>34.1</td>
<td>23.4</td>
</tr>
<tr>
<td>Pct Total Population that is urban (2000,UN)</td>
<td>17.5</td>
<td>20.0</td>
<td>24.5</td>
</tr>
<tr>
<td>Num UE's from Nighttime Lights</td>
<td>4</td>
<td>107</td>
<td>51</td>
</tr>
<tr>
<td>Num UE's from Regressions</td>
<td>8</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Num UE's from DCW</td>
<td>10</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Glossary:
- **Area**: Land area in square kilometers from the United Nations Statistics Division.
- **Num Settlement Points**: The number of populated places as defined by their latitude and longitude coordinates. This includes cities, towns, villages, and other populated sites.
- **Smallest Point (pop)**: The smallest settlement point by population.
- **Mean Point (pop)**: The mean settlement point by population.
- **Urban Criteria (UN)**: The definition of urban for a country as given by the United Nation's World Urbanization Prospects, 2001 Revision.
- **Num Urban Extents**: The number of spatial areas that are defined as urban, e.g. 5000+ persons.
- **Largest Extent (sq.km)**: The size of the largest urban spatial area by sq. km.
- **Smallest Extent (sq.km)**: The size of the smallest urban spatial area by sq. km.
- **Mean Extent (sq.km)**: The mean size of the urban spatial areas by sq. km.
- **Sum-All Urban Extents (sq.km)**: The sum of all of the urban spatial areas by sq.km.
- **Largest Extent (pop)**: The largest urban spatial area by population.
- **Smallest Extent (pop)**: The smallest urban spatial area by population.
- **Mean Extent (pop)**: The mean size of the urban spatial areas by population.
- **Sum-All Urban Extents (pop)**: The sum of the population of all urban spatial areas.
- **Pct Total Land Area in Urban Extents (sq.km)**: Percentage of a country's total land area that is taken up by urban spatial extents.
- **Pct Total Population in Urban Extents (2000,NSO est.)**: Percentage of a country's total population that is in urban spatial extents.
- **Pct Total Population that is urban (2000,UN)**: Percentage of a country's total population that is considered urban.
- **Num UE's from Nighttime Lights**: Number of urban extents that came from the Nighttime Lights source data.
- **Num UE's from Regressions**: Number of urban extents that came from the regressions performed by CIESIN.
- **Num UE's from DCW**: Number of urban extents that came from the Digital Chart of the World source data.

Table 2-4 The urban extent of Cambodia, Thailand and Viet Nam (Source: CIESIN et al. 2004)

The term desakota comes from two Indonesian words: desa (village) and kota
According to McGee (1991: 24), this term was adopted after discussions with Indonesian social scientists in order to privilege 'the empirical reality' of developing countries because he believes that "[r]eliance solely on the language and concepts of Western social science [...] can lead to a form of 'knowledge imperialism'". The original formulation of the term was kotadesasi, but it resulted in mixed reviews among the participants of a conference in 1988 (Ginsburg 1991b: xvii). Although it was not resolved then, desa-kota became the accepted form and is variously translated in English as 'extended metropolis' or 'dispersed metropolis'. These translations are, however, only considered as approximations as the exact nature of the model cannot be reduced to a few words, despite the former gaining currency. Ginsburg (1991b: xvii) highlighted that "[T]he ambivalence about terminology is not only understandable, but it also underscores the originality and uniqueness of the hypothesis [...]" Today, more authors are using either desa-kota or extended metropolitanisation to describe a zone within the hinterland of large cities where interaction is intense.

McGee (1989: 94) observes that the rapid urbanisation that occurred from the 1960s until the late 1980s in Southeast Asia was accompanied by extraordinary co-existence between agricultural and non-agricultural activities within the same space around the peripheries of large cities. This process has five main features. First, there is an increase in the number and diversity of non-agricultural activities in agricultural areas such as trading, transportation, and industry. Such a process is even manifested within farming households where some members may be involved in income generating activities de-linked from farming. Second, the zone, where such a process occurs, is characterised by 'extreme fluidity and mobility of the population' which is being aided, in part, by cheap and readily available transport options. Third, the intense co-existence of agricultural and non-agricultural activities in this zone pose both negative and positive externalities to each other in the sense that certain industrial activities pollute farming systems (negative externality) while the concentration of people involved in different activities provides for a ready market for agricultural produce (positive externality). Also, these non-agricultural activities can also utilise excess or unused labour among farming households. Fourth, there is an increasing feminisation of industrial ac-
tivities in this zone. Increasingly the female workforce is drawn into industrial work such as in the case of female garment and textile workers in Bangkok, Hanoi, and Phnom Penh. This is a reflection of the shift in the nature and pattern of activities in this zone from agricultural to industrial production (McGee 1991: 17). Fifth, desakota areas are institutional blind spots where existing sectoral institutions are unresponsive to the emerging use and access issues of space and resources that straddle the rural-urban divide (McGee 1989: 94-5). Finally, areas considered as desakota have in the past, and at present, a substantial number of their population engaged in small-holder rice cultivation (McGee 1991: 16).

McGee (1991) asserts that the development of settlement patterns among Asian cities is unique and profoundly reflects the agricultural and demographic heritage of the region. The production of rice is an important locus that defines the evolving settlement system. Such settlement transition is considered “distinctive to Asia” where there have been long settled dense populations involved in wet-paddy cultivation (Ginsburg 1991b: xiv). According to (Ginsburg 1991a: 36)

[...] most peoples in most Asian countries are concentrated in lowland areas, usually large alluvial, in which wet-paddy cultivation either for subsistence or for markets, is the norm. What is remarkable is that almost all urban development has been associated geographically with these already densely populated regions. Thus, urban populations and rural populations are juxtaposed and, one must argue, intimately related. This is not [italics not mine] the case in other parts of the developing world, with few exceptions.

McGee (1991: 7) suggests that the “existence of these agroeconomic systems provides the possibility for the emergence of certain urban systems and regions”. The role of rice farming in this settlement transition is predicated on the fact that such farming is labour intensive and the skills developed are transferable to other forms of petty commodity production such that, McGee (1991: 15) claims, “the labor force of these rice-bowl areas was ‘culturally’ prepared to commit its labour to various forms of ‘new’ non-agricultural activity”. As the space-economy is increasingly fused and more non-agricultural activities dot the erstwhile rice growing areas, it is assumed that the primary sources of livelihoods migrate away from agriculture - though still an important income source - to non-agricultural forms such as industries, services or trade. This, thus, becomes one of the defining characteristics of desakota areas (Ginsburg 1991a: 37).
Furthermore, the expansion of the city into the countryside with a high-density population involved in agriculture and its attendant artefacts was aided in large part by significant improvements in transport networks and systems (McGee 1991: 7). Extensive road networks cover Bangkok. In an effort to decongest the city centre, major lanes and highways are built which immediately connects the city and its hinterlands. In Hanoi, new bridges and ring roads (e.g. Ring Road No 3) are built to improve Hanoi's urban transport infrastructure and encourage the dispersal of activities and human settlements away from its congested city centre. In Phnom Penh, new roads and bridges connecting the core of the city with the other side of the Mekong River have been built resulting in development sprawling towards Kandal Province. In addition, new modes of transport exist in these cities aside from the usual cars and motorbikes. Commuter vans in Bangkok ferry passengers from key points in the city centre such as Victory Monument, On Nut Train Station, and Mor Chit Train Station to areas in the extended metropolis. In Hanoi, motorbikes are the transport of choice, although buses have recently been introduced. While Phnom Penh is also dependent on motorbikes for transport (Photo 2-1), the people's ingenuity has led to the adoption of an improvised motorised cart powered by either a hand-tractor engine or a motorbike to transport goods and
people to and from the city. The construction of these vehicles is normally basic, such as the absence of enclosures to protect the passengers from the elements, but they serve the purpose of bringing people and goods from one place to another. These transport networks and new vehicular forms deepen the connectivities between the city and its hinterland, the people in different spaces, and ideas leading to more flows and interactions.

McGee (1991: 6-7) outlined how a spatial system of a distinctive ‘space-economy transition’ in Asia might look (Figure 2-2). These spaces are occupied by one or two extremely large major cities (1) connected to secondary cities or towns by a good transport network. Around these major cities are peri-urban areas (2) within an accessible commuting distance to and from the city core. These areas may be located 30-50 km away. Desakota areas are those labelled (3). These areas are formed along major transport corridors linking the city core with industrial towns. Densely populated rural areas (4) are found beside desakota areas and are a pool of cheap labour when labour in the desakota is in short supply. Beyond these areas is a sparsely populated frontier (5) which is predominantly agriculture-based. Space-economy transition in Asia (adapted from McGee 1991: 6).

Depending on the local social and economic conditions, this spatial system may be expressed in three types: desakota Type 1, desakota Type 2, and desakota Type 3. Desakota Type 1 depicts regions with declining rural settlement, land use, and agricultural population due to strong rural-to-urban migration. Desakota Type 2 describes regions adjoining urban cores where there is rapid economic growth compared with other
regions of the country. Here is seen a shift from agricultural to non-agricultural activities, rising household income, better transport networks, and improved infrastructures. Finally, desakota Type 3 refers to regions with dense population, low productivity in both agriculture and non-agriculture sectors, surplus labour, and which are closely located to secondary urban centres with sluggish economic performance (McGee 1991: 8-9).

In sum, a convergence of factors led to the emergence of desakota including the expansion of the urban core; the existence of an already dense population and availability of cheap labour which does not need large-scale migration of labour to support nascent industries; changing employment sources; industrial concentration; and transport improvements easing commuting distance and movement of goods and people. Although desakota is now widely accepted, it has had its share of criticism notably from Dick and Rimmer (1998). They argued that the notion of an intense zone of interaction interspersed within a rapidly urbanising landscape and considered unique to Southeast Asia is not really what it claims to be. In fact, according to these scholars, the desakota paradigm is a misinterpretation of the history of Southeast Asian cities when growth diverged from the models followed by its western counterparts. Subsequent development, especially the advent of globalisation, has re-established the parallels in development pattern between developed countries and Southeast Asian cities such as the “westernization” of urban lifestyles, architectures, transportations and ways of doing business. The bulk of the Dick and Rimmer critique will be returned to in the succeeding section.

2.5 Convergence - The globalisation rebuttal - divergence

The histories of Thailand, Cambodia and Viet Nam are at various points intertwined and divergent, and their everyday realities are also simultaneously different and similar. They are different in a sense that their development follows different trajectories and the scale and diversity of the attending social challenges are characteristically unique in their own right. The development of each is attended to by different political, economic, social, cultural and religious influences. The manner by which they have internalised these influences is also unique to each country. Even their capital cities re-
flect their differences and similarities. In this broad canvas of mainland Southeast Asia’s early history, it should be fairly obvious that despite borrowed influences, the region has always had urban traditions (Figure 2-3). Indeed in the 14th to the 17th centuries, Southeast Asia “in relation to its total population [...] must have been one of the most urbanized areas in the world” (Reid 1980: 239 as quoted in Miksic 2000: 118). Dick and Rimmer (1998) proffer that throughout history, from the prototypical walled city or pre-colonial city to the idealised global city, there has been convergence, divergence, and finally convergence:

*Convergence* between urban forms in metropolitan countries and south-east Asia from about the 1880s to the 1930s was brought about by the increase in political and economic control exerted by metropolitan powers through colonial rule, trade, investment and new transport technologies.

*Divergence* in urban forms between metropolitan countries and south-east Asia occurred from the 1940s to the 1970s as a consequence of the breakdown of colonial political and economic control and the installation of indigenous administrations; marked by the disintegration of transport systems.

*Convergence* between urban forms in metropolitan countries and south-east Asia was renewed in the 1980s by increasing trade and investment and the application of telecommunications and high-speed transport. (Dick and Rimmer 1998: 2306)

To Dick and Rimmer, the convergence with largely American models at the third phase is a more appropriate lens to view developments in Southeast Asian urbanism than McGee’s *desakota* due to a ‘rebundling’ of urban elements. Such rebundling has been brought about by fear of discomfort that might befall the region’s new middle class. Their standpoint is that “the driving force behind the new urban geography of south-east Asia is the avoidance of social discomfort” resulting in “gated residential communities, condominiums, air-conditioned cars, patrolled shopping malls and entertainment complexes, and multi-storeyed offices”, which they argue are “the present and future world of the insecure middle class in south-east Asia” (Dick and Rimmer 1998: 2317).

McGee (2005: 15) cheekily likens such an idea “to that of George Bush and his advisors that sees the American model of democracy as applicable in all societies” and he further remonstrates that “there is a large amount of naiveté and indeed arrogance in assuming the universal application of systems that ignore the interaction between local forces embedded in different cultural milieus with these supposedly universalising tendencies”.
Figure 2-3 Dick and Rimmer's model showing phases of convergence and divergence in the development of South-east Asian cities (Source: Adopted from Dick and Rimmer 1998: 2306)

McGee (2002: 48) reduces Dick and Rimmer's criticisms to two issues: (i) desakota as a form of reconstituted Orientalism; and, (ii) desakota as ignoring the processes of urban sprawl. His responses then are that it is not assumed that the desakota model is applicable to the whole of Southeast Asia such as Kuala Lumpur and Singapore. The model is particularly more suited to mega-urban regions such as JABOTABEK\textsuperscript{11}, the Bangkok Extended Metropolitan Region, and the Manila-Cavite region. Furthermore, he adds, the desakota model is concerned with the interactions between the processes driving urban sprawl in general with "in-situ societies [...] within the broader political economy of the urban region where these processes were working their way out". Thus, McGee (2003) is persistent that his desakota model is still a useful paradigm through which settlement transition in Southeast Asia can be understood and in fact calls on the renewal of the debate on Southeast Asian urbanisation. Despite his persistence, Rimmer (2002: 4) still claims that there are major shortcomings of the model for it focuses on 'local contextualities', thus ignoring the impacts of globalisation, failing to explicate what mechanisms lead to such a settlement form. Thankfully, McGee is open to these criticisms and recognises that

\textsuperscript{11} It stands for Jakarta, Bogor, Tanggerang and Bekasi (Jones 2002: 125).
of people. Thus, the processes of divergence and convergence, inclusion and exclusion will occur at the same time as they work their way out in particular urban sites (McGee 2002: 49).

2.6 Divergence

McGee and Greenberg (1992: 24) argue that the pattern of urbanisation in Southeast Asia only superficially repeats that of the West. In fact, it differs in three ways: (i) what were distinctly defined rural and urban activities was dismantled faster in the region than it was in the West; (ii) the availability of new transport technologies such as two-stroke motorbikes makes transport affordable and accessible facilitating the increasing connection of places and people; and, (iii) the industrialisation and economic growth in Southeast Asia has been restricted to mega-urban regions such as Bangkok and Ho Chi Minh City thereby concentrating economic activities in these areas.

In today’s Southeast Asia, however, there are forces that are arguably continually reworking the nature of cities. These forces are transnational and are changing the economic, cultural, and technological landscapes of the region’s cities. These forces result from the process of globalisation. Leaf (2002: 23) describes globalisation as

[...] multidimensional and not easily summarized, as it derives from an array of transnational or, at least, trans-local connectivities which shape economic, social, cultural and political relationships and which are expedited by ongoing advances in communications and transportation technologies. The urban milieu plays an important function in this, as it is the primary spatial framework within which flows of capital, goods, people, and information are concentrated. The possible effects of globalization on cities are therefore complex, multifaceted and geographically diverse.

That said, globalisation will continue to be an important backdrop to urbanisation in the region (McGranahan et al. 2005: 818). Douglass (2000: 2315) notes that “[u]rbanisation and globalisation are interdependent and mutually reinforcing. The shaping of urban form and the dominant activities within a given city to an increasing degree reflect its mode of linkage with globalising circuits of capital.” The interlocking processes of globalisation and urbanisation “are combining to produce a form of mega-urban regionalism which appears to be economically dynamic but produces many problems of urban environmental deterioration, urban management and the creation of sustainable cities” (McGee 1997: 40).

An indication that these transnational, or globalisation, forces have penetrated
localities is the degree to which foreign-sourced capital has underpinned the local (as national) economies. Dixon and Smith (1997: 3-4) argues that "[...] with the rapid increase in the internalisation of finance and production since the late 1960s, capital has become increasingly sensitised to the differences between places, particularly in terms of the way in which they interact with capital". The flow of capital has been shown to be an important determinant in urban land use change in a significant number of cities or regions in Asia such as in the Pearl River Delta, China (Seto and Kaufmann 2003); Cebu, Philippines (Sajor 2003); Cavite, Philippines (Kelly 1998, 1999a, 2000); Bandung Metropolitan Region, Indonesia (Firman 1996); Hanoi, Viet Nam (Douglass et al. 2002:1-1; Leaf 1999, 2002; Nguyen Quang and Kammeier 2002); and Bangkok, Thailand (Greenberg 1994; Sauwalak Kittiprapas 1999; Utis Kaothien and Webster 2000; Webster 2002a, 2002b, 2003).

In the case of Viet Nam, for instance, the impacts of globalisation - mediated by institutions and economic development - was sudden and resulted in dramatic changes occurring in its peri-urban spaces. Here, the landscape and the households embedded there were profoundly affected as the urban core expanded and engulfed the city's hinterlands. Increasing demands brought about by economic development in the core brings about changes on the urban edge, such as new housing settlements, ad hoc densification of pre-existing villages, and competing demands for commercial, residential and agricultural activities on a limited space (Leaf 2002).

It is with this in mind that Bunnell et al. (2002: 3-4) call for a reconceptualisation of the city in Southeast Asia as 'nodes in transnational networks'. Being in a contiguous land mass, having improved transport and communication links, increasing transnational flows of people brought about by political rapprochement and the lowering of political barriers to cross-border movements, these cities are therefore linked in more ways than one. Such linkages or connectivities define them, their past and their future. Writing in the late 1970s on the trajectory of mainland Southeast Asia's metropolitan growth, Keyes (1977: 320) remarks that:

In premodern times, the city and village existed as part of an organic society. The city defined the meaningful world for city dwellers and peasants alike, since it was the sacred center of
the world. Forces unleashed in the colonial period shattered the organic unity of the traditional world and stimulated a process whereby the predominant political, cultural, and economic roles of the city in mainland Southeast Asia were fragmented, being defined in part with reference to a European-dominated context, in part with reference to the interest [sic] situation of migrants from non-Southeast Asian countries, and only residually with regard to the social demand of the natives of the country. This fragmentation of roles played by the cities of mainland Southeast Asia—and most intensely by the great cities in the region—persisted into the postcolonial period.

However through the different degrees of penetration of transnational forces into the many urban spheres of mainland Southeast Asia, the linkages established between and among people, spaces, and ideas and through the unique processes upon which cities imbibe and call on various knowledges, the detailed composite picture of Southeast Asian urbanism points to a divergence from that of the West. This divergence materialises despite broad similarities in their trajectories of development, as per Dick and Rimmer's (1998) argument. The continued unfolding of desakota zones in the region supports such an assertion. Thus, Simon et al. (2005: 11) contend that

\[\ldots\] it is unhelpful to expect or to search for uniform processes in different circumstances. Similarity of urban structure (including size) at one point in time is not a good predictor of similarity in underlying process and the dynamics of change. The effect of desakota and other emerging forms of metropolitanisation is to enable some profoundly urban and postindustrial features and activities within rural areas where other conditions are conducive. Conversely, increasing poverty, widespread urban agriculture and livestock rearing are increasing the 'ruralization' of many towns and cities. Therefore, it is increasingly difficult to think of the extremes of the continuum as truly 'urban' and 'rural' in the traditional sense.

Of course, it would be misguided to dismiss the role of global or transnational forces in urban and social change in Southeast Asia so that Rigg (2001: 155) reminds us that

\[\ldots\] when it comes to understanding—beyond the mundane and self-evident—the specifics of what is happening in any given area, then it is the role of local political economies in mediating the global which is critical in bringing precision to any interpretation.

As such, paraphrasing McGee (2002: 48), understanding Southeast Asian urbanism which privileges the interaction between local political economies with broader political processes is just what the desakota model seeks to achieve in this study.

Since a desakota is a splintered landscape, opportunities are created for certain livelihoods suitable to the metabolic outputs of the city or the natural endowments of the place such as the existence of natural rivers and streams that provide a ready source of water. The production of kangkong is argued in this study to have exploited these opportunities to satisfy the food demands of the city and provide important livelihoods to households in the peri-urban zone. However, not all production systems are the same. For example, Bangkok tends to use non-wastewater in its production of
kangkong while Hanoi and Phnom Penh rely heavily on the availability of wastewater from the city. As the discussion in Chapter 9 on the ecology of kangkong will show, this plant thrives efficiently in highly eutrophic water. This means that the use of wastewater in Hanoi and Phnom Penh provides their production systems with freely available nutrients. Because this is not the case for Bangkok, its production systems tend to be intensive with more inputs introduced than in the other cities.

2.7 Water and geography

In monsoon Southeast Asia, water is ubiquitous. The amount of rainfall the region receives defines the region’s unique tropical characteristics. The region’s abundant rainforests, productive rivers, and teeming seas owe much of their fertility to a copious supply of water. Water thus permeates both landscape and lifeways. In the landscape, the presence of water can have both generative and destructive tendencies. Water generates life and supports livelihoods. But too much water, as in the case of flooding, also affects human well-being. In Phnom Penh, for example, a New York Times reporter, Matt Steinglass, describes its relationship with water as

precarious [...] each summer, the combination of monsoon rains and melting snow flowing down the Mekong from the Himalayas floods the farmland surrounding the city and causes the Tonle Sap River to reverse direction (Steinglass 2005).

Phnom Penh is located along the confluence of four major river branches forming a quarter bras or four branches. These branches are the Tonle Sap (or Sap River), Bassac River, Upper Mekong River, and Lower Mekong River. Bangkok, on the other hand, is located on the main channel of the Chao Phraya River (Map 1-1).

Water then becomes the medium through which the link materialises and connects kangkong in the geographies of interstitial spaces. Water defines these households, their sources of income, and their settlement. But, on the other hand, water is also ‘reconstituted’ as it passes through different household and livelihood processes such as the degradation of its quality. This makes water both an actor and a space of circulation in such geographies. As Gandy (2004: 373) puts it:

Water is not simply a material element in the production of cities but is also a critical dimension to the social production of space. Water implies a series of connectivities between the body and the city, between social and bio-physical systems, between the evolution of water networks and capital flows, and between the visible and invisible dimensions to urban space. But water is at the same time a brutal delineator of social power which has at various times
worked to either foster greater urban cohesion or generate new forms of political conflict.

An important aspect of the geography of these interstitial spaces is the availability of water which makes aquatic livelihoods viable. Such water may come from either natural sources such as rivers or from wastewater from the city. Bangkok, in this study, uses water from the Chao Phraya River in producing kangkong while Hanoi and Phnom Penh use wastewater. Van der Hoek (2004: 12-13) defines urban wastewater as being composed of the following:

1) Domestic effluent consisting of blackwater (excreta, urine and associated sludge) and greywater (kitchen and bathroom wastewater);
2) Water from commercial establishments and institutions, including hospitals;
3) Industrial effluent; and,
4) Stormwater and other urban runoff.

These components are illustrated in Figure 2-4. The use of wastewater in agricultural production is widespread especially in urban and peri-urban areas. According to Baumgartner and Belevi (2001: 22), 10% of the world’s wastewater is currently used for irrigation. In the cities of Santiago (Chile) and Mexico City, 100% of wastewater are used for irrigation, amounting to some 70% and 80%, respectively, of the irrigation waters used in the surrounding agricultural areas during the dry season. The use of wastewater, excreta and greywater in agriculture worldwide is increasing due to increasing water scarcity, stress and degradation; improper waste disposal; population increase; and the increasing awareness of their values (WHO 2006b: 6). These are projected to increase due to continued urbanisation (WHO 2006a: 6).
2.8 Waste and metabolism

As cities grow, the amount of waste they generate also grows. This increased availability of waste has created the possibility for agriculture and aquatic food production systems in the peri-urban zone such as the use of wastewater in fish, vegetable and livestock production. Warren-Rhodes and Koenig (2001: 429) elucidate that just as materials and energy are required for human metabolism and work, cities rely on a continuing supply of energy, resources and information to function. In cities, metabolic flows arise from material use, food consumption and urban development; materials are stored as infrastructure; and materials and wastes are moved through man-made circulatory systems, with pollutants released to air, land and water systems. Wolman (1965) first articulated the notion of 'the metabolism of cities' in 1965. He said that the metabolic requirements of a city can be defined as all the materials and commodities needed to sustain the city's inhabitants at home, at work and at play. Over a period of time these requirements include even the construction materials needed to build and rebuild the city itself. The metabolic cycle is not completed until the wastes and residues of daily life have been removed and disposed of with a minimum nuisance and hazard. (Wolman 1965: 179)

In short, “energy and material flows through human settlements are conceived as urban metabolism, in which material inputs are transformed into useful energy, physical structure, and waste” (Decker et al. 2000: 687). The idea of ‘metabolism’ has physical and biological connotations, which are “based on the laws of thermodynamics which show that anything which comes into a biological system must pass through and that the amount of waste is therefore dependent on the amount of resources required”. Converting these wastes back into the system entails massive use of energy (Newman 1999: 221). Nonetheless, wastes can be ‘recycled’ without necessarily converting them back to their original state. This includes the use of wastes in urban agriculture and aquaculture.

Urban agriculture and aquaculture have huge promise in reducing cities’ ecological footprints by recycling wastes and producing food around the vicinities of cities where extended transport networks are not needed. Such agriculture is not only vitally important to farming households around the urban fringe of the city but to the food security of urban households. Despite the apparent associated health impacts of wastewater use, wastewater is considered a resource that with ‘best practises’ can be used effectively and safely. In the 2002 Hyderabad Declaration on Wastewater Use, it is recognised
that wastewater (raw, diluted or treated) "is a resource of increasing global importance, particularly in urban and peri-urban agriculture" and that "[w]ith proper management, wastewater use contributes significantly to sustaining livelihoods, food security and the quality of the environment" (Costa-Pierce and Desbonnet 2005: 8). Since this study is more related to aquaculture than agriculture, the former is given focus. Sites in this study where waste or specifically wastewater is used are Hanoi and Phnom Penh. Although Bangkok uses non-wastewater as claimed by farmers, it can be technically argued that it is contaminated with waterborne sewage or septage because the supplying canals are open, thus different kinds of debris or liquid can easily be conveyed, and ponds adjoin animal enclosures.

In general, waste use occurs in different forms ranging from simple kitchen wastes to animal manure to human excreta to urban wastewater. Furedy et al. (1999) have reviewed the different kinds of waste used in aquaculture. The use of waste and wastewater in aquaculture in particular is popular in South, East, and Southeast Asia (Furedy, Maclaren, and Whitney 1999). Viet Nam, for instance, is noted for having centuries-old tradition of using human excreta in agriculture and aquaculture (van der Hoek 2004: 16). The systems that grew out of the use of wastes in aquaculture is called wastewater-fed aquaculture.

Wastewater-fed aquaculture refers to a type of aquaculture that uses different forms of human excreta to produce fish and aquatic plants. It has many sub-types (Table 2-5) depending on the type of wastewater use and their delivery which ranges from fresh excreta to contaminated water, the nature of the aquaculture system (e.g., pond and rivers), and the species farmed (i.e., fish or plants) (Edwards 2002: 81-3). Wastewater use systems in general are largely developed by farmers and local communities themselves so that it can be classified as traditional (Edwards 2000: 38).
Table 2-5 Types of wastewater-fed aquaculture systems (Source: Edwards 2002: 83)

Among the study sites, the north of Viet Nam is particularly well-known for wastewater-fed aquaculture, although the area it covers is not as large as that of Kolkata in India, the world’s largest wastewater-fed fishpond complex (Edwards 2005b: 53). Conventional sewage was first used in aquaculture in Hanoi in the 1960s (Edwards 2002: 84). Wastewater-fed aquaculture is arguably a lynchpin in the food security of the urban population of poor developing countries such as Viet Nam and Cambodia. It provides cheap fish and aquatic plants. It also plays an important role in the recycling of waste and management of sanitation (Edwards 2000; Edwards 2002).

Edwards (2005a: 27-29) recently argued that the future prospects of small, household-based aquaculture systems in peri-urban areas dependent on wastes as a nutrient source are in peril due to drastic changes in land uses especially in the case of Viet Nam and Bangladesh. Earlier Edwards (2000) hypothesised that wastewater-fed aquaculture is “a transient phenomenon of pre-industrial and early industrial societies” where wastewater reuse in agriculture and aquaculture is socially acceptable due to existing social dynamics such as population density and limited resources. Then, he posited (Edwards 2005a: 29) that economic development itself pulls the curtain down on the growth of these systems due to land shortage for aquaculture when competition with
other more efficient land uses intensify; when there is a decline in the quality of wastewater; with changing preferences among consumers for 'clean' fish; and with the availability of other aquaculture farming systems.

To recap, conducive geography, presence of water, and abundant supply of wastes resulting from the metabolism of the city has led to the development of important and distinctive livelihoods around major cities in mainland Southeast Asia. But such development is embedded within turbulent spaces. We can understand these spaces by looking at the livelihoods that negotiate their existence within a landscape that is argued to be 'turbulent'.

2.9 Livelihoods and turbulence

A livelihood is composed of "[...] the capabilities, assets (including both material and social resources) and activities required for a means of living" (Carney 1998: 4) and "build [...] [poor people's] worlds" (Whitehead 2002: 577). A better definition will be achieved if access is included such that

a livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household. (Ellis 2000b: 10)

In general, livelihoods are derived from income - which may be in the form of cash, material, or services - of employment and other sources such as rents from assets owned or remittances (Buechler 2004: 25). Thus, it "encompasses income, both cash and in kind, as well as the social institutions (kin, family, compound, village and so on), gender relations, and property rights required to support and to sustain a given standard of living" (Ellis 1998: 4). The use of the livelihood framework provides a suitable scaffold in making sense of the intractable and interdependent dynamics between livelihoods, the people involved in this livelihood and the milieu through which livelihoods circulate and interact, and the turbulence that both people and their livelihoods encounter. The livelihoods perspective places the household, the processes surrounding the 'performance' of its livelihoods, and the different activities a household engages to address current or future vulnerabilities or satisfy different facets of its well-being at the centre of the analysis (Rakodi 2002a: 292; Whitehead 2002: 577-8).
The livelihood perspective evolved from the need for a more household-focused, bottom-up rural development (Chambers 1995; Ellis 2000b; Scoones 1998). Several authors have already applied this approach in the urban context (e.g. Ali 2002; Beall 2002; Devas 2002; Jones and Kingston Restoration Company 2002; Rutherford, Harper, and Grierson 2002; Sanderson and Hedley 2002; Satterthwaite 2002).

Within desakota areas, sustaining kangkong production is an important issue because of the nature of on-going settlement transition, land use changes, and the broader political milieu encapsulating desakota spaces. According to Carney (1998: 4),

A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.

Thus, microlevel (e.g. households, village and district) and macrolevel (e.g. governments, national and international) structures and processes are important determinants of the future (i.e. trajectories) of kangkong production.

Assets and the structures and processes surrounding them are central to the livelihood framework. Assets are influenced by the context and their access is defined by the form, structure, and shape of relationship, whether social, political, or economic (Rakodi 2002c: 9). In analysing the livelihood and institutional dynamics of kangkong production (Photo 2-2), access to assets is a primary focus as it has an important role in defining livelihood strategies in the face of a turbulent environment especially in an urban context where “proximity to resources and facilities means very little when access is denied” (Ali 2002: 277).

The intention of this research is not, however, to address primarily urban poverty per se but to understand the practise of a livelihood within a dynamic and distinctive space using kangkong production as the locus of engagement. The implication of this is that the ‘household’, the livelihood system and contexts are important foci. Thus, factors that affect the evolution or development of this livelihood are examined such as, for instance, issues relating to the use and management of urban land and competing demands for urban land from other users.
The livelihoods-turbulence framework adopted in this study is illustrated in Figure 2-5. This framework begins in “A” with the assets households deploy in *kangkong* production. These assets are human, natural, social, physical and financial (Bebbington and Perreault 1999: 2022; Devas 2002; Ellis 2000b: 31-7; Moser 1998: 4; Scoones 1998: 7-8). Assets may have two meanings: the material and normative. The material perspective is represented in Ellis (2000b: 28-51), in which assets are the basic building blocks upon which households are able to undertake production, engage in labour markets, and participate in reciprocal exchanges with other households [...] [They are] stocks of capital that can be utilised directly, or indirectly to generate the means of survival of the household or to sustain its material well-being at differing levels above survival.

Bebbington (1999: 2022) represents the normative end and argues that the people's assets are not merely *means* through which they make a living: they also give *meaning* to the person's world [...] [Thus], they are [...] both reflections and components of the meaning the person has tried to create through their livelihood strategies [emphasis in original].

Informed by Sen (1997) and Giddens (1979), Bebbington (1999: 2022) asserts that Assets [...] are not simply resources that people use in building livelihoods: they are assets that give them the capability to be and to act [...] assets are not only [...] things that allow survival, adaptation and poverty alleviation: they are the basis of agents' power to act and to reproduce, challenge or change the rules that govern the control, use and transformation of resources.

In this research, due to time constraints, attention is focused more on the mate-
rial assets without being prejudicial to the importance of the normative meanings of assets.

Natural capital refers to the environmental resources used in the livelihood such as land, water and other biological resources. It encompasses renewable and non-renewable resources. It is not static and has a differential potential in a sense that their inherent character, for example as fertile or dry, has impact on the development of the livelihood. Physical capital results are produced goods such as boats, farm implements, roads, and canals. Its acquisition through purchase turns it into a capital with a direct future material effect on standards of living. On the contrary, items which do not bring in future income stream are not considered a physical capital as in the case of a house which is not being used for profitable purposes such as rent out accommodation.

Human capital refers to the labour available to the household which is increased with education, training and other skills while financial capital is essentially the money the household has access to in times of need which can be used to acquire other forms of capital or in consumption (Ellis 2000b: 32-6).

### Figure 2-5 Livelihoods-turbulence framework (modified from Ellis 2000: 31)

Social capital is generally understood to mean “features of social organization such as networks, norms and social trust that facilitate cooperation and coordination
for mutual benefit" (Putnam 1995: 67). This is expressed as the “quantity and quality of associational life and the related social norms” in Narayan and Pritchett (1999: 872). In the Southeast Asian context, households do depend on social capital to make ends meet or to cope with instabilities or vulnerabilities in their livelihoods. For instance, households depend on siblings or other immediate family members to look after young children while the parents are away. Among migrants, kin networks are also important staging points in the search for employment opportunities in the city. During emergencies, kinfolk and networks of friends provide important safety nets. Perz et al. (2006: 838) use institutional membership especially with neighbourhood organisations as a measure of the ability of the households to mobilise cooperative labour arrangements and protect their land claims from land invasion. In the case of kangkong, sharing of technology and market inputs may be facilitated through networks with other co-producers or through membership of groups or organisations. The same entities could also be sources of information on how to handle disease outbreaks in production systems.

In B (Figure 2-5) is shown the mediating processes which Ellis (2000b: 39) contends to be “critical mediating factors for livelihoods because they encompass the agencies that inhibit or facilitate the exercise of capabilities and choices by individuals or households”. These processes define the terrain through which assets can be accessed. Access by certain groups of people could be hindered by virtue of these processes. For instance, certain village based institutions or organisations may be detrimental to the interests of minority groups such as women and those belonging to lower social classes. Or these processes could be captured by elite interests so that access by non-elites to certain class of assets might be closed off.

Thus, the interactions between A and B are underlined by turbulence so that tensions and conflicts may be produced. Ellis (2000b: 39) highlights that the interrelationship between assets, mediating processes, and livelihood activities is a process that is unfolding over time. The manner of this unfolding, and the stresses and strains that result in new patterns of activity emerging, are influenced by trends and events that are in varying degrees exogenous to household and to local circumstances.

Bunch et al. (2005: 151) summarise, based on Morley (1986), the characteristics
of turbulence as accelerating rates of change; increasing scale of perturbations; shifts in conditions; increasing unpredictability of events; continuing sense of crisis; frequent confrontation with problems at a level of complexity that makes them inaccessible to normal intervention strategies; and a tendency for increasing amounts of time to be spent on responding to unintended effects of previous actions. Thus, the best way to study turbulence is to embed the hub of study in different scales (e.g. local, national, and global) or nest it within different spatial hierarchies (e.g. urban, peri-urban, and rural). Turbulence may lead to vulnerabilities (F in the figure) which are defined as.

Insecurity and sensitivity in the well-being of households and communities in the face of a changing environment, and implicit in this, their responsiveness and resilience to risks that they face during such negative changes. (Moser 1998: 3)

Moser (1998: 3) argues that vulnerability and resilience are tightly linked to asset ownership as the assets available to households determine the degree to which resistance to possible changes and hardships can be made. She defines resilience as “responsiveness in exploiting opportunities, and in resisting or recovering from the negative effects of a changing environment”.

Aside from the conflict and tensions, however, convergence may be also produced. Convergence refers to opportunities that emerge from the coming together of possibly conflicting modes of using and managing natural resources. For example, the concentration of people in peri-urban areas leads to more demand and efficient marketing of products. Since farming is done within or around peri-urban spaces, sourcing raw materials is also not much of a problem. Therefore, to maximise convergence and reduce vulnerabilities, *kangkong* households would have to develop effective livelihood strategies to be able to thrive in the face of turbulence. In understanding turbulence in *kangkong* production as a livelihood system, key assets are monitored for a one year period to cover for seasonality. The monitoring aims to identify changes in their assets or whether there are social or spatial tensions and conflicts. The monitoring protocol is described in the Methodology section. Notionally, once those tensions and conflicts leading to turbulence are identified, the improvement of *kangkong* production should be explored to strengthen the livelihood, but since this is not the major focus of this study, recommendations for institutional modifications are at best minimal.
A household's livelihood is based on access to the livelihood platform (A) which is mediated by social relations, institutions, and organisations (B) in the context of turbulence (C) resulting in the deployment of livelihood strategies (D) that reflect the household's asset portfolio and evolving context. In the context of *kangkong* production, livelihood strategies are the activities of the members of the household that will produce income (Ellis 2000b: 40). These activities could consist of many things from the actual full-time involvement in producing *kangkong* to involvement in other part-time occupations (E in Figure 2-5). Such part-time work may also be agricultural or aquatic related or encompassing broadly other forms of resource extraction such as agroforestry. Or they maybe non-farm such as in trade, manufacture or services. Or the source of income itself could come from outside the household through transfers such as remittances or pensions. Migration to the city by members of the households could also be a strategy resulting in such streams of income.

In pursuit of a livelihood strategy, a household may gain higher income, attain secure livelihoods, and minimise turbulence or, in other words, reduce the household's vulnerabilities (F in Figure 2-5). And it can also lead, as the case of *kangkong* shows, to environmental sustainability by reusing wastewater flowing from domestic sources or the city. But the flipside if the strategy is unsuccessful is that vulnerabilities are increased and environmental sustainability may be undermined.

In *kangkong*, the process of livelihood construction is an 'ongoing process'. This means that the factors that we will analyse here may not necessarily be the same throughout the year. They can be constituted or reconstituted throughout the different cycles of the production system, the households, the seasons, and the overall context within which *kangkong* circulates. At best, the perspective offered in this study of *kangkong* households and the *kangkong* production system represents only one image. Ellis reminds us that

> Assets can be built up, eroded, or instantaneously destroyed (as, for example, in a flood). Available activities fluctuate seasonally, and across years, especially in relation to larger economic trends in the national economy and beyond. Access to resources and opportunities may change for individual households due to shifting norms and events in the social and institutional context surrounding their livelihoods. (Ellis 2000b: 10)
2.10 Summary

This chapter has spanned major conceptual layers. It starts with the notion of urbanism. What is it? And how is it reflected in Southeast Asia? Urbanisation, a rapid process indeed, is an important hallmark in such urbanism. The nature and rate of transformation of cities in the region has been considered phenomenal. Given existing trends such a phenomenon in this part of the world will continue into the next decade or two. And the corresponding spatial changes will have ramifications to economies, land uses, and households so that the geography of mainland Southeast Asia is continually being redefined. Such a process is not, however, bereft of local colour and flavour. Terry McGee coined the term kotadesasi, to describe the process by which the village and the city are intermeshed in a pattern unseen in the western world. Within this process is subsumed another process that builds on the ecology of the city. It is shown that cities metabolise. They have energy needs and there are products of metabolism. These products become important lynchpin of livelihoods in some cities. Waste-related production systems abound. Kangkong, a quintessential Asian vegetable, is one such example of a production system that is differentially exploited in different cities in mainland Southeast Asia and becomes the bulwark of reliable livelihoods.

Livelihoods are what people do to earn a living. Its study has been gaining currency since the 1990s. It started as a means to conceptualise rural development from the perspective of what people have and what they can do to change their circumstances. It offers a holistic picture of the condition of people’s livelihoods. It also opens up opportunities for a more joined up engagement with other processes that underpin people’s quest for better material welfare. We have seen above that aspects of the livelihoods framework can be adjusted to introduce another dimension. Such a dimension is turbulence which is argued to be ever present in peri-urban areas. The modification of the livelihood framework gives us the livelihoods-turbulence framework. The essence of the framework (Figure 2-5) is to determine the nature of the assets involved in kangkong production (A) then flesh out how they are governed and managed (B) in the context of turbulence coming, for example, from macro-forces defining the urban/peri-urban space such as urbanisation and globalisation (C) which then defines livelihood strategies (D)
resulting in vulnerability and environmental sustainability. However, the relationship between segments is not of direct causality but one that is complex and interacting, where processes are not necessarily linear (cf Rakodi 2002c: 8).

In the next section, I will discuss how the conceptual issues raised in this chapter will be unpicked. I will lay out the research questions that this research seeks to address. The methods and tools deployed are also described. Finally, the next chapter will also highlight the opportunities that support this research endeavour.
Chapter 3

Researching livelihoods, turbulence and spatial change – research questions, methods and analysis

Before laying down the questions that guide the study, the notion of turbulence appended to the livelihood framework is described, and the research questions listed. The data used and the methods deployed to find answers to these questions are also discussed in the latter part of this chapter. Due to the circumstances of my studentship, section 3.2 addresses the sources of the different streams of data used in the analysis. Appendix 3 also provides a fuller discussion of the overall contexts of my involvement in PAPUSSA and the contribution that the wider research project has made to this PhD. The chapter ends with a background to the respondents, the subjects of the research.

3.1 The notion of turbulence and the research questions of this study

Although it has roots in the physical sciences where it is described to have the properties of being unsteady, three dimensional, apparently random, dissipative, and covering a range of motions (Perry 1991 cited in Turnbull 1995: 31), turbulence is an important object of geographical inquiry because it offers material manifestations of spatial changes. It can be seen, on one hand, as the result of a process. On the other hand, it can also be the primordial factor that jumpstarts such a process. Douglass (2000), for instance, looks at the impact of economic turbulence on the mega-urban regions of Pacific Asia. The same perspective is also taken in the case of Viet Nam (Douglass et al. 2002). Turbulence is a general characteristic of the impact of major financial and other economic changes on cities such as the case of the Asian financial crisis in 1997 (Fir-
On the other hand, Crang (2000) considers the turbulence created by new forms of architecture on urban substance and form. In this study, turbulence is generally understood as a form of disturbance, agitation and disorder on households, space and livelihoods. It results from irregular flows (broadly conceived) and instabilities.

On the face of it, turbulence appears to be manifested in the very nature of the livelihoods adopted in the peri-urban zone. In wastewater-fed aquaculture, turbulence is presumed to be writ large. The land upon which this livelihood is found is considered 'idle' when compared with industrial uses where rents are higher. And with rapid urbanisation, land scarcity ensues as the cost of acquiring land becomes costly and gives rise to other more economically 'efficient' uses. Furthermore, the industrialisation that follows urbanisation leads to industrial contamination of nutrient-rich domestic wastewater posing risks to farmed animals and the farmers who tend their stock. Increasing nutrient inputs into the domestic wastewater from industrial sources may also overload the ability of production systems to utilise them leading to depletion of dissolved oxygen and thence possible higher mortality of organisms raised. The economic bonanza that rapid urbanisation and industrialisation brings to a segment of the population may lead to changes in consumer preferences reflected in the decline in demand for wastewater-fed aquaculture and an increase in modern, improved sanitation thereby decreasing the supply of cheap nutrients (Edwards 2002: 86-8).

This study takes the position that a desakota settlement transition is in existence in mainland Southeast Asia, especially in mega-urban regions and characterises sui generis their peri-urban zones. Furthermore, this study takes the view that Bangkok is a mature desakota space while Hanoi and Phnom Penh represent the incipient stages of desakota. (How they became so is laid out incrementally in each succeeding chapter by exposing key features of desakota which are then summarised in Chapter 11, the final chapter). The study, therefore, argues that these cities offer interesting comparisons and contrasts on how a plant-based livelihood negotiates its way through changing and dynamic spaces. Nevertheless, the holy grail of urban settlement research in the region is whether desakota is only transitory (i.e., whether the intense mixture of agriculture
and non-agriculture in peri-urban zones persist or is simply temporary) to a phase of full urbanization and what mechanisms drive this process, a critical concern which Rimmer (2002: 4) highlights as among the shortcomings of the desakota model. Given settlement transition in desakota areas, what is the extent upon which the presumed resulting turbulence is real among the livelihoods dependent on wastes from the city, such as kangkong? While it is not among the goals of this study, insights about the existence of turbulence in kangkong households have policy implications considering that it is a major livelihood in peri-urban areas and a substantial number of households are involved. McGee (2003: 5) befittingly argues that “the understanding of the context of peri-urbanization in the Asian context is a necessary requirement to be developing suitable policy responses” in light of increasing discourses of deregulation, decentralisation, and privatisation.

By looking at how kangkong unfolds spatially, both physical and imaginative, we have a point of entry to understanding desakota urbanism and all its attendant artefacts, notably, for our interests here, urban livelihoods and households. Kangkong’s engagement with the metabolic processes of Southeast Asian cities in the form of wastewater connects its ecology and space as well as people and their livelihoods. Kangkong, as we shall see later, therefore becomes a noteworthy prism to reflect on the dynamics of Southeast Asian urbanism with perspectives not telescoped from above but emanating from the ground. Using kangkong in this manner is similar to the process of segmentation advocated by Bryant (1995: 259-62) in understanding the interests and roles of local actors in transforming the urban fringe except that the view taken here is not political (in a sense of human power relations and interest groups) but one that is geographical (in a sense of spatial imprinting). From this perspective, households involved in kangkong production and even kangkong itself are one segment of life (one actor) in the urban fringe. In other words, perusing kangkong livelihoods and production systems is one way of understanding ‘the nature of the change processes’ attending development in mainland Southeast Asia because as Koppel and Hawkins argued:

[...] there is a tension weaving through all the major conceptions of development in the region - a tension that is sometimes characterized as existing between different scales (macro-micro) but that really centers on an argument over the imperatives of structure and culture,
the domains of discipline and area, and the possibilities of universalism and particularism. Caught between the demands of the imperatives, domains, and possibilities, development studies – born of the search to construct a composite bridge – has wandered, instead, into a cul-de-sac. (Koppel and Hawkins 1994: 21)

So how might we understand the turbulence in *kangkong* production systems? The best way to do this is to conceptualise it as a livelihood system with corresponding assets, processes, and vulnerabilities. As shown in Figure 2-1, livelihood is an important node in the geography of interstitial spaces.

The following questions are pursued in this study:

1) What social, historical, economic, political, institutional, and geographical processes can be seen among *kangkong* households and inscribed in its production?

2) How can the illumination of these processes inform and invigorate our understanding of Southeast Asian urbanism?

3) And to what extent is turbulence a defining characteristic of *kangkong* households?

These questions will be answered by satisfying the features of desakota as discussed in Chapter 11 so that the expositions that follow in the subsequent chapters pursue such an objective. In other words, the succeeding chapters progress towards a stage where one is afforded an appreciation of how *kangkong* livelihood satisfies desakota features. The whole process, from data collection to analysis and writing, is illustrated in the flow diagram in Figure 3-1. In this study, the landscape in the peri-urban is analysed by observations, interviews and secondary literature reviews to find out how it is being "reconstituted" for the purposes that governments (both at the national and local levels), local entrepreneurs, farmers, individuals, and house owners, among the myriad of users or actors, have for the land. This approach is similar to Panelli's (2003) wherein the landscape is read through people's perceptions, obvious physical changes, and the appearance of distinct new uses. In pursuing this intention, I am guided by Panelli et al.'s (2003: 384) assertion that "landscape approaches provide a means of reading the material and symbolic arrangements of local places, noting how landscapes register both the meanings of those constructing the changes and traces of those who might context these".

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1 The PAPUSSA part of the diagram is discussed in Appendix 3.
It is recognised that "research is a set of social relationships" (Harriss-White and Harriss 2007) such that the contexts of the research are underpinned by layers of social considerations (cf. Rose 1997). Each of these layers affects the conduct of the research. Aside from positioning myself within such contexts, the data used, the households interviewed, and the research framework (which are described in subsequent sections in this chapter), I have described in Appendix 3 my attachments and reflexivities in carry-
ing out the work for this study. In this appendix\(^2\), I lay down my 'positionality' especially as regards the collection of data. That said, this study is comparative, grounded, and combines both quantitative and qualitative data in the analysis.

### 3.2 The data

There are two sets of data used in this study: qualitative and quantitative. The qualitative data is based on the participatory community appraisals (PCA) and the qualitative interviews (Appendices 4 to 6) (Figure 3-1). The quantitative data comes from a set of baseline and monitoring surveys\(^3\) in each site under the auspices of PAPUSSA while I conducted the qualitative interviews myself for the purpose of the PhD study. The PCA was also produced under PAPUSSA. In Figure 3-1, I have illustrated the flow of activities involved in data production and analysis in the study. This figure shows that there are different sets of data and different layers of data production and analysis. Furthermore, the figure also delineates the data that are drawn from my direct involvement in the wider PAPUSSA project and those data that were separately generated as part of this PhD, informed by the research questions set out at the outset of the thesis. As described in Appendix 3, I was involved in designing, providing training, implementing and writing up the PCA. I was also actively involved in the design, implementation, management and analysis of the baseline and monitoring surveys. In order to tease out a more in-depth understanding of individual and livelihood histories, I carried out purposive semi-structured interviews with selected key informants.

The PAPUSSA data covers three sites, three baseline surveys\(^4\) and 12 monitoring surveys. 212 households in Bangkok, 200 in Phnom Penh, and 209 in Hanoi were interviewed. The surveys covered 3,008 individuals. From these surveys, *kangkong* households were extracted for the purpose of this study.

The monitoring surveys (M) were conducted as follows:

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\(^2\) I have placed this discussion in the appendix because such discussion is quite substantial. Placing it here will lengthen this chapter. Editing out other details also might risk losing important details weakening my goal of being transparent in my research approach.

\(^3\) Questionnaires for these surveys in English, Khmer, Thai, and Vietnamese are available in www.papussa.org.

\(^4\) An English version of the baseline survey questionnaire is in Appendix 10 while the Khmer, Thai, and Vietnamese versions can be accessed in the PAPUSSA website.
- Bangkok: M1 - 24 Apr to 11 June 2004; M2 - 11 to 19 July 2004; M3 - 07 to 23 December 2004;
- Hanoi: M1 - 14 Apr to 17 June 2004; M2 - 02 August to 30 Nov 2004; M3 - 06 to 29 January 2005; and
- Phnom Penh: M1 - 12 to 27 July 2004; M2 - 08 to 19 November 2004; M3 - 18 Jan to 03 February 2005.

The monitoring survey was designed to capture as much of the 'gross changes' of the households and their production systems as possible for a span of about a year.

Just as actors, agencies and localities are important underpinnings in this study, how the data were gathered, produced, analysed and written up are important in creating a reflexive study. Reflexivity means recognising the knowledge streams influencing the researcher, how this process of knowledge production is grounded within situations the researcher is engaged with, and the voices that become the sources of knowledge. This study has benefited from my involvement with PAPUSSA (Production in Aquatic Peri-Urban Systems in Southeast Asia), interaction with national and regional partners in the project, direct opportunities to work with local communities and government stakeholders in three cities, email exchanges with experts, and comments from my supervisor. The opportunity to do this study came out of a studentship at the Department of Geography of the University of Durham funded through the PAPUSSA project.

3.3 Sampling, selection and sample size

In determining the kangkong households to be surveyed, expert knowledge from national partners and local interviews were relied on because no list indicating total number of producers in each site was available. It is the view of partners and validated through several interviews that the sample interviewed in PAPUSSA project was representative of the kangkong 'universe' in these cities. During the PAPUSSA meeting in Hanoi to discuss the surveys, it was agreed that each city should sample 200 households involved in different peri-urban aquatic food production systems (PUAFPS). This sample was based on initial situation appraisals in each city plus 10% allowance of households in case there will be future problems with 'no-show' respondents. Such appraisals to ob-
tain a list of all of the households in a community involved in PUAFPS were carried out through key informant interviews with community heads and local administrators, chairmen and women of local community groups such as Farmers and Womens' Unions (PAPUSSA 2005: 9).

In Bangkok, key informant interviews and data from the Department of Agricultural Extension showed that Nonthaburi is the major producer of kangkong in the country so that villages producing this vegetable were sought out. Nongpaongai, a district, was chosen and then village headmen from kangkong producing villages ticked off from an electoral register those who are kangkong farmers. All kangkong farmers from this district were surveyed.

In Phnom Penh, in particular, and Cambodia, as a whole, it is widely known that kangkong is produced commercially in Boeung Cheung Ek only. This information is confirmed in Sideth Muong (2004) and Sokhen et al. (2004: 19). The problem in Phnom Penh is that no one, including the government, knows exactly how many households are there in the lake because it is legally a 'no man's land' by virtue of it's being a sewage lake. The lake is not zoned for settlement, although production of fish, vegetables and rice are allowed. In view of this situation, estimates of households involved in kangkong production vary from less than 300 to 863 households. Muong (2004) surveyed 248 households while Sokhen et al. (2004: 16) reported 863 households involved in kangkong production. The latter figure appears, however, to be untenable because it is too high especially if we take note of the fact that the 133 households surveyed in PAPUSSA already covered all of the inner kangkong households plus those on the roadside. Muong's survey appears to be more reliable especially if the region in question is the BCE so that around 54% of households would have been covered in PAPUSSA.

A similar situation presents itself also in Hanoi where it is not known exactly how many households are involved in kangkong production. Determining kangkong farmers in this city is further complicated by the involvement of households in multiple and seasonal production. At different times in the year, households rotate their productions incorporating other plant species such as watercress, water dropwort, and water
mimosa to cover seasonal demands and ideal cropping for the season. Due to the diversity of peri-urban AFPS in Hanoi and the need to limit overall sample size for this city to 200, only producers in So Do and Bang B villages were covered. The absence of an agricultural production census which includes *kangkong* at least for the district prevents the project from ascertaining the sample size for *kangkong*. Partners in Hanoi, however, believed that these villages are major producers of *kangkong* and by selecting all producers from known producing villages in selected districts the sample would have covered fairly widely.

Except for the wide coverage of production systems, one major limitation of the PAPUSSA methodology, especially if only a single production system is analysed comparatively across the different cities, is that the sample will not be representative of the whole city as other minor producing areas which are known to occur have been excluded. Admittedly, an intra city comparison of a single production system (e.g. *kangkong* or fish) would produce a differentiated picture defined by its local contexts. The collective picture is ideally a basis for comparison with the collective picture that emerges from other cities. But this is untenable in light of resource and time contraints for a three-year project such as PAPUSSA and for a PhD research project (see Appendix 3 for background of my attachments). A more manageable approach is to analyse comparatively only selected sites in each city. In the PAPUSSA case, only major producing areas as indicated from interviews and government statistics were selected in each city. Thus, a site from one city may only be indicative of city-wide dynamics.

As mentioned previously, the data used here came from PAPUSSA and is based on a sample of roughly 200 households in four cities. *But the actual data used in the succeeding analyses is based on households involved in the production of kangkong either as producers or hired labourers*.\(^5\)

Earlier discussions about the data highlights the fact that the respondents were chosen based on the national partners' perception of the type of production systems households are involved with and which were, in turn, based on interviews with local

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\(^5\) There are more hired labourers in Bangkok than other cities in the sample.
key informants. Such perceptions contain subjective biases, which may not adequately represent the true involvement of the households. To address this, I use baseline survey data which asked respondents their households' top three main income earning activities the last year prior to the survey (i.e., before 2004) and ranked according to their percentage contribution to overall income. A household is selected when *kangkong* is one of the main income sources. In the case of Bangkok, respondents who are not producers themselves but are hired labour in *kangkong* farms and derived at least 25% of their income from this activity were included because the performance of such an activity already enrols a household into a particular production system without becoming a producer. Arguably, for a production system to be called a livelihood does not necessarily preclude non-ownership of the production system. The act of production is neutral as to whether the actor (i.e., respondent) is actively involved in the production either as the producer himself/herself or as a hired labour. From the perspective of this research, what is important is the degree of dependence of a household on a production system. In this light, the approach privileges the households' own classification of their production system based on their role in their income. This implies that only those households which derive a substantial part of their income from these production systems are choosen.

To recap, the process of respondent selection from the PAPUSSA data ensures that the appropriate respondents are chosen in view of the underlying assumption of this study that *kangkong* production is a viable occupation within desakota areas (as such are affected by or drives spatial changes) such that its practise as a livelihood mirrors the landscape's spatial, social and cultural histories and dynamics. Table 3-1 shows that the number of households changes when main income is used to classify households, instead of external knowledge (i.e., knowledge from partners and key informants).
mants). A substantial increase is seen among Bangkok respondents when hired labour in *kangkong* is included as a main income. The sample used in all succeeding analyses in this study is based on 71 households in Bangkok, 72 in Hanoi, and 72 in Phnom Penh. These households derived a substantial part of their income from their involvement in the production of *kangkong*.

<table>
<thead>
<tr>
<th>Cities</th>
<th>PAPUSSA</th>
<th>THIS STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall Sample</td>
<td>HH</td>
</tr>
<tr>
<td>Bangkok</td>
<td>212</td>
<td>61</td>
</tr>
<tr>
<td>Hanoi</td>
<td>210</td>
<td>48</td>
</tr>
<tr>
<td>Phnom Penh</td>
<td>200</td>
<td>133</td>
</tr>
<tr>
<td>Total</td>
<td>622</td>
<td>242</td>
</tr>
</tbody>
</table>

Table 3-1 Study sample

Notes:
PAPUSSA - sample based on opinion of national partners and key informants
THESIS - *kangkong* sampled based on contribution to main income
HH - Households

### 3.4 Households

I make no claim for typicality of the villages included in this study in relation to the primary objective of this research, which is to understand how social, economic, and geographical differentiation among households involved in aquatic production activities in three cities in Southeast Asia influenced the outcomes of their chosen livelihoods in zones of manifestly intense rural-urban interaction. The villages were selected by partners in each city who know intimately these areas and were chosen as part of a bigger project on peri-urban aquatic production. These villages and their production systems are thought to be representative of the city-wide picture. If there is one aspect which sets them apart from other aspects of the landscape it is the preponderance of aquatic livelihoods. But what lies beneath this veneer of sameness may be some unexplored dimensions useful for understanding why certain livelihood practices exist in a particular landscape in the way that they do. My task, then, became to, as it were, shine a light on these households so as to unravel their configurations, historical contours, and hidden
stories so that social, economic, and geographical differentiation is exposed. I made ob-
servations, carried out interviews, trawled the literature, and added bits and pieces of
information to complete the canvas of peri-urban food production in these cities.

The 'household' as used here and in the PAPUSSA project is defined according to
its commonly (for example, Eder 1999; Lawson, McGregor, and Saltmarshe 2000; Moser
1997; Moser 1996) accepted definition. It is defined "as a group of people who normally
live and eat together in the same dwelling and who generally consider themselves to be
the unit for which plans and decisions about daily life are made" (Moser 1996: 71). Fol-
lowing Moser et al., "the person who is either the main breadwinner or the key decision-
maker, especially about matters affecting the household, or who is defined as such by
its constituent members" is considered the head of the household.

The identification of the household head was done through self-reporting; that is,
by asking household members who the household head is. There was no systematic
process of intra-household analysis to figure out household headship. Admittedly, this
will have implications for attempts at intra-household analysis of the sample.

In situations where the household head is absent, the spouse is interviewed and
the eldest children present if the latter is also not available. In view of the situations in
the field that cannot be controlled or influenced, the desire to interview actual house-
hold heads was not manifestly served in the survey. Instead, those who were present at
the household when the interviewers came were interviewed. This implies that certain
analyses, especially those directed at the household head, are restricted to certain types
of respondents as the survey questions were developed with the household heads in
mind. The presentation and analysis done in this study take this into consideration.

The use of 'household' as a conceptual framework recognises that, although it is
a contested domain, it is useful for the nature of inquiry I want to pursue in this study. I
am mindful of Rigg's (2001: 85) comment that criticisms levelled on the 'household' "is
not sufficient reason to reject the household as a useful unit of analysis as most South-
east Asians consider themselves to be members of households, and the household as a
collective enterprise is far from dead". Furthermore, the use of the household here, es-
pecially co-resident households, is in accord with Ellis' (2000b: 18-9, 27) formulation of
the household as the “basic social unit of livelihood analysis”. Gregory and Altman sums
up the pros and cons of using the household as a unit of study especially in the case of
time allocation studies of which a similar version is attempted in this study in Chapter
8:

The advantage of the household is that a single informant can assist in the reporting of the
activities, or whereabouts, of other household members. However, the household will be of
limited use in situations where there is rapid change in household composition during the
observation period; in such cases the unit of analysis will have to be the individual. (Gregory
and Altman 1989: 109)

Taking a cue from Hart (1995), I understand that how we view the household has
implications on how we understand intrahousehold and interhousehold relations. She
argued that “far from a natural unit, the household is a complex, culturally varied, and
dynamic set of institutional arrangements” and she offers as an example rural-urban
migration in Asia where “what seems to be emerging […] are complex systems of labor
circulation and spatially extended arrangements” (Hart 1995: 40).

There are three models of the household: unitary, collective, and gendered. At its
core, unitary models assume that the household is undifferentiated and no power rela-
tions define the relationship of each household member. It is also given that the house-
hold act as one unit to maximise utility devoid of bargaining and negotiations. In other
words, a unitary household has a single preference and that each member acts for the
good of the unit as a whole. Collective models, on the other hand, posit that each mem-
ber of the household has individual preferences and the household acts according to
which preference weighs more. The goal of the household within a collective model
framework is to attain pareto efficiency wherein household benefit is maximised without
making any member worse off (Agarwal 1997: 2-4). Such pareto efficient outcome is
achieved through intrahousehold allocation embedded in a process of bargaining9 (Qui-
sumbing 2003: 19). The gendered approach takes on the opposite of both unitary and
collective models by seeing the household as a “political arena constituted by dense
bundles of gendered rules, rights, and obligations governing relations between men and

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9 Bargaining is determined by: control over resources; the existence of factors such as legal rights, skills
and knowledge that influence the bargaining process; mobilization of interpersonal networks; and basic atti-
dudinal attributes (Quisumbing 2003: 19).
women, and elders and juniors” (Hart 1995: 59). Furthermore, this approach “entails reconceptualization of 'the household' in relational terms, and an analytical as well as an empirical focus on the gendered micropolitics of negotiation, cooperation, and contestation in different but intersecting institutional arenas” (Hart 1995: 61). This means that a gendered approach shows how the roles of each member of the household is defined, mediated and constituted by social, cultural, and institutional factors while at the same time paying attention on how relationships developed and are performed. Agarwal (1997) also offers a similar gendered approach to household modelling but follows up on the collective model and emphasises the role of bargaining in intrahousehold allocation.

In this study, the model of the household used is a hybrid of the three in view of logistical and disciplinary considerations, rather than theoretical. These are logistical and disciplinary considerations in view of the PAPUSSA survey which adopts a commonly understood definition because it was implemented by partners with different disciplinary backgrounds. Fundamentally, the research framework used took off from fisheries science so that a common understanding needed to be introduced at the start of the project to minimise confusion. Although this study recognises “the multiplicity and complexity of household forms” (Hart 1995: 40), attention on intra and interhousehold relations are, as will crystallise in the succeeding write up, superficial. This is so because these relationships are not the primary goal of this study; instead, it is how *kangkong* elucidate spatial relationships. So the hybridity of the model taken here is expressed in the following forms: the household is defined as above following that used by Eder (1999), Lawson, McGregor, and Saltmarshe (2000), Moser (1997), and Moser (1996) but takes on both the collective and gendered forms by unpacking the occupational multiplicities of both the husband, the wife and other household members as discussed in section 6.1. Specifically, the household as conceived in this study is unitary in form (e.g., sleeping and eating together for most times under one roof) but considers individual preferences occupationally (collective) and differentiates the role of male and female household members (gendered).

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10 See Appendix 3 for discussion on my reflexivities and contexts which made this study possible.
3.5 Analyses

This study adopts a comparative stance to analysis in that the three sites representing three cities are analysed in a relational manner and is guided by issues of validity, reliability, and triangulation (cf. Patton 1999). In this study, reliability and triangulation issues are addressed by using sufficiently widely used methodologies in the social sciences and different kinds or layers of data. In the first instance, rigorous methods of handling data and analysis are used. The survey data are stored in a relational database designed in MS Access, while the qualitative data in NVIVO, a qualitative data analysis software. Since themes were developed prior to the interviews, the analyses first arrayed the transcripts according to their themes and each theme is further coded according to other emerging sub-themes which might be covered. Queries were developed for the quantitative data which were then exported to SPSS 14 for analysis.

The process of data collection (or rightly, production) and analysis is iterative and a grounded theory perspective weaves through the dialogue of ideas and evidence. Grounded theory ensures that -- although existing theories are used as scaffold to guide the direction of initial thinking and exploration of the literature -- knowledge gained from the review of data collected feeds into the next level of data collection and analysis.

As validity underscores a lot of concerns in social research especially those involving some form of comparison, this study pays close attention to measurement validity. Measurement validity is defined as “concerned with the relation among scores, indicators, and the systematized concept” (Adcock and Collier 2001: 533). Adcock and Collier (2001: 538-543) identified and described three types of measurement validation: content validation, convergent/discriminant, and nomological validation. Content validation focuses on how the study captures adequately the different contents of the concept or phenomena being investigated especially in relation to how indicators developed represent the different shades of the concept (p.538). Convergent/discriminant validation refers to how chosen indicators are empirically associated with the concept under investigation and discriminates different groups of indicators (p.540). Finally, nomological/construct validation looks at how identified indicators fit with or confirm the overall
expectation of the causal analysis (p.542).

In light of the above, the best way to approach the many dimensions of the study is to use what Murray (1998: 20) aptly describes as specifically complementary quantitative and qualitative methods for the study of changing strategies of household livelihood over time[...] and [...] through a sustained and explicit focus on the interaction between macro- and micro-levels.

Furthermore, the use of both quantitative and qualitative approaches emboldens triangulation of information as “different survey techniques contain different social dynamics between the research team and their respondents” (Christiaensen, Hoddinott, and Bergeron 2001: 17). In this study, the analysis begins with the use of the survey data then qualitative information from the interviews, PCAs, and project reports are added in the discussion. Outcomes are cross-referenced with secondary sources. In this study, quantitative analysis – the use of numerical information and statistical methods of inference – is privileged over qualitative (or specifically, ethnographic) analysis – the use of non-numerical information, inductive methods of inference, and active involvement of those interviewed (cf. Kanbur 2001: 7). This decision was taken because of the need to generalise across the three sites involving a reasonably wider coverage of respondents. The qualitative interviews were used to recover meanings, values and intentions, especially those associated with the notion of turbulence, which is discussed in detail in Chapter 10.

The idea that livelihoods plays an important role in the geographies of interstitial spaces presented in Figure 2-1 serves the above purpose. On its own, the livelihood framework has been widely applied in rural development, official development assistance, and now increasingly in addressing urban poverty. The assets approach in the livelihood framework is a useful frame to array the various aspects of kangkong production.

The application of the livelihood approach has already been far-ranging, based on the number of development organisations, researchers, and universities using it, although the formulation and focus varies as shown in the use of different terms to describe a largely similar approach such as sustainable livelihoods (Ashley and Carney
1999), household livelihood security (Lindenberg 2002), and asset vulnerability framework (Moser 1998)\textsuperscript{11}. The approach as used here is influence by the work of Bagchi et al. (1998), Murray (1998; 1999; 2000; 2002) and Whitehead (2002).

In the household and community level analyses, the orientation was actor-oriented so that "concepts are grounded in the everyday life experiences and understandings of men and women [...] and "places the actor at the centre of the stage and rejects linear, determinist and simple empiricist thinking and practice" (Long 1992b: 5-6).

The use of actor-oriented approach recognises that developments in the realm of peri-urban livelihoods are as much endogenously as exogenously driven. That is to say, external processes – such as globalisation and urbanisation – while affecting individuals and social groups are also "mediated and transformed by these same actors and structures" and the extent to which such mediation and transformation occur are seen in the everyday life experiences and perceptions of the individuals concerned (Long 1992a: 20).

Moreover, the actor-oriented approach fits very well with livelihood analysis as "All livelihoods approaches are actor-focused and stress the tactical and strategic behaviour of impoverished people [...]" (Whitehead 2002: 576). Though not strictly actor-oriented in ambit as Long’s perspectives (1992a) but broader covering land and agrarian change, similar views are held by Askew (2002; 2003), Bryant (1995), Rigg (2001), Taylor, Watts and Johnston (1995), and others who value the role of the locality and the agency of actors.

The totality of the approach adopted in this study is influenced in part by the methodological fusion of both qualitative and quantitative traditions within the framework specified by Madsen and Adriansen (2004) which, in turn, is inspired by Vayda’s (1983) notion of “progressive contextualisation”, responds to the call of Yeung (2003), and reminded of the existence of “multiple conjunctural causation” (Ragin 1987: x) in social phenomenon. The appropriate mix of quantitative and qualitative approaches in this study takes note of Kanbur’s (2001: 1) suggestion that

\footnotesize{[...] there are indeed strengths and weaknesses at each end of a given spectrum. Numerical

\textsuperscript{11} Ashley (1999), Murray (2002), and Solesbury (2003) offer a good background to the history of livelihoods research.}
3.5.1 Quantitative analyses

Quantitative analyses in this study revolve around the use of several statistical procedures using SPSS\textsuperscript{12} as listed below:

1. **Descriptive statistics**

   Descriptive statistics such as means, maxima, minima, and standard deviations ($SD$) were generated as needed. Correlation is used to identify the relationship between two variables and the coefficient of determination determines their shared variance. To compare the standard deviations of variables with different means, their coefficient of variation (CV) is used. CV measures the size of the standard deviation in relation to the mean. Because CV has no dimension, it provides a relative measure of variation among variables (Anderson, Sweeney, and Williams 2002: 87).

2. **Independent-samples t-test**

   Assumptions of t-tests such as level of measurement, random sampling, independence of observations, homogeneity of variance, and normality were checked to ensure that the data is amenable to this kind of analysis. However, violations of normality is considered to be unlikely if the sample size is $>30$ (Pallant 2007: 238). This test was used particularly to confirm the results of the regression about the effects of the gender of the respondent on the responses to survey questions.

3. **Paired-samples t-test**

   For the monitoring data analysis, paired-samples t-test was used to compare the means of repeated measures data. Preliminary assumptions testing were also carried out as above.

4. **Multiple comparisons**

   Multiple comparisons are group of procedures that begin with the one-way analysis of variance (ANOVA) to test the equality of the means of the groups then com-

\textsuperscript{12} Statistical Packages for the Social Sciences
pare each group two at a time to determine which groups are significantly different (Toothaker 1993: 1). Either planned contrast or post hoc comparison follows ANOVA. ANOVA assesses the significance of the ratio between group differences and within group differences. It ensures that the differences between groups are not due solely to random error, but an actual difference in the sample. Resulting from ANOVA is an $F$ ratio which is the ratio of the average variability between group means and the average variability of scores within groups (Newton and Rudestam 1999: 202-8).

When the homogeneity of variance assumption is violated as indicated by Levene's Test, then the alternative provided by Welch's $F$ is used instead of the main table if the differences in variances are not too large or the Brown-Forsythe $F$ if the differences are large. In this study, Welch's $F$ is reported because the differences are not too large. Post hoc comparison is carried out to determine which among the different combinations of treatment groups (i.e., cities) produce the variation. It is possible that only certain combinations account for the variation. As such, a pairwise comparison is needed. When the homogeneity of variance is violated, either Gabriel's procedure or Hochberg's GT2 was used in post hoc comparison. Gabriel's procedure is ideal for slightly different sample sizes while Hochberg's GT2 is useful for large sample size differences (Field 2005: 325-57). Based on Field's (2005: 341) suggestion, Games-Howell procedure was also ran to confirm the results of Gabriel's and Hochberg's GT2 procedures. In calculating the subsets of groups with the same means under both Gabriel and Hochberg's GT2 procedures (or any multiple comparison procedures for that matter), the harmonic mean sample size (the weighted version of the mean), which takes on board the relationship between the variance and the sample size, is used. Through this, the biases resulting from unequal sample sizes are addressed ensuring that reliable results are produced (Field 2005: 356).
5. Sequential regression

As will be discussed later, predictors of dependence on kangkong as a main income are determined using sequential regression (aka hierarchical regression). This regression allows us to determine which independent variables explain or predict the dependent variable while controlling for the effects of blocks of variables. This technique assumes that the sample size is adequate; there is no strong multicollinearity; there are no outliers; and the residuals do not violate normality, linearity, homoscedasticity, and independence. Each of this was assessed before regression was carried out. The regression sequences are described in Chapter 7.

In this study, the issue of sample size becomes a point of importance because regression was run for each city, instead of the total of the three sites. Doing so results in smaller sample sizes. Such decision was made because the uniqueness of each city will be diluted, or at worst lost, when stronger correlates from other cities are factored in. Running the analysis at the regional level will magnify the interaction of variables statistically rather than the interaction of social factors which are socially, culturally, politically, and spatially embedded in the dynamics of a country. That is to say, for example, that the role of gender in aquatic production in peri-urban Hanoi cannot easily be assumed to have the same explanatory contexts when compared with the situation of the Bangkok and Phnom Penh peri-urban zones. Thus, the uniqueness of Hanoi will disappear if the pattern is not shared by the other two cities because the sample sizes are nearly equal.

Hair et al. (1998: 166) recommends that, for the generalisability of the results, there should be at least 5 observations or cases for every independent variable. Lower than this, the risk of overfitting the variate to the sample may result. In this case, the multiple regressions in this study for each city have 13 independent variables and at

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13 A method called fsQCA (fuzzy set Qualitative Comparative Analysis) developed by Charles Ragin (Ragin 2000) is an alternative to multiple regression in the domain of qualitative comparative analysis. But I chose to adopt multivariate statistics such as sequential regression as some of the literature on land use change (e.g., Caldas et al. 2007; Coomes, Barham, and Takasaki 2004; Legesse and Drake 2005; Murphy 2001; Perz, Walker, and Caldas 2006; Perz 2001; Perz 2005a; Perz 2005b; Seto and Kaufmann 2003; Walker 2003; Walker et al. 2002) use multivariate procedures. I wanted to be able to compare my results with these. fsQCA is interesting, but quite pioneering, and its application in comparative studies especially in geography is not yet that widespread. Having carried out this type of analysis in this study, the next step is to explore the same dataset in fsQCA, a possibility I want to pursue after the PhD in other opportunities.
least 70 cases so it is just within the required minimum. However, Hair et al.'s recommendation is just a rule-of-thumb. A more accurate test is provided by Green (1991): $N \geq (8/f^2) + (m - 1)$, $f^2 = .02, .15, \text{ and } .35$ for small, medium, and large effects and $m$ is the number of independent variables (IV). Assuming a medium effect and 13 IVs in the regression, $N$ should be $\geq 65$ cases, but we have 71 cases in Bangkok, 72 in Hanoi, and 72 in Phnom Penh.

In circumstances where missing data are encountered and cannot be remedied, pairwise deletion is chosen to maximise the theoretical significance of the cases. It should be mentioned that the goal of this study is not to infer kangkong findings for the rest of the population or production systems in the cities studied because it is obvious that kangkong households will have different dynamics compared to all myriad types of households found in each city’s peri-urban zones. Instead, this study will highlight the patterns, insights, and the stories from three cities in mainland Southeast Asia about the relationship between livelihoods tied to wetlands or aquatic environments around cities and spatial change using a popularly consumed and often belittled vegetable, kangkong, as a vehicle. If anything, therefore, I am only making a claim about how to wring out insights of spatial change from the dynamics on the ground as represented by a species whose production system straddles the peri-urban and whose ecology is markedly defined by the metabolism of the city.

On the issue of normality, tests showed that most of the variables were skewed and peaked. Attempts were made to address these such as checking the outliers for operator errors and validity14. Positive skew values were detected in the data so that they were transformed using their square roots (Sqrt) if the skew is moderate or their natural logarithms (Ln) if the skew is large. If the values are severely skewed, inverse transformation is used, which is simply $1/Y$ ($Y$ = old variable). These transformations also improve linearity and homoscedasticity of residuals and minimise outliers. If no transfor-

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14 The use of non-parametric statistics which are distribution free and therefore do not assume normal distribution was ruled out because they tend to be less powerful compared to parametric statistics, which some experts argue, are robust enough to address violations of normality (Pallant 2004: 82). Achieving non-normal distribution, however, is a common fact in social science research because of the nature of data being dealt with which tends to swing in extremes as in the case of levels of depression or other personality measures (Pallant 2004: 58, 103).
ations help in improving normality, variables are dichotomised based on the suggestion of Tabachnick and Fidell (2007: 88). Multivariate outliers were also assessed using Mahalanobis Distance and Cook's Distance.

In Bangkok, using an alpha level of .001 as suggested by Tabachnick and Fidell (2007) and 11 independent variables, the critical value is 31.26. The highest Mahalanobis Distance in the Bangkok regression is only 27.40. Neither were there Cook’s Distances above 1 so that multivariate outlier was not a problem. In Hanoi, with 13 independent variables, the critical value is 34.53. None of the distances were above this value so multivariate outlier was not a problem either in this city’s regression model. In the case of Phnom Penh, three cases had Mahalanobis Distance larger than the critical value of 32.91 but their Cook’s Distances are still less than 1. The previous is known to provide conservative estimates. Thus, a decision was taken to remove them from the analysis.

Multicollinearity was assessed using the values of Tolerance (critical level is above .1) and VIF (critical level is more than 10) in the regression. In cases where violations are detected dropping of the variables is the option taken.

For the normality, linearity, homoscedasticity, and independence of residuals, the normal probability plot (P-P) of the regression standardised residual was inspected. It emerged that the plots only had minimal deviations from the normal lines (so assumptions were essentially met). Still, to confirm that these small deviations do not compromise the results, the residuals were analysed applying the rules summarised in Field (2005: 164), which are:

1) No absolute values of the standardised residuals greater than 3.29;
2) No absolute standardised residual values greater than 2.58 for more than 1% of the sample; and,
3) No absolute standardised residual values greater than 1.96 for more than 5% of the sample

None of these rules were violated. Thus, the model was a good estimate of the data (as shown by the points around the 45-degree line of the residuals plot), but like all models, it is subject to some random errors that cause the points to slightly deviate from the 45-degree line. But that is normal for any model, given the complexities of so-
6. One-way repeated measures ANOVA

Data from the monitoring surveys, such as labour allocation, was analysed using one-way repeated measures ANOVA. These measures test the variance differences of the dependent variable across three monitoring periods. In addition to the standard assumptions of ANOVA, repeated measures ANOVA also checks for sphericity using Mauchly's test. Sphericity refers to the equality of the level of dependence of the same variable when subjected to two or more conditions. If Mauchly's test is significant, the assumption of sphericity is violated. This means that the variances of the differences in the test or experimental conditions are not equal. In view of this, I use Greenhouse-Geisser correction, which is known to be conservative among the corrections available in SPSS 14. In all the cases, however, both Greenhouse-Geisser correction and Huynh-Feldt correction yield similar significance values so that any of the two correction factors could have been used. Instead, I opted for the former in view of the reason already stated. The comparison uses repeated contrasts and Bonferroni procedures when sphericity was not met or Tukey LSD post hoc test when sphericity was upheld (Field 2005: 428-54).

3.5.2 Qualitative analyses

There are three types of qualitative data used in the study: participatory community appraisal (described above), life history interviews and key informant interviews.

3.5.2.1 Participatory community appraisal and narratives of participation

This study uses participatory community appraisals (PCA) (Photo 3-1) conducted under the PAPUSSA project. PAPUSSA has generated 11 PCAs from the 3 cities but only four are relevant to this study (2, Hanoi; 1, Phnom Penh; and 1, Bangkok). These PCAs were useful in getting a feel of the sites prior to the main surveys. They also highlighted the issues in each village which are important in defining their suitability as field sites.

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15 I have checked the examples from other statistical books (such as Field 2005; Hair et al. 1998; Tabachnick and Fidell 2007) and found generally similar results with the residuals plot.
PCA sites were selected on the basis of the knowledge of local PAPUSSA partners in each city. The PCAs were purely descriptive.

Chronologically, the first element of the field research was the PCA (see Figure 3-1), an approach based on the principles of participatory rural appraisal. PCA tools used were: wealth ranking, community mapping, timelines, seasonal calendars, activity matrix, food consumption, resource mapping and problem ranking. Wealth ranking provided an indication of the "wealth" groups within the village and this division provided an opportunity to stratify village members according to their relative wealth as assessed by key informants using locally defined criteria. A community map was produced during community mapping showing the households in the village and important landmarks. The timeline provided an overview of the major historical events that shaped each village. Seasonality of production, community activities and health problems were shown in seasonal calendars and the various activities of household members in their activity matrices. Key food items consumed in the village were revealed through food consumption matrices. The location of ponds, other waterbodies, sources of inputs and markets were shown in the resource mapping exercise which led to the production of resource maps. Finally, village members were asked to identify and rank the problems they faced in their villages to get a sense of their priorities and concerns.

Despite the claim of being 'participatory', PCA as conducted in PAPUSSA and used in this study cannot claim to be truly 'participatory' as the agenda or the contexts of the research were predefined largely by European partners with inputs from national organisations. Communities were not involved in designing the research or setting the agenda. Instead, they were involved in finding out, through key informant interviews and PRA-borrowed tools, some of their 'issues'. What transpired in the field can be rightly called rapid community appraisal (cf. Christiaensen, Hoddinott, and Bergeron 2001). These caveats are borne of my awareness that there are increasing critiques of the participatory approach notably in Cooke and Kothari's (2001b) edited volume. Authors in that volume argued primarily that there is a need for "a genuine and rigorous reflexivity" in the practices of participation in development (Cooke and Kothari 2001a: 15); that participatory rural appraisals (PRAs) as tools reproduce the same patronage politics that top-down planning propagates (Mosse 2001); that participatory approaches focus only "on the highly visible, formal, local organisations, overlooking the numerous communal activities that occur through daily interactions and socially embedded arrangements" (Cleaver 2001: 53); that the formulaic approaches in PRA have overlooked other important factors in community development such as respect, trust and friendship (Hailey 2001); and, that the power reversals and destabilising binaries advocated in PRAs miss an important dimension that power is not solely located in institutional centres or towards the top of the development pyramid but is also reproduced in the daily interaction of individuals with each other at the local level (Henkel and Stirrat 2001; Kothari 2001; Mohan 2001). Despite these well-founded criticisms, this research and the project I was involved with decided to use this approach to uncover narratives that are often not easily accessible to outsiders (i.e. those that do not belong to the community) in a manner that is not too extractive.
The use of the term “community” is intentional in order to de-emphasize “pure” rurality and urbanity as the peri-urban is an interface lying between these two zones. This does not, however, deny the fact that there are distinct typologies that exist between ‘rural’ and ‘urban’ especially in terms of livelihoods as shown in Table 2-1, even if their true nature exists as a continuum. These typologies also presuppose that these are unique differences between the ‘rural’ and the ‘urban’ such that the misuse of tools based on ‘rural’ contexts without appropriate adjustments can be potentially problematic. These differences include the notion that urban/peri-urban dwellers have multiple occupations, are highly mobile, and closely connected with the circuits of information such as TV and or media, which their rural counterparts do not easily have access to (Farrington, Ramasut, and Walker 2002). The implication of this is that when approaching peri-urban/urban communities one has to be mindful that the residents may not have the time to engage in participatory activities and their social contexts, including their vulnerabilities, are different.

In Bang B, Hanoi, the PCA was conducted among a group 27 people classified by wealth groups: rich men, rich women, poor men, and poor women. The ranking was

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17 Together with other project staff, I provided the training for project partners who will become PCA facilitators (Refer to Appendix 3 for more discussion on my involvement in this activity). Guidance on what the PCA is all about and how to carry them in the field were provided in a form of protocols. In the protocol, the list of tools to be administered, their rationale, and the order of presentation are provided. An important part of the protocol is the wealth ranking where rich and poor groups are to be separated in the activities to control for the effects of wealth or perceived social class in the participation of producers. In addition, another important part of the protocol was for the results of the PCA to be feedback to the community for validation and sharing. However, there were some lapses in the implementation so that only Hanoi was able to carry out the PCA tools according to wealth ranks. Instead, groups in Bangkok and Phnom Penh were divided by gender. But this is just as well because the analyses of the survey results in succeeding chapters show that gender is an important issue such that the PCAs from these cities are still useful pieces of information. All cities were able to feedback the results to each villages where they had the PCAs.
made by key informants based on the wealth categories they created. The groups were:
rich women = 7 (2 vegetable farmers, 2 mechanic and inox steelworker, 2 livestock farmers and 1 rice farmer); rich men = 7 (3 rice farmers and inox steelworker, 2 vegetable farmers, 1 wooden electric board maker, and 1 livestock farmer); poor men = 6 (3 vegetables farmers, 2 fish farmers, and 1 rice farmer); and poor women = 7 (3 vegetable farmers, 2 cattle farmer and 2 rice farmers). The PCA ran for 3 days in October 2003.

In Kbal Tumnob, Phnom Penh, the PCA ran for five days in October 2003 and involved 21 villagers (12 females and 9 males). The participants were divided by gender. In Bangkok, the PCA was conducted for four days in October 2003 and was participated in by 17 villagers of roughly the same gender proportion.

3.5.2.2 Retrospective approach – life histories and key informant interviews

As part of the process of ‘looking back’, life history interviews were conducted for selected individuals. These interviews provide information on the processes of change at the individual and household level (cf. Bagchi et al. 1998). Such a retrospective approach represents an attempt to understand situations at the micro-level, i.e. at the level of the household, and deepens our understanding of kangkong as a livelihood system. Writing of livelihood trajectories in general, Murray (2002: 496) is of the opinion that life histories provide greater depth and understanding than other approaches. Life histories together with a menu of other qualitative approaches have been used extensively in livelihood studies where understanding human agency is important. Slater (2000: 32) has successfully shown that certain outcomes of livelihood trajectories can be elucidated through the analysis of life histories.

The use of a retroactive approach, life histories in particular, recognises the importance of locality and actor-oriented world views. “Localities are not inert population aggregates, they are constituted of people and their social networks that can, and do,

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18 It is a home-based steel coating industry to produce stainless steel products such as trays and kitchen utensils.
19 The guide questions for the interviews are provided in Appendix 9.
20 Such studies include that of the University of Manchester’s Multiple Livelihoods and Social Change Project (Murray 1998, 1999, 2000; Murray 2002; Whitehead 2002), Askew (2003), Bagchi (1998). It is also one of the tools or focus in participatory rural appraisal (Divamett et al. 2001; Farrington, Ramasut, and Walker 2002; Garrett and Downen 2002).
devise practices to attract, retain, boost, and otherwise ameliorate forces that seem to go beyond control" (Taylor, Watts, and Johnston 1995: 378-380). This goes back to Rigg's (2001: 155) argument on the importance of the locality in the globalisation discourse and practise. In the case of *kangkong*, the notion of marginality as affected by urbanisation and globalisation may have local components that need to be disentangled in order to understand the trajectories of change. Its continuities, discontinuities and ruptures may hold important keys to our understanding of its political economy. The use of life histories in delineating livelihoods in this study is influence by Bagchi et al's. (1998: 458) proscription that:

> Embracing the recognition by 'postmodernist theory' that reality is complex, problematic and perhaps ultimately inaccessible, and that the claims of all earlier totalising theories appear inadequate to deal with the dynamics of contemporary economy and society, yet refusing the extreme relativity of postmodernism, livelihoods analysis starts from daily lives and experiences (including subjective notions of what constitutes well-being and 'the good life'), but moves on from there to explore not only 'how people make history' but also the constraints that limit their functioning and capabilities.

*Kangkong* producers who were interviewed during the baseline and monitoring surveys were selected for further qualitative interviews. These were selected primarily on the bases of their age so that memories of the landscape and production systems could be retraced. But as cities in the survey have different demographic profile, the cut off age was adjusted. For instance, in Phnom Penh and Hanoi, the cut off age was 40 years old while it was 60 years old in Bangkok as the surveyed households in the latter are substantially older. Then gender and the nature of their production systems were added so that women were included and there was a diverse representation among the different production systems.

The questions pursued in the interviews were developed based on the different stages of transition in peri-urban aquatic food production systems hypothesised in the case of Southeast Asian cities. This means that questions of livelihood changes, multiple livelihoods, occupational history, land use history, perspectives on landscape changes, occupational aspirations for off-spring, and involvement in homegardening, among others, were asked.

Life history interviews provide information on livelihood history, local settlement histories, views on landscape changes, and perception of future well-being. Aside from
kangkong farmers, fish farmers from other sites were also interviewed to gather a mix of perspectives for comparative analysis. The informants were chosen on the basis of age, type of production system they were involved, and gender. This study uses 9 life history interviews from Bangkok, 12 in Phnom Penh, and 12 in Hanoi. In addition to these interviews, I also carried out key informant interviews to gather further insights on the research topic. These are listed in Appendices 4 to 6.

3.5.3 Language

Methodologically, this study relies heavily on interview-derived information whether in the surveys or life histories. As a footnote to the widespread use of this approach, this study accepts the fact that interviews are ‘negotiated texts’ and that the resulting information represents the interpretations, perceptions, and narratives and counter narratives between the interviewee and the interviewer (cf Fontana and Frey 2003). In other words, as the interview process is subjected to various hermeneutic processes, the outputs used may only represent the contexts on which the interviews predispose them to. As Fontana and Frey (2003: 64) write: “Each interview context is one of interaction and relations; the result is as much a product of this social dynamic as it is a product of accurate accounts and replies”. Therefore, the objectivity of the methods, the analysis and the discussion are limited to the extent the interview as a methodology allows.

Because I am not competent in any of the languages in the study sites, the interviews were conducted in the interviewee’s national languages (i.e., Thai in Bangkok, Vietnamese in Hanoi, and Khmer in Phnom Penh) through an interpreter using a prepared questionnaire outline which both the interpreter and I rehearsed before hand. The interviews were recorded and transcribed in the vernacular before they were translated into English. In the transcript, English translations were written alongside the vernacular transcripts and were sent to another local person to verify whether the English translations reflect what was originally contained in the vernacular transcripts. This process was adopted in view of the recognition that the translator has his/her own positionality. Twyman et al. (1999: 322) argues, based on their fieldwork experience, that
contextualising the positionality of the translator is important for a nuanced understanding of the data generated because "language plays a central role in the construction of meaning, yet when one language is mapped onto another there is a compensation of these issues". Furthermore, they added that "...[...] the researcher can never have access to the 'original' text, only the secondary text produced with the translator, and this has significant implications for the interpretation of meanings and the power and authority of the texts". Such position on the role of the translator in the production of texts is influenced by a Derridean perspective that "every translation creates a new text rather than the copy of another text" (Twyman, Morrison, and Sporton 1999: 321).

3.6 Background of respondents

Table 3-2 lists the key characteristics of the respondents in this study based on data culled from the PAPUSSA Survey. The mean ages of respondents are significantly different, $F(2, 212) = 7.03, p<0.001$. In particular, post hoc Gabriel tests show that the mean ages for Phnom Penh ($M = 39.71$) and Hanoi ($M = 46.06$) are significantly different, whereas it is not the case between Bangkok ($M = 43.20$) and Hanoi ($M = 46.06$), or, Bangkok ($M = 43.20$) and Phnom Penh ($M = 39.71$).

Furthermore, a close to two-thirds of respondents is female. It may be recalled from earlier discussion that the brief given to PAPUSSA partners was to interview producers who are involved in aquatic food production. Thus, there was no intentional se-

<table>
<thead>
<tr>
<th>Background of respondents</th>
<th>Bangkok</th>
<th>Hanoi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>71</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Age</td>
<td>43.20</td>
<td>46.06</td>
<td>39.71</td>
</tr>
<tr>
<td>SD</td>
<td>11.84</td>
<td>8.39</td>
<td>10.03</td>
</tr>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39.0</td>
<td>33.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Female</td>
<td>61.0</td>
<td>67.0</td>
<td>69.0</td>
</tr>
<tr>
<td>Relation to household head (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child of HH head/spouse</td>
<td>16.0</td>
<td>13.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Household head</td>
<td>49.0</td>
<td>40.0</td>
<td>38.0</td>
</tr>
<tr>
<td>Other extended family member</td>
<td>3.0</td>
<td>47.0</td>
<td>61.0</td>
</tr>
<tr>
<td>Spouse of HH head</td>
<td>32.0</td>
<td>42.0</td>
<td>61.0</td>
</tr>
<tr>
<td>By family relationships (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband</td>
<td>31.0</td>
<td>29.2</td>
<td>29.2</td>
</tr>
<tr>
<td>Wife</td>
<td>50.7</td>
<td>58.3</td>
<td>69.4</td>
</tr>
<tr>
<td>Other family members</td>
<td>18.3</td>
<td>12.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Lifetime migration (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifetime migrant</td>
<td>11.0</td>
<td>64.0</td>
<td></td>
</tr>
<tr>
<td>Non-lifetime migrant</td>
<td>89.0</td>
<td>100.0</td>
<td>36.0</td>
</tr>
<tr>
<td>Religion (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buddhism</td>
<td>100.0</td>
<td>96.0</td>
<td>97.0</td>
</tr>
<tr>
<td>Christianity</td>
<td></td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Islam</td>
<td></td>
<td></td>
<td>3.0</td>
</tr>
</tbody>
</table>

Table 3-2 Background of respondents (Source: PAPUSSA Survey)
lection of female producers. In Hanoi and Phnom Penh, a large part of those who were interviewed, 47% and 61% respectively, were spouses of HH head whereas slightly more HH heads themselves were interviewed in Bangkok (49% vs 32%).

In terms of lifetime migration gauged through a question on whether respondents were born at their current residence (i.e., the place of enumeration), nearly two-thirds of respondents in Phnom Penh are lifetime migrants. Bangkok and Hanoi have largely non-lifetime migrant households. Lifetime migration's implication to kangkong production will be explored later. On the issue of religion, Buddhism is the respondents' dominant religious affiliation.

3.7 Summary

This chapter has described the key research questions of the study. It also discusses the contexts and considerations in conducting the study, producing the data, and interpreting the findings. I have described my attachments and the data used. I have also highlighted how I deploy a comparative stance and the various lineaments that underpin such comparison. I highlight the use of both quantitative and qualitative data in this study as an important direction towards achieving reliability and validity of findings. This study recognises that the whole research enterprise is a socially mediated process and one cannot truly be unbiased and objective. In the chapter, I have laid down the various 'subjectivities' that inform findings hoping that this study will be interpreted in its contexts. I have also provided a short description of the respondents. These descriptions will be returned to in the discussions in the following sections. A fuller description of the dynamics of data collection is provided in Appendix 3.

Before proceeding forward to the description of kangkong and the opportunities it offers in terms of understanding spatial change in mainland Southeast Asia, I will describe the contexts of the study, providing a detailed description of each city and field sites.
Chapter 4
The field sites in this study

"Asia" is not one mass, not one face, not one experience, not one thing, as Orientalist impressions would have it. In both joy and tragedy, we are as richly diverse as we are umbilically connected by land, water, and history. - From the blog of Jose Dalisay, Jr., a shortlisted novelist for the inaugural Man Asian Literary Prize, http://homepage.mac.com/jdalisay/blog/

The countries of South East Asia encompass a remarkable range of levels and forms of development – Dixon and Smith (1997: 8)

There are three countries, three capital cities, and several villages (Table 4-1) in this study. Although each is unique in its own right, the cities covered in this study are some of the most beautiful cities in the region, earning various epithets such as ‘city of angels’ and ‘Paris of the East’. Yet their development trajectories are many things other than homogeneous. These uniquenesses and differences will be highlighted in this chapter, aside from introducing the field sites.
<table>
<thead>
<tr>
<th>Administrative Jurisdiction</th>
<th>District</th>
<th>Commune</th>
<th>Village</th>
<th>Distance from key city feature and nature of water body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phnom Penh</td>
<td>Mean Chey</td>
<td>Boeung Tompon</td>
<td>Kba Tomnub</td>
<td>c. 6 km from Wat Phnom, in Boeung Cheung Ek (sewage lake) area</td>
</tr>
<tr>
<td>Nonthaburi (Bangkok)</td>
<td>Sainoi</td>
<td>Nong phrao-ngai</td>
<td>Thaom Canal</td>
<td></td>
</tr>
<tr>
<td>Hanoi</td>
<td>Thanh Tri</td>
<td>Khuyen Luong, Tran Phu</td>
<td>So Do Village</td>
<td>c. 27 km from Victory Monument, adjoins Thaom Canal</td>
</tr>
<tr>
<td></td>
<td>Hoang Mai</td>
<td>Hoang Liet</td>
<td>Bang B</td>
<td>c. 13 km from Hoan Kiem Lake, receives city effluent through traditional, large swamp</td>
</tr>
</tbody>
</table>

Notes:
District - Khan in Phnom Penh
Commune - Sangkat in Phnom Penh

Table 4-1 Field sites

4.1 Bangkok – ‘city of angels’

Bangkok¹, Southeast Asia’s, and possibly the world’s, most primate city (Dixon 1999: 190), is located in the Chao Phraya Delta. The delta is fed with waters from the Chao Phraya and Mae Klong Rivers. This region is known for its productive rice areas (oftentimes described as the country’s rice bowl) and rapid development (Chunnasit, Pagès, and Duangngam 2000: 2; Sirisup and Kammeier 2000: 3). It covers an area of 1,810,000 ha (Dao The Tuan and Molle 2000: 11). Bangkok accounts for a highly disproportionate amount of Thailand’s industrial output generating 37% of the country’s GDP in the mid to late 1990s² (Jones 2001: 1). The historical dominance of Bangkok in relation to the rest of the country leads some scholars, for example Dixon (1999), London (1980), Parnwell (1997; 2004) and Parnwell and Wongsuphasawat (1997), to note that Bangkok’s development is by itself leading to uneven development³ in the country.

Thailand’s oldest tourist publication, Where, calls Bangkok ‘the epitome of contradictions’ because it is

¹ Bangkok’s official name is Krungthepmahanakhon, amornrattanakosin, mahintharayuthaya, mahadilok-pop, nopparatrachathaniburirom, udomratchanivetmahasathan, amornpimanavatarnsathit, sukkathattiyavisanukarmprasit or translated as ‘A big capital city, where the Emerald Buddha dwells, full of nine kinds of gems and magnificent palaces. A beautiful, prosperous place just like paradise. The angels couldn’t resist such loveliness and called it their own. This beautiful metropolis was built by Vishnu, on the royal command of Lord Sukhathewaraja. Thus, no enemy can conquer this kingdom’ (Where 2005: 27).

² But this is already a reduction from 50.1% in 1988 (Dixon 1999: 192).

³ This phenomenon has been subjected in detailed scrutiny in Dixon (1999), Greenberg (1994) and Parnwell (1996), among others.
traditional yet outrageously modern. A city of many shades, many layers. Modern glass towers vie for space with traditional Thai temples and teak houses. Swank shopping malls exist alongside local markets. It is an archetypal modern Asian metropolis, with tradition never far away. (Where 2005: 26)

Although Thailand was technically never colonised, European influences left their mark in the lives and representation of space and places, particularly in Bangkok. European colonisation has introduced new artistic temperaments and European sensibilities among the society’s elites and foreshadowed architectural designs in the cityscape. Keyes (1977: 282) rhapsodises that elites send their children either to Catholic or Protestant schools and were taught in English or French or at least with curricula similar to those in England or France.

Vast changes in the Chao Phraya Delta’s land uses have been brought about by the rapid urbanisation of Bangkok. Bangkok has transformed its erstwhile hinterlands into productive economic zones and dynamic human settlements. Canals were instrumental in extending the reach of the state to its frontier (Dixon 1999: 199). Originally intended to dispatch soldiers to warring areas especially during the Ayutthayan period, they brought irrigation and exploitation of frontier agricultural areas to produce rice (Brummelhuis 2007: 17–8). But saline intrusion followed – as the case of Rangsit shows – so that enterprising households, with government prodding and support, found aquaculture production and orchards good alternatives (Nathalang 2000). With the onset of the property boom brought about by foreign direct investments and the attraction of Thailand as a hub for regional manufacturing activities, new zones mushroomed devoted solely to industries and new forms of human settlement (Greenberg 1994). Necessarily, amenities catering to the needs of this new economic geography followed such as golf courses, recreation establishments, new airports and exclusive gated communities.

To extend the reach further into Bangkok’s hinterland in a process known as EBMRisation (Extended Bangkok Metropolitan Region4), new transportation arteries to connect the core with the periphery in the form of ring roads, elevated highways, and rail networks, both elevated and underground, were and continue to be constructed transforming the cityscape into a web of concrete structures. Nowhere is this image more palpable

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4 The EBMR is composed of the Bangkok Metropolitan region (comprised of the Bangkok Metropolitan Administration, Samut Prakan, Pathum Thani, Nakhon Pathom, Samut Sakhon, and Nonthaburi) and the outer ring changwats of Ayutthaya, Chachoengsao, Chonburi, Samut Songkram, Ratchaburi, Kanchanaburi, Saraburi, and Suphanburi.
than at the major intersections in the inner city. Bangkok is, therefore, a pre-eminent Asian megalopolis. And this image finds resonance among buyers and brokers of Bangkok's property market as shown in the comment made by David Simister, the Chairman of CB Richard Ellis Thailand, an international real estate company that "[...] Bangkok is probably the cheapest civilised city in the world" due to its good hospitals, buildings, and offers a very affordable yet quality lifestyle comparable to that of Hong Kong and London (Anonymous 2005: 13).

The EBMR had around 13.5 million people in 1990. The industrial activities of Thailand are largely located in the EBMR. And on its peripheries also are housing settlements, aquaculture ponds, shopping malls and recreation centres (Greenberg 1997: 166-8). The process of EBMRisation results from the dual impact of government policies to disperse\(^5\) industrial activities away from Bangkok to under-industrialised peripheral regions and of firms' decisions to locate in areas that improve their business efficiency and competitiveness such as better facilities and incentives (Wongsuphasawat 1997: 197, 206). Chunnasit et al. (2000: 3) noted that "the outward expansions of economic activities together with the economic and environmental factors are likely to intensify land use in these fringe areas".

The field site in Bangkok is in Nonthaburi\(^6\) (Table 4-1) (Map 2-1) one of the inner provinces comprising the Bangkok Metropolitan Region\(^7\) and located immediately north of Bangkok. Before the emergence of Bangkok's extended metropolitan area, rice, fruit and vegetable growing were the dominant activities in Nonthaburi. The province was known for its orchards and home gardening. Since the beginning of the Rattanakosin\(^8\) era (1782 AD up to present), Nonthaburi has had a reputation for producing the best Thai fruits (Gajaseni and Gajaseni 1999:4). These fruits include jack fruit (Artocarpus

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\(^5\) In actuality, what Wongsuphasawat (1997) has found is that true decentralisation of industrial activities to other areas outside of Bangkok did not occur; instead, 'dispersed concentration' resulted where much of the industries are concentrated in the provinces surrounding Bangkok (or Zone 2 in the planning lexicon of the Thai Board of Investment).

\(^6\) Although the actual field site is Nonthaburi, comparisons across the three cities use 'Bangkok' as a spatial reference. When the issues being discussed concern a local level dynamic which cannot be adequately and properly explained using 'Bangkok' as the reference, Nonthaburi is used instead.

\(^7\) The Bangkok Metropolitan Region is composed of the Bangkok Metropolitan Administration and the five inner changwats or provinces of Samut Prakarn, Pathum Thani, Nakhon Pathom, Samut Sakhon, and Nonthaburi. The city of Bangkok is within the Bangkok Metropolitan Administration.

\(^8\) The Rattanakosin era covers the period from 1782 AD to the present during which Bangkok was founded (Wyatt 1984:145-166).
heterophyllus Lamk), Burmese grape (Baccaurea spinda Muell.), plum mango (Boeua macrophylla Griff.), durian (Durio zibethinus L.), Java apple (Eugenia javanica Lamk.), Malay apple (Eugenia malaccensis L.), mangosteen (Garcinia mangostana L.), and yellow santol (Sandoricum koetjape Merr.). However the integration of Thailand into the global economy, the accompanying economic boom and the improvement in the purchasing capacity of households coupled with Nonthaburi’s proximity to Bangkok and improvement in road networks have contributed to the changes in land use in the province.

Askew (2003: 287) describes the transformation in the economic base and landscape as ‘radical’. Such transformation is underlined by two associated processes: (i) conversion of agricultural lands to other non-agricultural uses; and, (ii) shift in the type of crop produced from predominantly rice to fruit and vegetable production. The land uses of the provinces surrounding Bangkok are presented in Table 4-2. Notice that Nonthaburi is the smallest among the provinces in the Bangkok Metropolitan Area.

While retaining its image as an agricultural province, Nonthaburi became a well-known supplier of fresh kangkong and water mimosa in major wholesale and retail markets in Bangkok. A huge swath of land is covered with kangkong and water mimosa production alongside remaining ricelands, housing estates and roads. Farms for these commodities occupy previously ricelands in the province.

<table>
<thead>
<tr>
<th>Province</th>
<th>Total land (rai)</th>
<th>Forest land (rai)</th>
<th>Total farm holding (rai)</th>
<th>Housing area (rai)</th>
<th>Paddy land (rai)</th>
<th>Crop land (rai)</th>
<th>Fruit trees and other tree crops (rai)</th>
<th>Vegetable and flowers (rai)</th>
<th>Grassland (rai)</th>
<th>Idle land (rai)</th>
<th>Other (rai)</th>
<th>Number of households</th>
<th>Farm size (rai/HH)</th>
<th>Unclassified land (rai)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangkok</td>
<td>978,263</td>
<td>1,565</td>
<td>124,236</td>
<td>4,813</td>
<td>100,755</td>
<td>-</td>
<td>13,805</td>
<td>4,766</td>
<td>40</td>
<td>-</td>
<td>13,805</td>
<td>7,301</td>
<td>17.02</td>
<td>852,263</td>
</tr>
<tr>
<td>Chachoengsao</td>
<td>3,344,375</td>
<td>576,885</td>
<td>1,780,957</td>
<td>43,829</td>
<td>821,620</td>
<td>578,911</td>
<td>193,332</td>
<td>15,664</td>
<td>4,577</td>
<td>34,439</td>
<td>86,585</td>
<td>53,061</td>
<td>33.56</td>
<td>986,733</td>
</tr>
<tr>
<td>Nakhon Pathom</td>
<td>1,355,204</td>
<td>-</td>
<td>728,483</td>
<td>38,004</td>
<td>344,482</td>
<td>103,714</td>
<td>98,570</td>
<td>45,995</td>
<td>666</td>
<td>5,502</td>
<td>91,520</td>
<td>37,133</td>
<td>19.62</td>
<td>626,721</td>
</tr>
<tr>
<td>Nonthaburi</td>
<td>388,939</td>
<td>-</td>
<td>168,760</td>
<td>3,083</td>
<td>103,589</td>
<td>-</td>
<td>38,872</td>
<td>18,844</td>
<td>-</td>
<td>2,300</td>
<td>2,300</td>
<td>2,177</td>
<td>16.19</td>
<td>220,179</td>
</tr>
<tr>
<td>Pathumthani</td>
<td>953,660</td>
<td>-</td>
<td>500,729</td>
<td>6,266</td>
<td>343,100</td>
<td>-</td>
<td>114,480</td>
<td>12,726</td>
<td>-</td>
<td>1,796</td>
<td>11,939</td>
<td>15,382</td>
<td>32.55</td>
<td>452,931</td>
</tr>
<tr>
<td>Samut Sakhon</td>
<td>545,217</td>
<td>19,375</td>
<td>144,918</td>
<td>4,062</td>
<td>29,252</td>
<td>-</td>
<td>69,442</td>
<td>4,063</td>
<td>-</td>
<td>311</td>
<td>37,688</td>
<td>10,584</td>
<td>13.68</td>
<td>381,024</td>
</tr>
</tbody>
</table>

Notes:
1 rai = 0.16 hectare, or = 0.395 acre
1 hectare = 6.25 rai
A holding is an economic unit of agricultural production (cultivating crops, rearing livestock and culturing fresh water) under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title or legal form. The holding’s land may consist of one or more parcels, located in one or more separate areas of the same province (National Statistical Office 2004: 18)

Table 4-2 Land use in the Bangkok Metropolitan Area (Source: Office of Agricultural Economics, online)
In 2005, the population of Nonthaburi was 973,821 in a land area of 622.303 km²; thus, it has a population density of 1,564.87 people per km² (Department of Provincial Administration-Thailand). Administratively, Nonthaburi has six districts (amphoe), which are in turn made up of 52 communes (tambon) and 309 villages. These districts are Mueang Nonthaburi, Bang Kruai, Bang Yai, Bang Bua Thong, Sai Noi, and Pak Kret. Sai Noi, the district where a field site for this study was selected, is composed of seven communes or sub-districts: Sai Noi, Khun Si, Rat Niyom, Khlong Khwang, Nong Phrao-ngai, Watthana, and Sai Yai (ThaiTambon Website).

Nong Phrao-ngai (NPN) is a sub-district of Sai Noi District (Map 4-1). NPN covers an area of 17,170 rai (2,747 ha) in 12 villages (ThaiTambon Website). It has a total population of 5,892. NPN has 16 canals providing irrigation. NPN is primarily an agricultural village with rice, land vegetables, aquatic vegetables, and orchards among the major crops. There are also fish farms in the village which produce tilapia, silver barb and giant gourami for household consumption. Rice is cropped three times a year while *kangkong* is harvested all year round. The vegetables produced in NPN are sold at Pak Klong and Bang Yai markets. Ta-Thom and Kij Sang Kom canals are the main irrigation canals supplying water mainly for agricultural purposes. Farming of *kangkong* was introduced after the major floods in 1993 and 1995. But its commercial production at a scale seen today began in 1999 through the efforts of the government. In 2000, financial support from the Japanese Government, through the Miyasawa Fund, enabled the establishment of several farmer groups (e.g., rice paddy group, *kangkong* group, vegetable plantation group and aquaculture group) which were the vehicle for further intensification of their production systems. In 2001, more factories were built in the village (Yoonpundh et al. 2003: 8, 12).
4.2 **Hanoi – ‘city amidst the rivers’**

Being a capital of a country that went through several wars in years of struggle against foreign colonisers, war and its aftermath define Hanoi. Colonial vestiges are found all over the city. In its architecture and town planning. In café culture and food. In arts, language and politics. As “Hanoi Jane” Jane Fonda (2005), a 1970s Hollywood icon, fitness guru, and political activist observed: “Hanoi is a sprawling former colonial city shaped by French architects, with wide, tree-lined boulevards, parks, and lakes”.

Memories of war are etched on the landscape through street names, museums, monuments and statues. Yet it is a city that has moved on and accepted the vicissitudes of the past with ease and dignity. Hanoians are in fact proud of their history – a history highlighted by struggles and hard won victories over the Chinese, the French, and the Americans. The observations of an American journalist, who twice evacuated Viet Nam during the war and later returned to work for an American newspaper during peacetime, captured the enigma that is Hanoi. He wrote:

> Humbled by more than a millennium of war, poverty, and foreign domination, Hanoi has been rejuvenated and invigorated by the communist government’s decision to open Vietnam’s doors to foreign investors, tourists, and private enterprise. But rather than falling victim to the machinery of development that has pounded the character out of other Southeast Asian
cities, Hanoi has stood its ground, perfumed in seductive charm, protecting all that is old and special. The city is at once approachable and aloof. In the sunshine, it feels joyful; in the mist, melancholy. It is a place where the ghosts of a lost Indochina hover in the breeze. (Lamb 2004: 84)

Hanoi is the capital of Southeast Asia’s much awaited transitional economy, Viet Nam, and considered the oldest among Southeast Asia’s capital cities (Lamb 2004: 84). It is a historic city filled with vigour and ambition rooted in its colonial and pre-colonial past and demanding present. It is ‘formal’ and less capitalistic than its southern counterpart, Ho Chi Minh City, but nonetheless shows dramatic promise as the capital of an upcoming Asian economic powerhouse. “Unlike Ho Chi Minh City, with its frenetic pace, Hanoi seemed to me to be a slow, contemplative town. Its lakes, crumbling temples and monuments evoked its onetime grandeur as the imperial capital of Tonkin, the northernmost state of Vietnam in ancient times”, reminisces Karnow (1991: 48).

![Map 4-2 Hanoi City in relation to other provinces in North Vietnam (Drawn from HAIDEP Study Team 2005: 3)](image)

Already, Viet Nam is a major exporter of coffee and rice, commodities widely traded in world markets. In fact, Viet Nam is the second largest producer of coffee in the world after Brazil with output in 2001 of 800 000 tons valued at US$400 million (Ministry of Planning and Investment and Japan International Cooperation Agency 2003: 17).

In 2004, Hanoi had an average population of slightly more than 3 million people on a land area of 921 km² giving a population density of 3,347 persons/km², which is
by far the densest region in the whole country. On the other hand, Ho Chi Minh City, its southern capital, had a population of nearly 6 million people on a land area of 2,095.2 km²; hence, a density of 2,735 persons/km² (General Statistics Office 2005: 40), several notches sparser than its capital.

Hanoi breathes life as a city through French sponsorship and colonial ambitions in the region. The French wanted to build a capital to represent and manage its interests in what was then Indochina. Before the French’s intervention in the history of Hanoi, the settlement agglomeration that later became the capital of the country started as a Chinese city known as Thang Long. Chinese influences are everywhere. They are so pervasive that sometimes one is wont to believe that he or she is trudging a Chinese city. Yet despite this influence, the charm that is evoked is unmistakably Vietnamese. Chinese culture, traditions and architecture have melded with indigenous folkways to produce a remarkably charming entity.

The field sites in Hanoi are shown in Table 4-1. Two districts were covered in Hanoi – Thanh Tri and Hoang Mai. These districts are considered suburbs of Hanoi. Until early 2000, Hoang Mai was part of Thanh Tri District, which is a major freshwater aquaculture area in the city due to its low lying relief and a major recipient of wastewater from the city.

<table>
<thead>
<tr>
<th>Major socio-economic parameters</th>
<th>2000*</th>
<th>2001*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of communes and precincts (unit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xa – commune</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Thi Tran – town</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Land area (km²)</td>
<td>98.2</td>
<td>98.3</td>
</tr>
<tr>
<td>Average population</td>
<td>228,286</td>
<td>234,717</td>
</tr>
<tr>
<td>Density (person/km²)</td>
<td>2,324.7</td>
<td>2,390.2</td>
</tr>
<tr>
<td>Planted area of paddy (ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>spring paddy</td>
<td>2,931</td>
<td>2,930</td>
</tr>
<tr>
<td>winter paddy</td>
<td>2,580</td>
<td>2,025</td>
</tr>
<tr>
<td>Gross output of paddy (ton)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>spring paddy</td>
<td>14,069</td>
<td>13,522</td>
</tr>
<tr>
<td>winter paddy</td>
<td>10,604</td>
<td>7,088</td>
</tr>
<tr>
<td>Gross output of fishery (ton)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>exploitation</td>
<td>16.5</td>
<td>17.1</td>
</tr>
<tr>
<td>culture</td>
<td>3,601</td>
<td>4,386</td>
</tr>
<tr>
<td>Industrial output value at current prices (million dong)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>state owned enterprises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>non state enterprises</td>
<td>98,570</td>
<td>105,796</td>
</tr>
<tr>
<td>foreign invested sector</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*During these years, Hoang Mai was not yet created from Thanh Tri so this data includes Hoang Mai.

The total area occupied for aquaculture in Hanoi has slightly decreased from 3.4
thousand hectare in 2000 to 3.3 thousand hectare in 2003. This area is a lot smaller compared with other well-known aquaculture areas in the country such as the provinces in the Mekong Delta, which had a total aquaculture area of 621.2 thousand hectare in 2003 (General Statistics Office 2005: 231). Compared with Ho Chi Minh City, which has an expanding aquaculture area from 4.2 thousand hectare in 2000 to 7.7 thousand hectare in 2003, Hanoi’s aquaculture coverage indicates stagnation and, possibly, decline.

Table 4-3 shows the major socio-economic characteristics\(^9\) of Thanh Tri District. Thanh Tri District has 22,925 agricultural households in 2002 (Hanoi Statistical Office 2003: 162).

4.2.1 Thanh Tri District

In Hanoi, Thanh Tri District (Map 4-3) is considered an agricultural district with 95% of the population involved in agriculture based on the estimates made by JICA in their feasibility study for the construction of the Thanh Tri Bridge (Pacific Consultants International 1998).

Tran Phu Commune is located 13 km from the city centre and has two villages: Khuyen Luong and Nam Du Ha. These villages are close to the Red River so that some of their agricultural lands are affected by the flooding during June and August every year. Due to its low lying relief, the commune is also affected by floodwater coming from the inner city. In 1990, Linh Nam pump station was built to drain floodwater out to the Red River. The commune has a total land area of 3.78 km\(^2\) of which land devoted to agriculture is 2.21 km\(^2\) and 0.96 km\(^2\) for aquaculture (Research Institute for Aquaculture 1 2005).

Agriculture is the main income source in the commune. Tran Phu is one of the communes in the district with the highest fish production of over 300 tonnes per year. With the introduction of the Hire 10 policy in 1987, each person received a total of 814 m\(^2\) of agricultural land composed of different parcels of land for different types of pro-

\(^9\) No data was available for Hoang Mai published in English at the time of data collection possibly because it was just recently created from Thanh Tri.
duction system. For instance, an individual may have been given 108 m² for rice production, 72 m² for rice-fish production, or 120 m² for aquaculture use. Aside from the parcels of land they received from the Hire 10 policy, some individuals can access larger chunks of land by negotiating a contract with the commune (Research Institute for Aquaculture 1 2005).

**Map 4-3 Thanh Tri District, Hanoi (Source: Research Institute of Aquaculture-1, Hanoi)**

Aside from working in agriculture, younger members of the commune also work as teachers, mechanics, builders, textile workers, security guards, workers in the service sector, traders, and office workers (Research Institute for Aquaculture 1 2005).

**4.2.2 Hoang Liet Commune, Hoang Mai District**

There are five villages in Hoang Liet Commune, one of the Hanoi field sites lo-
cated about 10 km south of the city centre. These villages are Bang A, Bang B, Tu Ky, Phap Van, and Linh Dam. Most of the work in this study was done in Bang B. Bang B is a well-known area for the production of aquatic vegetables and has 364 households. Two major waste water channels surround the village: the Kim Nguu and To Lich rivers (Nguyen Thi Dieu Phuong 2004: 1). Villagers draw water from these rivers through government provided pumping stations. These rivers in turn receive wastewater from the city, which by virtue of the water's nutrient rich quality enables the production of aquatic plants.

Rice farming was the mainstay of the villages prior to 1970. Only a few households were involved then in producing floating *kangkong* and water mimosa in the To Lich River, which was not yet badly affected by the chemicals used by aquatic plants growers as they were not in extensive use at that time. Life in the village began to change after 1970 when electricity became available, a new wastewater pumping station was constructed, and canals and the main road were built in the village. With the worsening water quality of the To Lich River due to inorganic pollution from the city and the impact of aquatic plant cultivation on the flow of the river, the production of aquatic plants in the river ceased in 1995 and shifted to ponds in areas traditionally used for land vegetables. Water from the rivers was then supplied through pumping stations and canals. The pumping service was provided by the local agriculture cooperative. When farmers learned that aquatic plant production is possible this way, more and more converted their fields to its cultivation. Aside from *kangkong* and water mimosa, farmers also took up growing water dropwort and watercress from 2000 when they realised that good money can be made from these, too. Water mimosa is grown particularly in the summer while watercress and water dropwort are cultivated in winter. *Kangkong* is grown throughout the year (Nguyen Thi Dieu Phuong 2004: 1-2).

Around 50% of households in Bang B are involved in aquatic plant production and such a production system has made very significant contributions to the income of the households in the village (Nguyen Thi Dieu Phuong 2004: 1-2).
4.3 Phnom Penh – ‘Paris of the East’

Phnom Penh (Map 4-4) was once touted as the Paris of the East with its tree-lined boulevards, wide roads, well-planned promenades and public places, Parisian cafes and French-inspired buildings and colonial houses. Phnom Penh’s well-known architect and architect-in-chief in 1957, Vann Molyvann, visualised his design of the city in the 1960’s as expressing French utopian urbanism popular at the time in his grand concept of ‘la Ville Radieuse’. Evidence of this still stands today as seen in the buildings he designed, such as the Chaktomuk Conference Hall, the State Palace, the National Bank of Cambodia, Independence Monument, National Sports Complex, and the Institute of Foreign Languages Library (Steinglass 2005).


Drawing from historical and archival materials, Silver (1999: 21-28) argued that Phnom Penh came to being as a capital of Cambodia due largely to the strategic and commercial interests of the French to build a ‘river road’ to China wherein its location within the Quartre Bras was a major consideration. But before it became a French city, Phnom Penh had already supported a population of floating households who lived in boats. However the French failed to successfully exploit commercially Cambodia as a protectorate due to its failure to understand the important role of water in defining
Cambodia's environment and the lifestyle of its people. Silver (1999: 5) contends that:

Perhaps the French did not understand Cambodia's water-dominated environment with its implications and the limitations it placed on Cambodia's economy. They learned that the rivers and floods that dominated life in Cambodia were central to the lives of the peasants, but never incorporated this knowledge into their visions of commercial success in Cambodia, or into their strategies for achieving such success. They did not respect the watery nature of the Cambodian landscape.

Phnom Penh, covering an area of 37,500 hectares, is composed of seven districts (or khan) (Dangkor, Meanchey, Russey Keo, 7 Makara, Tuol Kok, Chamkarmon, and Daun Penh). These districts comprised 76 subdistricts or communes (sangkats) and 637 villages. The four inner khans are almost totally urbanised while the remaining districts are slowly being transformed. Despite this slow transformation, the non-built up areas in the remaining districts offer possibilities for agriculture (Hash Chamly and Nguon Sovann 2004). In the future, the area of the city will change once the new boundaries are adjusted (Mr Aunny Ieng, Appendix 6). Like Hanoi, Phnom Penh is, in relation to Bangkok, distinct due to its compactness.

In 1998, Phnom Penh, located in the country's plains regions, had a population of slightly over a million people, but this is projected to double by 2020. Despite this, its annual rate of growth of its population is projected to decline to 2.34 in 2019-2020 from 3.56 in 1998-1999. The projections for the city's total fertility rate remains the same at 2.10 from 1998 to 2020 (National Institute of Statistics). Between 1998 and 2004, the country as a whole has an average growth rate of 1.84% (National Institute of Statistics 2004b). Based on the 1998 Census of Population¹⁰, Phnom Penh has a sex ratio of 93.1; a dependency ratio of 56.1%; a population density of 3,448 per km²; and an urbanization rate of 57% (National Institute of Statistics). The percentage urban of Phnom Penh is 52 indicating that the city’s population is still significantly distributed in what is considered spatially to be rural areas (National Institute of Statistics 2005b). Phnom Penh is the capital of the country and the biggest city¹¹. It has 27% primacy rate over the country’s next big city, Sihanoukville, which is located on Cambodia’s coast (National Institute of Statistics 2005b).

¹⁰ As of this writing (19 May 2005), the detailed results of the intercensal survey are not yet publicly available.
¹¹ Other big cities are Svay Pao (Battambang), Siemreap, Serei Sao Phoan (Banteay Meanchey), Kratie, Stueng Saen (Kampong Thom), Ta khmou (Kandal), Sampov Meas (Pursat), and Kampong Leav (Prey Veng) (National Institute of Statistics 2005a).
Devastated infrastructures from years of war and neglect are slowly being reconstructed. Donor monies have been used to spruce up dilapidated government offices and build new ones. The Dutch government has just recently built a new Institute for Fisheries Research and Development on the grounds of the old American Embassy, which is currently the country's Department of Fisheries, while the Finnish and German governments together with the World Bank have allocated money for a new Ministry of Land Management, Urban Planning and Construction building. Expensive gated communities have sprung up in streets and alleys of the city to supply the needs of new elites and a sizeable expatriate community connected with development organisations and embassies. New and renovated old hotels have also materialised over the last ten years or so. Pesky dust during summer and sticky red mud during the rainy days are slowly giving way to new sealed roads courtesy of Japanese grants and World Bank/IMF loans so that new Honda motorcycles and Toyota Camrys can take on the road with ease. Major infrastructures in the city such as sewerage are also being made possible through Japanese money (Photo 4-1). The irony of it all is that the same reconstruction effort and
development are threatening what is left of unique architectural heritage which pre-
Khmer Rouge Phnom Penh had and seriously undermining the habitability of the city
(Steinglass 2005; Vachon 2003).

Matt Gross’ (2005) reportage on Cambodia captures where the country is now. He raves that:

[...] Cambodia [now is] so far removed from the one I’d encountered when I first visited, in
March 1997, that I began to wonder if I was even in the same country. Back then, Cambodia
was the Wild West, with Phnom Penh its Deadwood [...] To say that Cambodia has come a
long way is to state the obvious. Gone are the Khmer Rouge, the Vietnamese occupation, the
United Nations democracy-restoration period and the era of warring prime ministers (the
current prime minister, Hun Sen, came out on top in 1997).

Similar views are captured by students of Cambodia’s history, the most eminent
of which is Prof David Chandler. His observations of Phnom Penh evocatively capture
the dilemmas of its development and its attendant social change. Asked by New Mand-
dala12 (Farrelly 2007), a popular blog on mainland Southeast Asia, about how Phnom
Penh was in the 1960s and how it is today, his response was, to my mind, right on the
mark. He said:

Plus ca change, in some ways, but yes, the city has become a teeming metropolis, which it
never was before. Much of Phnom Penh north of the Independence Monument and south of
Wat Phnom looks and feels roughly the same as it did in the 1960s, but of course the city is
much, much larger, and a great deal of it is much uglier and dirtier than it was. Phnom Penh
is prettier along the riverbank than it was. The restaurants are better (for expats, anyway)
Traffic is ghastly. Crime is worse. I miss the almost somnambulistic Provencal quality that
the town had in the 1960s, when Phnom Penh was probably the prettiest city in Southeast
Asia.

Compared to other areas, the sites in Phnom Penh are generally closer to the city
core due to the relative size of the city itself. It is thus more compact and is not as built
up as Hanoi or Bangkok. The site in Phnom Penh is the Boeung Cheung Ek (BCE) area
in the south axis of the city and is a sewage lake receiving most of the city’s wastewater
(Map 4-4).

BCE is an important storage basin for the wastewater and stormwater flowing
out of Phnom Penh before being flushed out to the Bassac River. During the summer
months when water levels are low and a huge swath of the floodplain dries up, depres-
sions form into small lakes which the locals call by many names. Some maps show
these small depressions. However sedimentation and the gradual retreat of the flooded

12 This blog is hosted by the Research School of Pacific and Asian Studies of the Australian National Univer-
sity and moderated by Andrew Walker and Nicholas Farrelly.
area due to land filling and housing developments have led to the disappearance of the smaller lakes or a reduction in their size. Boeung Cheung Ek originally belongs to Kandal Province, but has slowly become part of Phnom Penh as the latter expands its boundaries, geographically and demographically. BCE is connected to two other lagoons: Boeung Tompun and Boeung Trabek. A small river also leads into BCE bringing in water drained from the Pochentong Airport area. It also receives wastes from abattoirs, piggeries, restaurants, and textile and tanning factories together with the wastes coming from the households in the area. During the rainy season, usually June to November, water from the Mekong, Tonle and Bassac rivers (Map 8-2) inundate the lake causing the water level to rise before receding as the dry season sets in (Balmisse and Maisonhaute 2005: 37).

Towards the end of the dry season (such as shown in Map 4-5), the surface of the lake has an area of 1,300 ha but this expands to 2,000 ha during the monsoon season. However, the BCE region itself comprising the lake and surrounding land covers an area of 3,293 ha and had a population of 46,857 people in 1998 (Balmisse and Maisonhaute 2005: 36). Technically, it has a density of about 14 people/ha but this is an underestimate as this is computed from the total surface area including the lake itself. There is no accurate estimate of its dry area as it changes according to the season. However, field observations show that a lot of the housing in the lake is clustered in patches of land that are not too deeply flooded during the rainy season. A dramatic increase in population was noted when the roads on the Tompun dike and Takhmao were built (Balmisse and Maisonhaute 2005: 38). At least 400 houses, composed of several hundred households, are found inside the lake itself (Kuong Kuov, pers comm.). More houses are located around it. According to Moustier et al. (2005: 4), 35 ha of the lake is covered with kangkong production.
Map 4-5 Part of Boeung Cheung Ek Lake, Kbal Tumnob Village, as seen from the air. This is likely to be a dry season view as the dry, unsealed road leading to the village from the national highway on the upper right corner can be seen. Most of this space is covered with water during the wet season. The green undulating rows are the kangkong fields. The continuous brownish green mat on the left may be water hyacinth, water lilies and other aquatic macrophytes. (Source: Google Earth)

The lake is covered with plant growth, but the most prominent of these are those being harvested for food such as kangkong, cresson Oldenlandia fraterna, peppermint Mentha arvensi, leaf lettuce Lactuca sativa, and lotus Nelumbo nucifera (Balmisse and Maisonhaute 2005: 36). In a survey by Muong (2004), kangkong is shown to be widely farmed in the lake, with 248 farmers involved (Table 4-4).
<table>
<thead>
<tr>
<th>English Common Name</th>
<th>Scientific name</th>
<th>Farmers involved</th>
<th>Area covered (m²)</th>
<th>Production (kg/day)</th>
<th>Price (USD/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yard-long bean</td>
<td>Vigna unguiculata</td>
<td>2</td>
<td>3,000</td>
<td>60</td>
<td>0.21</td>
</tr>
<tr>
<td>Water Mimosa</td>
<td>Neptunia Oleracea</td>
<td>2</td>
<td>3,300</td>
<td>70</td>
<td>0.38</td>
</tr>
<tr>
<td>Peppermint</td>
<td>Mentha arvensis</td>
<td>18</td>
<td>29,803</td>
<td>660</td>
<td>0.1</td>
</tr>
<tr>
<td>Mustard green</td>
<td>Brassica oleracea</td>
<td>8</td>
<td>19,397</td>
<td>210</td>
<td>0.21</td>
</tr>
<tr>
<td>Lotus</td>
<td>Nelumbo nucifera</td>
<td>4</td>
<td>7,000</td>
<td>390 pcs</td>
<td>0.03</td>
</tr>
<tr>
<td>Leaf lettuce</td>
<td>Latuca sativa</td>
<td>17</td>
<td>23,452</td>
<td>655</td>
<td>0.77</td>
</tr>
<tr>
<td>Kangkong</td>
<td>Ipomoea aquatica</td>
<td>248</td>
<td>1,086,116</td>
<td>21,787</td>
<td>0.03</td>
</tr>
<tr>
<td>Cresson</td>
<td>Oldenlandia frutetra</td>
<td>21</td>
<td>25,175</td>
<td>1,167</td>
<td>0.38</td>
</tr>
<tr>
<td>Chinese kale</td>
<td>Brassica juncea</td>
<td>13</td>
<td>21,010</td>
<td>498</td>
<td>0.26</td>
</tr>
<tr>
<td>Chili pepper</td>
<td>Capsicum annuum</td>
<td>2</td>
<td>4,600</td>
<td>23</td>
<td>0.21</td>
</tr>
<tr>
<td>Angled luffa</td>
<td>Luffa acutangula</td>
<td>5</td>
<td>1,776</td>
<td>83 pcs</td>
<td>0.06</td>
</tr>
<tr>
<td>Amaranth</td>
<td>Amaranthus tricolor</td>
<td>7</td>
<td>4,240</td>
<td>230</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>294</strong></td>
<td><strong>1,228,869</strong></td>
<td><strong>25,359</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4-4 Production of different leafy vegetables in Boeung Cheung Ek, Phnom Penh, Cambodia** (Source: Adapted from Sideth Muong 2004)

The village of Kbal Tumnob (Table 4-1) (Map 4-5) is located in Boeung Tumpun quarter, Mean Chey District not more than 7 kilometres from the centre of the city.

These villages are located right on Tompun Dike, which is an outer ring dike that protects the city core from flooding, then expands outwards towards the middle of the lake so that houses are built on stilts in the lake itself. Aquatic production systems in the lake therefore co-mingle with human settlements. The dike starts from the junction of St 271 and runs for 4.4 km until National Road 303. There are two major pumping stations located on the Tompun Dike area: Trabek Pumping Station and Tompun Pumping Station. These pumping stations release water into BCE Lake, which is the retention and purification pond for the city's sewage. The lake has a storage volume of 520,000 m³, but is believed to be decreasing due to sedimentation, landfilling and the increasing growth of human settlements. The Trabek Pumping Station is responsible for removing stormwater from 40% of the city core area, which is equal to a catchment area of 10.63 km² while the Tompun Pumping Station covers a catchment area of 17.47 km². These pumping stations were originally built in the 1960s as part of Phnom Penh's flood defences. The wastewater pumped out of these stations into BCE is untreated before outfalls (Photo 4-1). Considering that only a tiny amount of households in the city are connected to the sewerage network, these outfalls are rich in nutrients and possibly contain pollutants and parasites (CTI Engineering Co Ltd and Nippon Koei Co Ltd 1998: 68-69,
4.4 Summary

This chapter describes the cities covered in the study. Each of them is unique in their own right. These cities are capitals of some of the most exciting countries in the region. Economically, each of them differs. Bangkok is at one end, being economically better off, while Phnom Penh is at the opposite end, being the poorest. Hanoi, a capital of a major economy in transition, lies midway, although the country itself is experiencing a robust economic growth. Despite this difference, all of them belong to a class of country known as the ‘developing world’ or the ‘global south’. Economics is not the only difference they exhibit. They also differ politically, socially and culturally. Yet amidst these differences, certain similarities exist. For instance, Buddhism is a major religion in each city, although the type of Buddhism may differ. Geographically, all of them are located along major river systems: the Chao Phraya, Red, and the Mekong rivers. These rivers define their social and cultural milieus. The rivers are their lifeblood.

In each city, sites known to be involved in the production of kangkong were specifically chosen. All of these sites are located within the peri-urban zone but their distance to the city centre varies with Bangkok, the farthest, and Phnom Penh, the closest. The sites in Bangkok and Hanoi are prime agricultural areas while that of Phnom Penh is a sewage lake. Despite the different characteristics of each locale, it is shown in the succeeding discussions that the production of kangkong flourishes with equal vigour.

Admittedly, the representativeness of the national picture is limited especially in the case of Bangkok and Hanoi as only a site in each of these cities are chosen when it is known that other sites do exist. (In the case of Phnom Penh, BCE is the only major producing area in Cambodia.) I argue that my intention is not to create a national picture. Instead, I want to point out how spatial and social changes are articulated within a desakota space so that the choice of field sites representing different levels of urbanisation is paramount. In other words, the opportunity to generalise comparatively different social, political, economic, and geographical spaces is important because it is only in

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13 This is discussed in detail in Chapter 9.
this broadness can we appreciate how *kangkong* becomes an important organising space. That is to say, the success of this endeavour is measured by the ability to cross borders, so to speak, with *kangkong* providing the vehicle.
Chapter 5

The characteristics of *kangkong* households

If poetry were just
a bouquet of words,
I'd rather take
a bunch of *kangkong* leaves,
or a sheaf of sweet potato shoots
gleaned from some patch near a sewer
or filched from some vendor's basket —
because I am hungry
and hunger's stomach
is indelicate....


We have seen in the previous chapter the cities and villages involved in this study, which suggests different levels or scales of engagement. Each of these scales pos-
its its own geography. In this chapter, we will look at the households involved in

*kangkong* production.

The choice of the household in this study is intentional because, as Buzar et al.
(2005) argue, 'households matter'. The household matters because in the practises of
the everyday and the banal they are simultaneously key actors and important networks.

The household is, therefore, an urban agent because

In their entirely, the demographic, cultural and economic outcomes of household-level dy-
namics constitute a powerful force of urban transformation. This is because cities simulta-
neously shape, and are shaped by, the consumption practices and mobility patterns of their
constituent households (Buzar, Ogden, and Hall 2005: 424).
This insight is, however, borne from the west where the agency of the household has been moulded by interacting social, spatial, and cultural factors unique to this part of the world. These factors include the "second demographic transition, new positionality of gender and family structures, noncapitalist economic activity, and post-Fordist restructuring" (Buzar, Ogden, and Hall 2005: 425). The cumulative effects of these changes on settlement have been reviewed in Buzar et al. (2005). Among the changes detected include the reshaping of mobility patterns, gender roles, employment patterns, and housing demands. To claim that similar changes happen in Southeast Asia cannot simply be assumed but must be justified and exemplified in Asian context. Although some countries in Asia are showing marked fertility declines such as Singapore and Thailand (Hirschman 2001: 5599), others (such as Viet Nam, Cambodia, and Philippines) are still exhibiting increases in fertility or beginning the transition. Among these countries which are exhibiting the latter fertility trajectories, changes in lifestyle and consumption choices may be the only aspect that follows that of the West, at least for now. Based on Hirschman's observations,

Fertility in Southeast Asia first showed signs of decline in a few countries in the late 1960s, and then moved downward, at varying speeds, throughout the region from the 1970s to the 1990s. Although fertility in Southeast Asia is likely to approach the replacement level (around two births per woman) early in the twenty-first century, the force of demographic momentum and the power of compound rates of growth will continue to expand the population of Southeast Asia relative to Europe (and North America). (Hirschman 2001: 5597)

Among the countries in this study, it seems that Thailand is entering a second demographic transition with a fertility level below replacement for a period of ten to twenty-six years (Atoh, Kandiah, and Ivanov 2004: 43) while Viet Nam is "at a very advanced stage" with a fertility rate of 2.2 children per woman in 1998 (Bélanger et al. 2003: 233-4). Although mortality in general is declining in Cambodia, especially during the post-Khmer Rouge period (Heuveline and Poch 2007), its fertility rate is high but declining at 3.34 in 2004 as compared to 3.99 in 1998 (National Institute of Statistics 2004a: 40). Alongside this transition is the occurrence of desakota regions described in

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1 Instances in this second demographic transition include the creation of one-person households in Paris (Ogden and Schnoebelen 2005), new forms of fertility behaviour and ageing in Eastern Europe (Steinfuhrer and Haase 2007), and falling marriage rates across Europe (Buzar, Ogden, and Hall 2005: 416). The second demographic transition is characterised by "a trend toward less committed and more fragile relations between men and women, and the delayed and less likely transition to parenthood and a sharp reduction of higher-order births, or, in other words, postponement of marriage and first birth, more cohabitation and divorce, and declining fertility" (Bernhardt 2004: 25). Declining fertility is a major indicator adapted by a number of demographers.
section 2.4. Considering their co-occurrence, we need to chart the links between households and spatial change in the region to be able to understand their implications for settlement and social histories, in general, and the degree of attending turbulence, in particular. In pursuing this, the 'everyday life' of households in the desakota needs to be understood because their everyday performances underpin the ‘social production of space’.

The everyday life of households is admittedly complex, multifaceted and multilayered. It can be limitless. Despite being “the oldest and most widespread production unit in the world, [it] is also the least understood” because they are “complex and variable systems: open, dynamic, fluid, and adaptable”, claims Sick (1999: 6). Turbulence may be manifested at different levels. In this study, my engagement is limited to kangkong households and their livelihoods to find associations between household or livelihood turbulence and spatial change. I am hoping that engaging with this aspect of their everyday lives will shed fresh insights into the geographies of interstitial spaces.

In this chapter, I will make a case for the ‘household’ as the unit of engagement in the geographies of interstitial spaces. In particular, I will present the profile and make up of household membership. Wealth indicators are also provided such as the ownership of selected (expensive) goods and vehicles and the nature of the dwelling units to differentiate households in different cities economically.

5.1 Unpicking the households

5.1.1 Household membership

Household membership in the three sites is nearly evenly distributed by gender (Table 5-1). Out of a total household membership of 1,191 from all the three sites, only less than 2% are not domiciled at the respondent’s residence at the time of the interview. Eighty-three percent (83%) of these non-domiciled household members are children of the household head. Household sizes differ among the three study sites, $F(2, 212) = 29.79, p<0.001$, in particular between Bangkok and Phnom Penh, and Hanoi and

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2 The context upon which such notion of the everyday is unpicked is through the performance of a livelihood.
Phnom Penh based on post hoc Hochberg GT2 tests. The mean household sizes between
Bangkok ($M=4.46$) and
Hanoi ($M=5.04$) are not
significantly different. Phnom Penh has the
highest mean of 7.10.

<table>
<thead>
<tr>
<th>Key characteristics</th>
<th>Bangkok</th>
<th>Hanoi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>71</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48.0</td>
<td>50.0</td>
<td>48.0</td>
</tr>
<tr>
<td>Female</td>
<td>52.0</td>
<td>50.0</td>
<td>52.0</td>
</tr>
<tr>
<td>HH size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Max</td>
<td>9</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Mean</td>
<td>4.46±1.56</td>
<td>5.04±2.86</td>
<td>7.1±1.78</td>
</tr>
<tr>
<td>Type of household (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single HH member</td>
<td>1.4</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Two HH members</td>
<td>4.2</td>
<td>2.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Three or more HH members</td>
<td>94.4</td>
<td>97.2</td>
<td>97.2</td>
</tr>
<tr>
<td>Ave. no. families living together</td>
<td>1.27±0.56</td>
<td>1.07±0.26</td>
<td>1.14±0.59</td>
</tr>
<tr>
<td>Type of families (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple family</td>
<td>78.9%</td>
<td>93.1%</td>
<td>94.4%</td>
</tr>
<tr>
<td>Multiple families</td>
<td>21.1%</td>
<td>6.9%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Total HH membership</td>
<td>317</td>
<td>363</td>
<td>511</td>
</tr>
<tr>
<td>Relation of HH members (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child of HH head/spouse</td>
<td>41.3</td>
<td>47.4</td>
<td>54.4</td>
</tr>
<tr>
<td>Household head</td>
<td>22.1%</td>
<td>19.8%</td>
<td>14.1</td>
</tr>
<tr>
<td>Other extended family member</td>
<td>15.8</td>
<td>10.2</td>
<td>17.8</td>
</tr>
<tr>
<td>Spouse of HH head</td>
<td>20.5%</td>
<td>20.1%</td>
<td>12.3</td>
</tr>
<tr>
<td>Non-relative</td>
<td>0.3%</td>
<td>2.5%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Table 5-1 Household characteristics (Source: PAPUSSA Survey)

The average household size for the Hanoi sample is larger than that reported in the 2002 Household Living Standards Survey, which is 4.03 for the whole of Hanoi. A 2005 survey of 20,000 households provided by the project 'The Comprehensive Urban Development Programme in Hanoi Capital City' revealed an average household size of 4.5 (HAIDEP Study Team 2005: 5). Similarly, the 4.46 mean household size for the site in Bangkok is higher than the national average of 3.8 in 2000. Our figure is closer to the 1990 average household size of 4.4 (National Statistical Office 2007b). Nationally, there has been a general trend of decreasing household sizes in Thailand. Phnom Penh's larger mean household size (7.1) offers an insight of the demographic characteristic of post-conflict Cambodia, in general, and the nature of the peri-urban households in Phnom Penh, in particular. The average household size of Cambodia, based on the 2004 Population Inter-Censal Survey, is 5.1, with urban households larger than rural households (5.4 vs 5.0, respectively) (National Institute of Statistics 2004a: 11).

Ellis (2000b: 43) reminds us that
households can also split, combine, or change their demographic structure in other ways as a response to stresses and shocks. It is a mistake to view households in static terms, and also to think that units that become demographically non-viable for one reason or another are unable to pursue adaptive responses.

The process through which households splinter and affect, whether negatively or positively, the different factors of production such as the availability of land and transmission of technical knowledge offers an insight into the trajectories of change in *kangkong* livelihoods.

In general, nearly all households have more than three household members (Table 5-1) indicating the presence of parents and children. The incidence of simple families – which may consist of married couples living alone, married couples with unmarried children or one parent with unmarried children – is high in both Phnom Penh and Hanoi, but less so in Bangkok. There are more multiple families\(^3\) cohabiting together in the same dwelling in Bangkok than in the other cities (21% vs 7% and 6% in Hanoi and Phnom Penh, respectively). Thus, Bangkok has a higher average number of families per household at 1.27 (SD=0.56) compared with 1.07 (SD=0.26) for Hanoi and 1.14 (SD=0.59) for Phnom Penh.

Based on the 2000 Census of Population and Housing, 60% of Thai households are composed of nuclear families and only 30% are extended families (National Statistical Office 2007a). Bangkok households appear to exhibit a form of “nesting” wherein family members live in houses owned by relatives or other family members (Moser 1997: 55). In Cisne Dos, Guayaquil, Ecuador, Moser (1997: 56) has noted that nesting led to the decrease in average plot sizes. She further found out that the process of subdivision and nesting arises most commonly among older, more established households who own their own plots and houses. Following this line of explanation, Hanoi and Phnom Penh therefore consist still largely of nuclear households while Bangkok may include offspring households within the same dwelling unit based on the categories developed by Eder (1999) in his work in rural Palawan in the Philippines. Extended family arrangements reflect a traditional family structure. Modern family structures tend to be nuclear. The extent to which this dynamic can be properly explained and understood is

\(^3\) Multiple family households as used in this survey refer to two or more families living together in the same dwelling unit regardless of whether they are off-spring families or other non family members. Thus, this may include extended family members.
limited as the survey only asked for the number of families currently living together in the same house. Phnom Penh, however, is intriguing because it is largely composed of simple families but has a high number of extended household members, as we will see below. In general though, all households have only a very small number of non-relatives as household members (Table 5-1).

Overall, the age-gender profile of Phnom Penh is pyramidal indicating a larger number of younger household members as depicted in Figure 5-1 than either Bangkok or Hanoi. The youthfulness of the family make up in Phnom Penh (Photo 5-1) translates into a high age dependency ratio\(^4\) of 0.65 (SD=0.58), a figure several magnitudes higher than Bangkok at 0.43 (SD=0.43) and Hanoi at 0.46 (SD=0.51). This dependency ratio among kangkong households in Phnom Penh is only a few points higher than the average for urban areas (0.68) based on the 2005 Demographic and Health Survey. In the same year, Thailand had a national age dependency ratio of 0.45 while the figure for Viet Nam was 0.54 (The World Bank). A high dependency ratio affects overall household well-being with every 10 working age household members supporting more than 6 dependents.

\(^4\) The dependency ratio is computed as the ratio of young people (under 16) and older people (over 64) against people of working age (16 to 64) (Kögel 2005: 148).
A high coefficient of variation (CV) in all cities reflects a wide distribution of households across the dependency ratio scale. We need to find out how they are actually distributed. In Figure 5-2, the households in each city are divided according to their age dependency ratios. It is striking that barely 10% of households in Phnom Penh have no dependents while those with dependents can go as high as three dependents per household member of working age.
5.1.2 Household headship

In general, the household heads of the surveyed households are male (84% of surveyed households) with a mean age of 47 years old, who are currently married (87% of sample), and with a low level of education. Unless the husband is absent, household heads tend to be mainly husbands (Table 5-2). Among Thai families, the father or the husband is considered the head of the household “to whom the wife and children show respect” (National Statistical Office 1991: 35). Similar understanding may also be said for Khmer and Vietnamese households. In the Viet Nam Living Standards Survey conducted in 1997 to 1998, a household head is the person in the household with the highest income and the most decision-making power (General Statistical Office 2004: 9).

<table>
<thead>
<tr>
<th>Key characteristics of HH Head</th>
<th>Bangkok</th>
<th>Hanoi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>71</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>29</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Max</td>
<td>98</td>
<td>73</td>
<td>66</td>
</tr>
<tr>
<td>Mean</td>
<td>49.35±14.24</td>
<td>51.24±10.63</td>
<td>41.58±9.69</td>
</tr>
<tr>
<td>Gender, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>57 (80.3)</td>
<td>59 (81.9)</td>
<td>64 (88.9)</td>
</tr>
<tr>
<td>Female</td>
<td>14 (19.7)</td>
<td>13 (18.1)</td>
<td>8 (11.1)</td>
</tr>
<tr>
<td>Education - Male HHH (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entered or finished primary education</td>
<td>82.5</td>
<td>10.2</td>
<td>57.8</td>
</tr>
<tr>
<td>Entered or finished secondary education</td>
<td>3.6</td>
<td>83.1</td>
<td>25.0</td>
</tr>
<tr>
<td>Further education</td>
<td>6.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>14.0</td>
<td></td>
<td>17.2</td>
</tr>
<tr>
<td>Education - Female HHH (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entered or finished primary education</td>
<td>92.9</td>
<td>39.5</td>
<td>25.0</td>
</tr>
<tr>
<td>Entered or finished secondary education</td>
<td>23.1</td>
<td></td>
<td>12.5</td>
</tr>
<tr>
<td>Further education</td>
<td>7.7</td>
<td></td>
<td>12.5</td>
</tr>
<tr>
<td>No formal education</td>
<td>7.1</td>
<td>30.8</td>
<td>62.5</td>
</tr>
<tr>
<td>Marital status - Male HHH (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently married</td>
<td>94.7</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Never married</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated/divorced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status - Female HHH (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently married</td>
<td>71.4</td>
<td>46.2</td>
<td>25.0</td>
</tr>
<tr>
<td>Never married</td>
<td></td>
<td></td>
<td>25.0</td>
</tr>
<tr>
<td>Widowed</td>
<td>14.3</td>
<td>53.8</td>
<td>37.5</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>7.1</td>
<td></td>
<td>12.5</td>
</tr>
</tbody>
</table>

The household heads among *kangkong* households in Phnom Penh, with a mean age of 41.58 (SD=9.69), are generally younger compared with those from either of the other two cities. Phnom Penh also has a larger proportion of male household heads at 88.9 of the sample. The demographic norm in Cambodia, however, reveals a much higher level of female headship with 28.6% of households in urban areas are female headed (National Institute of Statistics 2004a: 40), a result of the very high male mortality during the 1970s (de Walque 2005; Heuveline 1998; Heuveline and Poch 2007; Kiernan 2003; Neupert and Prum 2005).
In terms of education, household heads from both genders have generally low levels of educational attainment with only a handful with education beyond secondary, but nonetheless highly differentiated across the three cities. For one, male household heads tend to be better off educationally compared to female household heads with 7%, 31% and 63% of Bangkok, Hanoi, and Phnom Penh, respectively, of female household heads with no formal education at all (Table 5-2).

Among male household heads, Hanoi appears to have higher educational attainment. The legacy of mass education in the north, which tends to favour male household members, geared toward communist and revolutionary objectives during the long and arduous period of Viet Nam's socialist journey explains, in part, this emerging picture. From the Revolution of August 1945, education was seen as quintessentially important in moulding a new nation so that in the period 1945 to 1954 nearly everyone who was considered literate and not involved in the resistance was co-opted to teach others. This continued even after independence. A comprehensive system of education and what was said to be “the most extensive program of adult education found anywhere in Southeast Asia” at that time was established in the north from 1954 onwards (Keyes 1977: 296). The most recent Demographic and Health Survey of Viet Nam (Committee for Population Family and Children 2003: 11) concludes that “the level of education attainment in Viet Nam is relatively high compared with other developing countries and the high level of education was achieved many years ago”.

Phnom Penh, however, is worst off educationally among the cities in this study with high proportion of male and female household heads with no education at 17% and 63%, respectively. de Walque (2004) showed that this is a legacy of the Khmer Rouge regime when the educational system totally collapsed putting the people during this period out of school; thus, creating a cohort of an uneducated working class. However, de

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5 Under the French, two types of educational opportunities were available to the populace: temple-monastery schools and elite education based on the French system. The former was secularized after independence especially when state sponsored education was introduced (Keyes 1977: 293). Before 1953, there were only 9 high schools in the country. But the period after independence in 1953, before the Khmer Rouge era, saw the rapid expansion in the provision of education confined to the urban areas especially Phnom Penh and to an extent Kampot, Kompong Cham and Battambang guided by Prince Norodom Sihanouk’s interest in education. Whether this has contributed to the quality development of the nation’s human capital is another matter altogether (Duggan 1996: 364).
Walque's findings point to the male individuals having had much lower educational attainments than females. Her analysis revealed that:

Individuals who were of secondary schooling age at the end of the 1970s have a lower level of educational achievement than the preceding and subsequent birth cohorts. Both average years of education and, even more dramatically, the proportion of individuals who have at least some secondary education are much lower for individuals who were teenagers in 1975. This is especially marked for males (the differences are only statistically significant for males and for both gender together, not for females). Since, among the young adult males in 1975, the educated have been especially targeted by the violence and the mortality, as shown in figure 5, it is also likely that the difference between the teenagers in 1975 and the preceding birth cohorts would have been even larger in the absence of selective mortality of the highly educated. As a consequence of the collapse of the school system, a large number of children were not allowed to attend secondary school, even though they might have been willing to. Once the reconstruction of the country and the school system started, they were older and had probably many other priorities. (de Walque 2004: 19-20)

If we look at the average age of our sample in this study, most of them would have been around 13 years old during the Khmer Rouge period. Thus, they are likely to be the "teenagers" de Walque is referring to. The Khmer Rouge took over in mid-1975 and thereafter purged the country of nearly all its educated class, killed teachers, destroyed schools and books, wiped out what was left of the education system during Lon Nol's time, and sent people to the countryside (Asian Development Bank 1996: 2-3; Duggan 1996: 362, 365).

If we will set aside the educational status of household heads in Phnom Penh and compare only Bangkok with Hanoi, we will find that Bangkok has lower overall educational attainment than Hanoi, despite the fact that Hanoi, or the country as a whole, went through devastating wars that changed Vietnamese society. In Bangkok, it appears that the early schooling years during the 1950s and 1960s of the older cohorts coincided with a period in Thailand's educational development when secondary education was yet to come out of the woodwork. The World Bank (2001: iii) noted that

Historically, the limited provision of secondary education was a major bottleneck in skills development in Thailand. Enrollment rates lagged considerably behind those in other countries in the region in the 1970s and 1980s. Major expansion in the 1990s, however, lifted enrollment rates to about 72 percent at the lower secondary level by the end of the decade, and 48 percent at the upper secondary level, for both boys and girls. About 40 percent of these students were enrolled in vocational secondary schools. If we also count those enrolled in non-formal programs, the proportions enrolled at the lower and upper secondary levels rise to about 90 percent and 50 percent. (The World Bank 2001: iii)

The level of secondary enrolment during first half of the 1960s was only 2% of the age group. The First National Education Development Scheme, which ran from 1960 to 1976, was introduced to improved access to primary education. During the 1960s, the government's efforts were directed at increasing enrolment rates instead of improv-
ing the overall quality of education as well as addressing social equity and distribution issues. Attention to and investment on secondary education at this time was also limited such that substantial growth in secondary enrolment was only achieved in the early 1990s. Such inattention and underinvestment by the government together with poverty and high direct cost of education prevented families from sending their children to continue their secondary education. The government's funding at the time was geared more towards primary education and public higher education. By the 1980s, the gross enrolment rate in secondary education was only around 30%. The sorry state of secondary education in Thailand in the 1970s and 1980s led to 83% of workers having only primary education or less in 1990. During the early 1990s, competitive pressures from a globalising economy compelled the Thai labour force to have secondary education as a minimum requirement which the government then responded with a series of measures such as extending the basic education cycle from 6 to 9 years, focusing on raising the transition rate between grades 6 and 7, and providing subsidies to families to reduce educational costs. These measures and the corresponding improvement in household income during that period have led to an increase in lower secondary enrolment from 34% to 63% between 1989 to 1994 (The World Bank 1998: 6, 10). In short, historical problems in the Thai educational system underscore the patterns we see in Bangkok.

The current basic educational system in Cambodia, Thailand and Viet Nam are similar with primary education spanning years 6 to 11 or 12, then lower secondary from age 11 or 12 to 14, and finally upper secondary from age 15 to 17. Primary education is also universal.

The presence of female headed households among 'married' households in Bangkok (71% of female household heads) is intriguing, but not entirely peculiar as a similar observation has already been noted in several slum settlements in Bangkok in early 1970s where the household is female-headed despite the presence of the husband (Keyes 1977: 316). Table 5-2 shows that, out of 14 female household heads in Bangkok, 71% are currently married while only 21.4 are either widowed or separated. In compari-

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6 The system of formal education in Viet Nam is based on what is called the 5-4-3 system where there is 5 years of primary school education, 4 years of lower secondary education, and 3 years of higher secondary education (Committee for Population Family and Children 2003:10).
son, only 46% of 13 and 25% of 8 from Hanoi and Phnom Penh, respectively, have married female household heads. This appears to indicate, at least for Bangkok, that female headship is not a matter of death or separation of the husband, but a role recognised by parties to the arrangement as such. Possibly income and decision-making power are factors which within the dynamics of the households in Bangkok the husbands do recognise that female spouses provide more income and exercise a degree of decision-making equal to or greater than their own making them the household heads, but unfortunately this kind of analysis cannot be straightforwardly discerned in the survey. Instead, secondary sources of information need to be used.

The proportion of female-headed households we found in this survey in Bangkok is lower than the national average of 26.2%\(^7\) in 2000. This national proportion has grown to nearly 7% from its 1990 level (National Statistical Office 2005). With respect to Hanoi and Phnom Penh, the proportion of female-headed households noted in this survey is way below that of their national percentages. In Viet Nam in 1997 to 1998, 21.56%\(^8\) of households are headed by females according to the Viet Nam Living Standards Survey (General Statistical Office 2004: 20). Interestingly, Hy Van Luong (2003: 221-2) noted that female-headed households in Viet Nam have higher average per capita income and/or expenditure compared with male-headed households. He reckoned that this is due to a confluence of several factors, namely: higher frequency of extended and joint family arrangements in the country, the ‘developmental cycle’ of Vietnamese households, and longer life span of women\(^9\).

During the intercensal year, Cambodia, on the other hand, has 29.2%\(^10\) of households headed by females (National Institute of Statistics 2004a: 11-12). The figure

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\(^7\) This is based on a national census of population and housing conducted in 2000 (National Statistical Office 2003).
\(^8\) This is based on a partial panel sample of 6000 households selected throughout the country but based on the pre-existing sample from the VLSS 1992-1993. This may have posed biases against young and newly established households and recent in-migrant households (General Statistical Office 2004: 6-7).
\(^9\) However, Hy Van Luong (2003: 221-2) made an interesting comment with respect to female-headed households he studied in HCMC where these households declare women as heads of the household for registration purposes as these women are the long-term residents of the city while their husbands hail from other provinces who need to be registered as a permanent resident due to a marriage with a legally resident spouse. It is not known whether this is the case of Hanoi, but could just be an explanation, too.
\(^10\) This is based on an Inter-Censal Population Survey carried out on a de facto basis where if the usual household head is not around, the person managing the household during the household head’s absence is considered the household head. This situation has been noted to have likely inflated this figure (National Institute of Statistics 2004b: 11).
for Phnom Penh alone based on the 1998 Census of Population is 28.7% (National Institute of Statistics 2004b). Other surveys such as that by the Mekong River Commission covering fishing households had female headship at 19% (Boreak 2000: 10). Kangkong households in this city have a female headship rate of 14% (Table 5-2). Such low female headship among kangkong households in Phnom Penh may be attributed to the rapid demographic recovery among post-Khmer Rouge households and the corresponding occurrence of early marriages.

Like Bangkok, there are some households in Hanoi and Phnom Penh with female household heads, but death of the husband is among the major reason in these cities unlike Bangkok where it accounts for only 14% (Table 5-2).

### 5.1.3 Other household members

As opposed to the gender distribution among household heads in the three cities, which is predominantly male, non-household head members are more likely to be female with a ratio of six out of ten members (Table 5-3). The proportion with no formal education is highest in Phnom Penh at 25% of household members in this age cohort. As with household heads, other household members aged >7 years old in Hanoi have better educational background than either Bangkok or Phnom Penh with 96% having entered or attained levels of education. The education of household members will have important role in defining trajectories of change of kangkong production in the field sites given that in section 10.5 indications of changing aspirational choices are noted. Rigg (2005: 181) points out in the case of farming in rural Southeast Asia that “education and consumerism create the aspirational context where rural people will disintensify, even abandon their land, in favour of non-farm pursuits”. In this light, educational improvements will intensify the shift from farming to non-farming occupations already detected in Hanoi especially among children of kangkong producers (see section 8.2).

In terms of marital status, 63% of household members in Bangkok aged >15 years old are married as compared to only 54% in Hanoi and 43% in Phnom Penh. Marital status plays an important factor in population dynamics because of its role in fertility, mortality, and migration (National Institute of Statistics 2004a: 16). Despite a slight
discrepancy in the data for Phnom Penh with nearly 15% of household members lacking
data on their marital status, the ‘never married’ category is three points higher than the
marital status of urban households in Cambodia. The currently married category for ur-
ban areas in the 2004 Inter-Censal Survey is 55%. The figure for
Bangkok is close to the national average of 63% (National Statistical Of-

tice 2007a).

<table>
<thead>
<tr>
<th>Key characteristics of other HH members</th>
<th>Bangkok</th>
<th>Hanoi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>247</td>
<td>291</td>
<td>439</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>1 yr or less</td>
<td>1 yr or less</td>
<td>1 yr or less</td>
</tr>
<tr>
<td>Max</td>
<td>92</td>
<td>94</td>
<td>87</td>
</tr>
<tr>
<td>Mean</td>
<td>28.75±18.60</td>
<td>27.84±18.24</td>
<td>20.37±14.85</td>
</tr>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>38.9</td>
<td>42.3</td>
<td>41.0</td>
</tr>
<tr>
<td>Female</td>
<td>61.1</td>
<td>57.7</td>
<td>59.0</td>
</tr>
<tr>
<td>Education of &gt;7 yo HH members (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>221</td>
<td>264</td>
<td>363</td>
</tr>
<tr>
<td>Entered or finished primary education</td>
<td>57.0</td>
<td>13.6</td>
<td>59.8</td>
</tr>
<tr>
<td>Entered or finished secondary education</td>
<td>25.8</td>
<td>61.0</td>
<td>15.2</td>
</tr>
<tr>
<td>Further education</td>
<td>6.3</td>
<td>21.6</td>
<td>9.6</td>
</tr>
<tr>
<td>No formal education</td>
<td>10.9</td>
<td>3.8</td>
<td>24.5</td>
</tr>
<tr>
<td>Marital status of &gt;15 y.o. HH members (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>184</td>
<td>222</td>
<td>266</td>
</tr>
<tr>
<td>Currently married</td>
<td>62.5</td>
<td>54.1</td>
<td>43.2</td>
</tr>
<tr>
<td>Never married</td>
<td>34.2</td>
<td>41.9</td>
<td>40.2</td>
</tr>
<tr>
<td>Widowed/separated/divorced</td>
<td>3.2</td>
<td>4.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Missing cases</td>
<td></td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>&gt;15 y.o. HH members not domiciled at residence during survey (%)</td>
<td>4.3</td>
<td>4.1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Other household members may also have productive role in the household through their contributions to total household income. A one-way between-groups ANOVA was ran to explore whether the number of other household members involved in kangkong production differs in the three cities. The results, indeed, show that there is a statistically significant difference at $p<.05$ level for the mean of three cities: $Welch F(2, 127.41) = 8.53$, $p<.001$. Post hoc comparisons using Hochberg GT2 reveal that Phnom Penh ($M=1.08$, $SD=1.62$) and Bangkok ($M=.44$, $SD=.77$), and, Phnom Penh and Hanoi ($M=.26$, $SD=.56$) differs, but not with Bangkok and Hanoi. This implies that it is the size of Phnom Penh in terms of the number of other household members that created the statistically significant difference. Otherwise stated, there are more ‘other’ household members in Phnom Penh who are involved in kangkong production than the other two cities. But these household members do not explain dependence on kangkong as a liveli-hood in all of the cities $[Bangkok: R^2 = .001, F(1, 69) = .08, ns];$ Hanoi: $R^2 = .034, F(1, 70) = 2.45, ns;$ Phnom Penh: $R^2 = .003, F(1,70) = .21, ns.$ This implies, indirectly, that

11 Refers to ‘not significant’ or $p>.05$. I decided to use ns instead of the $p$-value so as not to confuse the reader with so many numbers and different signs.
those other household members who are also producing kangkong as a livelihood do not have much contribution to overall household main income.

5.1.4 Husbands and wives in smallholder farms

The above discussion does not highlight the role of the husbands and wives among our household members. Although it is the case in most situations, household heads cannot always be assumed to be the husbands. In Table 5-1, we saw that some of our households tend to have more than one family living together especially in the case of Bangkok. These households have both core and offspring households (cf. Eder 1999) residing in the same dwelling unit. In the case of Bangkok particularly, 10 of the households have parents living with their children. This explains why Bangkok households in this study have, on average, older household heads because, although they are no longer productive due to old age, they are still considered the heads of the households. It is in view of this situation that we need to unpick who contribute most to household income through the conduct of productive activities. It is thought that in a family situation much of the income will be accounted by either the joint or separate effects of both husbands and wives. Productive activities are used here in terms of activities that generate income. One can argue that housework is a productive activity, but is not included in our definition because they do not have immediate contribution to income. But I do recognise that housework especially those done by women is an important activity in the household and encompasses all activities related to homemaking. Berheide et al. (1976: 491) have shown in the United States that women's unpaid labour as housewives is “time consuming and necessary activity occurring daily” and such work is “without doubt the most common “occupation””. Berheide et al (1976: 506) concluded, after assembling facts borne out of their research, that:

[...] the wife does the bulk of the household work. In a few families or for certain tasks, the women may be 'helped' by the husband, the children, other household members, a paid worker, friends, or appliances. Yet household work is still the wife's responsibility [italics not mine].

Such understanding of the importance of women's work in the household is accepted, whether in the west or the global south. Hence, Roy and Crow (2004: 18) claims that globally “women do more unpaid work than men”. Thus, without being prejudicial
to the important roles of homemaking by women in the households, this study adopts the functional notion that productive activities only include those activities that generate income for the household.

5.2 Unpicking the production systems

5.2.1 Number of production systems

The three cities can also be arrayed in terms of the number of culture systems of the household ranging from a single culture system of kangkong to a mix of different aquatic plants such as kangkong, water mimosa, water dropwort, watercress, and lotus to polyculture systems involving both plants and fish. Bangkok and Phnom Penh lie at one end with 87% and 100%, respectively, of households surveyed involved in the culture of kangkong alone. In Bangkok, the remaining 13% of households farm both kangkong and fish. By contrast, Hanoi has only 29% of surveyed households involved solely in kangkong production. The rest are involved in mixed or integrated systems. Forty-four percent (44%) are involved in the production of different aquatic plants and 26% in the farming of both kangkong and fish. The different culture systems of a household reflect the natural endowment of their locations and the consumer demands for different aquatic produce. Such natural endowment allows for the possibility of different culture systems to be carried out especially in the case of Hanoi where there is a seasonality in aquatic vegetable production. But more than just a reflection of such natural endowment, the diversity of production systems also reflects the household’s livelihood strategies, which is discussed in detail in Chapter 8.

5.2.2 Number of years involved in the production system

The number of years involved in kangkong production indicates how long the system has been in existence, the currency of the farming system, and its reliability as an occupation. Hanoi households were involved the longest with a mean number of

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12 This data, however, has significant missing values especially in those households where farming kangkong is not a major occupation by most members of the household (i.e., an adjunct to the main occupation) or in those households where their involvement with kangkong is limited to being hired labour. Because the PAPUSSA data is production-based (i.e., either aquatic plants or fish) focused solely on aquatic production, other systems which are not directly based on producing aquatic plants or fish were left out in the survey. In order to include these households in the analysis without jeopardising the empirical findings, households with missing data were given a default figure of 1 year. This is based on the assumption that for
years of involvement of 12.54 (SD=5.43) followed by Phnom Penh with a mean of 10.74 (SD=7.21). Bangkok has relatively the shortest involvement at 8.58 years (SD=7.38). Results from a one-way between groups ANOVA with post hoc tests show that there are significant differences in the mean number of years of involvement among cities, Welch $F(2,137) = 6.74, p<.05$. The difference is particularly statistically significant between Bangkok and Hanoi based on Hochberg’s GT2 test. However some producers are involved in producing kangkong much earlier than the averages suggest. In a timeline exercises in the PCA conducted in each cities it was known that kangkong production started around 1989 in NPN (Yoonpundh et al. 2003: 13), 1983 in Bang B (Nguyen Thi Dieu Phuong et al. 2003: 14), and 1987 in Kbal Tomnub (Chhouk Borin et al. 2005a: 11).

5.3 Unpicking the wealth characteristics of kangkong households

'Wealth' is tricky information to collect in the field because of its sensitivity. Instead, we can resort to proxy measures, which provide a sense of how households are differentiated by wealth or economic well-being. In this study, three ways of understanding the wealth characteristics of households are offered: an index of physical capital ownership, the nature of housing and a wealth index. The first one offers a hint based on the household’s ownership of farm implements. But this measure is saddled with several measurement limitations because the existence of a particular implement might be totally unrelated to kangkong production. Furthermore, a particular value of an implement depends on its condition, design, and price of acquisition. For instance, a water pump has different corresponding values depending on whether it is made in Taiwan or Japan. To balance these limitations, further measures are used including the characteristic of the dwelling unit, ownership of toilets, and the source of light, as explored below.

5.3.1 Level of physical capital ownership

The measure of physical capital is an index of the different farm implements owned by the household. This capital refers to the ‘manmade’ capital used in the pro-
duction system such as nets, pesticide sprayers, boats, generators, and tractors. These are important factors of production, collectively classified as farm equipment, which signify the intensity through which production is carried out and the extent to which the households rely on their production system. For instance, the ownership of a number of water pumps could substantially influence production as ponds can easily be irrigated. But the purchase of this equipment also means that the production is sizeable enough to ensure that a farmer recoups his or her investment. Each of them is counted and qualitatively scored in the following manner, based on their qualitative worth as indicated by their relative prices:

- 5 = nets, woks, small oxygen cylinders, pesticide sprayers, and boats;
- 15 = pumps, aerators, other machines, engines, generators;
- 20 = hand tractors; and,
- 25 = 4-wheel tractors.

The total of all physical capital own by the household becomes the index of physical capital. Boats are given lower scores because they are non-motorised and the design is basic. They are basically dug out wooden canoes and serve more as floating structures amenable for short term movements in the pond or sewage lake than for long distance transport. They neither have outriggers nor sails. Their sizes are also generally smaller than those used in marine or riverine transport (Photo 5-2). The scale between the first and the second categories of farm equipment is intentionally inflated by ten-points to reflect the fact that mechanical farm implements are generally more expensive.

Multiple comparisons using Hochberg GT2 test of the means of the index among the three cities showed that the differences are statistically significant, *Welch F (2, 132.47) = 23.88, p<.001*, especially with respect to Bangkok (*M=8.89, SD=6.37*) vs Hanoi (*M=3.47, SD=3.66*) and Hanoi (*M=3.47, SD=3.66*) vs Phnom Penh (*M=7.13, SD=5.61*).

Bangkok vs Phnom Penh is not statistically different because their means are nearly the same. The involvement of some fish producers in Phnom Penh inflates their count somewhat as fish production is capital intensive. In reality, *kangkong* production is not
as capital intensive as rice or fish production. The experience in Phnom Penh shows that with just seedlings, strings, and wooden posts production is possible because *kangkong*, as already mentioned in Chapter 9, thrives in eutrophic environments and is 'invasive'.

![Photo 5-2 Harvesting and transporting kangkong in Hanoi (left) and Phnom Penh (left) in 'boats'. (Photos by: Author)](image)

It is tempting to think that a high level of physical capital correlates with a certain level of wealth. The result, however, is negative in that no significant correlations were found in the three cities. This means that wealth is not a factor for a certain level of physical capital putatively because it is a necessity. That is, households whether poor or rich need to access certain forms of physical capital in their production system. But in view of the number of households who carry out single production activities in both Bangkok and Phnom Penh as discussed in section 5.1.4, it would seem that the number of owned farm implements corresponds with a degree of monocropping as the cases in these cities suggest.

### 5.3.2 Housing

Writing for the Living Standards Measurement Survey of the World Bank, Malpezzi (2000:293) noted that housing is the largest fixed capital investment that households make, whether in developed or developing countries. In this study, housing characteristics, which include access to electricity, availability of drinking water, and nature of toilet facilities, indicates the relative living standards among different producer groups across and within cities. Following Moser (1996:44-47), housing is also considered an important productive asset which households involved in *kangkong* can draw
upon as and when needed. In terms of addressing severe poverty in urban areas, Moser found in her studies involving four urban communities in four cities (i.e. Chawama, in Lusaka, Zambia; Cisne Dos, in Guayaquil, Ecuador; Commonwealth, in Metro Manila, Philippines; and Angyalfold, in Budapest, Hungary) that housing served as a base for enterprise such as renting extra rooms to others, selling it when there is an urgent need for cash, and using it to make or maintain social capital. However the ability of the household to use housing to tide over emergency financial situations depends on the nature of the existing land market and the tenure security the household possess. *De jure* or *de facto* security of tenure has substantial implications on the extent to which house owners can use their homes to leverage investments or upgrade it. The possession of a housing unit by itself does not automatically guarantee that one can use it productively. In most instances, financial institutions only accept housing as collateral for loans if the house is formally titled.

The length of time of residence and the nature of *kangkong* householders’ dwellings offer insights into their settlement history and relative well-being. In terms of the years respondents live in their current residences, Bangkok registers the highest proportion of respondents (82%) who have lived in their current dwellings for more than 6 years. Hanoi follows with 75% of respondents. In the case of Phnom Penh, only 67% of respondents have lived for more than 6 years in their current dwellings. Another 22% has been in their current residence for only 2 to 5 years, while the remainder for a year or less (Table 5-4).

In Hanoi, all of the sampled households claimed ‘owning’ their dwelling unit in comparison to only 93% for Bangkok and 82% for Phnom Penh (Table 5-4). Such a high ownership rate seems to be in accord with a HAIDEP Survey which recorded that the ratio of house ownership is higher among lower income groups (i.e, those with incomes under 1.5 million VND/month). In this survey, 95% of houses are self-owned in this income group as compared to only 91% among the higher income group. At the district level, Hoang Mai has an ownership ratio of 90%, while in Thanh Tri it is 98% (HAIDEP Study Team 2005: 5, 8). A similar trend between the three cities is also shown for the
ownership of the plot of land the dwelling unit is built on, where Hanoi is at the top. The full ownership among Kangkong households of both their dwelling unit and residential land is likely to reflect historical antecedents wherein householders were given a fixed amount of land for residential purposes during the decollectivisation process.

Table 5-4 Housing characteristics 1 (Source: PAPUSSA Survey)

Another important aspect in considering housing as a productive asset is the structural quality or durability of the dwelling unit. Here, it is instructive to use an internationally-applied definition to make it more comparable as issues concerning durability and structural quality of a particular dwelling unit can be highly subjective and therefore problematic. In the UN-Habitat Report on slums (UN-Habitat 2003:243), durability is satisfied if a house is built on a non-hazardous location and has a structure permanent and adequate enough to protect its inhabitants from the extremes of climatic conditions such as rain, heat, cold and humidity. Generally, a housing structure is considered durable when certain strong building materials are used for roof, walls and floor. Even though some houses may be built with materials classified as durable, the dwellers may still not enjoy adequate protection against weather and climate due to the overall state of a dwelling. Alternatively, a material may not look durable, in the modern sense, but is, in the traditional sense, when combine with skills of repair.
The definition goes on to highlight the role of local conditions and the ability of the household to carry out proper and adequate repair on the dwelling such that building materials which are not necessarily very durable may be made to last longer with proper construction and maintenance. In this survey, the state of repair or nature of construction of the dwelling would have enhanced greatly our understanding of the structural quality and durability of the dwelling had this information been collected. Instead, information was collected only on the nature of building materials used for roofing, walling and flooring. However, some observations and impressions made during several field visits are used to place the foregoing discussion in context. Kabeer and Tran Thi Van Anh (2002) also use housing durability to differentiate the rich from the poor rural households in their study of gender differentiation in Viet Nam.

Photo 5-3 Some types of housing in BCE (left) and Hanoi (right). (Photos by: Author)

Using the predominant construction materials for roofing, flooring, and walling as proxy measures for the permanence of the dwelling unit, it is clear that those in Phnom Penh are temporary structures (Photo 5-3). Most of the materials used in the construction of the dwellings consist of thatch, wattle, wood and prefabricated boards. In contrast, the use of bricks, cement or concrete predominates in Hanoi and Bangkok. Interestingly, a substantial number of houses in Bangkok have used wood for walling, as in Phnom Penh (Table 5-4). But field observations show that Bangkok houses use cut hardwood timber such as teak which tends to be associated with old architectural designs whereas wood is used in a functional and not design-centred way as well as of being of the soft wood variety (e.g., plywood) in Phnom Penh. The survey showed that 88% of kangkong households in Phnom Penh reside in temporary dwellings. Only 3% can be considered to have permanent dwellings, at least based on materials used in construction. The rest are semi-permanent. It is imaginable that the location of houses within
the lake which is susceptible to yearly flooding and the public nature of the land is a disincentive from building permanent dwelling structures. In Hanoi, 99% of kangkong households live in permanent dwellings built in bricks and concrete. In Bangkok, the use of wood in traditional architectural designs gives a degree of ‘semi-permanence’ so that only 75% of kangkong households in this city live in permanent units. The rest dwell in semi-permanent structures with iron sheetings and concrete/tiled floorings, but walls made of wood.

Table 5-5 Housing characteristics 2 (Source: PAPUSSA Survey)

<table>
<thead>
<tr>
<th>Key characteristics</th>
<th>Bangkok</th>
<th>Hanoi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>71</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td><strong>Source of light (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mains electricity</td>
<td>97.2</td>
<td>100</td>
<td>34.7</td>
</tr>
<tr>
<td>Tapped electricity from another house</td>
<td>1.4</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>Kerosene</td>
<td>1.4</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Candles</td>
<td>4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td>29.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Toilet ownership (%) N</strong></td>
<td>98.6</td>
<td>98.6</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Vehicle ownership</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle (% N)</td>
<td>88.7</td>
<td>94.4</td>
<td>30.6</td>
</tr>
<tr>
<td>Motorbike (% N)</td>
<td>83.1</td>
<td>75.0</td>
<td>27.8</td>
</tr>
<tr>
<td>Car (% N)</td>
<td>49.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goods ownership</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landline telephone (% N)</td>
<td>43.7</td>
<td>31.9</td>
<td>6.9</td>
</tr>
<tr>
<td>TV (% N)</td>
<td>95.8</td>
<td>98.6</td>
<td>61.1</td>
</tr>
<tr>
<td>Refrigerator (% N)</td>
<td>97.2</td>
<td>41.7</td>
<td></td>
</tr>
<tr>
<td><strong>Main drinking water supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own tap connected to mains (% N)</td>
<td>53.5</td>
<td>1.4</td>
<td>33.3</td>
</tr>
<tr>
<td>Public tap or standpipe (% N)</td>
<td>8.5</td>
<td>69.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Rainwater (% N)</td>
<td>64.8</td>
<td>58.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Borehole/Well (% N)</td>
<td>4.2</td>
<td>70.8</td>
<td>63.9</td>
</tr>
</tbody>
</table>

The sources of light of households also vary among the cities with both Bangkok and Hanoi at one end having most of their lighting provided by electricity connected to the mains. At the opposite end is Phnom Penh with mains electricity used by only 35% of households. Another major source of energy in Phnom Penh is battery (Table 5-5). The case of Phnom Penh is instructive of the nature of infrastructure in the country where basic necessities for modern living such as electricity are still years away from complete coverage even among peri-urban households located only 5 to 7 kilometres from the city centre. Nationally, 51% of urban households use electricity as light source as compared to only 44% among kangkong households. Of this 44%, 10% tap their electricity from other houses. The use of batteries among 29% of kangkong households is particularly high compared with the national figure of 9% for urban households. Kerosene use, although substantial, is less than the national average of 34% in urban areas. In general, electricity use only covers 14% of households in Cambodia and much of it is concentrated in
urban centres. Alternative energy sources are still dominant, especially in rural areas (National Institute of Statistics 2004a: 15).

Again both Bangkok and Hanoi can be contrasted with Phnom Penh when it comes to toilet ownership with nearly all households having toilets as compared to only 13% in Phnom Penh (Table 5-5). Even simple toilet designs (i.e., hole-on-the-ground or pit toilets) are not present in most of the households in this city. Householders may not find it necessary to have a toilet considering that their houses are mostly built on stilts in the lake. Although it was not visually assessed, it is likely that floors have openings into the lake through which defecation can take place. In general, toilet ownership in Cambodia is very low at just 22%. Although 55% of households in urban areas have toilets (National Institute of Statistics 2004a: 37). When this figure is read alongside that of kankong households in this study, which is only 13%, a grim picture emerges. In BCE, which is located outside a flood embankment, a JICA-funded study has noted in 1998 that a sewerage system is essentially non-existent in areas outside of the dike such that all domestic wastewater is either disposed off on-site via septic tanks or pit latrines or commonly through privies of houses built on stilts funnelling wastes directly into the lake (CTI Engineering Co Ltd and Nippon Koei Co Ltd 1998: 102). Toilet ownership, or access to one, among these households needs to be extended if health and sanitation is to be improved.

Ninety-eight percent of urban households in Thailand have improved sanitation facilities (The World Bank 2006b). In Hanoi as a whole, a 2005 survey showed that 79% of households have toilets (HAIDEP Study Team 2005: 9). A World Bank review of infrastructure provision in Viet Nam in relation to poverty during the 1990s has noted that sewerage and sanitation infrastructures are limited and their performance is poor. In northern Viet Nam, most of its sewers were built before 1954 and before 1975 in the South. The types of toilet considered hygienic by the Ministry of Health include flush toilets, double vault composting latrines, and pit latrines. Human waste disposal systems such as bucket and fishpond latrines, toilets hanging over a waterbody, and animal and human waste manure tanks are not recommended by the government (van de Walle
Further differences among households are noted in vehicle ownership where only 31 and 28% of households in Phnom Penh own bicycle and motorbikes, respectively. Hanoi has higher levels of bicycle (94%) and motorbike (76%) ownership than Phnom Penh but Hanoi’s cumulative vehicle ownership is topped by Bangkok with 89%, 83%, and 49% of households own bicycles, motorbikes, and cars, respectively (Table 5-5). Compared with the rest of Asia, Bangkok has the highest total vehicle ownership at 296/1,000 people of which 56% are cars. Such levels of vehicle ownership is only a little behind Europe at 341/1,000 people (Kenworthy 1995: 33). In Hanoi, the motorbike dominates as the main mode of transport among households, with more than 80% owning a motorbike. Car ownership is non-existent among kangkong households, and for the city as a whole the figure is only 2% (HAIDEP Study Team 2005: 5). Motorbikes, in general, are popular in Southeast Asia because they are affordable (Kenworthy 1995: 33).

Consumer good ownership also follows the same pattern as vehicle ownership with Bangkok owning more of the expensive items such as refrigerators (Table 5-5). TV ownership among kangkong households in Hanoi is at 99%, which is exactly the same proportion for the rest of the city where almost all households have one. While refrigerator ownership among Hanoi’s kangkong households is only at 42%, the trend in the city increases with income from 43% among upper lower income groups to 75% among upper middle income groups and to 94% among upper higher income groups (HAIDEP Study Team 2005: 5). TV ownership in Thailand was at 92% in 2004 (The World Bank 2006b).

In terms of drinking water supply, it appears that kangkong households use different water supplies depending on the season or the availability of water. For instance, the use of rainwater is remarkably high in Bangkok (65%) and Hanoi (58%) but not in Phnom Penh. In addition, 54% of householders also source their water from the mains in the case of Bangkok and 69% from public taps or standpipes and 71% from boreholes or wells in the case of Hanoi. The use of the latter is also very prominent in Phnom Penh.
where 64% of households use boreholes or wells as their main sources of drinking water (Table 5-5). In general, 62% of households in Hanoi have piped water supply, although its coverage in suburban areas is low at 42.4% (HAIDEP Study Team 2005: 11). In Cambodia, piped water is only available to 37% of urban households (National Institute of Statistics 2004a: 35). In general, improved water source is available to 98% of urban households in Thailand (The World Bank 2006b). The wide use of boreholes or wells among *kangkong* households in both Phnom Penh and Hanoi may have serious health implications if these water sources are contaminated.

**5.3.3 Wealth index**

One way of summarising the different aspects of the households presented above is to create a wealth index which will provide an overview of the relative economic status of households. The index is based on the notion that the ownership of items and the nature of the dwelling unit ascribe to the household a certain level of wealth. Furthermore, the basis of the index is consumption goods and infrastructure. Thus, the index is not a definitive measure, but only indicative. As indicators, their purpose is to suggest the putative wealth characteristics of the households in this study in view of the absence of more solid measures such as censuses and other economic statistics.

The index of physical capital, above, is separated from the wealth index because it is felt that cross-city comparison is limited with measures that are production based. That is, much of the productive assets used in the index of physical capital come from different production systems which not all cities share in the same intensity as in the case of Hanoi vs Bangkok or VAC vs monocropping. Also, these assets are of different quality or state of use and the acquisition costs of each asset differ so that would have to be deflated (cf. Sahn and Stifel 2003: 466). To address these concerns, the wealth index covers seven measures representing key household characteristics and vehicle ownership. In large part, it is still asset based except that it does not rely solely on physical or 'man-made' capital:
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rich</th>
<th>Average</th>
<th>Poor</th>
<th>Very poor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of dwelling unit</strong></td>
<td>A row of two houses, brick houses (big) with iron sheet roofs and plywood walls</td>
<td>Wooden houses with iron sheet roofs and small plywood or leaf walls</td>
<td>Thatched house with leaf and bamboo walls</td>
<td>Dwelling unit with roofs constructed of thatch or wattle or rented from other people (no land)</td>
</tr>
<tr>
<td><strong>Size of residential land</strong></td>
<td>10x50 m²</td>
<td>4x8 m² or 4x8 m²</td>
<td>4x6 m²</td>
<td>4x8 m² (land rented from other people)</td>
</tr>
<tr>
<td><strong>Size of production system</strong></td>
<td>More than 10,000 fish stocked (pangasius, walking snakehead, and tilapia) and 20-30 pigs</td>
<td>1 pig and 3-4 chickens</td>
<td>1 pig (exchange with other people) and 4-5 chickens</td>
<td>None</td>
</tr>
<tr>
<td><strong>Pond characteristic</strong></td>
<td>Ponds owned and rented out to other people</td>
<td>10x50 m² (small amount of people have owned ponds and most of them rent from others)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Nature of occupation</strong></td>
<td>Fish sauce shop, fishing lot, fish landing site, building construction, and houses for rent, animal culture, lending money</td>
<td>Small scale fish culture, master of construction workers, fishermen, good and fish sellers, factory workers (smaller one)</td>
<td>Small scale fishermen, working in rice field, motorbike taxi, construction workers, and very small business owner</td>
<td>Very small scale subsistence fishermen, workers, motorbike taxis, beggars</td>
</tr>
<tr>
<td><strong>Ownership of assets</strong></td>
<td>Cars, motorbikes, and TV (modern) and bicycles</td>
<td>Cars, motors, and TV (second hand or not modern and bicycles and boat with engine)</td>
<td>Motors (old), bicycles and boats without engine</td>
<td>Old bicycles, small boats without engine</td>
</tr>
<tr>
<td><strong>Nature of investment in business</strong></td>
<td>Big investment</td>
<td>Small investment, when doing business needs loan from ACILIDA bank or from neighbours</td>
<td>Smaller investment than average, needs small amount of loan from ACILIDA bank or their neighbors to start a business</td>
<td>No investment</td>
</tr>
<tr>
<td><strong>Educational level of children</strong></td>
<td>Grade 10 (Senior secondary school)</td>
<td>Grade 7-8 (Junior secondary school)</td>
<td>Grade 4-5 (Primary school)</td>
<td>Grade 1-3 (Primary school)</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td>High income</td>
<td>Medium income</td>
<td>A small amount of income</td>
<td>Smallest amount of income</td>
</tr>
</tbody>
</table>

Table 5-6 Wealth ranking criteria suggested by key informants for PCA wealth ranking exercise used in Duong Village (Source: Chhouk Borin et al. 2005:14)

1) Ownership of house (1=ownership, 0=otherwise);
2) Ownership of the residential plot of land (1=ownership, 0=otherwise);
3) Whether electricity is the source of light (1=electricity, 0=otherwise);
4) Ownership of a toilet (1=ownership, 0=otherwise);
5) Vehicle ownership (3=car/van/truck, 2=others, 0=none);
6) Receipt of remittances (1=yes, 0=none); and,
7) Whether the dwelling unit is made up of permanent materials such as brick or cement (1=permanent, 0=otherwise).

The constituent parts of this index are similarly found in indicators used in wealth ranking exercises in participatory rural appraisals. In fact, the above index is inspired by the criteria suggested by key informants in Duong Village, Phnom Penh for the wealth ranking exercise (Table 5-6), specifically those concerning the dwelling unit, land, and assets. The key informants developed their own criteria for rich, average, poor, and very poor households. They then grouped the members of their community according to these criteria. The result is a qualitative classification of households by their wealth characteristics. Although these are subjective, they represent a local perspective on wealth or well-being.

A similar index was used by Felkner and Townsend (2004: 11-2) to create a wealth index for four provinces in Thailand where the key indicators are per capita TVs per village, per capita motorcycles per village, per capita pick-up trucks per village (Photo 5-4), and the percentage of households having flush toilets per village. In the Quality of Life Survey under the Wellbeing in Developing Countries project, the revela-

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13 Certain studies, however, use only a single indicator of wealth. For instance, Emans (2006: 13) uses the ownership of a car as an indicator of wealth in rural Thailand for the very reason that cars are important in transporting goods and people; thus, improving productivity. Also, their ownership also poses affordability issues because a pickup truck is expensive compared to other modes of land transportation.
tion about how local people perceive wealth in Thailand is telling: “a TV set, fan, refrigerator and motorcycle. A pick-up truck was a most wanted automobile in every family in the peri-urban areas.” (quoted in Clarke 2006: 13).

Using this index, three sets of ranges are possible: 6 to 8 (high), 3 to 5 (medium), and 0 to 2 (low). Bangkok emerges to be at the lower range of high with a mean of 6.24 (SD=1.84). Hanoi follows at the upper end of middle with a mean of 5.03 (SD=0.33). Phnom Penh lies at the middle point of low with a mean of 2.27 (SD=1.32). A one-way between groups ANOVA with Hochberg’s GT2 post hoc tests showed that the means of the three cities are significantly different: Welch $F(2, 212) = 169.46$, $p<0.001$. The actual difference of the mean wealth index among each of the three cities is large with a calculated eta squared of .62 based on the guidelines summarised in Newton and Rudestam (1999: 73-77). We can, therefore, tentatively conclude that Bangkok had households that are doing well economically while we have households in Phnom Penh which can be considered destitute. Hanoi households seem to be a borderline case where the indicators suggest that they are not as poor as Phnom Penh households but neither as rich as Bangkok\textsuperscript{14}.

5.4 Income dependence on \textit{kangkong} production

In section 2.9 above, we noted that livelihoods are generally derived from income. Although they are not synonymous, they are “inextricably related because the composition and level of individual or household income at a given point in time is the most direct and measurable outcome of the livelihood process” (Ellis 2000b: 10). In the baseline survey conducted in 2004, households were asked to state their top three main income sources ranked according to their percentage contribution to overall income during the year prior to the survey. Income here is viewed only as cash income and do not include in-kind contribution to material welfare (Ellis 2000b: 10). The results showed that the level of dependence on \textit{kangkong} as a major income source varied significantly among the three cities, Welch $F(2, 137.06) = 48.05$, $p<0.05$. Post hoc Gabriel test revealed that

\textsuperscript{14} To what extent these households differ at a country-level is beyond the scope of this study. Nonetheless, comparing \textit{kangkong} households with the overall economic make up of each country is a useful exercise in determining the importance of \textit{kangkong} production as a livelihood among households in the peri-urban zone.
there is no particular combinations of cities that produce the variation as all combinations significantly vary. This indicates that different cities have different levels of dependence on *kangkong*. Phnom Penh has the highest level of dependence on *kangkong* at 84.11% (SD=19.98). Households in Hanoi depends less with only 46% (SD=26.74) of their annual income being derived from the production of *kangkong*. Bangkok lies midway at 68.8% (SD=29.03) (Table 5-7). Although these are only proxy measures based on recall and relative estimates, the results provide a picture of the level of dependence households from different cities have on *kangkong*. We can therefore conclude that, in so far as *kangkong* is concerned, Hanoi households are only 'moderately reliant' or dependent which may reflect their degree of specialisation in its production (cf McSweeney 2002: 169). And in view of its wealth index, which is higher than Phnom Penh, such moderate reliance can only mean that they depend on other activities for income.

<table>
<thead>
<tr>
<th>City</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangkok</td>
<td>71</td>
<td>20</td>
<td>100</td>
<td>68.80</td>
<td>29.025</td>
</tr>
<tr>
<td>Hanoi</td>
<td>72</td>
<td>2</td>
<td>95</td>
<td>45.49</td>
<td>26.738</td>
</tr>
<tr>
<td>Phnom Penh</td>
<td>72</td>
<td>10</td>
<td>100</td>
<td>84.11</td>
<td>19.975</td>
</tr>
</tbody>
</table>

To understand the extent of dependence on *kangkong* in each city, we need to look at the distribution of households according to percent dependence on *kangkong* incomes. From Table 5-7, we see that the coefficient of variation (CV) is quite substantial indicating significant variability in the level of dependence. In Hanoi, dependence on *kangkong* could be as low as 2% of income, while it is 20% in Bangkok.

Figure 5-3 illustrates the degree of income dependence on *kangkong* adopting Vedeld et al.'s (2004: 88) classification of degree of dependence as applied to forest resources. In this classification, the degree of dependence is defined in terms of percentage of total household income accounted for by *kangkong*. Four levels of dependence are possible:
Figure 5-3 Degree of income dependence on *kangkong* (Source: PAPUSSA Survey)

1) Not dependent – percentage of total household with 0% of main income from *kangkong*;
2) Weakly dependent – percentage of total household with <=20% of main income from *kangkong*;
3) Dependent - percentage of total household with 20 to 40% of main income from *kangkong*; and,
4) Strongly dependent - percentage of total household with >40% of main income from *kangkong*.

Among the three cities, Phnom Penh emerges, at 96%, as the city with the largest proportion of household income from *kangkong* production. This is followed by Bangkok (72%) and Hanoi (47%).

The notion of dependence that runs through this study is similar to that of McSweeney (2002: 164) wherein financial dependence, in this case, to forest resources comes about “when a given user group earns a top-level share of its income from forest-product sale, engages in few other sectors besides, and does so through time”. In effect, dependence is based on a ‘sustained and near-exclusive’ use of a particular resource. Such goal of resource use is linked with attaining better incomes which would also imply wealth creation. Thus, we need to ask whether wealth and degree of dependence are correlated. That is to say, is there a relationship between degree of dependence on *kangkong* with the economic well-being of the household as measured in the wealth index described above? The results from the Pearson product-moment correlation, \( r \), shows only a small negative correlation between these two measures, \( r = -0.261, n=215 \),

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15 Degree of dependence (DEGDEP) was transformed using its square root due to some deviations from normality.
This means that an increase in wealth will lead to a small reduction in dependence on *kangkong* because this vegetable is exploited differentially among different households in mainland Southeast Asia.

The previous discussions show that *kangkong* is among the aquatic culture systems in Hanoi, a main income source in the sewage lake in Phnom Penh, and a commercial crop in Bangkok. If the experience in Bangkok is an indication, *kangkong* will continue to be farmed by households despite an improvement in their economic situation because it is more lucrative than say, rice production (Interviews, Appendix 4). One possible dependence-changing outcome associated with increasing wealth is when windfalls created from the sale of land will lead to a change in lifestyle and residence (i.e., a move to the city), as has been gleaned from the interviews to have been the case already with some farmers in Nonthaburi. Furthermore, the coefficient of determination of the two variables is only 7%. This represents their shared variance and means that wealth only plays a small aspect in determining degree of dependence. Other factors come into play.

The different levels of dependence appear to be underpinned in large part by the household's livelihood strategies. That is to say, households deploy different strategies in generating income which could include the disposal of a household's available labour solely on a single income generating activity or a production system or the pursuit of a mixed bag of activities that are seasonally determined. There is also the conscious effort among householders to pursue integrated production systems such as the integration of fish, livestock, and aquatic plants in Hanoi. Other households may be pluriactive where they may be paid employment either in formal or informal sectors while carrying out aquatic plant production on the side. Thus, there are various ways in which a living can be made and the success of the households depends on the strategies they employ. These strategies will be explored in greater depth in the next chapter.

In Figure 5-3, it is shown that different cities differentially exploited *kangkong* according to locally embedded contexts such as, for instance, marketability and demand, involvement in other production systems, availability of alternative sources of in-
come, and the overall economic situations of the households. The extent to which the
differences in dependence are a manifestation of these local contexts demands empirical
investigation. So in the next chapter, we will identify the key factors that will explain
such dependence then subject them to regression analysis in Chapter 6.

5.5 Summary

This chapter has described some of the key agents in *kangkong* production: the
households and its members. I show that, despite being involved in the production of a
single vegetable, using similar resources, and exploiting more or less similar landscapes,
*kangkong* households are differentiated socially and economically. Some cities have bet-
ter educational attainment than others. Some have multiple families cohabiting in the
same dwelling unit. Some cities have older producers while others are noticeably
younger. Economically, their levels of dependence on *kangkong* differ indicating that
*kangkong* production plays different roles in the households' livelihood matrix. They
have primary roles in income in Bangkok and Phnom Penh, but only secondary or terti-
ary roles in Hanoi. In Hanoi, we have seen that households are involved in a variety of
production systems which tend to operate in an integrated manner in a sense that nu-
trients flow from one system to another. Phnom Penh households appear to be 'poorer'
while Bangkok and Hanoi households appear to be comparatively better off. Yet when
we delve deeper into the economic circumstances of the households in Bangkok and
Hanoi further differentiation emerges with Bangkok households rather better off than
Hanoi especially when gauged in terms of asset ownership (e.g., refrigerators and cars)
and nature of water sources. In later sections, these cities are also differentiated in
terms of the size of land households deploy for their production systems.

The differentiation that weaves through this chapter only emboldens the obvious,
that contexts matters. That is, if we are to understand *kangkong* production we have to
look at its broader political economy. But intrinsic into the wherewithal of such a po-
itical economy is the space through which everything circulates. We may envisage such
space as the landscape, the physical vessel that contains all elements of human liveli-
hoods. That is to say, households, their production systems, markets, dwellings, and
aspirations are located within a landscape for the simple fact that human beings, being largely terrestrial entities, negotiate their lives within a physical space. This space could be variously ascribed as the city, the hinterlands, the farms, or the peri-urbans. The intentions of succeeding chapters are to draw out these spatial linkages, connections, or attachments.
Chapter 6
Livelihood strategies and spatial attachments

This production system has been practiced since the generation of my mother. At that time, the inner part of the lake was a rice field while the surrounding area was used for trakuon and lotus farming and fishing. Later, people stopped farming rice because the flooding period became longer and lands were bought by land agents and were later filled up. Land filling blocked the water flowing out resulting in longer flooding of the lake. In general, the flooding season in the village took 3 months and the flood expanded to Beoung Keok Kong area. — Bunthach (Interview, Appendix 6).

In section 5.4, income dependence on kangkong was discussed. It was shown that households have different levels of dependence on this vegetable for their main income. Such different levels of dependence, I argue, is a reflection of different contextual factors operating within the domain of the household, the livelihood system and the overall spaces both households and livelihoods are entangled with. These factors are social, political, cultural and spatial. How households engage with these factors represent their livelihood strategies. A livelihood strategy refers to how the household as a social unit modifies the activities it pursues in view of its changing asset position and circumstances (Ellis 2000b: 31). A strategy could include "subsistence production, self-employment, wage labour, mutual exchange, and so on, while the resources they seek to mobilize can be material (equipment, finance and credit, seeds, fertiliser), human (labour power, skills, education), or social (the claims, entitlements, and opportunities that
arise through social networks and collective action)," state Kabeer and Tran Thi Van Anh (2002: 111). Hence, the nature and form of the strategy reflects the extent to which a household is dependent on a particular livelihood.

Here, we have a livelihood based around the production of a single plant located within a very dynamic landscape. It is also a production system heavily entangled in the metabolism of the city. There is therefore a very strong spatial connection between *kangkong* and the spaces where it exists. So far we have shown that through the metabolism of the city, part of that spatial connection is already established. What is needed now is to understand the spatial imprint on *kangkong* livelihoods as mirrored in the agency of the households. That is to say, we need to identify the aspect/s of the households that will be heavily spatialised. Or in a more mundane way, which important aspect/s is/are affected by the on-going spatial changes in Southeast Asia? We will pursue this by delving into the factors that explain why the households in this study depend on *kangkong* for their main income. Households depend on a particular crop or activity as part of their overall livelihood strategy, which is, in turn, a manifestation of their needs.

In Walker et al.'s. (2002: 175) view, "[...] the choice of any crop represents investment of a kind, some yield high-certainty outcomes in the short run, while others are riskier over long planning horizons, but with a much greater potential for economic gain". The former may be called income crops while the latter, investment crops. *Kangkong*, in this context, falls within the former. Previous discussion on the *kangkong* cropping cycle shows that it is a crop planted for both short-run and long-run income depending on the type of household involved and the city in question. For instance, it is only one of several aquatic plants cultivated seasonally in Hanoi whereas the production of *kangkong* in Bangkok and Phnom Penh is year round and covers a sizeable part of the year's income stream. The level of dependence on *kangkong*, therefore, represents a household's calculation of the best investment for their time, labour and resources that will improve overall household welfare. Such dependence is embedded within a gamut of livelihood strategies adapted by the household which is, in turn, tightly linked with their
access to natural, human, physical, and financial capital (de Sherbinin et al. 2007: 32).

Ellis (2000b: 75) writes that these capital “constitut[e] the platform upon which livelihood strategies are constructed”. Furthermore, Ellis (2000b: 9), defines access in several ways:

- "the rules and social norms that determine the differential ability of people in rural areas to own, control, otherwise 'claim', or make use of resources";
- "impact of social relations, for example gender or class, on this ability"; and,
- "the ability to participate in, and derive benefits from, social and public services provided by the state".

It is argued here that spatial imprinting occurs at the most crucial juncture of making a living. That is, at the point where households depend on a particular activity to make ends meet, so to speak. This is at the point of dependence, which, in our case, means dependence on main income. The value of kangkong as a tracer of spatial change and a lynchpin in peri-urban livelihoods cannot be made without discussing dependence, as only through this notion can we judge the importance of a particular activity. In other words, dependence is a corollary of livelihood strategy because how a household strategises with respect to the deployment of key assets affects its dependence. In view of the above, the livelihood-turbulence framework (Figure 2-5) will serve as our guide.

In this chapter, I will describe the factors that explain households’ dependence. Let me clarify that my goal is not to understand income dependence per se. That is, issues of elasticities and opportunity costs of various income choices, for example, are not my key concerns. Instead, I want to find out why households consider themselves to be dependent on kangkong production given that their levels of dependence vary. Specifically, I want to find out which facet of the household and its livelihood explains the dif-

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1 I used this term intentionally to highlight my approach and intention in this study. As I explain in the succeeding discussion, I do not mean to analyse the determinants of dependence. Rather I want to find out how to understand why households consider themselves to be dependent on kangkong by looking at the proportion of their income based on this vegetable and then using their responses to other variables in the survey, imputing the factors that will explain the dependent variable, degree of dependence. In a sense, what I want to find out, in a truly grounded way, is an understanding of dependence based on a reading of context (emic), broadly drawn. Such reading is not pre-formed or rehearsed prior to the survey or data collection. That is, the survey was not designed with dependence as an overarching theme. Indeed, it was livelihood. So in the course of engaging with the data through different stages of data exploration, the notion of dependence emerges out of the data. And because the data was comprehensive enough, I was able to wheedle out factors that I thought (etic) might explain why they consider themselves dependent on kangkong. One can argue that the advantage of this approach is that it does not bias the results because the question was not predetermined. What was predetermined was the framework revolving around livelihoods. On the other hand, one can also say that the lack of a proper design may have failed to capture important constructs.
ferential engagement with the production system. So, when a household claims that 30% of the household’s main income comes from *kangkong* while another household claims 100%, I want to interrogate what factors explain this difference.

With this objective in mind, therefore, the first step of the process is to tease out these explanatory factors. Like all social processes, the pursuit of a livelihood, whether at the individual or household level, is mediated by many factors. In this study, these factors are limited to the assets or endowments specified in the livelihood-turbulence framework (Figure 2-5). It is hypothesised that the explanatory factors of a household’s dependence on *kangkong* are underlain by access or availability of different forms of capital, which, in turn, underpins the livelihood strategies of the household.

These factors are represented by a collection of measures which act as proxies for capitals and are argued to have a bearing on livelihood strategies. These measures are identified and entered in a regression model. The model is run for each of the three cities in this study to identify unique explanatory factors of dependence. In a sense, the regression step is a variable reduction exercise meant to filter out parsimonious explanations. Then these factors are fleshed out using data from the monitoring surveys and qualitative interviews in the succeeding chapter. These interviews and surveys will thicken the endogenous contexts of key dependence predictors as the regression is unlikely to capture the various permutations of a household’s political economy. By endogeneity, I am referring to social mechanisms arising from the “internal workings of the household” (Walker *et al.* 2002: 195).

The notion, which was discussed earlier, that the household is an important ‘agent’ of urban transformation underpins *kangkong* dependence and spatial change. The selection of variables is guided by the life cycle hypothesis (LCH) in the first instance anchored within an overarching livelihood framework. The LCH posits that the

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*2 The use of this term follows its usage in land use change analysis exemplified by the works of Perz (2006; 2001; 2002; 2005b), Walker (2002), Coomes (2004), Barbieri (2005), Moran (2005), and de Sherbinin (2007) in the Amazon. Even Hart (1986) uses the same term in her work in Indonesia. That said, I understand that there is a contrary view, especially within the medical sociology and social gerontology fields, that a life’s journey is not straightforward, but filled with “false starts, changes in direction and hidden obstacles” (Hockey and James 1993: 50). Thus, the unidirectional assumption in a life cycle is not tenable and that a life course is a better conceptual frame. According to Kronenfeld (2006: 503), “one of the advantages of the life course terminology [over lifespan or lifecycle] is that it conveys a less static approach to issues and allows a recognition of the variation in experience that different people have as they become older”.*
"life cycle may partly explain the evolution of the landscape, given that land managers and their families, like everyone else, experience an ever-changing set of needs, capabilities, and objectives, all of which affect their economic decision making" (Walker et al. 2002: 170). This framework starts off as Chayanovian, but market attachment especially in the use of outside labour in current household production systems limits its applicability. Although the Chayanovian perspective on household structure and its role in land use transformation is germane to variable selection, it does not necessarily round off the explanation because of different contexts. But Chayanov offers a good starting point to think of households and spatial change from a livelihood perspective by looking at how households make decisions on resource or asset allocation which then underpin their choice of a livelihood.

In view of the above, the nature of the household economy revolves around the deployment of available labour by key members of the household (i.e., the husband, spouse, and other household members) in pursuit of a livelihood. Such deployment is simultaneously influenced by the existence of other capitals, notably financial, physical, natural, and social. These capital assets affect household decision-making in terms of labour allocation or deciding which production system to pursue given their capabilities, their needs for income earning activities, and the availability of other employment or income generating opportunities. Thus, our model of dependence is composed of two parts. The first part concerns the livelihood strategy of the household while the second part consists of capitals that underlie such a strategy.

A household's labour deployment or allocation is also affected by access to other important assets in the sense that these assets will bear upon the pathway through which the household's available human capital is exploited. For instance, the availability of credit and support networks may help a farmer to decide which production system to pursue. In short, access to financial, physical, natural, and social assets mediates specialisation and dependence. A household will specialise in an occupation, or diversify, to

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3 "Chayanov suggested that the peasant family suppressed its production below a culturally prescribed limit and that the productivity of the domestic unit was regulated by the ratio of food producers to nonproducers in the household. Thus as children matured and began to participate in production, the rate of production per producer would fall off. The theory has an important place in Marxist theory which predicts that precapitalist producers in general produce for use not for exchange", says Gross (1984: 529).
maximise profit or well-being depending on the supply of factors of production such as land, labour, and capital (cf. Caldas et al. 2007: 89).

6.1 Human capital

A livelihood strategy implies the tactical deployment of various assets available or accessible to the households. A large part of these assets are 'human' in character in the sense that it depends on the quality and quantity of human involvement. But this capital does not happen in a vacuum. It is also served by other forms of capital which are accessed depending on the situation or need. So the first part of the regression is a series of human capital indicators.

Human capital is an important asset in the livelihood framework. In this study, issues of human capital are conceptually similar to the life cycle hypothesis especially in terms of the indicators used, notably age of the household head, the amount of available labour, the number of dependent consumers, and the use of hired labour and off-farm income (Walker et al. 2002: 172). The difference is that the framing of family life in a series of stages along an 'evolutionary track' is not a central concern because this study only offers a slice of a life in the dynamic peri-urban zones in Southeast Asia. A more thorough study along the LCH framework would have included the different stages households go through in their family lives following through changes in livelihoods, splintering of household members, welfare decisions, ageing, and then eventually woven into the settled landscape. This is because the LCH assumes a linear lifecycle from the point of entry into the landscape, as in the case of migrants arriving in a particular frontier and then taking up various occupations, until they find one that best serves their interests. Along the same lines, Walker et al. (2002: 173) point out with reference to settlers in the Amazon that the "welfare function of the family presumably changes as its needs evolve, which [...] necessarily affects the farm system and its attributes".

Because field observations indicate that kangkong production is the domain of both the husband and the wife to the degree that both parties are heavily and productively involved in the activity, I will assess equally the role of the husband and the wife. Characters that are associated with each 'unit' of deployed labour such as main occupa-
tion and occupational multiplicity as well as household demographics such as age and education are measured. Then, because livelihood strategy is the object of concern, I will also look at the role of other productive household members. And because households not only strategise based on within household considerations but also in terms of their relation outside the household, social capital is also measured. Finally, since a livelihood strategy is also further underpinned by immediate access to cash income, measures of financial capital are included. In the event that the gender of the respondent is shown to have a significant effect in the survey responses, they are included in the regression. But the first step in this process is to ascertain that, indeed, gender has an effect by comparing the mean differences in responses between male and female respondents. This is described in section 6.4.

6.1.1 Occupational multiplicity

Our first human capital indicator is the primary involvement of the husband and wife in the production of kangkong ‘subjectified’ in terms of the ranking of kangkong as the number one occupation of both the husband (H_MAIN) and the wife (W_MAIN)⁴. These are binary variables with ‘1’, if kangkong is the number one occupation, and ‘0’, if not. The objective of this is to ferret out the main effect of kangkong as an occupation. The occupational role of kangkong is further deepened by looking at the number of occupations of the husband (H_MULT) and the wife (W_MULT)⁵. This is based on the assumption that the household operates as a profit maximising agent where the disposal of labour is a

[...] function of on-farm returns to labour time compared to off-farm earning opportunities. With a given asset base, that is, land plus farm infrastructure and equipment, and a given total amount of labour time, the household makes comparisons between the return to using more of that time on the farm or deploying it in off-farm or non-farm wage or other income generating activities. Factors that increase the return to time spent on farm activities would tend to reduce the motivation to diversify. Two such important factors are an increase in the prices of farm outputs or a rise in farm productivity, obtained, for example, by cultivating a higher yielding variety. Conversely, a rise in off-farm or non-farm wage rates, or greater opportunities to undertake remunerative non-farm self-employment would increase the motive to diversify. (Ellis 2000b: 57)

Our hypothesis here is that a household’s livelihood strategy depends on occupational specialisation (i.e., whether kangkong is the main occupation practised by key

⁴ Among multiple households, ‘husband’ and ‘wife’ refers to the conjugal pair wherein one of them is the household head.
⁵ The baseline survey asked the respondent to list the three main occupations of each member of the household.
members of the household) and that the availability of other occupations is limited (i.e., diversification). The corollary being that specialisation in a particular activity or occupation diminishes diversification into other viable income earning activities. These indicators also assess the gender aspect of kangkong dependence by treating equally both the husband and the wife.

Although Ellis (2000b: 5) claims that "individual level diversity tends to characterise the diversification strategy of poorer households, while household level diversity combined with occupational specialisation tends to characterise the diversification strategy of better off households", there was no significant correlation in each city between the spouse’s/husband’s occupational multiplicities and the wealth index discussed in section 5.3.3 above. While kangkong is dubbed as the poor person’s vegetable, different economic classes of cities as indicated by their wealth indexes are differentially involved with kangkong production. On one hand, ‘richer’ households as in the case of Bangkok and ‘poorer’ households as in the case of Phnom Penh focused singly on its cultivation. On the other hand, the households in Hanoi, who can be considered to lie midway between the ‘poor’ Phnom Penh and ‘rich’ Bangkok, farm kangkong together with other crops. This means that wealth is not a factor in diversification. There are other factors that come into play including location, assets, income level, opportunity, institutions, and social relations, according to Ellis (2000b: 6).

Figure 6-1 Kangkong as the main occupation of key household members (Source: PAPUSSA DATA)

Figure 6-1 shows that in Bangkok and Hanoi, kangkong is the main occupation -
proportionally - by more wives in the sample. Although the case of Phnom Penh is different in that sense because there are proportionally more husbands who have *kangkong* production as their main occupation, the overall proportion of husbands and wives working solely in *kangkong* is substantially greater than in the other cities.

If we compare Figure 6-1 with Figure 6-2, we notice that Bangkok and Phnom Penh have just about the same mean number of occupations per husband and wife although Bangkok, based on the above figure, has a smaller proportion of households primarily involved in farming *kangkong* compared to Phnom Penh. In comparison, Hanoi, which has the least involvement in *kangkong* production on a per household basis, has the highest occupational multiplicity (wife, $M = 2.21$, $SD = .71$; husband, $M = 2.20$, $SD = .88$) as compared to either Bangkok (wife, $M = 1.25$, $SD = .76$; husband, $M = 1.23$, $SD = .77$) or Phnom Penh (wife, $M = 1.28$, $SD = .51$; husband, $M = 1.63$, $SD = .64$). Their differences are highly statistically significant: $F(2, 402) = 69.49$, $p < .001$. This indicates that other factors might be into play in Hanoi. These factors will be highlighted in succeeding chapters because the distinctive feature of Hanoi is repeated in other indicators and I suspect the same factors provide the same explanations.

![Figure 6-2 Occupational multiplicity of husbands and wives](Source: PAPUSSA Data)

For now, we shall move on to look at whether the husband and wife in each city
have the same occupational multiplicities because a difference might have a bearing on
the overall engagement with the production system and the financial welfare of the
household. Independent-samples t-test revealed that differences only occur in Phnom
Penh where the husband engages in more activities ($M = 1.53, SD = .64$) compared to
the wife, $M = 1.28, SD = .51$; $t(120.41) = 2.48, p = .02$ (two-tailed). But the magnitude of
their differences (mean difference = .25, 95% CI: .05 to .45) was very small (eta squared = .04). The conclusion therefore that the wife and the husband carry out the same level of
burden in terms of providing for the needs of the household is inescapable. Yet in the
above calculation of occupational multiplicity, we have not factored in the involvement
of the wife in housework. We will return to this once we have run the regression and
seen to what extent gender weaves its way through the data as an overarching theme.

6.1.2 Age

In household lifecycle analysis, the age of the household head is a key factor.
Hypothetically, the older a person the more life experience he/she has which, together
with education, contribute to the family's stock of human capital (Walker et al. 2002:
174). Furthermore, Walker et al. (2002) note that farm evolution from one production
system to another follows the maturation of the family workforce especially in the case
of frontier agriculture such as ranching in Amazonia. I hypothesise that age as far as
kangkong production is concerned exhibits the reverse as that seen in the case of ranch-
ing in the Amazonia in that older household members may be more deeply involved in
the production system than younger ones. The latter may find their employment in
other agricultural production systems, if they have not totally abandoned agriculture
and shifted towards other sectors such as trade or services. Because the kangkong
households in this study are located in areas where non-agricultural land uses and op-
portunities abound such as manufacturing, and not forgetting their proximity to the
city, it might turn out that kangkong production does not register in the menu of occup-
ational aspirations of younger generations or the aspirations of their parents for them-
selves. Our qualitative interviews of selected producers revealed the latter (see section
10.5).
In the qualitative interviews (Appendices 4 to 6), one can gather that there is a feeling of unease and disquiet over the future of *kangkong* as an occupation, in particular, and agriculture/aquaculture around cities, in general, such that they would prefer their children do something else. But the reality is that the desired shift is not easy to come by as reflected in the case of Phnom Penh where most of the occupations among the offspring generation are still farm-based (see section 8.2 below). But the intention to branch out to more 'desirable' productive activities is there. The nature of these aspirations and their implications for trajectories of change are discussed in section 10.5.

The households interviewed in the PAPUSSA survey are family households, where the husband and the wife, or the household head and the spouse, are assumed to be present in a conjugal relationship and are the household's major constituent parts. This is in contrast to non-family households or those being led by a non-married individual. None of the households sampled in PAPUSSA are non-family households. Husbands are, in general, older than the wives in our sample. Furthermore, Phnom Penh can be characterised to have younger families in view of the younger mean ages of husbands and wives (Table 6-1).

<table>
<thead>
<tr>
<th></th>
<th>Bangkok</th>
<th></th>
<th>Hanoi</th>
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<th>Phnom Penh</th>
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<tbody>
<tr>
<td></td>
<td>Husband</td>
<td>Wife</td>
<td>Husband</td>
<td>Wife</td>
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<td>n</td>
<td>66</td>
<td>68</td>
<td>66</td>
<td>72</td>
<td>61</td>
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<tr>
<td>Age</td>
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<tr>
<td>Min</td>
<td>29</td>
<td>22</td>
<td>35</td>
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<tr>
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<td>84</td>
<td>78</td>
<td>66</td>
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<tr>
<td>Mean±SD</td>
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<td>45.6±13.4</td>
<td>50.3±11.2</td>
<td>49.0±11.6</td>
<td>40.4±9.7</td>
<td>38.9±9.6</td>
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<tr>
<td>Education (%)</td>
<td></td>
<td></td>
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<tr>
<td>Entered or finished primary education</td>
<td>85.0</td>
<td>82.0</td>
<td>12.0</td>
<td>19.0</td>
<td>58.0</td>
<td>43.0</td>
</tr>
<tr>
<td>Entered or finished secondary education</td>
<td>3.0</td>
<td>4.0</td>
<td>80.0</td>
<td>67.0</td>
<td>25.0</td>
<td>14.0</td>
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<tr>
<td>Further education</td>
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<td>8.0</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>No formal education</td>
<td>12.0</td>
<td>13.0</td>
<td>6.0</td>
<td>17.0</td>
<td>43.0</td>
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Table 6-1 Age and education of husbands and wives (Source: PAPUSSA Data)

In the case of Bangkok, the initial run of the regression model showed that the age variables H_MAIN and W_MAIN, representing the ages of the husbands and wives,
violate tolerance (equal to 0.2 or less) and VIF (equal to 5 or more) indicating problems with multicollinearity. That is to say, they are highly correlated. This is a serious problem in regression analysis because it will result in an unstable regression matrix (De Vaus 2002: 343), thus producing faulty results. A Pearson product-moment correlation showed $r = .937$ (two-tailed, $p<.01$). This is a very high correlation, which means that their age ranges are nearly perfectly similar. Such correlation, however, between the age of the husband and that of the wife is understandable in actual situations because people tend, but not always, to marry someone of, or close to, their age. It, therefore, follows that a mature husband will have a mature wife. Dropping one of the variables was the option taken because any of these measures suffices as far as our regression is concerned.

6.1.3 Education

Education is an important component of human capital because it influences the quality of human capital by enhancing knowledge and skills. “All studies that have looked into the matter concur that education is a great facilitator of livelihood diversification. Lack of education has been identified as a critical constraint inhibiting diversification [...]”, writes Ellis (1998: 27). Education is measured in terms of whether the husband and the wife have attained a certain level of formal education and as such, are dichotomous variables. Such attainment could include only a few years of primary or secondary education to their completion or even the pursuit of further education. The hypothesis is that a certain level of educational attainment affects the degree of dependency on kangkong because an improvement in education will lead to better skills and knowledge and hence, more choices so that kangkong production may be substituted for other forms of income generation. The important benchmark of this variable is the difference between having no education, on the one hand, and attaining a certain level of education, on the other. Understandably, the effect of education on skills varies according to the number of years of schooling. But this only applies in cases where there are significant differences between having and not having education. What this variable is testing in our regression model is whether education has a bearing on dependence irre-
The husbands and wives in Hanoi are generally better off educationally than either Bangkok or Phnom Penh (Table 6-1). A very high number of wives in Phnom Penh (43%) have no education. Some husbands (12%) and wives (13%) in Bangkok have also no education. Education, therefore, markedly differentiates those 'productive' husbands and wives in the three cities. The same contexts we discussed in section 5.1.2 also apply here. In terms of wealth, however, a positive but small correlation is detected in Bangkok between the wealth status of the household and the education of the wife ($r = .25, n = 68, p<.05$). No significant correlations exist for the husband's education. This means that household wealth improves with an increase in a wife's education, at least for this city. No meaningful correlations in both the education of the wife and husband exist in other cities.

Although it belongs to other contexts, it bears mentioning that education does have a role in household well-being. A logistic regression analysis by Kabeer and Tran Thi Van Anh (2002: 139) for their study on gender differentiation and livelihoods in rural Viet Nam shows that household food security is linked with an increase in the husband's education while the education of the wife increased diversity of household diet.

6.1.4 The presence of other productive household members

The measures of human capital used in the regression concern the number of other household members who belong to the age group 8 to 64 years old (OHHMEMBERS). This is considered the productive age and is included as a measure of human capital because, hypothetically, the size of the available workforce in the family affects the choice of production system (Walker et al. 2002: 178, 185). This means that other household members can be depended on to assist in income generation through their gainful employment or assistance in the income generating activities of the household head or the spouse. In so doing, their contribution to household income is hypothesised to lead to a reduction in dependence on *kangkong* because what *kangkong* income provides is substituted for by other sources.
As a measure of household labour availability, working-age is restricted to the age range 8 to 65 years old, instead of the usual 15 to 65 years old to account for the cultural aspects of child labour wherein it is observed that some kangkong households do involve young children on their farms to help in daily cropping, bundling, or selling the produce in the market (Photo 6-1). Given a differential appreciation of child labour in Southeast Asia, the beginning age of 8 years old is chosen in view of the fact that most schooling in the region begins at six years, which might be too early for household chores, while eight might just be the point at which the child begins to take on some household chores. In the activity matrix carried out during the PCA conducted in Kbal Tomnub, for example, it was shown that children are involved in morning glory production but the times at which they work in the fields are different, with female children working in the early morning (3-6 AM) and the afternoon (1-5 PM) while male children

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6 The reason behind this is admittedly arbitrary and is informed in large part by my experience growing up in the Philippines and my observations in the field. Furthermore, "childhood is a social construct", according to Gailey (1999: 119) and to define childhood is to delve into the "intersections of class, ethnicity, and gender". Convention 138 of the International Labour Organisation (1973) prescribes the general minimum age for admission to employment shall not be less than the age of completion of compulsory schooling and should not be less than 15 years (International Labour Organisation). The age of admission for light work is 12-13 years old. Light work is defined as work which is not likely to be harmful to the health or development of children and which does not prejudice their schooling or their capacity to benefit from the instruction received (International Labour Organisation). But the problem with this definition is that it only refers to children who are 'economically active'. That is why it is 'child labour' and not 'child work'. Those in unpaid work, such as doing housework or errands in the farm, are not considered. Including them will increase by several magnitudes the incidence of child labour worldwide (Basu 1999: 1085). It is the prevalence of child work within the cultural milieu of agricultural households in rural Southeast Asia which led me to take the view that the prescribed age of child labour is not appropriate for this study because child work is not counted. Perhaps for reasons akin to mine, Hart (1986: 123, 134) uses the age of 10 as a baseline in her work on labour allocation in Java, but did not offer any explanation. In her work, however, she found that boys aged 6 to 9 years old from poorer households "spend substantial amounts of time cutting grass for animals, collecting fuel, fetching water, and so forth" (p. 134). Furthermore, in her child care survey, she reported that "virtually all children from the age of 5 or 6 are involved in looking after younger siblings" (p. 134). Thus, Gailey (1999: 119) asks "who 'counts' as a child?". What I, in effect, is saying follows what White (1999) advocated which is the framing of the child labour/work issue 'relative' to the culture of the households in question. Relativism as used here refers to "a way of opening our eyes to the variety of human ideology and practice, but not a basis for legitimizing whatever we may see" (White 1999: 137).
work during the late morning (7-10 AM) and again for two hours in the afternoon. Such
differences might be due to the involvement of male children in other work such as pre-
paring the food for the pigs (Chhouk Borin et al. 2005a: 24-5). It is also shown in the ac-
tivity matrix that schooling is part of their activities so it is likely that their involvement
in kangkong production is done alongside their studies.

Statistically, the mean of OHHMEMBERS is significantly different at p<.05 level.
A one-way between-groups ANOVA with post-hoc tests confirmed such difference, Welch
$F(2, 131.59) = 14.31, p<.001$. Post hoc comparisons using Hochberg GT2 revealed that
the mean for Bangkok ($M=2.03, SD=1.56$) is significantly different from Phnom Penh
($M=3.96, SD=2.67$). At the same time, Hanoi ($M=2.38, SD=1.26$) is significantly different
from Phnom Penh. Hanoi did not differ significantly from Bangkok, however. Recall that
in Table 5-1 the household size of Phnom Penh is larger than all the other cities, while
Bangkok and Hanoi are similar in this regard.

6.2 Financial capital – land and credit

Credit is an important measure of financial capital because it provides alterna-
tive sources of funds to counterbalance financial scarcity which may have implications
for the pursuit of a particular livelihood (Perz, Walker, and Caldas 2006: 839), and thus
bears also on land use change. These are also capitals which the household can draw
on to invest in their production systems. Stated differently, these are substitutes for
other assets in a sense that they can be used to build up or improve other assets. Cash
in the form of credit, savings or remittances is the “most substitutable of all assets”
(Ellis 2000b: 44). Some 23% of households in Bangkok accessed credit for their produc-
tion system. In contrast, credit use in Hanoi was low at only 10%. Credit, however, is
widely availed in Phnom Penh, with 61% of households borrowing money for various
uses.

Credit is used in Phnom Penh to purchase physical capital for their production
systems such as equipment and nets (72%), rent land (26%), and buy seeds (2%). Those
who did not avail themselves of credit in all the three cities did not do so mainly because
they did not have a need for credit (54%). Others did not do so because of fear, shame
and the feeling of being not credit worthy (27%), unacceptable terms and risks (12%),
while in some cases, the key reason was lack of credit sources (8%).

Photo 6-2 An advertisement for sale of land on the edge of BCE, Phnom Penh. Notice the text that says “This property is 100% legally owned by one person”. This is to assure prospective buyers that the property is legally owned and the title to the property is not disputed. In recent times, incidence of land grabbing in Cambodia is high. (Photo by: Author)

Land (AQUALAND) is another important measure of financial capital because it is convertible to cash through disposal or it can act as collateral to obtain loans (Photo 6-2). Its control through ownership or exclusive access productively contributes to the asset position of the household (Hart 1986: 102-14). AQUALAND is a respondent provided estimate of the size of their land converted to hectares. Access to land is a basic factor of production. In research on land cover and land use change such as deforestation in the Amazon, access to land is a source of future wealth and has been a key factor driving deforestation (Caldas et al. 2007: 90-1). Land as an indicator has three functions here: (i) as a main factor of production; (ii) in terms of understanding whether the production of kangkong depends on its availability; and (iii) whether the area of land matters in analysing livelihood dependence.

Basic textbooks in introductory economics always highlight the incontrovertible fact that land, together with labour and capital, is one of the main factors of production. In Marx’s Capital, they are described as the ‘trinity formula’ (Hart 2004: 4) where land holds an immense importance. In every society land is important (Simpson 1976: 1; Thompson 2001: 1). Thompson (2001: 1) notes that land differs from other types of property in their being both ‘permanent’ and ‘indestructible’ giving a person ‘a relationship with the land’, which he notes to ‘less likely occur with other forms of property’. Referring to Bangkok, Askew (2002: 196) remarks that
Land represents a multivalent resource—it is alienable property (sapsin), a place for living (thi yu), a livelihood resource (thi din) and household inheritance (moradok).

It is also

[... the source of all material wealth. From it we get everything that we use or value, whether it be food, clothing, fuel, shelter, metal, or precious stones. We live on the land and from the land, and to the land our bodies or our ashes are committed when we die. The availability of land is the key to human existence, and its distribution and use are of critical importance. (Simpson 1976: 1).

Farmers interviewed affirmed the importance of the land. Mr Chung in Hanoi said that owning land is important and receiving the red paper[^7] is “the most important thing in our [their] household”. This view is echoed by Mr Da who said that land is important because it can be sold or transferred to his children. Unequivocally, Mr Phuong claimed that “Land is the most important thing to the farmer” (Interviews, Appendix 5).

Thus, the question of land is a very emotive issue and evokes intense nationalism, pride and sentiments among people. Countries, states or individuals commit violence to protect their lands or pursue their interests on them. Much of the history of countries in the world in general and the mainland Southeast Asia in particular is shaped by the expansion and accumulation of land and the concomitant identities that are formed when people’s attachment to their lands solidified. Aside from land being an asset useful in the economic sustenance of a household, land has cultural, social, political, and spatial meanings and dimensions especially when viewed within the context of a dynamic urban fringe so that land sale and conversion can be either seen as a process or an outcome of events outside the household and the nature of household decision-making (Askew 2003: 300).

Together with water, land is a *sine qua non* in *kangkong* production. It is a crucial and limiting factor in its success. Between urban agriculture and urban aquaculture, land is more crucial for the latter as it has to exist together with an ample supply of water and nutrients, preferably free flowing such as domestic wastewater. Not all lands therefore are suitable for urban aquaculture if the other important factors of production are absent. Leschen et al. (2005: 3) explains:

> For both urban agriculture and aquaculture access to land is one of the main requirements for producing crops, fish or livestock. The attributes of the land required by the urban farmer are considerably less stringent than for the person cultivating fish or aquatic vegetables.

[^7]: Possession of a red paper denotes “ownership” defined within Vietnamese institutions.
Growing crops and even livestock can often be carried out very successfully within cities utilising relatively small areas of marginal land, which can be enhanced using chemical or organic fertilisers. However, the prospective fish or aquatic vegetable farmer has to not only find and retain access to the necessary area of land, but also obtain a source of water that is reliable both in terms of seasonal availability and quality (it does not deteriorate due to effluents from surrounding factories or other detrimental human activities). These factors can restrict and pre-determine to a large extent where more permanent peri-urban aquatic systems are located. (Leschen et al. 2005:3)

Addressing land access in the context of kangkong production as a precursor to change or driving trajectories of change takes an important turn when land access is linked with the important role of kangkong production in food and livelihood security.

As shown in earlier chapters, kangkong production is important as sources of income, food and livelihood in mainland Southeast Asia. Access to land and decisions on which type of kangkong production to produce are to an extent dependent on how households balance its livelihood strategy to cope with changing or potentially vulnerable situations. Thus, livelihood and food security are interlocking processes through which 'access to and rights in land and natural resources are central to an analysis of livelihood strategies and livelihood security' (Maxwell and Wiebe 1998:14) and that land tenure issues are important factors on how far peri-urban households employed their access to land to produce the type of kangkong production they are currently involved with to sustain household income and address seasonal vulnerabilities. Similarly, the deployment of certain livelihood practices as for instance integration of farm, livestock and fish, varietal rotation and cropping, and the increasing dependent on waste may be explained in part by the nature of the land tenure systems vis-à-vis livelihood and food security. However, land tenure per se is not a concern in our model. Instead, we are interested in finding out whether size matters.

Although suitable land has been shown to be an important factor in the adoption of aquatic food production systems especially fish farming in selected developing countries such as Malawi and Bangladesh (Pemsl et al. 2006), no data exists that suggests an optimum size for land to have a significant role in kangkong livelihoods. This could be due to the fact that size is not so much the issue but access as well as type of production system, intensity and the overarching livelihood intention (i.e., whether subsistent or commercial). This is unlike rice production, for which Hart (1986: 104) has shown that in Java, Indonesia a household of five members, equivalent to four con-
sumer units, must control a minimum of 0.575 ha of rice land producing two crops annually to be able to derive a net income of 300 kg per consumer unit, which is the threshold to be considered self-sufficient. In Kedah, Malaysia also during the 1970s to 1980s, Hart (1994: 68) cited an amount of 1.4 ha of owner-operated, double-cropped land that adequately provides income for an average-sized family while accumulating a modest surplus. Landholdings below 1.1 ha are considered 'subviable'. Estimates such as the above are not available for kangkong because it can be farmed in various land sizes. Kangkong even thrives in canals or any eutrophic water bodies. Among fish farming systems in particular, the species farmed, the intensity, and availability of other inputs are more crucial. Varying land sizes, in effect, affect yield or income depending on the marketability of the fish cultured, technology used, nature of fingerlings (native varieties vs genetically improved), cropping times, and amount and quality of inputs. In the same manner, we cannot say for certain how much land is needed to achieve higher returns from kangkong production. As shown below, each of the cities has different mean sizes of land used in kangkong production.

A one-way between-groups ANOVA with post hoc tests showed that the size of land used for aquatic or agricultural production are statistically significantly different among the three cities, Welch $F (2, 105.02) = 16.08, p < .001$. In particular, the difference is marked between Phnom Penh vs Bangkok and Bangkok vs Hanoi as revealed in Hochberg GT2 tests because Bangkok has the largest amount of land deployed for agriculture and aquaculture production systems with a mean of 1.74 hectares per household ($SD = 1.64$). In contrast, Phnom Penh and Hanoi have only $M = 0.56$ ha per household ($SD = .49$) and $M = 0.82$ ha per household ($SD = 1.39$), respectively. At this rate in Hanoi, it would seem that areas used for kangkong and aquatic plants production are bigger than fish pond areas, according to the ADB, where the sizes are generally small ranging from 80 to 200 m$^2$, which may have something to do with the sizeable capital investment needed to operate a fish farming enterprise (ADB et al. 2003: 40). The VLSS, however, revealed that the average Vietnamese farm is only around 0.70 ha (Food and Agriculture Organisation and United Nations Development Programme 2002: 10) giving the kangkong households in Hanoi slightly bigger land areas.
Highest coefficient of variation (CV) is registered in Hanoi with a sample standard deviation of 169.5% of the value of the mean as compared to Bangkok and Phnom Penh at 94% and 88%, respectively, although all of these coefficients indicate a very high variation. As I will show below, the case in Hanoi can be explained in terms of the integrated nature of its production systems where a degree of seasonality dictates which crop a household pursues for the season. This means that the farming of *kangkong* will depend on how much land is left after allocations to other production systems are made. Presumably, crops of commercial nature or those which offer larger profit (e.g., fish farming or livestock production) are allocated more land. The land reform process in Viet Nam has ensured that Hanoi households have similar land endowments to start with. Although current processes of land disposal and acquisition will not maintain such equality for long, the land reform pursued under Resolution 10 and the 1993 Land Law was considered remarkably equitable especially in the north (Kerkvliet 2005: 225-7; Ravallion and van de Walle 2003: 5). For example, Mrs Nguyen Thi Ngo in Hanoi in an interview revealed that each person in her village received 1.9 *sao* (684 m²) following what she calls as the “Hire 10 policy”, otherwise formally known as the Resolution 10 (Interview, Appendix 5). In Bangkok, the land used in *kangkong* production is notably variable due to the presence of certain households which are not full time *kangkong* producers or whose involvement in *kangkong* production is as hired labour. In Phnom Penh, variability of land deployment is not as high as other cities because of the limited space available for all households in the lake.

If we recall the discussion in section 5.1.4 where it was shown that 71% of households in Hanoi have mixed production systems while Bangkok and Phnom Penh tend to engage in monocultures, we will note that the size of land has no bearing on the

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8 Equity occurs at the level of the population where each household received similar land sizes. Genderwise, however, land distribution in Viet Nam favoured male-headed households. Female-maintained households received smaller land holdings. Furthermore, women lose their use rights to the land when they got divorced, among many other gender disparities women in Viet Nam encounter in relation to land ownership (Kabeer and Tran Thi Van Anh 2002: 147).

9 A *sao* is a unit of land popularly used in North Viet Nam and is equivalent to 360 m². Similar figure is reported in Hoang Xuan Thanh et al. (2005: 10) in two villages in the Red River Delta.

10 Issued by the Communist Party of Viet Nam’s political bureau in April 1988 for “renovating agricultural economic management”. This dismantles collective farming in favour of family farming; thus, began the process of decollectivisation. Resolution 10 actually synthesised several earlier directives and policies (Kerkvliet 2005: 227-8).
number of systems a household engages with. The amount of land used in both agriculture and aquaculture production in Hanoi is significantly smaller compared to Bangkok. But while the size of land is roughly similar to Phnom Penh, this city is not involved in mixed culture systems. This, therefore, highlights certain natural and social characteristics in Hanoi that enable mixed or integrated production systems to develop. This will be discussed in the next chapter.

Although no meaningful correlations can be made between the size of land and number of production systems in Bangkok and Phnom Penh due to the preponderance of single production systems, the case in Hanoi is different. A Pearson-product moment correlation showed that the size of land used in the system in Hanoi has a positively significant but small correlation with the number of production systems a household is involved with, $r = .21; n=72, p<.05$. This means that larger land sizes tend to have more production systems. This correlation has a coefficient of determination of .04, which means that only 4% of the number of production systems is explained by size of land. Said differently, 96% of the variance is unexplained. Such unexplained variance is huge and can only mean that the number of production systems a household is involved with is determined by a host of other factors. The size of land only provides a very small part of the explanation.

When we ran a Pearson product-moment correlation between AQUALAND and degree of dependence to find out whether land has a bearing on dependence, only a small to medium correlation was detected for Bangkok ($r = -.231; n=65, p<.05$) and Hanoi ($r = -.389; n=72, p<.001$), respectively. As can be expected for these correlations, their coefficients of determination are small. The correlation coefficient for Phnom Penh was not significant. Interestingly, Bangkok and Hanoi have negative coefficients meaning that an increase in land used in kangkong production will lead to a decrease in degree of dependence.

Similarly, we find the correlation between AQUALAND and wealth (the latter is described in section 5.3.3). The size of land and wealth has medium correlation in Bangkok ($r = -.303; n=65, p<.05$, two-tailed) and no significant correlations in other
cities. In simple terms, households with bigger sizes of land devoted to producing agriculture and aquaculture tend to be wealthier. But since the shared variance for such correlation in Bangkok is miniscule, only 9%, there are other factors associated with wealth. For example, the productivity (i.e., returns to inputs) of a plot of land and other ways of generating income may have important roles. In other cities, the size of land and wealth are not correlated at all so that we may perceive this as an indication that access to other resources underpin wealth. Nonetheless, if we associate size of land in Bangkok with wealth using categories put forward by studies in rural Thailand, it would seem that kangkong households are poor peasants. Anan Ganjanapan classified poor peasants in Northern Thailand as those with less than 1 ha of land; middle peasants, 1-2.4 ha; and, rich peasants, 2.4 ha (Ganjanapan 1984: 124 cited in Rigg 2001: 952), using the size of land sufficient to meet the needs of a household of 5.6 people as a basis. But proximity to the city centre, industrial establishments, more services (e.g., roads, sewerage etc), and demand, land in peri-urban areas tend to be pricier which makes the possession of any piece of land advantageous to households. Jongkroy (2006) and Askew (2003) have shown, for example, that the transformation of agricultural lands in Nonthaburi to other non-agricultural uses such as housing subdivisions and commercial establishments has led to price increases. In this situation, those with lands can hold them as insurance for future needs. Indeed, the price of land among monocentric cities broadly follows an inverse relationship with distance and declines with time (Dowall 1992; Lewis 2007; Wisaweisuan 2001).

The type of access rights to these plots of land are discussed in section 8.2.4.

6.3 Membership to institutions as social capital

Membership of groups or organisations (INSTITUTIONS) is a measure of ‘formal’ social capital. These groups or organisations are those that operate on the basis of formal rules, instead of just trust and social norms. These rules may define who will become members. Godquin and Quisumbing (2005: 1) claim that several authors use membership of groups or organisations as a common indicator of social capital. One important assumption in its importance to livelihoods is that membership is ‘costless’ to
acquire. However, it takes time to develop and maintain networks. There are also sometimes social barriers to membership such as lack of education, health, age, class, and wealth. Godquin and Quisumbing (2005) have shown that in an area in rural Philippines those who are asset-rich, better-educated and living closer to town centres are more likely to participate in groups and to have larger social and economic assistance networks.

In our formulation here, institutions are equated with organisations. However in the strictest sense, organisations are subsets of institutions in that they are the physical manifestations of institutions wherein we define institutions as sets of rights and rules of resource use, access and development among and between groups of people, members of an organization or individuals in a community. Rights are actions that are authorized while rules refer to prescriptions that forbid, permit, or require acts performed in relation to a right (Ostrom 1990: 51). Institutions, therefore, are “instruments for interpreting and transforming information into knowledge” (Saleth and Dinar 2004: 24) so that organisations can act (i.e., pursue their mandates) accordingly.

Institutions can be either formal or informal. Formal institutions are those enacted by the state or its various apparatuses such as policies, laws, and regulations issued by different branches of the government. Informal institutions refer to those commonly agreed rules of behaviour in a community which are not written down or encoded within a formal system of governance but nonetheless define behaviours among members. These include customary laws or local or indigenous systems, which depend on trust, norms, and reciprocities. Examples of such institutions include village burial associations, known in Bohol in the Philippines as dajong, and the bayanihan (a system of reciprocal work). Some studies suggest (e.g., Smith et al. 2001) that informal groups or associations are important vehicles of livelihood diversification. This type of social capital cannot be picked up from the PAPUSSA data11, so that the institutions referred to in this study relate to formal institutions only. One reason why such social capital was not collected in the PAPUSSA survey is due to its inherent and intractable nature. Recipro-

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11 The question in the PAPUSSA baseline survey is: are any members of the household involved in any organisation?
cal relations or any relationship based on trust or historically agreed norms are essentially amorphous and do not have tangible manifestations which the 'ordinary' observer can easily understand. This leads Ellis (2000b: 37) to conclude that

A great deal of reciprocity is hidden, or is discovered only by time-consuming anthropological research, or emerges into the open only at times of serious livelihood crisis. The processes that create 'insiders' and 'outsiders' with respect to social capital are complex and difficult to unravel, but clearly such divisions do exist, and they sometimes result in the 'social exclusion' of particular individuals or groups [...]

Household institutional membership in the three cities significantly varies as shown by one-way between-groups ANOVA with post hoc comparisons, Welch F (2, 116.26) = 258.36, p<.001. Hanoi has the densest\textsuperscript{12} membership with $M=3.60$ (SD=1.26). Bangkok and Phnom Penh only have $M=0.48$ (SD=0.63) and $M=0.11$ (SD=0.32), respectively. The differences among the three cities are surprising. It is not clear whether the differences are due to the actual situation on the ground or how the data were collected. Table 6-2 lists the types of organisations household members belonged to in the three cities. It is clear from the table that organisational membership is not widespread in Phnom Penh in comparison to other cities. The credit union is popular in Bangkok while a string of organisations including the farmers' union, cooperatives, women's union, and youth union count as having the most members in Hanoi. The first three are organisations to which nearly all kangkong households belong.

The credit union and cooperative in Bangkok may be one and the same because a credit union is one type of cooperative. Other types of cooperatives are: agricultural, land settlement, fisheries, consumer, thrift and credit, and service. The major source of credit for agricultural cooperatives in Thailand is the Bank of Agriculture and Agricultural Cooperative (BAAC). As of January 2006, there were 6,712 primary cooperatives with a total membership of 9,684,508 representing about 14% of the country's total population. Agricultural cooperatives are the largest with 4,137 primary cooperatives and 5,950,809 individual members (Thuvachote 2007: 3-15).

\textsuperscript{12} Institutional density as used here is only classificatory to suggest comparison. They have no meaning outside of their national contexts because density is very much a reflection of a country's history and socio-political system, as subsequently shown in the discussion.
The farmers' union is a mass organisation associated with the Communist Party of Viet Nam. Cooperatives are modern incarnations of the cooperative groups that originally emerged during the collectivisation process in 1954 which aimed to replace the household as the production unit. Cooperatives in Viet Nam are 'recently' modernised (dubbed as 'new-style' cooperatives) through Decree No 68 and the Cooperative Law of 1996 to provide a mechanism to support farmers 'production' efforts (Fforde and Nguyen Dinh Huan 2001: 8). They range from units which offer little service, to fully functioning cooperatives (Wirth, Thu, and Neef 2004: 5). In a survey of 600 households in Ninh Binh Province in the Red River Delta, Fforde and Huan (2001: 29) found that 85% of households were members of new-style cooperatives.

Mass organisations such as the farmers' union, youth union, and women's union are found throughout Viet Nam. For example, the Viet Nam Women's Union, which was founded in 1945, aims to promote women's advancement and enhance their participation in society. According to Santillán et al. (2004: 542), the union has been responsible for a high and more developed level of women's involvement in collective activities outside the home compared to most other Asian countries. The union widely encouraged
and endorsed women's social participation.

The density of organisational memberships in Hanoi is a reflection of the country's history of mass based movements as influenced by Leninist dogmas of direct interventions with social organisations (Fforde 2004: 287). Santillán et al. (2004: 543) observe that state ideology is pervasive in the everyday life of the Vietnamese. Such a mechanism exerts coercive attraction among the local population. The same mechanism is not found in the other cities. Political scientists, development experts, and Viet Nam observers (e.g., Fritzen 2003; Gray 2003; Hansson 2003; Stromseth 2003; Vasavakul 2003; Vasiljev 2003; Wischermann and Nguyen Quang Vinh 2003) are sometimes intrigued by the density of organisations in Viet Nam especially after the decollectivisation in the late 1980s (popularly circumscribed within the overarching theme of "renovation", doi moi), resulting in an edited volume (i.e., Kerkvliet, Koh, and Heng 2003) to reflect on this phenomenon in a greater depth. Prior to the 1980s, says Kerkvliet (2003: 2-3), "Vietnam's political-economic system had little room or opportunity for people to form voluntary organizations and associations" except those with connections to the Communist Party of Viet Nam. Since the 1980s, Kerkvliet continues, the Vietnamese increasingly found more opportunity to move about, form groups, and be involved in activities of their own choosing. This larger space for individual and group activity is reflected in legislation and regulations, which have moved considerably away from sharp restrictions on such self-generated activities of the late 1950s.

### 6.4 Role of the respondents

In section 3.4, we saw that there are more female respondents in this study than males: 61% in Bangkok, 65% in Hanoi, and 69% in Phnom Penh. These need to be checked as more female respondents surveyed may have biased the survey results. All variables entered in the regression were subjected to independent-samples t-tests with gender of the respondent as the grouping variable.

In Bangkok, the results showed that there were no significant differences in the responses of male and female respondents except for the variable INSTITUTIONS. In this variable, the male respondents report a higher institutional membership of $M = .61$ ($SD = .50$) while the female respondents lower at $M = .30$ ($SD = .47$); $t (69) = 2.63$, $p = .01$ (two-tailed). To understand the effect size of this difference, we need to get the Eta squared,
which is .09. According to Cohen (1988: 284-7), this effect size is moderate. Since the
gender of the respondents only affects one variable and of moderate size, I decided not
to include it in the regression.

In Hanoi, the differences between the responses of male and female respondents
were statistically significant in three variables: W_MAIN, H_MAIN, and AQUALAND. In
W_MAIN, there is a statistically significant difference between the mean responses of
female respondents ($M = .74, SD = .44$) and male respondents ($M = .16, SD = .37$); $t (70) = -5.64, p < .001$ (two-tailed). In H_MAIN, the attribution of the husbands' involvement in
kangkong as their main occupation is statistically significantly different between female
respondents ($M = .30, SD = .46$) and male respondents ($M = .09, SD = .29$); $t (60.66) = -2.18, p < .05$ (two-tailed). These differences, however, could just be an artifact of the lar-
ger number of female respondents in the sample (65%). In fact, GENDER is correlated
with W_MAIN ($r = .56, n = 72, p < .01$, two-tailed) than with H_MAIN ($r = .23, n = 72, ns$).
A definitive effect of the gender of respondent can be seen in AQUALAND where both re-
spondents provide statistically significant different estimates of the size of land the
household uses for agriculture or aquaculture production. Male respondents provide
higher estimates ($M = 1.66, SD = 2.08$) than female respondents ($M = .38, SD = .41$); $t
(24.99) = 3.07, p < .01$ (two-tailed). With this in mind, the gender of the respondent is
added in the regression model.

In Phnom Penh, there are no statistically significant differences between the re-
sponses of male and female respondents so adding GENDER in the regression model is
not considered.

6.5 Summary

This chapter sets out the contexts for the regression by describing the variables
that are entered. In particular, it proffers the rationale for their choice. The hypotheses
underlying each variable are also laid out. The variables were chosen based on the live-
lihoods analysis framework, which was discussed in section 2.9. This framework lays
down the different capitals that form the assets that household can bring to bear in
building their livelihoods. Access to these assets, the framework suggests, is mediated
by social, political, cultural, economic, institutional, and environmental considerations.

Thus, a livelihood is a portfolio of activities and mechanisms a household carries out to earn a living. It is due to these myriad contexts and the panoply of relationships, connections, juxtapositions, and flows between and among people, interests, and contexts that the livelihood analysis framework suits well our goal of understanding peri-urban spaces in mainland Southeast Asia. It is also in view of this dense network of affairs that we need a tracer, such as *kangkong*, to serve as both the object and the terrain of the analysis. The farming of *kangkong* is one of the many productive uses of the peri-urban landscape.

In carrying out the regression analysis, we want to find out aspects of *kangkong* that we can further dissect and elucidate. In particular, our goal is to find out which aspects of *kangkong* livelihoods are crucial in explaining household dependence for their main income. The dependent variable in the regression is a household’s degree of dependence on *kangkong* as main source of income. Our independent variables are the explanatory factors of such dependence. Through the regression, these explanatory factors will be tested to find out which among them significantly explain dependence. Then the succeeding chapters explain why these factors are critical to understanding the spatial implications of the life and times of *kangkong*. 
Chapter 7

Spatial change and household dependence on *kangkong*

...the city is always becoming a product, but that is because, first of all, it is a process — Porter (2000: 10)

The previous chapter has shown that understanding the asset endowments of *kangkong* households is an important starting point to understanding how *kangkong* and its production reflect spatial change. This is so because assets endowments play a role in shaping dependence on a particular livelihood. According to Ellis (2000b: 31), asset endowments refer to the "stocks of capital that can be used directly or indirectly". These endowments shape strategies of the household in the pursuit of a livelihood that will maximise their welfare. Understanding this in the context of *kangkong* is important for it will help to unlock the livelihood dynamics of *kangkong* households. The use of asset endowments as an entry point to this analysis is crucial because of the following reasons, outlined by Perz (2005a: 264) as:

[...] First, asset endowments are defined to a great extent at the household level, and reveal inequalities among households. Second, asset strategies constitute an interface between households and their context, including other factors important to diversity such as seasonality and markets. Third, asset endowments in part reflect asset strategies, including the use of credit and labor markets, such that access to credit and use of hired labor constitute assets a household may deploy for diversification. And fourth, because inequalities in asset endowments may generate different asset strategies among households, asset endowments and strategies may yield household-level differences in agricultural diversity.

In this light, we need to test asset endowment and strategies sequentially so a sequential (aka hierarchical) regression is appropriate. This procedure ensures that each model is assessed for its fit with the data and that the effects of different variables are controlled and examined in sequence. The first set of indicators entered is the hu-
man capital indicators because it is a substantial determinant of dependence following a Chayanovian perspective on household labour allocation. The entry of human capital indicators in the regression also highlights its theoretical importance in defining dependence in this study. The block of human capital is further subdivided according to key actors in the household: wives, husbands and other productive household members. Indicators relating to each of these entities are entered sequentially. These are then followed by the entry of each of the indicators of financial, physical, natural, and social capitals. The order of entry of these capitals (i.e., except human capital) does not follow any a priori theory except to test whether they improve our understanding of dependence at each level of the regression. It is assumed that these capitals affect a household's decision to become involved in a particular livelihood so that they may be conceived of as contextual variables leading to the choice of an occupation. In the case of kangkong, for example, existing producing households in Bangkok, Hanoi, and Phnom Penh may have been co-opted into its production due to their differential access to other assets. Favourable access to these assets could enable a household to carry out other activities in line with the opportunities presented. But then this is hypothetical because the dynamics of household decision-making is complex. Predicting the factors that determine dependence is one way to unravel this complexity. This is the goal of the following discussion.

The regression model of the final sequence is specified as:

\[
\text{Degree of dependence on } \text{kangkong} = A + B_1(W\text{\_MULT}) + B_2(W\text{\_MAIN}) + B_3(H\text{\_MULT}) + B_4(H\text{\_MAIN}) + B_5(W\text{\_AGE}) + B_6(H\text{\_AGE}) + B_7(W\text{\_EDUC}) + B_8(H\text{\_EDUC}) + B_9(\text{OHHMEMBERS}) + B_{10}(\text{REMIT}) + B_{11}(\text{AQUALAND}) + B_{12}(\text{INSTITUTIONS}) + B_{13}(\text{R\_GENDER}) + \text{error}
\]

where A is the intercept and B₁ to B₁₃ are the coefficients. Error means the random error or those aspects that cannot be captured by the model. The above model is

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1 However, this does not preclude the fact that the context is in reality wider and encapsulates the broader political economy of the household so much so that social science research always assumes that there are random errors — differences between actual and predicted outcomes accounted for by chance — in any model. We have only shown here key variables based on the livelihoods-turbulence framework. Deeper contexts will be introduced when the resulting regression models are analysed.
applied to each city to identify the unique explanatory factors. The regression, therefore, becomes a variable reduction exercise. In view of the sample size limitation to attain an acceptable regression model, a ratio of 5k (k is the number of variables) is maintained. This implies that only those theoretically plausible variables are selected which means that a full specification of the asset pentagon is not followed. Physical capital is excluded in the regression because the ownership of farm implements in *kangkong* production is limited. Instead, physical capital is shown as part of the description of *kangkong* households in section 5.3. Natural capital is also excluded because there is a general lack of variability in access to natural capital. For instance, the use of wastewater is distinct in Hanoi and Phnom Penh while the use of canal-channelled river water in Bangkok is the norm. This capital refers to the natural endowment of a place, which, in other words, means aspects of the livelihood underpinned by environmental factors of varying kinds depending on the ecosystem within which the production system is located. Thus, the theoretical frame of the regression model is that a household which considers itself to be dependent on *kangkong* for its main income can be explained by a set of human capital indicators in the corroborating presence of the size of land used for the production system, access to credit, and membership of organisations while controlling for the effect of the gender of the respondent.

### 7.1 Regression results

Assumptions and treatments of the regressors are described in detail in Chapter 6. Below, I will describe the results for each city.

#### 7.1.1 Bangkok

The descriptions of the variables entered in the regression for this city are pro-

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2 Insisting on using natural capital despite this caveat would have been counterproductive because it will overly simplify the natural capital households deploy in their livelihoods. In the daily pursuit of livelihoods, different forms of natural capital are co-opted and only differ in the intensity upon which households use them. Moran et al. (2005: 129 quoted in de Sherbinin et al. 2007: 31) remind us that "The reality is that people are interacting with the physical environment in a myriad of ways – from the cognitive act of choosing where to settle, whom to migrate with, whether they pick flat or steep terrain, whether they give priority to proximity to a water supply or not, to soil color or not, whether they interact with natives or keep to themselves, whether they collect germplasm regularly from neighbors or import it from areas of origin, whether they have the knowledge and the means to practice contraception, and how the timing of contraception fits with views they may have of desirable family size and long-term goals for those children and themselves. This complexity of human-environment interactions requires multi-disciplinary research involving theoretical flexibility and a multiplicity of data collection tools that can capture the variety of sources of change and the variety of responses by the population".
vided in Table 7-1. Because some of the continuous variables in the model are skewed, they were transformed using their natural logarithms (refer to section 3.5 for background of the statistical procedures deployed in this study). Using Mahalanobis distance, no outliers among the cases were identified. Except for OHHMEMBERS and INSTITUTIONS, all variables had missing data. In the case of the husbands and wives variables, the missing cases result from either their non-involvement in productive activities due to old age or they are widowed or separated. In the case of AQUALAND, the missing cases stems from the non-involvement of the household directly in *kangkong* production. Instead, they are involved as hired labour. Since H_AGE and W_AGE are highly correlated, the latter is dropped in the regression.

<table>
<thead>
<tr>
<th>Classification Variables</th>
<th>Unit</th>
<th>Description</th>
<th>Transformation</th>
<th>n</th>
<th>Mean±SD</th>
<th>% of obs.</th>
<th>Skew values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Independent variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_MAIN</td>
<td>Percent</td>
<td>Degree of household dependence on <em>kangkong</em></td>
<td>71</td>
<td>68.80</td>
<td>0.325</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_MULT</td>
<td>Number of occupations</td>
<td>Main occupation of wife</td>
<td>68</td>
<td>54.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MAIN</td>
<td>Number of occupations</td>
<td>Main occupation of husband</td>
<td>64</td>
<td>45.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MULT</td>
<td>Number of occupations</td>
<td>Occupational multiplicity of husband</td>
<td>64</td>
<td>0.422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_EDUC</td>
<td>Dummy (1 = with some levels of formal education, 0 = no formal education)</td>
<td>Education of wife</td>
<td>68</td>
<td>86.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_EDUC</td>
<td>Dummy (1 = with some levels of formal education, 0 = no formal education)</td>
<td>Education of husband</td>
<td>66</td>
<td>87.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OHHMEMBERS</td>
<td>Number of productive HH members</td>
<td>Other household members aged 18-64</td>
<td>71</td>
<td>1.99±1.43</td>
<td>1.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_AGE</td>
<td>Years</td>
<td>Age of the wife</td>
<td>68</td>
<td>45.8±13.38</td>
<td>0.482</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_AGE</td>
<td>Years</td>
<td>Age of the husband</td>
<td>66</td>
<td>50.2±14.2</td>
<td>0.822</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CREDIT</td>
<td>Dummy (1 = yes, 0 = no)</td>
<td>Credit availment of the household</td>
<td>71</td>
<td>22.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AQUALAND</td>
<td>Hectare</td>
<td>Total area of land used for agriculture or aquaculture</td>
<td>65</td>
<td>1.7±1.64</td>
<td>1.755</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln Ha</td>
<td>Hectare</td>
<td>Total area of land used for agriculture or aquaculture</td>
<td>65</td>
<td>86±5.5</td>
<td>0.380</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 7-1 Description and summary statistics of explanatory variables - Bangkok**

The results of the sequential regression for Bangkok are shown in the next table (Table 7-2) where $R^2$, $\Delta R^2$, unstandardised regression coefficients ($B$), standard error of $B$, the standardised regression coefficients ($\beta$), and the $F$ change after each entry into the sequence are described. $R$ was significantly different from zero at the end of each step. The final $R^2$ is .33 with 95% confidence limits from .03 to .41, $F(11, 48) = 2.14$, $p<.05$. The adjusted $R^2$ value of .18 shows that slightly above one sixth of the variability in dependence on *kangkong* for main income in Bangkok is explained by human, social, and
financial capital indicators. Obviously, the implication of this result is that other factors are not captured in the model.

The introduction of different aspects of livelihood strategies as manifested in the deployment of both the husband’s and the wife’s labour, the presence of other productive members of the household, and social and financial capitals one at a time ensures that we account for their interactive effects. At each step, new variables control for the presence of the previous variables. The block of human capital, which is the core of a household’s livelihood strategy, is subdivided into the different entities thought to be involved in *kangkong* production. As a result, indicators for the wives and husbands are separately entered.

### Table 7-2 Sequential regression of dependence explanatory variables, Bangkok (Source: PAPUSSA Data)

<table>
<thead>
<tr>
<th>Step</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>$F$ change (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.207</td>
<td>.007</td>
<td>4.86 (3, 56)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>67.85</td>
<td>10.44</td>
<td>W_Mult</td>
<td>-14.06</td>
<td>4.62</td>
<td>-0.37 **</td>
</tr>
<tr>
<td>W_MAIN</td>
<td>17.41</td>
<td>6.98</td>
<td>0.30 *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_EDUC</td>
<td>0.98</td>
<td>0.91</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.269</td>
<td>.062</td>
<td>1.10 (4, 52)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>98.44</td>
<td>27.22</td>
<td>W_Mult</td>
<td>-23.60</td>
<td>9.26</td>
<td>-0.62 *</td>
</tr>
<tr>
<td>W_MAIN</td>
<td>7.78</td>
<td>11.51</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_EDUC</td>
<td>1.35</td>
<td>1.23</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MULT</td>
<td>8.69</td>
<td>9.64</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MAIN</td>
<td>15.34</td>
<td>11.29</td>
<td>0.27</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>H_AGE</td>
<td>-0.36</td>
<td>0.32</td>
<td>-0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_EDUC</td>
<td>-1.78</td>
<td>1.49</td>
<td>-0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>.271</td>
<td>.003</td>
<td>.18 (1, 51)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>99.46</td>
<td>27.54</td>
<td>W_Mult</td>
<td>-24.45</td>
<td>9.55</td>
<td>-0.64 *</td>
</tr>
<tr>
<td>W_MAIN</td>
<td>8.87</td>
<td>11.89</td>
<td>0.15</td>
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<td></td>
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<tr>
<td>W_EDUC</td>
<td>1.38</td>
<td>1.24</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MULT</td>
<td>9.66</td>
<td>9.99</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MAIN</td>
<td>14.59</td>
<td>11.52</td>
<td>0.25</td>
<td></td>
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<tr>
<td>H_AGE</td>
<td>-0.42</td>
<td>0.35</td>
<td>-0.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_EDUC</td>
<td>-1.89</td>
<td>1.52</td>
<td>-0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OHHMEMBERS</td>
<td>1.10</td>
<td>2.62</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td>.329</td>
<td>.058</td>
<td>1.39 (3, 48)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>101.57</td>
<td>27.79</td>
<td>W_Mult</td>
<td>-21.50</td>
<td>9.76</td>
<td>-0.66 *</td>
</tr>
<tr>
<td>W_MAIN</td>
<td>11.65</td>
<td>11.91</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W_EDUC</td>
<td>1.26</td>
<td>1.41</td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_MULT</td>
<td>8.49</td>
<td>10.53</td>
<td>0.22</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>H_MAIN</td>
<td>14.17</td>
<td>11.47</td>
<td>0.24</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>H_AGE</td>
<td>-0.41</td>
<td>0.36</td>
<td>-0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H_EDUC</td>
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*95% confidence limits from .03 to .41.

When we introduced indicators of the wife’s involvement in step 1, the result was $R^2 = .21, F_{\text{change}(3, 56)} = 4.86, p<.01$. Although the regression model at each step is significantly different from zero as shown by ANOVA, further additions to $R^2$ after this step are no longer statistically significant and the change in $R^2$ declines. At step 2 with the inclusion of the characteristics of the husband, $R^2 = .27, F_{\text{change}(4, 52)} = 1.10, \text{ns}$. Only .06 is added to $R^2$. At step 3, the inclusion of OHHMEMBERS leads to minuscule improvements in $R^2$. The change in $R^2$ was only .003 and $R^2 = .27, F_{\text{change}(1, 51)} = .18, \text{ns}$. 

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Finally, at step 4, $R^2 = .33$, $F_{change}(3, 48) = 1.39, \text{ns}$, with the addition of financial and social capitals.

W.MULT (occupational multiplicity of the wife) is the only regressor that stays statistically significant across the four stages. At the final step, it has the strongest unique contribution to the explanation of the dependent variable. It has a $\beta$ of -.56. The Part correlation coefficient (semi-partial correlation) of W.MULT is .260. This equates to a unique contribution to the explanation of variance in degree of dependence of 7%. This coefficient removes or partial out the contribution of other variables.

The main outcome in the regression in Bangkok is that dependence on kangkong decreases with an increase in the wife’s occupational multiplicity as shown by a negative $\beta$ while holding all other variables constant. We shall return to the discussion of the implication of this result in the next chapter. For now, we will proceed to the regression models of Hanoi and Phnom Penh.

### 7.1.2 Hanoi

In the regression model of this city, the variables W.AGE, H.AGE, and AQUALAND were transformed to minimise skew values using the natural logarithms for the previous two variables and inverse transformation for the last one. The new values are included in the summary in Table 7-3. Six wives in the sample were widowed resulting in corresponding missing data for variables relating to the husband. The GENDER of the respondent is also included in the regression model in view of the findings in section 6.4.
Table 7-3 Description and summary statistics of explanatory variables - Hanoi

Table 7-4 presents the results of the regression. R was significantly different from zero at the end of each step. The final $R^2$ is .65 with confidence limits from .40 to .72, $F(13, 52) = 7.61, p<.001$. With an adjusted $R^2$ of .57, we can claim that more than half of the variance in the degree of dependence on *kangkong* as sources of main income among Hanoi households is explained by human, social, and financial indicators while controlling for the effect of the gender of the respondent.

There are five steps in the regression model. During the first step, the presence of a block of indicators measuring the characteristics of the wife has already contributed 45% of $R^2$. Succeeding contributions to the change in $R^2$ by blocks of indicators theoretically chosen to explain dependence on *kangkong* is declining. Here, it is beginning to precipitate the important role of both the wife and the husband, but more on this later.
At step 1, $R^2 = .45$, $F_{\text{change}}(4, 61) = 12.62$, $p < .001$. Then the addition of the characteristics of the husband in step 2 brings in $\Delta R^2 = .18$ so that $R^2 = .63$, $F_{\text{change}}(4, 57) = 6.81$, $p < .001$.

By step 3, $R^2$ was only equal to .65, $F_{\text{change}}(1, 56) = 2.39$, ns. The inclusion of OHHMEMBERS only contributes a very small amount to the variance in the dependent variable.

Onwards, $\Delta R^2$ is very small and reaches nothing in step 5. At step 4, when indicators of social and financial capitals are added, $R^2 = .65$, $F_{\text{change}}(3, 53) = .46$, ns then at step 5 with GENDER included $R^2 = .66$, $F_{\text{change}}(1, 52) = .01$, ns.

Since steps 1 and 2, W_MAIN, W_AGE, W_EDUC, and H_MAIN were statistically significant predictors of the degree of dependence on *kangkong* as the household’s main income source. This means that the direct involvement of both the husband ($\beta = 0.36$, $p < .001$) and the wife ($\beta = 0.37$, $p < .001$) equally affect *kangkong* income dependence.
Their unique contribution to the variance in the dependent variable is accounted for by their semi-partial correlation which is .58 for both \textit{W-MAIN} and \textit{H-MAIN}. This translates to a coefficient of determination of 34\%. In other words, 34\% of degree of dependence, our dependent variable, is explained by these two variables. Furthermore, our model suggests that, if both the husband and wife team up and directly engage in the production of \textit{kangkong}, there is a corresponding positive increase in the percent of the main income contributed by \textit{kangkong} at the household level. The level of statistical significance of their involvement is not degraded with the addition of other predictors theoretically considered to be associated with income dependence such as social and financial capitals as well as the presence of other productive household members whose additional labour was thought to be important in household income.

However, it is interesting to note that there are caveats to the wife's direct involvement. Our model shows that if the age and the education of the wife increase, degree of dependence will decrease. That is to say, there is an age limit to the wife's involvement. Presumably, the older a wife gets the more involvement she will have in the maintenance of the household including an increase in her reproductive roles such as looking after growing up children, up to a point (i.e., will decline after children mature and are available to help in domestic chores). Also, an increase in her education will take her away from \textit{kangkong} production, likely towards non-farm related work.

These findings suggest that a household's income dependence on \textit{kangkong} production in Hanoi is largely a product of the strong participation of both the husband and the wife, but subject to other household dynamics wherein the wife is heavily entangled with (e.g., reproduction and family maintenance). The results of the second VLSS showed that households with both husband and wife working have better incomes than those which are single-headed. Furthermore, the same survey showed that men and women in Viet Nam as a whole spend similar amount of time in productive activities (Food and Agriculture Organisation and United Nations Development Programme 2002: 5, 8).
7.1.3 Phnom Penh

Eight wives in the Phnom Penh sample were widowed so that eight corresponding cases in the variables describing the husband are missing. One husband was also widowed. Three cases were also excluded because their multivariate outlier values measured by Mahalanobis Distance surpassed critical values (refer to section 3.5 for background of the statistical methods). The regressors in this city are described in Table 7-5 and the results in Table 7-6.

### Table 7-5 Descriptive statistics of explanatory variables - Phnom Penh

Composite blocks of variables were entered in four steps to control for other variables in the model. $R^2$ was significantly different from zero at the end of each step with a final $R^2$ of .57 with 95% confidence limits from .30 to .66, $F(12, 47) = 5.23$, $p<.001$. The adjusted $R^2$ is .46, meaning that 46% of the variance in the degree of dependence (dependent variable) is accounted for by the variables entered in the model.

When the variables related to the characteristics of the wife were entered at step 1, 32% of the final $R^2$ was already accounted for. At step 1, $R^2$ was .32, $F_{change}(4, 55) = 6.37$, $p<.001$. The next substantial addition to $R^2$ was at step 2 when variables related to the characteristics of the husband were included and the change in $R^2$ was .22. At step
The interaction between the role of the husband and wife among the *kangkong* households in Phnom Penh raises interesting questions about household dynamics. At step 1, when all the variables relating to the wife were solely present, the adjusted $R^2$ is \( .27 \). This means that 27% of the variance in the dependent variable is explained by these variables alone. But when all of the variables related to the husband were added, the significance of W_MULT is lost. This could only mean that there is some form of suppression in the model. I experimented with adding each of the variables for the husband separately to determine their effects on W_MULT, but the significance of W_MULT was maintained. However, such significance disappeared when all the 'husband' variables were included together. Perhaps it is in the interaction among the 'husband' variables that explains the effects on W_MULT so I reversed the order of entry in the next run by including the block of 'husband' variables first followed by the block of 'wife' variables. The same effect materializes as when the 'wife' variables were added first then followed by the 'husband' variables. That is, H_MULT is significant and W_MULT is not. In both entries, the nonsignificance and $\beta$ coefficients of W_MULT are the same, but the significance of H_MULT is maintained with a slight reduction in its $\beta$ value. I also tried entering only H_MULT first followed by the block of wife variables. Still, H_MULT had a higher $\beta$ value and was significant. We can, therefore, reasonably conclude that the presence H_MULT is robust despite the existence of other variables. This is supported by the result in Table 7-6 showing that its $\beta$ value and significance is largely unchanged throughout the three steps in the regression. Thus, the role of the husband in Phnom Penh is of crucial importance in explaining a household's dependence on *kangkong* for its main income. In particular, such dependence decreases when the husband takes on more occupations.
7.2 Intact vs mixed households

What we have done so far is to show the regression models of the three cities looking at the various aspects of a household’s human, social, and financial capitals. In this run, we take the households as given. That is to say, we did not assume completeness of the household (i.e., the presence of both husband and wife). In everyday reality, the lifecourse of a household may be interrupted by the death of key household members so that these could be the key moments in the trajectory of the household. The absence of the husband, for instance, due to death may affect the income of the household especially if the husband is the main breadwinner. Or the death of the wife could change the dynamics of the household through the decision of the husband to take another wife. This could possibly splinter the household. Or their deaths could deal an
emotional blow, although temporary, affecting household members’ desire to improve their well-being. More time could be used in mourning, taking time away from the maintenance of production systems. The point I am making is that the physical permanent absence of either the husband or the wife affects a household’s livelihood strategy because both of them are key parties to homemaking. Otherwise stated, the equation of dependence may be different between a ‘complete’ household (i.e., the presence of both mother and father, or head and spouse) from an ‘incomplete’ one (absence of either mother or father, or head only) or a mix of both complete and incomplete households (hereinafter referred as mixed households), which is the nature of households used in this study. Complete households may also be called intact households while incomplete households, single households. Both of these types of households are described under the rubric of family households, i.e, presence of parent/s and children (National Statistical Office 1991: 34-5).

Since we have already seen above the results from the regression models of mixed households, we will now look at the regression models for complete households or those households with living husband and wife in the same dwelling unit. My intention here is only to show what the result might be like if we had complete households. This study maintains that looking only at complete households will misread the actual situation on the ground where kangkong producers are buffeted with the same threats to their mortality as other types of household.

That said, we recall in section 3.5 that we use pairwise deletion/inclusion to handle missing data, instead of listwise. This procedure does not delete rows of cases with missing data, but only excludes those with missing data points. Specifically, it uses all the observed values of the independent variables to estimate its standard deviations (Schafer and Graham 2002: 155).

If we look back in the summary statistics of each city, we will find that five households have no husbands while three households have no wives in Bangkok while six and eight households in Hanoi and Phnom Penh, respectively, have no husbands. The main reason for the absence of the husband or wife (which happens in nearly all the
cases) is death, although family separation or breakdown is another reason to some. Although the PAPUSSA data did not uncover the exact reason for the deaths of the husbands (and hence the creation of incomplete households), we can impute through general impressions of the demographic data of each city and their histories the cause of death. It seems to be that old age and disease is the cause of death in Bangkok and Hanoi in view of the fact that households in these cities are generally older compared to Phnom Penh. In the latter, the qualitative interviews (Interviews, Appendix 6) corroborated by secondary literature on the demographic history of Cambodia (e.g., Dasvarma and Neupert 2002; de Walque 2004; de Walque 2005; de Walque 2006; Heuveline and Poch 2007; Kiernan 2003; Neupert and Prum 2005; Zimmer and Kim 2001, 2002) seem to suggest that most of the female headed households in our survey lost their husbands to the genocide during the Khmer Rouge period (see section 5.1.2 for more discussion).

In view of this dynamics among family households in the PAPUSSA survey, how we handle missing values in the regression is crucial because it affects the generalisability of the results. According to Tabachnick and Fidell (2007: 63), it is not so much the values that is the concern but the pattern created by the missing data. They posit that missing 5% or less data points is acceptable and does not pose very serious problems. In the case of this study, our missing data points surpassed this threshold. However, I argue that this situation is unavoidable because we sought out, in the first instance, households involved in the production of kangkong in the surveys so that the resulting sampling frame did not take on board the completeness of the households. Furthermore, the death of the husband in our survey, which occurred even prior to the survey, is a completely non-random event. If the missing values are caused by random factors other than death then we could use the techniques outlined in Tabachnick and Fidell (2007: 66-70) and reviewed in Schafer and Graham (2002) to estimate the missing data. These techniques include the use of educated guess, mean substitution, regression, expectation maximisation, and multiple imputation.
In view of the above, we will look at what the regression results might be like if we had intact households or data points. For this regression, I chose to enter all the variables in one block, instead of sequentially, to mimic the final model of our earlier regression exercises. The goal here is to find out whether the resulting variates differ from those we had earlier.

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Table 7-7 Regression of complete households (Source: PAPUSSA Data)

Table 7-7 shows that listwise deletion of missing data points provides different results compared with pairwise deletion. The number of cases is reduced to only intact households so that we only have 57 cases in Bangkok out of 71, 66 out of 72 in Hanoi, and 66 out of 69 in Phnom Penh. The previous regression exercises produce the following important variates:

**Bangkok:** the occupational multiplicity of the wife results in a decrease in dependence;

**Hanoi:** the direct involvement of the husband and wife in *kangkong* production increases dependence but the role of the wife in explaining dependence decreases with age and increasing educational attainment; and,

**Phnom Penh:** the occupational multiplicity of the husband results in a decrease in dependence.
In comparison, the regression of intact households results in the following:

- **Bangkok**: an increase in the amount of land leads to a reduction in degree of dependence on *kangkong* as a main income source;

- **Hanoi**: the direct involvement of both the husband and wife in *kangkong* production but subject to age and education of the wife wherein degree of dependence decreases with the increase of these factors as well as the occupational multiplicity of the husband; and,

- **Phnom Penh**: the occupational multiplicity of both the husband and the wife results in a decrease in dependence.

In other words, land is an important factor in Bangkok, instead of the occupational multiplicity of the wife. In Hanoi, the occupational multiplicity of the husband is an added dimension. Previously, the number of occupations a husband had was not important in explaining dependence. But its role becomes significant among intact households. We have similar readings for Phnom Penh where the occupational multiplicity of the wife becomes a significant explanatory factor in dependence. In this city, the husband and the wife become the lynchpin of the livelihood strategy among intact households.

Despite the high statistical generalisability that can be made from using intact households in the regression, due to the absence of missing data points, I opted to use mixed households in view of the following considerations. Firstly, I argue that the generalisability and improvement of the results resulting from the use of intact households are only methodological rather than real because the situation on the ground dictates that certain households will have mortality coefficients heavily underpinning their members' lifecourses. As has been stated previously, I consider deaths among the key household members prior to the PAPUSSA survey as non-random events whatever the reasons because they had already occurred. The situation might be different if a death happened during the survey and was not anticipated in the survey design. Schafer and Graham (2002: 155) argue that "when the missing data are not MCAR (missing cases at random), results from case deletion may be biased, because the complete cases can be unrepresentative of the full population." Or the contrary could work wherein the deleted cases may be representative of a particular social situation such that their removal from the analysis will diminish the generalisability of the findings. Secondly, listwise deletion is inefficient because "mild rates of missing values on each item may cause large por-
tions of the sample to be discarded" (Schafer and Graham 2002: 156). This has just been shown in the number of cases used in the regression shown in the table above. Luckily in our case here, listwise deletion did not reduce the sample size below 5k (k = number of variables).

Thirdly, although the appearance of land in the Bangkok regression looks interesting from the perspective of settlement change research, it only proves the point that land is crucial in *kangkong* livelihoods – at least in this city – when *both* the husband and wife are present in the household and actively involved in *kangkong* production. Among incomplete households, it is not land that matters so much but the ability of the household to carry out and maintain the production in the first place, which is underpinned by available labour. In this sense, land becomes the 'limiting factor' and not labour. Put differently, labour becomes constant and the success of the production system hinges on the amount of land deployed in the production of *kangkong*. Given our existing households in Bangkok, labour is a limiting factor because some households have no husbands or if they are present they are involved in other occupations. That said, both land and labour are important factors in livelihood analysis so that these are included in the regression analysis.

Finally, beyond methodological concerns, adopting such an approach (i.e., listwise deletion) denies the materiality of societal and political histories onto the personal and settlement trajectories of households in Phnom Penh who have been victimised by the misguided ideology of the Khmer Rouge and the dominant geopolitical hegemonies at that time which make pawns of hapless nations in the game of ideological dominance. Opting for listwise deletion because of its simplicity is a lazy excuse. Analysing only these intact households alone will categorise those who do not belong as if they are people who are unworthy of any analysis because one of their members is dead. Or worse, they are treated as if they are “people without histories”. This would be tragic because the quest this study embarks upon is to understand how settlement change in peri-urban areas has led to the growth of certain important livelihoods as a reaction to the opportunities offered regardless of the completeness of the households. In view of the
above, the compromise taken was to include both the complete (intact) and incomplete households so that the resulting sample is one of mixed households. Those with missing data points were treated pairwise.

### 7.3 A view to a claim

To recapitulate what we have done so far: using theoretical understandings of livelihood strategies we selected measures of human, social and financial capitals. In the case of human capital, key entities in the household are identified. These are the husband, the wife, and other household members who are of productive age. The latter are included as their productive activities are hypothesised to contribute to the pool of household income upon which the household can draw from for its well-being. The involvement of both the husband and the wife are given critical treatment because of field observations that seem to suggest that *kangkong* production is heavily gendered. Within each of these entities, we measured their characteristics such as age, education, main occupations, and occupational multiplicity. The preponderance of human capital measures over measures of social and financial capitals follows our discussion above that a household’s livelihood strategies follow human calculations. In turn, the ability to ‘calculate’ is predicated on key characteristics of a household’s key decision-makers such as age and education. But any decision done in pursuit of a strategy is also influenced by other factors within the milieu of the decision-maker, which, in this instance, could include social and financial capital considerations as well as the presence of other productive household members. As had already been suggested, social and financial capitals offer the networks and other cash sources, respectively, to draw from when there is a need in the household with respect to how the livelihood can be improved. Or in vulnerability terms, social and financial capital can be relied upon to assist the household during financially or emotionally challenging times.

The results of the regression (of mixed households) shown in this chapter indicate that the above two levels are reflected among *kangkong* households except that the character of their imprint is different in the three cities. But the role of gender in diversification, and therefore in the livelihood strategy of the household, stands out. This
means that we will have to understand the varying roles of both the husband and the wife in producing *kangkong*. In particular, we need to find out why gender is differentially played out in the different cities. So the next step in our analysis is to understand the significance of these contexts by looking at the mechanics of labour allocation.

I will begin by looking at the amount and type of labour deployed in the production system using data collected quarterly in 2004-2005. These data are not disaggregated in terms of who specifically among the household (i.e., whether husband, wife or children) contributes to labour deployment. This is, admittedly, a limitation, but nonetheless, it still provides useful perspectives on labour allocation. To address this limitation, I will deepen this analysis using the activity matrices summarised by selected members of each village in this study during participatory community appraisals (PCA) described in section 3.5.2.1. These matrices will fill in, although in quite a 'rough' way, insights missed in the monitoring data. Specifically, they will show that women are as much involved in the production system as men. These activity matrices are discussed in the next chapter.

As a first step towards this geographical exploration of the dependence constructs highlighted above, we need to understand how labour is allocated in the household that markedly differentiates the husband’s involvement from the wife’s in the production system. We also need to look at the historical or inter-generational trajectory of the household’s involvement in *kangkong* production. How did they become *kangkong* producers in the first place? What qualitative factors embolden the livelihood choice? Answers to these questions will be tackled in the next section.

### 7.4 Household labour dynamics

As already indicated in section 3.3, PAPUSSA carried out three rounds of monitoring, with roughly a quarterly interval between each, in a span of a year (between 2004 and 2005) to capture possible seasonal variations in the production systems. Due to varying circumstances of field work and human resources, each city has different monitoring periods, but they all follow the 3-month interval. Bangkok and Hanoi started monitoring in April 2004 while in Phnom Penh it was July 2004. Monitoring finished by
December 2004 for Bangkok, January 2005 for Hanoi, and February 2005 for Phnom Penh. The monitoring surveys asked for the type and number of labour used during the last week prior to the survey. Gregory and Altman (1989: 94) defines labour as a process whereby people interact with the environment to produce useful products for the purposes of human reproduction. It is a social activity that requires the expenditure of time and energy, and involves the transformation of raw material inputs into outputs using various techniques; labour also includes the work involved in reproducing people.

There are three types of labour: family labour, hired labour, and exchange labour. Hired labour can be either tenants or permanent or casual labourers (Reardon and Glewwe 2000: 165). Reciprocal labour exchange was not captured in this study.

Table 7-8 illustrates the deployment of both household and hired labour in kangkong production in the different cities. Several general observations can be made from this information.

First, when we look at the overall mean of each for both types of labour, we will notice that labour use in Bangkok is substantially larger than Hanoi or Phnom Penh. This means that Bangkok production systems demand more household and hired labour.

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3 I have chosen to use household labour instead of family labour because our survey unit is the household as defined in section 3.4. Also, family labour assumes that only the immediate family is deployed to work in the farms. This tends to be inapplicable in all cases due to co-habitation and the presence of non-relatives in the household (see section 5.1). We can, therefore, make the case that household labour is more encompassing than family labour.
paid labour. In the case of Phnom Penh, we can surmise that either the parents or one of them plus other household members worked in the farm almost daily. In other words, at least two people are working in the field. Hanoi, on the contrary, may have times when less than two people are working in the farm. Our data are unable to tell us who among the household members undertake this work or whether it shifts according to season. Furthermore, the data above also show us that hired labour deployment in Hanoi and Phnom Penh may only be temporary, especially during harvest periods when more workers are needed. In Bangkok, three to five hired labourers are needed depending on the season. Across the seasons, however, the number of hired labourers declines, $F(1.49, 74.68) = 8.01, p<.05$ with Greenhouse-Geisser correction, as well as its corresponding equivalent working days, $F(1.64, 82.08) = 3.82, p<.05$ with Greenhouse-Geisser correction. The decline in the number of hired labourers in Bangkok is significant from M2 to M3, $F(1, 50) = 10.34, p<.05$, but not from M1 to M2 where it was not significant. Around 1.73 ($p<.05$, Bonferroni adjusted) labour units are taken off from M2. Here, we can sense that certain production dynamics may be at play, which may be partly explained through environmental changes such as flooding or labour movement across other occupations. But we have seen in section 6.1.1 that the occupational multiplicities of both husband and wife in Bangkok are substantially lower than Hanoi and slightly lower than Phnom Penh. This implies that labour transfers among various occupations are not so much of a factor. Instead, seasonal changes in the production system may have a dominant role. Such seasonality is a recurring theme in the succeeding discussion and one where I will pay attention to later. What the foregoing discussion tells us is that the operation in Bangkok is labour intensive and attains commercial scale as opposed to small scale because the deployment of paid labour demands substantial capital costs which only commercial production can sustain.

Overall, the size of the production system is positively correlated with the size of the labour deployed (i.e., total of household and paid labour) ($r = .26, n = 188, p<.01$, two-tailed). But such a correlation is small and the percentage of variance explained is only 7%. Such correlation is intuitive because a larger production system demands

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4 A working day is assumed to be 8 AM to 5 PM.
more work and maintenance so all types of labour is utilised. However, the bulk of work carried out in the field shifts from household labour to paid labour. The mean total equivalent working days of household labour declines with an increase in the size of the production system ($r = -.23, n = 188, p<.01$, two-tailed) while the amount of equivalent working days provided by paid labour increases ($r = .15, n = 188, p<.05$, two-tailed).

In relation to Bangkok therefore, and this is a second observation, Hanoi and Phnom Penh systems can be considered family-based, (or more appropriately, household-based due to the presence of non-relatives who are involved in various stages in the production system some of which may just be part-time) and small scale. Between these two sub-categories, the former is easier to define because it essentially means that the type of labour deployed comes from within the family or household. But the latter one is slightly problematic because scale could depend on several factors such as the species farmed, the intensity of the production, level of market interactions, and returns. For instance, certain production systems such as the farming of freshwater ornamental fish can be done in comparatively small land areas as against tilapia farming, but the intensity is high due to the addition of different inputs (e.g., various nutrients) and the high unit price of the market, especially overseas. Furthermore, returns to ornamental fish production are higher than other conventional aquaculture systems. So in terms of land demand as an indicator of size, ornamental fish production is not as big as tilapia production. What this means is that scale has many dimensions.

Third, the trend of household labour deployment among the three cities differs during the periods of monitoring. Bangkok appears to have a permanent workforce from the household, which, as can be gathered from Table 7-8, a reflection of the presence of multiple families in the household. We will recall that Bangkok had 21% of households with multiple families as compared to only 7% and 6% in Hanoi and Phnom Penh, respectively. A one-way repeated measures ANOVA showed that there was no significant change in the labour deployed in three quarterly monitorings, $F(2, 100) = 1.97$, ns. Roughly, three to four household labourers are deployed in each quarter. It is, however, interesting to note that the equivalent total number of days spent by each household la-
bourer is significantly different between each monitoring, $F(1.25, 62.67) = 4.53, p<.05$ with Greenhouse-Geisser correction ($\epsilon = .63$), with a trend that is generally declining from 3.67 (SD=3.79) during M1 in April-June 2004 to 2.24 (SD=2.31) in December 2004. But it should be pointed out that the change during M1 to M2 was not statistically significant, $F(1, 50) = 1.90, ns$, meaning the equivalent working days are the same, whereas change from M2 to M3 was statistically significant, $F(1, 50) = 8.9, p<.05$, meaning the equivalent working days significantly decreases between the amount of household labour allocated in July 2004 to December 2004. The effect size of M1 to M2 is only $r = .19$ as compared to $r = .39$ from M2 to M3, which according to Cohen (1988: 79-81) is only a medium effect size. The declining working days could imply that household labour is being redeployed in other production systems. Or labour demand from *kangkong* production in itself is in decline possibly due to seasonal changes but the number of household members who attend to the farm is still the same. That is to say, routine activities by household members in the farm are still maintained, but the amount of time they spend in the field decreases.

For Hanoi, the trend decreases significantly both for the number of household labourers deployed, $F(2, 136) = 33.52, p<.001$, and the equivalent working days, $F(2, 136) = 35.45, p<.001$. In terms of the number of household labourers deployed during each stage of the monitoring, M1 to M2 was significant, $F(1, 68) = 6.62, p<.05$. But a highly significant change occurs at M2 to M3, $F(1, 68) = 31.56, p<.001$. The equivalent working days follows a similar trend. M1 in this city happens between April to June 2004; M2, August to November 2004; and M3, January 2005. Pairwise comparisons using Tukey’s LSD of the number of household labour showed that the mean difference between M1 and M2 of -.28 is significant ($p<.05$) while the difference of -.68 from M2 to M3 is highly significant ($p<.001$). The sizeable reduction in household labour during M3 is, therefore, notable and its explanation can only be guessed at, which, I suspect, is re-

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5 As will be shown in the activity matrices in section 8.1, *kangkong* production is not carried out for the whole day. Instead, segments of time in the morning and the afternoon are devoted to this activity. Equivalent working days captures the cumulative sum of time spent in *kangkong* production expressed in terms of the usual daily work time of 8 hours per day. This measure assumes that farm work has a defined starting and finishing time, which is not the case in real life. I admit that this is a limitation, but I could not think of other approximate measures which can serve the purpose I intend to show.

6 Least significant difference.
lated again with seasonality. Although Hanoi, compared to all the cities in Southeast Asia, follows a largely tropical weather system, it has a mild winter during December to February. Temperature dips to a mean low of 16°C in January (Figure 7-1) (General Statistical Office 2007). Kangkong is harvested until December. During the winter season, farmers switch to producing winter aquatic crops such as water dropwort and water cress (Nguyen Thi Dieu Phuong et al. 2006: 33).

Figure 7-1 Monthly mean air temperature of Hanoi in 2004-2005 (Source: General Statistical Office 2007)

In contrast to both Bangkok and Hanoi, the deployment of household labour in Phnom Penh increases over the monitoring periods, $F(1.72, 121.74) = 5.66, p<.05$, and so does the equivalent working days, $F(1.82, 129.23) = 5.66, p<.001$. Both $F$-ratios have Greenhouse-Geisser corrections due to violations of sphericity. The number of household labourers deployed in M1 and M2 had no significant interaction, $F(1, 71) = .29, ns$, whereas M2 to M3 does, $F(1, 71) = 11.19, p<.05$. The increase of .49 labour units from M2 to M3 is significant ($p<.05$) with Bonferroni adjustment. In terms of equivalent working days, labour changes during M1 to M2 was significant, $F(1, 71) = 7.34, p<.05$, while that of M2 to M3 is not, $F(1, 71) = 2.39, ns$. An increase of 1.13 working days ($p<.05$) was noted between M1 to M2 while only .49 (ns) during the succeeding monitoring. This means that Phnom Penh producers deploy more household labourers but spend less time in the farm during the latter part of the year, i.e., between July to November 2004. The extent to which this is cyclical cannot be ascertained due to the limited duration of the monitoring. But some indicative trends in labour deployment between seasons can be gleaned. As in the case of Hanoi, it appears that climate, in particular seasonal flood-
ing, affects the amount of time households devote to their production systems.

Water level monitoring data from a monitoring station close to Phnom Penh, Kompong Chhnang, between 2000 to 2002 shows that there are peak periods of high water levels as shown in Figure 7-2. Flooding usually occurs during these periods of very high water levels. In the absence of corresponding data during the monitoring periods, I assume that a similar pattern occurred during 2004 and 2005 because no major catastrophic climate or environmental change was reported. Here, we can see that the water levels during July to November are high and coincide with high labour deployment. The high level of deployment may be related to the renewal stage of the production system where new ropes and stakes are added to replace the old ones which were damaged during the season of high water levels and strong currents. Furthermore, during or immediately after the high water season, the demand for kangkong is high as the production of land vegetables declines due to the effects of flooding (Kuong, Little, and Leschen 2006: 70-1). However, the flooding that occurred during 2003 to 2004 is considered mild by regional standard while that of 2005 is described by the MRC to be "positively balanced". Nationally, the 2005 flooding destroyed 6.7% of planted rice (MRC 2006: 26, 40).

Fourth, in relation to the third point, it appears that the nature of labour deployment in Hanoi, whether household or hired, is associated with the nature of their production systems (which is integrated) and the level of dependence they have on kangkong production. We have seen in earlier chapters that Hanoi has the least dependence on kangkong and the most integrated production systems among the three cities, such that kangkong is only one of several production possibilities attached to the household. What this obviously implies is that kangkong farmers in Hanoi are not devoted solely to the production of this vegetable, a point already rehearsed in section 5.1.4. In fact, the experience in PAPUSSA has shown that untangling household production issues in Hanoi are met with considerable difficulties due to the high level of integration among the systems. That is, facets of a household's livelihood cannot easily be unpacked due to the interlocking terrain through which livelihoods and production sys-
tems interact in sustaining the household. The VAC is a case in point.

![Graph showing water level at Kompong Chhnang station near Phnom Penh during 2000 to 2002](image)

**Figure 7-2** Water level at Kompong Chhnang station near Phnom Penh during 2000 to 2002 (Source: MRC/MOWRAM water level monitoring data)

VAC\(^7\) stands for the Vietnamese terms *vuon*, *ao*, and *chuong* which means garden, pond, and livestock. VAC has been widely promoted in Viet Nam since the early 1980s, but, in the sites in this study especially in Dong My, the timeline suggests that VAC took off around 2001 (Nguyen Dieu Phuong *et al.* 2003: 10-1). This system is managed by the family and is found in different ecosystems whether irrigated lowlands, rain-fed uplands, or peri-urban areas. The VAC system found in Hanoi belongs to the irrigated lowland category where garden plots, livestock pens, and fish ponds are closely integrated so that nutrients flow from one production system to another. Wastes from livestock, for example piggeries and poultries, serve as feeds to fish and nutrient inputs in ponds aside from also providing fertilizer to gardens. Water from the pond is used to irrigate gardens and fruit stands while grasses and other leaf cuttings from the garden may serve as food to certain kinds of fish, such as grass carp. Some of the vegetables commonly grown in the garden include green onion, sweet potato, water cress, tomato, tomato, tomato, tomato.

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\(^7\) VAC belongs to a category of farming system known in broad terms as integrated agriculture-aquaculture systems (IAAS) (Pant, Demaine, and Edwards 2005: 204).
cabbage and water spinach (Le Thanh Luu 2001). The high involvement by farmers in Hanoi in both livestock and fish production reflects the importance of the VAC production system here. In fact, Luu et al. (2002: 56,60) have noted that aquaculture in the Red River Delta is dominated by small-scale, household-level integrated garden systems or VAC. Integration between farm, ponds, and livestock is further made possible due to the high involvement of households in livestock raising, which is considered a secondary occupation among VAC households. In fact, 84% of Vietnamese households raise some type of animal and livestock raising is "undoubtedly the most female-oriented income-generating activity in agricultural enterprises" (Food and Agriculture Organisation and United Nations Development Programme 2002: 11). As I will discuss later, this level of occupational multiplicity is prevalent in Hanoi due in part to the high level of integration among production systems.

Figure 7-3 An illustration of bioresource flow before and after integration of pond and farm in integrated agriculture-aquaculture systems (Adapted from: Prein 2002: 131)

In addition to trade and services in the case of Bangkok and Phnom Penh, the nature of integration in agriculture-aquaculture systems in Hanoi further adds another dimension. The original production system of the household is agriculture, but aquacul-
ture is incorporated to maximise existing capacity, nutrients, and improve household income (Prein and Ahmed: 467). Prein (2002: 128) defines integrated farming involving aquaculture [...] as concurrent or sequential linkages between two or more human activity systems (one or more of which is aquaculture), directly on-site, or indirectly through off-site needs and opportunities, or both. Linkages between aquaculture and human activities involve not only agriculture (crops, livestock, irrigation dams, canals) but also include roles in sanitation (nightsoil, septage or other forms of human excreta re-use; sewage treatment), nutrient recovery (hydroponic-fish, breweries), and energy recovery (culture in heated effluents of power plants, dairies, etc.).

Such integration is schematically represented in Figure 7-3 wherein different resource flows are drawn. Thus, a farmer in Hanoi can be both a vegetable/rice farmer and fish/aquatic plants farmer. This, I believe, explains the high level of occupational multiplicity in Hanoi we noted in section 6.1.1, although northern Viet Nam in general has higher levels of occupational diversity than the south because the likelihood of a household in the north to be involved in both rice farming and livestock raising is higher (Kabeer and Tran Thi Van Anh 2002: 122, 125).

Figure 7-4 Equivalent working day spent per household labour across the different monitoring periods in the three cities (Source: PAPUSSA Data)

Fifth, it is shown in Figure 7-4 that the equivalent working days per household labour unit is higher in Hanoi than other cities with an average of 5.39 equivalent working days per week per household member. In comparison, Bangkok only has 0.77 and Phnom Penh has 2.41. But what has been raised in point four should be borne in mind when reading the case of Hanoi as such a figure includes all forms of aquatic production the household is involved with throughout the year. Assuming for the sake of argument that only half of this is accounted for by kangkong production, it is important to point out that the work load factor of each household member during the week differs among the three cities. In the case of Bangkok where a large number of household members are deployed in kangkong production, the proportional amount of time each household member worked
in the farm is actually smaller compared to Hanoi and Phnom Penh. Since we know that
Bangkok systems employ a significant amount of hired labour, we can guess that most
of the work of household members is substituted by those they hired.

Finally, if we go back to Table 7-8, we will see that in the case of Bangkok and
Phnom Penh, at least two household labourers are deployed. I argue that this indicates
that both the husband and the wife are involved in *kangkong* production while in Hanoi
the involvement of either of these two household members shift according to the season
and the demand of other production systems. This claim is proven by the result of the
regression where the involvement of the wife strongly emerges. Even in the case of
Phnom Penh, where it is the occupational multiplicity of the husband that matters in
explaining dependence, we can read this as due to the withdrawal of the wife's involve-
ment in the production system when other demands of her time dominate so that de-
pendence on *kangkong* income from the husband decreases with the husband's uptake
of more income earning activities. This goes to say that income diversity and gender are
intertwined. This will be discussed in the next chapter.

### 7.5 Summary

This chapter has shown the results of the regression model of mixed households
in the three cities. Due to problems with multicollinearity in Bangkok, one variable was
removed so that only 11 variables were entered sequentially in the regression. The gen-
der of the respondent was shown to have no effect on the survey responses. In Hanoi,
however, gender was included because an initial correlation analysis showed that men
and women respondents provide different and statistically significant responses to their
main occupations and estimates of the size of land. Since no variables were highly corre-
lated, all of the 12 variables we have originally identified to explain the dependent vari-
able were entered in the regression. The same number of variables was entered in
Phnom Penh while gender of the respondent was not included in the analysis because
strong and significant correlations with any of the variables were not detected.

The results of the regression of mixed households are contrasted with the regres-
sion model of intact households to examine whether notable differences can be detected.
While the results are different, this study sticks with understanding the geography of interstitial spaces using the insights gained from the regression model of mixed households as a vehicle for further engagement. Useful constructs were derived from the model which were then further refined through the analysis of the labour deployed in the production system.

It is interesting, however, to note that other explanatory variables in the regression such as the presence of other productive household members, access to credit, size of land, and membership of organisations are not critical determinants of income dependence (the dependent variable). Although their effects in the regression were small and not significant, their relationships with the dependent variable are not consistent. These are worth commenting upon because they will deepen our understanding of the livelihood dynamics in each city and how livelihood strategies are affected in some ways. These comments are, nevertheless, only imputations as this study did not delve into these deeply and no solid data are available.

The presence of other productive household members has a negative relationship with the dependent variable in Hanoi but a positive relationship in Bangkok and Phnom Penh. This possibly indicates that there are other occupational alternatives available to other productive household members in Hanoi and that the production system does not need much labour whereas the case is different in the other cities where more labour could be useful for the production system. The reverse is true in the case of size of land where a positive relationship is noted in Hanoi and a negative one for Bangkok and Phnom Penh. Given what we know now about the land dynamics in these cities, we can assume that the size of land is useful in Hanoi because of the multiple production systems of the household. In comparison, the situation in Bangkok and Phnom Penh are different where the demand for more land is crucial to agricultural income yet with high opportunity costs obviously due to land scarcity and robust land markets.

For credit, the relationship is positive for both Bangkok and Hanoi but negative for Phnom Penh. Credit does appear to be used to maintain and improve household production systems. But its role seems to be crucial for Phnom Penh where its access
might lessen somewhat a household's dependence on *kangkong* production. Given the available opportunities in this city, credit might be used by households as a substitute for the income they get from *kangkong* production to tide them over their daily needs. In this sense, it acts as a substitute for *kangkong* income.

Finally, coefficients for membership of organisations are negative in Hanoi but positive for both Bangkok and Phnom Penh. Such relationships could mean that membership of more organisations in Hanoi brings added benefits such as networks, knowledge, and technologies. These provide useful opportunities to the households leading to a shift away from *kangkong* production into other income sources. What we will find later is that non-farm income sources are abundant in Hanoi. Dependence among households in Phnom Penh will rise with an increase in organisational membership because most households in Phnom Penh have no other alternatives so that organisational membership may be deployed as a strategy for livelihood survival. For instance, it was gathered from the qualitative interviews (Appendix 6) that some households receive certain forms of financial and material assistance through their church membership such as the Maryknoll congregation and other evangelical Christian groups. For Bangkok, the commercial viability of *kangkong* production may be boosted with more membership of organisations as they bring in benefits in light of the households key concerns. Results from a workshop with various stakeholders in Bangkok in 2004 showed that their key concerns are the coordination of the community interventions of the Tambon Administrative Organisations (TAO), better prices for agricultural commodities, and new technologies (Rigg and Salamanca 2006: 39). These can only be achieved if the concerns of producers are heard and acted upon by concerned government bodies.

In the latter part of this chapter, the nature of labour deployed in *kangkong* production in the different cities was discussed. It presents household labour, hired labour and their equivalent working days. It also highlights the interactions between the different monitoring periods and the degree of change between the monitorings. The analysis of trends in labour deployment shows different patterns among the cities. In particular, Bangkok seems to have constant deployment of household labour across the monitoring
periods while Hanoi and Phnom Penh shows diverging patterns in that the former shows a declining trend while the latter shows an increasing trend. The deployment of hired labour is also prominent in Bangkok. In contrast, production systems in both Hanoi and Phnom Penh tend to depend on household labour. Environmental factors such as flooding and weather are deemed to be major determining factors. The above analysis, however, only paints a broad picture because it offers just a snapshot. More than this, such analysis is also gender blind because the gendered nature of the deployed household labour is not taken into consideration. The different contributions of the husband and the wife are not unpacked. To address this limitation, in Chapter 8, I turn to look at the activity matrices of each city to get a feel for the gendered nature of household work and farm labour. In the same chapter, attention is drawn to how occupational multiplicity as a livelihood strategy is deployed especially with respect to the differential involvement of the husband and the wife in the production system.
Chapter 8

Occupational multiplicity and gender

Places are always formed through relations with wider arenas and other places; boundaries are always socially constructed and contested; and the specificity of a place - however defined - arises from the particularity of interrelations with what lies beyond it, that come into conjuncture in specific ways. (Hart 2004:20)

In the previous chapter, we saw the results of the regression exercises where a series of asset measures were incorporated in blocks starting with human capital indicators followed by financial and social capitals and then, depending on initial tests, capped by the addition of a gender dummy to account for the effects of the respondent's gender. Each of these sets of indicators was used in each of the three cities. The results showed that contexts matter. Despite different mean levels of dependence as shown in section 5.4, there are notable similarities between the cities which have been discussed at various points in this study: the same plant species, similar locations around the edges of cities, and -- as will be discussed in a separate chapter -- similar ecology and agronomy. Yet these similarities led to divergent results in so far as our regression model is concerned. The factors that will explain why these mixed households are dependent on kangkong for their main income are reduced to the following:

Bangkok: the occupational multiplicity of the wife results in a decrease in dependence;

Hanoi: the direct involvement of the husband and wife in kangkong production increases dependence but the role of the wife in dependence explanation decreases with age and improvement in educational attainment; and,

Phnom Penh: the occupational multiplicity of the husband results in a decrease in dependence.

1 As discussed in the previous chapter, I use the term 'mixed' to highlight that I am presenting the results of both complete and incomplete households. See Section 7.2 for further details.
The nature and configuration of these factors are uniquely circumscribed within a particular city. They are neither repeated nor seen in the other cities. The existence of these factors reflects a particular facet of the households in each city. These are facets that, I argue, constitute the critical elements in our quest to understand how the life and times of kangkong reflect spatial inscriptions, entanglements, and attachments. That is to say, these important and statistically significant factors are the important openings where we can make our case for kangkong and spatial change. Based on the results of the regression and the discussion above, two areas of engagement are preferred: the notion that women's work underlines income dependence on kangkong and the possibilities of being involved in other activities while being actively producing kangkong. Both of these, I argue, are responses to the splintering of an aquatic landscape reconfiguring the household's spatial attachments. Aside from specifying areas of engagement, the results of the regression also imply that there are dominant aspects of livelihood strategy: the process of en-gendering and that of income diversification. These processes are inter-related. In fact, we can think of en-gendering as a form of diversification. En-gendering means the replacement of male labour with female labour so that the latter becomes the predominant characteristic of labour in kangkong production. This strategy will be shown in Chapter 9 to be rooted in the ecology and agronomy of kangkong as well as in market integration. The ecological and agronomic explanations posit a tight connection between kangkong, on the one hand, and the processes and metabolism, on the other, in the household including the use of wastewater for its production. Both the 'metabolic' and the market parts are made possible due to the splintering of the landscape stated above. In light of this, I am showing how kangkong highlights the geographies of interstitial spaces.

To understand these key strategies of the household, the first part of this chapter will highlight, although in broad terms, how the 'household' allocates its activities. Such allocation is crucial in understanding diversification as a strategy. Then the discussion moves to looking at the nature of income diversification especially in terms of the types of income.
8.1 Activity matrix

During the PCA, participants were asked to draw an activities matrix to illustrate their usual daily activities from waking up to bedtime (i.e., technically a 24-hour cycle). The matrix provides a 'snapshot' of their time use or allocation and provides an insight into the activities of *kangkong* producers. The rationale for time allocation studies is outlined by Johnson in the following manner:

> The idea is simple: because there are only twenty-four hours in a day, people allocate their available time to those activities that seem most necessary, reasonable, pleasurable, fulfilling, or proper to them. Even in situations in which leisure is abundant, time is still "scarce" in the sense that people must decide how to pass the time in the ways that seem best to them. In line with this economizing assumptions, therefore, descriptions of time allocation provide evidence concerning which activities individuals have deemed worthy of their time. (Johnson 1996: 1313)

Thus, time allocation decisions impact on household welfare especially for those households with limited capital because time becomes an asset which they can use to earn income, as in the case of hired labour (Harvey and Taylor 2000: 250). In the case of Bangkok and Phnom Penh, their activities are summaries of the usual activities villagers do and the order of their presentation does not represent a hierarchy of importance. Being summaries of the activity profile of several individuals, all the listed activities cannot be assumed to apply to everyone. What is presented in the figure below is just a broad representation of their activities, which was agreed to be their usual daily routine by all of those who attended. In the case of Hanoi, participants used the average of the proportion of their time spent on a particular activity.

The result of the activity matrix in Phnom Penh arrayed separately by gender is shown in Table 8-1. This shows that wives are very much involved in *kangkong* production time-wise, although not as long as the husband because they need to cater to other tasks in the household such as preparing food for the family and doing other home-based income generating activities. Unlike the husband, the nature of their involvement is limited to harvesting the produce and preparing it for the market. The husband, in contrast, is also involved with the actual maintenance of the *kangkong* field such as

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2 Johnson (1996: 1314) lists the advantages of informant self-reporting: (i) minimises bias arising from the presence of the fieldworker; (ii) provides a degree of privacy for the informant; and (iii) reduces research costs. However, Johnson points out that self-reporting is seriously disadvantaged by the very shortcoming of human agency wherein, he quips, "human beings, even the best intentioned, are unreliable observers of their own behaviour". Thus, in an ideal field situation, direct observation is preferred, but is not possible in this instance due to the limitations of the study as highlighted in Chapter 3.
making sure that the stakes, ropes and rafts are in proper order. Possibly the involve-
ment of the husband in more production-related activities explains why it is his occupa-
tional multiplicity that matters in a household’s dependence on *kangkong* production
because a number of households in Phnom Penh have lost a senior male partner. With-
out an able partner to help the wife in maintaining the household’s *kangkong* fields, the
income position of the household might be tough.

<table>
<thead>
<tr>
<th>Activities (Women)</th>
<th>24 hour period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24</td>
</tr>
<tr>
<td><strong>Productive activities</strong></td>
<td></td>
</tr>
<tr>
<td>Laying fish nets</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Making textile floor mats</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Mobile-weighting service</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Picking/harvesting morning glory</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Selling fish</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Selling food (rice)</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Selling mats</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Homemaking</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Cleaning the house</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Preparing lunch</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Shopping in market</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Homemaking</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning the house</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Preparing lunch</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Shopping in market</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Personal</strong></td>
<td></td>
</tr>
<tr>
<td>Waking time</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Breakfast</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Lunch</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Watching TV</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Taking a bath</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Dinner</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Watching TV</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Sleeping</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities (Men)</th>
<th>24 hour period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24</td>
</tr>
<tr>
<td><strong>Productive activities</strong></td>
<td></td>
</tr>
<tr>
<td>Helping in business</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Laying fish nets</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Look after fish</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Opening store</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Picking/harvesting morning glory</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Work in a pagoda</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Work in morning glory field</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Homemaking</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning house</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Cooking food</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Teaching children</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Waking time</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Homemaking</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning house</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Cooking food</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Teaching children</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Waking time</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Personal</strong></td>
<td></td>
</tr>
<tr>
<td>Breakfast</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Chatting</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Doing exercise</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Listening to radio</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Lunch &amp; dinner</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Preparing bed to sleep</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Rest</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Taking a bath</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>Sleeping</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 8-1 Activity matrix of Kbal Tomnub Village, Beung Tumpun Square, Mean Chey
District, Phnom Penh (Source: adapted from Chhuok Borin et al. 2005: 5-6)

A similar PCA activity was carried out in Bang B, Hanoi, but here the facilitators
decided to use proportion of their time devoted to a particular type of work. They also
grouped the participants according to wealth status and gender (Figure 8-1). Despite the
broad similarities in their time allocation, there are notable differences between men and women, and between poor and better off. For example, the poor men’s group tend to spend time feeding or pasturing their livestock. This activity is sometimes carried out during breakfast or dinner time whereas the better off men’s group are not involved in this activity. This means that the amount of time they devote to productive activities is higher than the better off men’s group. In the case of women, the poor women’s group spend more time working than their better off counterparts. In addition, better off women spend additional time on personal care and meals. Setting wealth ranks aside, men, on average, spend more time working in the farm or production system than women because the latter are doing other household chores.

Figure 8-1 Activity matrix of different gender and wealth groups in Bang B, Hanoi (Source: adapted from Nguyen Thi Dieu Phuong et al. 2003: 20-2)

The picture that emerges in the case of Bangkok appears to be different to that of the other cities as there seems to be no noteworthy differences between the amount of
time allocated to key activities by men and women other than the latter being early risers and spending more time doing food-related activities such as preparing breakfast and lunch, as shown in (Table 8-2).

<table>
<thead>
<tr>
<th>Activities (Men)</th>
<th>24 hour period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1   2   3   4   5   6   7   8   9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24</td>
</tr>
<tr>
<td>Housework</td>
<td>✓   ✓   ✓</td>
</tr>
<tr>
<td>Crop harvesting and vegetable</td>
<td>✓   ✓   ✓   ✓   ✓   ✓</td>
</tr>
<tr>
<td>cultivation</td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td>✓   ✓</td>
</tr>
<tr>
<td>Vegetable cultivation</td>
<td></td>
</tr>
<tr>
<td>Relaxation and entertainment</td>
<td>✓   ✓   ✓   ✓   ✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities (Women)</th>
<th>24 hour period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1   2   3   4   5   6   7   8   9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24</td>
</tr>
<tr>
<td>Preparing breakfast</td>
<td>✓   ✓   ✓</td>
</tr>
<tr>
<td>Crop harvesting and vegetable</td>
<td>✓   ✓   ✓   ✓   ✓   ✓</td>
</tr>
<tr>
<td>cultivation</td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td>✓   ✓</td>
</tr>
<tr>
<td>Vegetable cultivation</td>
<td></td>
</tr>
<tr>
<td>Housework, relaxation and</td>
<td>✓   ✓   ✓   ✓   ✓</td>
</tr>
<tr>
<td>entertainment</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-2 Activity matrix of men and women in Nongpaongai, Nonthaburi (Bangkok)  
Source: adapted from Yoonpundh et al. 2003: 13-4)

In all, the above three activity matrices from the three cities give us an inkling into how kangkong households budget their time. In particular, they confirm what is generally accepted that men and women in farming households have different priorities and requirements, and allocate their time accordingly. Moreover, some of these patterns reflect the intricacies of a farming existence. The matrices also show that women as wives spend substantial amounts of time with domestic or reproductive work such as looking after the children and preparing food while also being involved in the production systems.

Thus far, these activity matrices confirm the results of the regression that both husbands and wives are involved in kangkong production and that the households are involved in a number of other activities. Yet these matrices also raise important new questions about household labour allocation in light of the results of the regression in each city where unique explanatory factors emerge. These factors can be broadly catego-
rised in terms of two key issues: the role of occupational multiplicity and the role of gender among *kangkong* households. I argue that these two factors are related and, as has been already stated, intertwined so that to explain one would be to disentangle the other so much so that our next step is to understand occupational multiplicity.

### 8.2 Occupational multiplicity as livelihood strategies

#### 8.2.1 Occupational multiplicity and income diversity

The terms occupational multiplicity and income diversity are often used synonymously, but strictly speaking are not exactly the same. In this study, occupational multiplicity refers to the number of occupations a household member is involved with while income diversity refers to the different streams that form the income of the individual or the household. In Ellis' (1998: 5) terms, income diversity refers to the "composition of household incomes at a given instant in time". Since income is defined as "the cash and in-kind contribution to the material welfare of the individual or household deriving from the set of livelihood activities in which household members are engaged" (Ellis 2000b: 10), income diversity may include remittances, commissions, and credit. This means that occupational multiplicity is a subset of income diversity because the involvement in a number of occupations is just one income stream. However, as shown in sections 5.3.3 and 6.2, remittances\(^3\) and credit are not major sources of income among the *kangkong* households in this study, although they have been demonstrated to have important roles to play in livelihoods (Ellis 2000b: 67-70).

In the sample of this study, only 7% each in Bangkok and Hanoi and 3% among Phnom Penh households, respectively, received remittances from household members living outside of their villages. On the other hand, access to credit among the cities varies. Only 23% of households in Bangkok, 10% in Hanoi, and 61% in Phnom Penh accessed credit for their production system. The small number in receipt of remittances

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\(^3\) According to Maimbo and Ratha (2005: 5), "remittances may help improve economic growth, especially if used for financing children's education or health expenses. Even when they are used for consumption, remittances generate multiplier effects, especially in countries with high unemployment. In many other countries, a large part of remittances are invested in real estate, reflecting both a desire of migrants to provide housing to families left behind, and a lack of other investment instruments in the recipient community. Whether remittances are used for consumption or buying houses, or for other investments, they generate positive effects on the economy by stimulating demand for other goods and services."
among the households in this study led to its exclusion as an explanatory factor in the regression but credit was included in such regression and found to have no significant effect in explaining income dependence in all of the cities. So with remittances and credit factored as assets to some households, we can make a reasonable assumption that households in this study have diverse income sources. Put differently, activities, which is E in Figure 2-5, are pursued to build livelihoods or as a manifestation of a livelihood strategy (Ellis 2000b: 40-1) so that they are equated with income sources. Income sources are classified in terms of farm income, off-farm, and non-farm. Farm income, as the name suggests, is derived from the farm. Income here is broadly defined to encompass income in the form of consumption of own produce (fungible income⁴) and cash income (earned income) from selling farm outputs. In this study, farm income also includes harvesting from the wild. Off-farm income is that from wage and exchange labour within agriculture or aquaculture. Non-farm income sources are non-agricultural and include non-farm rural wage employment, non-farm rural self-employment, rent from properties, and remittances, both urban-to-rural and international (Ellis 1998: 5). Thus, the portfolio of different income sources of an individual or a household represents income diversity.

Although located along a continuum of urban/peri-urban space, the focus on the 'farm' in this study underlines the fact that kangkong production is an agricultural occupation. As such, occupational diversification implies a move towards more “non-agricultural income generating activities” (cf. Bah et al. 2003: 17).

8.2.2 Types of income and generational aspects

Our analysis of income diversity begins with a perusal of its generational component. Using the household membership data provided by each respondent, household members involved in productive activities are enumerated. Those who are not involved in productive activities such as those categorised as dependents (e.g., students, young children, retired, or handicapped) are excluded so that the total household membership in this analysis will be lower than the total household membership in section 5.1.1.

⁴ Fungibility is defined as the “substitution of goods or labour for money that would have to be earned to acquire these (or equivalent) goods” (UNDP 1996: 10).
To establish the generational analysis, I recoded the household head (HHH), spouse of the HHH, parent of the HHH/spouse, and sibling of HHH/spouse into the 'parental' generation and the child of HHH/spouse, grandchild of HHH/spouse, other extended family members (e.g., nephews and nieces), and non-relatives into the 'offspring' generation. A notional arbitrariness is introduced in this analysis because the parental generation of the HHH is obviously older than the HHH himself or herself, but due to the fact that the number of this parental generation is small, no useful comparison will result. Instead, I combine the generation of the HHH/spouse and those 'above' them (i.e., those who are older or senior) and consider them the 'parental' generation for the sake of argument. In the same vein, the presence of non-relatives who at times may be older than the 'actual' off-springs are notionally included in the category 'off-spring' because their number is small and, more importantly, their functional role in the household is closer to being 'off-spring' rather than the 'parents'. The 'parental' generation is then compared with the 'offspring' generation. We may also categorise the 'parental' generation as the 'older' generation and the 'offspring' generation as the 'younger' generation.

Table 8-3 shows the type of income sources of each generation. The proportions of each type of income source are significantly different between the parental and offspring generations in Bangkok $[\chi^2 (2, n = 273) = 27.88, p<.01, \text{Cramer's } V = .32]$ and Hanoi $[\chi^2 (2, n = 476) = 41.36, p<.01, \text{Cramer's } V = .30]$. In both cities, a substantial number of household members belonging to the offspring generation have non-farm income sources compared to the parental generation, although farm income is still a dominant source in both generations. In contrast, farm income is an overwhelming source among a large majority of household members in Phnom Penh. This apparent generational shift, at least for Bangkok and Hanoi, has been discussed in section 6.1.2. Further discussion in terms of agrarian transition and the creation of 'agrarian entrepreneurs' and 'quasi-peasants' is pursued in section 11.1.

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5 For example, some of these non-relatives may actually be considered by the parental generation as fictive kin so that they are treated relationally as 'off-spring'.
Table 8-3 Different types of income sources classified by generation of household members (Source: PAPUSSA Data)

<table>
<thead>
<tr>
<th>City</th>
<th>Type of generation</th>
<th>n</th>
<th>Income source type (%)</th>
<th></th>
<th></th>
<th></th>
<th>$x^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parental</td>
<td>188</td>
<td>Farm</td>
<td>75.00</td>
<td>16.10</td>
<td>8.90</td>
<td>27.88, p &lt; .01</td>
</tr>
<tr>
<td></td>
<td>Offspring</td>
<td>105</td>
<td>Off-farm</td>
<td>47.60</td>
<td>20.00</td>
<td>32.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>273</td>
<td>Non-farm</td>
<td>64.50</td>
<td>17.60</td>
<td>17.90</td>
<td></td>
</tr>
<tr>
<td>Bangkok</td>
<td>Parental</td>
<td>290</td>
<td>Farm</td>
<td>83.10</td>
<td>3.10</td>
<td>13.80</td>
<td>41.36, p &lt; .01</td>
</tr>
<tr>
<td></td>
<td>Offspring</td>
<td>186</td>
<td>Off-farm</td>
<td>59.70</td>
<td>1.10</td>
<td>39.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>476</td>
<td>Non-farm</td>
<td>73.90</td>
<td>2.30</td>
<td>23.70</td>
<td></td>
</tr>
<tr>
<td>Hanoi</td>
<td>Parental</td>
<td>195</td>
<td>Farm</td>
<td>87.70</td>
<td>1.00</td>
<td>11.30</td>
<td>3.28, ns</td>
</tr>
<tr>
<td></td>
<td>Offspring</td>
<td>97</td>
<td>Off-farm</td>
<td>86.60</td>
<td>4.10</td>
<td>9.30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>292</td>
<td>Non-farm</td>
<td>87.30</td>
<td>2.10</td>
<td>10.60</td>
<td></td>
</tr>
</tbody>
</table>

Note: $n$ refers to the number of occupations.

In terms of household income dependence on a particular income source, more than 90% of household income in Phnom Penh is classified as farm income as compared to only 64% in Bangkok and 72% in Hanoi (Figure 8-2). Off-farm and non-farm income sources in Phnom Penh only account for very small portions of a household's income. However, there are circumstances wherein those which are considered "primary activities for some producers are or may become livelihood diversification strategies for others" (Hussein and Nelson 1998: 5). This is notably the case in the off-farm and non-farm occupational involvement among some *kangkong* producers where their dependence on *kangkong* production is significantly less than other income sources.

Figure 8-2 Percent dependence of households on a particular income source (Source: PAPUSSA DATA)

In Bangkok and Hanoi, however, the comparatively lower dependence on farm income is supplemented by off-farm and non-farm sources. The former is a major supplement in Bangkok at 19% of total income while the latter provides 22% of household income in Hanoi. There are, however, cases in Hanoi, Bangkok, and even Phnom Penh, where farm income is the supplement to non-farm and off-farm in-
come sources. But these are exceptions rather than the rule. The main income sources are still largely farm-based. The supplementation with off-farm income in Bangkok (i.e., Nonthaburi) indicates that there is an active agricultural labour market. Nonthaburi is known to be a major area for vegetable and fruit production among the provinces bordering the Bangkok metropolitan area (Askew 2000; Chunnasit, Pagès, and Duangngam 2000; Gajaseni and Gajaseni 1999; Jongkroy 2006; Panichsakpatana 2007). As shown in Table 4-2 and Table 8-4, Nonthaburi has a variety of different agricultural land holdings and a highly vibrant commercialised farm sector with a buoyant labour market. In such a context, it is no surprise that the Nonthaburi households are engaged in agricultural wage labouring.

Table 8-4 Nonthaburi's major forms land uses and their changes between 1993 to 2003 (Source: Adapted from Jongkroy 2006: 99)

<table>
<thead>
<tr>
<th>Land use types</th>
<th>Area</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1993</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td>Rai</td>
<td>Rai</td>
</tr>
<tr>
<td>Farmholdings</td>
<td>193,293</td>
<td>50</td>
</tr>
<tr>
<td>Agricultural use</td>
<td>189,011</td>
<td>98</td>
</tr>
<tr>
<td>Idle lands and others</td>
<td>4,282</td>
<td>2</td>
</tr>
<tr>
<td>Urban uses</td>
<td>195,926</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>389,219</td>
<td>100</td>
</tr>
</tbody>
</table>

8.2.3 The nature of farm income

Farm income among household members in the three cities is not characterised by uniformity of sources; instead, it exhibits a degree of heterogeneity (Figure 8-3). Bangkok is composed of eight crops; Hanoi, five; and Phnom Penh, also five. However, the degree to which kangkong dominates differs among the three cities with a very large degree of dominance in Phnom Penh followed by Bangkok and then Hanoi. As has been stated previously, specifically in section 7.4, kangkong is not a major source of farm income in Hanoi (contributing only 13% of income) because of the nature of integration or intercropping that households' practise in this city. But in Phnom Penh, kangkong is a major source of farm income for 81% of household members. This means that the results shown in Figure 8-2 where households in this city based more than 90% of their income on farm sources is actually accounted for solely by kangkong. Then when we look back at section 5.4 where it was stated that households in Phnom Penh depend for an average of 96% of their income from kangkong production, we can conclude that

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6 Refer also to section 4.1 for more discussion on Nonthaburi.
farm income in Phnom Penh is *kangkong* income, although a small number of households (some 16%) may also fish from the wild to augment their income. It will also be recalled that our site in this city is a lake. As discussed in section 4.3, this lake was originally a natural lake which the Municipality of Phnom Penh turned into a sewage lake for the biological filtration of the city’s enormous sewerage discharge. The part of the lake towards Kandal Province and close to the Bassac River is used for fishing presumably because the organic pollution load at this part of the lake is diluted by the mixing of water from the river. This area of the lake was in fact formerly fishing lot number 1 which Prime Minister Hun Sen, allegedly, released for community use (Interview, Head of the Inland Fisheries Research and Development Institute of Cambodia’s Department of Fisheries, Appendix 6).

In Bangkok, household members are also involved in rice (23%), (land) vegetable (10%), fruit (1%), flower (1%), and livestock (1%) production. The production of livestock, in contrast, predominates in Hanoi with 44% of household members involved in its production followed by the production of seasonal aquatic plants (24%) and fish (19%). The above discussion implies that the nature of farm income varies in each city which is a reflection of each city’s environmental endowments and agricultural markets.

![Figure 8-3 Types of farm income (Source: PAPUSSA Data)](image-url)
8.2.4 Income diversity, distance and land

In the figures presented above, two aspects of income diversity and distance may be suggested. First, there appears to be an inverse relationship between distance to the city and degree of dependence on farm income. If we recall the background of the field sites in Chapter 4 where Bangkok household (Map 8-1) are the farthest and Phnom Penh the closest to the city core (Map 8-2), we will note that reliance on farm income appears to decrease with distance. The households we surveyed in Phnom Penh are located not more than 7 km from the city centre. They are literally just on the edge of the built up area. In comparison, those in Hanoi are located 10 to 15 km from the city centre. Our field site in Bangkok, Nonthaburi, is located between 25-26 km from Victory Monument, a major landmark of the Bangkok Metropolitan region.

Such an inverse relationship could be due to two things. Firstly, there is a tendency among industries, which could be the sources of non-farm employment among kangkong households in Bangkok and Hanoi, to be located around the peripheries of major cities as a function of the price and availability of land, good infrastructure, reliable sources of labour, and easy access to raw materials. The peri-urbanisation of Bangkok has been due in large part to this (Dowall 1992; Kittiprapas and McCann 1999; Webster 2002a, 2002b, 2005; Wisaweisuan 2001). It would thus follow that the option to engage in non-farm income activities is enhanced. Secondly, such a relationship is a reflection of the state of the economy and the operation of the space economy of a particular city. The vitality of a city economy is reflected in the diversity and availability of non-farm-based occupations. The dependence on farm-based occupations in Phnom Penh and the deployment of household labour mostly to agricultural activities suggest that the city is not yet heavily industrialised so that manufacturing-based occupational choices are limited. But more than this, the lack of diversity of occupational sources among kangkong households in Phnom Penh and their strong dependence on a livelihood characterised heavily by the use of wastewater, notwithstanding the location

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7 See also section 6.2 for a discussion of land.
of their settlements within a sewage lake itself, point to an element of destitution and poverty among these households. We have seen in several measures discussed in earlier chapters that the *kangkong* households in Phnom Penh are poorer than those in other cities.

Map 8-1 Estimated distance of the field sites in NPN (~25-36 km). The point of reference for the centre of the city in Bangkok is the Victory Monument, a prominent landmark traversed by major transport networks. A straight line in yellow is drawn. (Source: Google Earth)
Map 8-2
Upper: Estimated distance from Dong My, one of the field sites in Hanoi to city centre, the Hoan Kiem Lake (~13). The Red River on the right of the city is shown.

Below: Kbal Tumnob to Wat Phnom, centre of the city (~7km). Also shown is the Quarte Bras (right), the meeting point of the upper and lower Mekong River, Tonle Sap, and Bassac River. (Source: Google Earth)
The second aspect of the relationship between income diversity and distance seems to be related to the notion of informality mentioned above. It appears that the closeness of the site in Phnom Penh to the city and its location in the lake (and not just any ordinary lake, a sewage lake!) limit the options to undertake farming so that the next best alternative for the households, after kangkong production, is to fish in the wild. In section 6.2, it was shown that Phnom Penh has the smallest land area available for either agriculture or aquaculture activity at only 0.56 ha compared to 0.82 ha in Hanoi and 1.74 ha in Bangkok. Furthermore, excessive inundation during the rainy season, a shortage of water in the dry season, and water quality problems connected with sewage outflow from the city all pose serious problems for other production systems. On top of this, the majority of the land is not owned by the household (Figure 8-4). Seventy percent of the land currently used for kangkong production in the Phnom Penh study site is rented in from others, which appears to be a reflection of the settlement history of these households. A sizeable segment of the households in Phnom Penh were resettled after the Pol Pot regime and a semblance of stability heralded during the brief UNTAC period.

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8 In Cambodia, the right of possession was recognised and protected even during ancient times when all land belonged to the king. This principle of right of possession was then transmitted into the Civil Code of 1920 wherein possession was recognised when the person actively cleared, fenced and cultivated the land. During the French protectorate period from 1863 to 1953, French concepts of property rights were introduced. This tradition was carried through the period of independence (1953-1975) until the regime of Democratic Kampuchea when private property was abolished. These ‘dark days’ lasted until the late 1980s when private property was slowly introduced during the period of the People’s Republic of Kampuchea (1979-1989) first with the ownership of houses which then was extended to the right of possession of farmland up to a maximum of 5 hectares. The country’s modern land law was introduced in 1992 during the period of the State of Cambodia (1989-1993) under the auspices of the UNTAC. The principle of land ownership enshrined in the Civil Code of 1920 was adopted. The Land Law of 1992 underlined the re-introduction of private ownership in the country, although it was at first limited to the ownership of residential land. This law provided for the transfer of ownership through succession, will, contract of sale, by gift, and by possession. By early 2000, this law was found to be defective and a new law was passed in 2001 (East-West Management Institute 2003: 21-5).
The uniqueness of the Vietnamese land laws explains the small number of owned plots compared to Bangkok, but the use rights\textsuperscript{9} given to land currently leased to the households in Hanoi are a form of ownership right because access is exclusive. The Land Law of 2003 (The National Assembly of The Socialist Republic of Vietnam 2004) provides land use rights to its citizen\textsuperscript{10} bestowing the right of ownership, possession, and use of the land\textsuperscript{11}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure8-4.png}
\caption{Type of access rights to land used in agriculture or aquaculture (Source: PAPUSSA Data)}
\end{figure}

The above implies that we cannot always assume that farm-based occupations diminish with increasing distance from the city especially in cities located in floodplains in mainland Southeast Asia because spatial splintering, environmental endowments and needs have simultaneously connived to create ‘opportunist’\textsuperscript{12} households. These opportunities have been the rationale for the advocacy for urban agriculture\textsuperscript{13} as a key component in attaining ‘sustainable’ cities (UNDP 1996). In fact, the UNDP (1996: 3) claims that urban agriculture is a “rapidly growing industry that is increasingly essential to the economic and nutritional security of urban residents and that has far-reaching eco-

\textsuperscript{9} Use rights may be given with the following duration depending on the type of land. For land allocated for the cultivation of annual crops, aquatic farming and salt production to households and individuals, 20 years. For land allocated for cultivation of perennial crops and production forest to households and individuals, 50 years (Article 67 (1), The National Assembly of The Socialist Republic of Vietnam 2004).

\textsuperscript{10} (Article 5(4), The National Assembly of The Socialist Republic of Vietnam 2004)

\textsuperscript{11} Specifically, a person who possess land use rights may exchange, transfer, inherit, sublease, mortgage, provide guarantee, and make capital contribution using his/her land use rights (Articles 46(2) & 61(1), The National Assembly of The Socialist Republic of Vietnam 2004)

\textsuperscript{12} Opportunism here should not be interpreted in a derogatory way. Instead, it should be interpreted as a descriptor of the livelihood strategy.

\textsuperscript{13} Urban agriculture is defined as “an industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock” (UNDP 1996: 40).
8.2.5 Income diversity and wealth

Although income diversity underpins dependence on *kangkong*, it does not correlate with wealth. The cumulative total number of occupations between the husband and the wife has no bearing on the wealth status of households in any of the cities in this study (Bangkok - Spearman's rho = .003, n = 61, ns; Hanoi - Spearman's rho = .051, n = 72, ns; Phnom Penh - Spearman's rho = .128, n = 72, ns). This means that a household with a single occupation is not necessarily worse off than a household with two or more occupations. However, occupational multiplicity correlates significantly with the cities in this study (r = .49, n = 215, p<.001, two-tailed) which implies that there is a relationship between occupational multiplicity and the character of a city and, more specifically its environmental endowment, which will be discussed in detail later. The nature of the relationship is as shown in Table 8-5 where occupational multiplicity is a predominant characteristic in Hanoi but less so in Bangkok and Phnom Penh. This point confirms the discussion in section 6.1.1 where the mean occupational multiplicities between the husband and the wife among Hanoi households were significantly larger than in the other cities. Furthermore, there is no correlation between area of land and occupational multiplicity. This implies that occupational multiplicity, it seems, is not inherent to the production system but is linked to localised, contextual factors which, according to Ellis (1998: 3) are “differentiated in practice by location, assets, income, opportunity and social relations” so that their impact on diversification “manifest [...] in different ways under different circumstances”. These localised factors are reflections of the ecology, agronomy, and political economy of *kangkong*. These are discussed in the succeeding chapter.

<table>
<thead>
<tr>
<th>City</th>
<th>Total occupational multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangkok</td>
<td>-0.25 **</td>
</tr>
<tr>
<td>Hanoi</td>
<td>0.52 **</td>
</tr>
<tr>
<td>Phnom Penh</td>
<td>-0.28 **</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (two-tailed)**

Table 8-5 Correlation between city and occupational multiplicity (Source: PAPUSSA Data)
8.2.6 Income diversity and gender

On one hand, Bangkok and Phnom Penh have no significant differences in the income categories of male and female household members (Table 8-6). On the other hand, male and female household members have significantly different income categories, \( \chi^2(2, n = 476) = 16.56, p<.01, \) Cramer’s V = .19 in Hanoi. Such effect size, measured by Cramer’s V, is small (Pallant 2007: 217). Eighty-two percent (82%) of female household members in Hanoi earn income from farming as compared to only 65% of males. At the same time, more male household members (32%) have non-farm income sources compared with females (17%), which means that, for this city, income diversity or ‘productive *bricolage*’\(^{14}\), a phrase used by from Batterbury (2001: 441) and Croll and Parkin (1992: 12), is gendered.

<table>
<thead>
<tr>
<th>City</th>
<th>Gender</th>
<th></th>
<th>Income Category</th>
<th></th>
<th></th>
<th></th>
<th>( \chi^2 )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Farm</td>
<td>Off-farm</td>
<td>Non-farm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangkok</td>
<td>Male</td>
<td>133</td>
<td>63.9</td>
<td>20.3</td>
<td>15.8</td>
<td></td>
<td>1.77, ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>140</td>
<td>65.0</td>
<td>15.0</td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>273</td>
<td>64.5</td>
<td>17.7</td>
<td>17.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hanoi</td>
<td>Male</td>
<td>221</td>
<td>65.2</td>
<td>3.2</td>
<td>31.7</td>
<td></td>
<td>16.56, p &lt; .01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>255</td>
<td>81.6</td>
<td>1.6</td>
<td>16.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>476</td>
<td>73.9</td>
<td>2.3</td>
<td>23.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phnom Penh</td>
<td>Male</td>
<td>155</td>
<td>85.2</td>
<td>2.6</td>
<td>12.3</td>
<td></td>
<td>2.01, ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>137</td>
<td>89.8</td>
<td>2.9</td>
<td>7.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>292</td>
<td>87.3</td>
<td>2.1</td>
<td>10.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: n refers to number of household members

Using Ellis’ (1998: 5) classification of non-farm income described in section 8.2.1, Figure 8-5 shows that women tend to be associated with non-farm self-employment such as textile work, sales and other cottage industries whereas men tend to be involved in wage work such as taking up government and commune positions and the military, and unskilled work such as construction labouring. Similar results were found by Kabeer and Tran Thi Van Anh (2002: 123) where wage labour is predominantly a male activity. This pattern reproduces national trends where women’s skilled work in Viet Nam is confined to the textile, garment, and construction sectors (Food and Agricul-

\(^{14}\) These are tasks "carried out according to available materials, weather conditions, availability of land, and the health, skills, and disposition of the producer. They expand and contract according to need and desire and are intertwined with other activities but neither strictly prescribe nor are prescribed by them" (Croll and Parkin 1992: 12).
The gendered difference in wage work is likely due to differences in educational background. Among household heads, 31% of female household heads in Hanoi do not have any education at all while 83% of male household heads have secondary education (Table 5-2). Such higher educational background among male household heads widens their occupational choices.

Figure 8-5 Types of non-farm income in Hanoi (Source: PAPUSSA Data)

Given the discussions presented so far (from households, human capital, occupational multiplicity, household labour dynamics, and diversification), a conclusion arises: women are actively involved in kangkong production. This supports Razavi's (2002: 7) assertion that "gender mediates the welfare impact of the contributions of individual household members". The role of gender in kangkong farming has broken down the traditional notion that men and women have separate roles in the household with women traditionally allocated the roles of homemaking while the husband takes on the productive roles (Razavi 2002: 13). It is assumed that the productive roles are more important than those relating to homemaking and reproduction. The results of this study suggest that women do play important roles in kangkong farming and their involvement has "real comparative returns" (Ellis 1998: 23). Such a conclusion was reached even without factoring in women's 'reproductive tax', which refers to the "disproportionate amount of reproductive work undertaken by women – child bearing/rearing and the domestic tasks required to guarantee the maintenance and reproduction of the labour force, both present (spouse and working children), future (infants and school-going children) and past (the elderly)"
Women's involvement in *kangkong* farming is not only incidental and occasional but intentional and in addition to their reproductive roles. Otherwise stated, they are not just using their 'free' time, but farm full-time. In Viet Nam, for example, it has been reported that women spend almost twice as much time as men undertaking housework, completing household chores for which they are not remunerated. As a result, women consistently work significantly more hours than men at each point in the life cycle. Their leisure hours therefore are substantially less than those of men. Between the ages of 25-34 years, a woman spends on average, 13.6 hours a week in housework, compared to a man who contributes 6 hours a week to household chores. (Food and Agriculture Organisation and United Nations Development Programme 2002: 8)

In *kangkong*, therefore, we see how a “male bias in development” (Elson 1991) is turned on its head and heralds “the emergence of women as a constituency in development” (Kabeer 1994: 1-10). What is it about *kangkong* production that allows women to participate while they are still involved in other roles in the household? In other words, why is the traditional gender division of labour not clearly demarcated or rigidly enforced in *kangkong* production? In terms of occupational multiplicity, what is in *kangkong* production that allows household members to be dependent on *kangkong* for a major part of their income yet be involved in other activities? Is it because *kangkong* production does not earn much or is it because its system of production leaves ample time for other opportunities to earn income? Or is it due to the flexibility of the system and the ability to mould *kangkong* around other household demands? Are the explanations truly endemic to the production system itself or are they embedded in the broader political economy where poverty and the absence of alternatives force women to be involved in farming *kangkong*? One answer to these questions lies in how income diversity and diversification is deployed as a strategy. Another is encoded in the ecology, agronomy, and political economy of *kangkong* production. These issues are discussed in detail in the next chapter.

But before proceeding forward, we need to ask whether the emerging substantial involvement of women labour in *kangkong* production is an indication of the feminisation of labour highlighted as one of the features in McGee's *desakota*. Feminisation of labour refers to two things: “rapid and substantial increase in the proportions of women in paid work” and the ‘flexibilisation’ of women's labour arising from new forms of work
characteristics such as informal work, home-based, and part-time. The former accom-
panies the shift from agricultural work to manufacturing and services especially among
industries that demand a special kind of labour, notably the textile and electronic in-
dustries where women workforce are preferred for specific factory work based on female
sterotypes (Kanji and Menon-Sen 2001). The case of kangkong tends to be the latter
wherein kangkong production offers a degree of flexibility that jibes with women’s other
domestic work. This is the intention of section 8.1 and Chapter 9 wherein I show that
the production of kangkong suits women’s schedule and preference. This perspective of
feminisation of labour diverges from that of Kanji and Menon-Sen (2001) and McGee
(1991) wherein the process of feminisation in their formulations is associated with the
‘new international division of labour’ brought about by economic liberalisation (cf.
Standing 1989, 1999). In this sense, transnational and labour intensive manufacturing
industries have shifted to developing countries to access a huge pool of cheap labour,
among other factors (Wongsuphasawat 1997). Neither is the process we see in kangkong
related to export-oriented agribusiness enterprises (e.g., pineapple and banana exports)
because all households in this study are producing for the local market. Wage labour-
ing is not also the overarching reason why women are involved in the production sys-
tem, although some of them do occasionally. Instead, women as wives are involved in
kangkong production as part of the overall household labour deployed in the production
system; in other words, a strategy. Aside from the idea of flexibility in the definition of
feminisation of labour described above, an important change occurring in the case of
kangkong is the replacement of male labour with female labour. Male household labour
especially of that of the husband is being shifted to other livelihood activities. For in-
stance, male labour is deployed in off-farm and non-farm work while maintaining the
household’s involvement in kangkong production through the involvement of their
wives.

8.3 Income diversity and livelihood diversification

What has so far been imputed in our analysis is that income diversity, specifi-

15 This does not, however, imply that kangkong is not exported because as we will see later a company in
Bangkok is exporting it to European markets.
cally occupational multiplicity, is a strategy among *kangkong* households to achieve livelihood security. Diversification, in this sense, involves the pursuit of a diverse income portfolio by key members of the household, such as either the husband or the wife. This could have multiple layers such as at the level of the production system wherein one member is involved in different production systems at the same time; or at the sectoral level, wherein one household member’s occupational activities span different sectors such as a fisherman being involved in fishing by night while a tourist boat operator by day. Or, in our case here, the direct involvement of women in the production system on top of her reproductive roles in the household\(^{16}\).

Ellis (1998: 5) contends that income diversity, or occupational diversification in some of the literature, is different from livelihood diversification which is “an active social process whereby households are observed to engage in increasingly intricate portfolios of activities over time” for reasons of “survival and [...] to improve their standard of living” (Ellis 1998: 4–5). Livelihood diversification in this sense may span widely in terms of the number of production systems the household is involved with, the diversity of occupations practised by household members (e.g., agriculture, aquaculture and trade), the number of ‘spaces’ or ecosystems in which such activities occur, the number of sectors covered by their occupational choice (e.g., informal vs formal sectors, or tourism vs fisheries sectors), the diversity of household members involved in earning income including the involvement of women, and the various social networks the household or its members are linked with. We have seen in the previous discussions that different household members carry out varied occupations and these occupations are not solely located within the agriculture or aquaculture sectors. In addition, we also saw that some households do receive remittances and access credit. Kabeer and Tran Thi Van Anh (2002: 111) similarly differentiate ‘diversity’ from ‘diversification’ except that the latter is limited to “expansion of livelihoods into off-farm activities and away from a reliance on farming as the sole or primary means of livelihood”, while Ellis (1998) takes a wider view.

\(^{16}\) In rural parts of Southeast Asia as a whole, livelihoods, writes Rigg (2005: 176) are “diversifying, both spatially (i.e. livelihoods are becoming delocalised) and sectorally (i.e. they are moving beyond agriculture)".
Although diversification over time leads to specialisation, they are not exclusive at the level of the household. Instead, they can coexist within a household livelihood strategy. Specialisation only occurs at the individual level (Ellis 2000b: 23) because a specialist cannot, at the same time, have a diverse portfolio of activities. But at such a level, specialisation and multi-tasking need to be differentiated. It is possible that a specialist can multi-task at different times of the year when the main production system is not ‘in season’, such as the case of farmers who engage in wage labour during lean months. But such multi-tasking is not the norm, and hence does not equate with diversification; in such circumstances, the individual maintains his/her character of a specialist. Ellis (2000b: 45) further argues that “diversification, often, but not always for everyone, contributes to a successful livelihood strategy [...] due to its ameliorating effects on the risks and seasonality of rural livelihoods that are prone to unpredictable events and adverse trends”. This may be one of the reasons driving diversification among *kangkong* households. The other being that *kangkong* production is not a full time affair but something that can be done alongside other activities freeing some time to pursue other productive activities.

Going back to an earlier point on whether what we have here is a case of income or livelihood diversification, the evidence points towards the latter in view of the assumption and results of our regression models in section 7.1 wherein the importance of income diversity arises not only from the strength of its relationship with the dependent variable but also from its interaction with measures of financial and social capital. Thus, we can say that such income diversity is by and large an expression of the process of livelihood diversification of the households. Specifically, we know that the significance of the occupational multiplicity of the wife in Bangkok, the occupational multiplicity of the husband in Phnom Penh, and the active involvement of the husband and wife in *kangkong* production explain a household’s dependence on *kangkong* for income while holding the presence of other measures of human capital, the size of land, access to credit, and membership of institutions constant.

However, diversification understood in terms of shifting reliance away from a
farming activity (i.e., *kangkong* production in this case) to one or more non-farming activities as used by Kabeer and Tran Thi Van Anh (2002) is not the manifest process among *kangkong* households. Instead, it is diversification as an enhancement or a strengthening of income position so that other activities, broadly construed, are used to generate additional income for the household while maintaining their engagement with *kangkong*. In other words, diversification in this study is pursued not in place of *kangkong* but in addition to it. But more than this, a unique feature of this diversification is the strong involvement of women’s labour in the production system. In our analyses, we have seen that the role of the wife in the production system significantly affects dependence in Bangkok while keeping all other factors related to livelihood strategy and assets constant. A household’s dependence on *kangkong* in this city decreases with the increase in the number of occupations of the wife. Two likely explanations may be offered, specifically female headship and the absence of husbands (see section 5.1.2), which are generally both high in this city resulting in an increasing burden on the wife.

In Hanoi, both the direct involvement of the husband and the wife are strongly implicated in household income dependence, but such dependence decreases with the increase in the wife’s age and education. The husband’s age and education do not factor in. This implies that the role of the wife’s income from *kangkong* production is more critical to the household because changes in her stock of human capital have corresponding effects on income. As such, we may envisage the income position among Hanoi households to be hanging on two fine threads each simultaneously contributing to the stability and level of household income. Thus, women, among Vietnamese households in this study, are important partners in the household’s economic well-being. This is due largely to the fact that the

Male breadwinner model does not apply in Vietnam today, nor is it likely that it ever did. Women have traditionally played a key role in household production, marketing, and financial management in Vietnam, and they continue to do so. (Kabeer and Tran Thi Van Anh 2002: 148)

A household in Viet Nam can then be said to be generally better off if both spouses are present and working (Food and Agriculture Organisation and United Nations Development Programme 2002: 6). The jointedness of the role of both men and women in the household is also captured in studies elsewhere. In an interview by Kibria
and Mowla (2006: 11), a commune head in an ethnic minority village in Northern Viet
Nam explained (although the interviewee obviously sees gender in a somewhat discrimi-
natory way): "My wife contributes 80% of her earnings for family purposes. Although I
have a salary, much of it is spent on social maintenance. Therefore, I have to use the
family's income." Another woman they interviewed from another commune confirmed
this view: "If any Thai ethnic family has a hardworking and fit wife, the living standard
of that family will be better. In contrast, the living standard of a family will be lower if it
possesses a lazy or unhealthy wife."

In Phnom Penh, the role of the husband in contributing to the household’s main
income is stronger, such that the income position of the household is affected by the
number of occupations he is involved with. The higher educational attainment of the
husband compared to the wife, as shown in section 7.1.3, could have been one of the
likely explanations if not due to the fact that non-farm income is generally low in this
city as our discussions above show. This implies that we cannot impute proximity to the
city and its attendant job opportunities as important explanatory factors. Other social
factors are surely mediating this finding in Phnom Penh, but which we cannot ade-
quately comprehend due to the limitations of available primary data. However, using
secondary literature we can guess the likely scenario. One of the most immediate is the
issue of urban poverty. In 2003, there were 62,249 poor households vying for opportuni-
ties in the city resulting in a higher incidence of poverty in the city than in rural areas
(Asian Coalition for Housing Rights 2004: 14). Although its provenance could be much
earlier, current urban poverty in Phnom Penh started as a social problem immediately
after the return of displaced urban inhabitants and rural residents wanting the security
of the city at the end of the Khmer Rouge regime in 1979. "They camped out in empty
buildings and lit open fires to cook their rice. When all the houses and flats had been
occupied, newcomers built shelters wherever they could find space, along river banks
and railway tracks, on streets, in the areas between buildings and on rooftops. These
became thriving communities and home to a new generation of city builders […], re-
of Phnom Penh notes that, in 1994, 100,000-130,000 people or 15% of the city's total
population lived in urban poor communities. Most of them worked, and continue to work, as food sellers, cyclo-drivers and construction workers, while some of them are employed in government service, the police or the army. Less than 50% of children attended school, only 36% of the households had a sanitary toilet, 38% had poor access to water supply and 68% had no solid waste collection service. Most houses were made of temporary, fire-risk materials and only 19% of the areas had paved roads (Municipality of Phnom Penh 1999).

Judging from the results of the regression, it may seem, at the surface, that the wife's role in Phnom Penh is less important because what came out in the regression model is the strong and statistically significant role of the occupational multiplicity of the husband in explaining income dependence. But I argue that this is not truly the case because the sequential entry of regressors in the regression model starting with the wife's indicators of human capital showed that it is the occupational multiplicity of the wife that explains the main dependence of the household in *kangkong* production. The importance of such occupational multiplicity is, however, 'suppressed' when we enter the human capital indicators of the husband. But bear in mind that the regression model at this stage pertains to mixed households. When we ran the regression analysis for intact households in section 7.2, where both the husband and the wife are present, it is shown that both of their occupational multiplicities significantly explain income dependence. In view of what we have learned in section 5.1.2 that female headship is comparatively high in Phnom Penh due to the high mortality of male household members during the Khmer Rouge period, we can appreciate the emergent fact that the presence of both income earners in a Khmer household, at least among *kangkong* producers, boosts income significantly compared to single (largely female) headed households (Food and Agriculture Organisation and United Nations Development Programme 2002: 5).

The regression model for intact households in section 7.2 attests to this. Given what we know now in Phnom Penh, we can fairly say that female-headed households in Phnom Penh are coping with the multiple demands of household maintenance, headship and making a living. We will recall that female headship in our sample results from the loss of a spouse so that a household will only have a single income earner until the children
reach an age suitable for labour deployment either in household work or wage earning activities. The exception to this pattern is when a strong network of relatives provides a safety net. In Cambodia as a whole, men and women have the same participation rate at nearly 66% and approximately 60% of women workers are in unpaid family work (National Institute of Statistics 2004a: 39).

The nature of diversification discussed thus far raises an important question whether kangkong households carry out diversification by necessity or by choice (Ellis 2000b: 55-7; Kabeer and Tran Thi Van Anh 2002: 111; Perz 2005a: 264). In necessity, diversification is pursued to meet basic needs or cope with crisis while diversification by choice is taken as a way to accumulate income (Kabeer and Tran Thi Van Anh 2002: 111)\(^{17}\). This notion of diversification by necessity or choice is similar to Hart’s (1994) diversification to survive or diversification to accumulate. But in Hart’s typology access to landed elites who offer patronage, politics and the emergence of a new social class are major defining factors so that those who are politically well-connected diversify to accumulate while those who are unfortunate to have no connections and who are landless or nearly-landless, diversification is part of their strategy for survival. Essentially, this means that those who diversify to accumulate are driven by capability while those who diversify to survive are driven by constraints (Batterbury 2001: 441). Where each of the city in this study falls in this continuum will be discussed in Chapter 11.

As regards explaining the nature of diversification among kangkong households in the cities in this study, models such as the ‘rural growth linkages model’ are valuable in illuminating the processes underway and the relations that exist. This model posits that increasing farm productivity leads to diversification through multiplier effects on expenditure in the farms (Ellis 1998: 19-23). But the location of kangkong farms around peri-urban areas which are intimately affected by the urban economy renders the applicability of this model limited because the interactive linkage between the farm and non-farm sectors on regional growth cannot be traced with precision. It is likely that the nature of commodity demands in the city and opportunities cities provide to households in

\(^{17}\) Alternatively households, depending on their asset position, needs, and wealth status may slide in and out of necessity and choice due to temporal, social, cultural or political circumstances.
peri-urban areas impact more on the livelihood strategies of households. Or it could be that stagnation in agricultural income (or to use Chayanov’s term, the ‘drudgery’ of farming) and the increasing allure (and, of course, immediate availability) of non-farm based occupations are in some ways driving the pattern in Bangkok and Hanoi. Although we cannot really tell with certainty based on the surveys, we can speculate that involvement in non-farm activities among these households is more of an in situ process associated with changes in the peri-urban. The role of remittances is one of the sources of evidence to explain this. Households receiving remittances are only a handful, which means that household members are not migrating elsewhere for better employment. But such a move might not be necessary considering the proximity of the households to the city. Given the distances, commuting time, and good infrastructures, it is possible for household members to find additional work in the city without changing their residence.

The second source of evidence, but which is related with the first, can be gleaned from the number of household members undomiciled at the household head’s current residence. If we go back to section 5.1.1, only 23 out of 1,191 total household members are residing elsewhere of whom 83% are children of the household head. Fifty-seven percent (57%) of these non-domiciled household members are employed in non-farm work while another 4% are doing farm work. The rest are children who are described as dependents. We can only imagine that these children move elsewhere to study or to live with relatives or other extended family relations.

In view of such limitations, a model which I find useful to explain the divergent directions of diversification in the three cities is related to the ecology, agronomy, and political economy of producing kangkong. Put differently, there is an interaction between geographical/spatial factors and local (i.e., city-wide) development contexts. Households are in a way tied by their geography, both social and physical. This may seem deterministic, but it only means that there is a strong localised context that props up a household’s decision to choose a particular livelihood. Such local context may define or mould livelihood trajectories through their influence on household decision-making and its outcome, but each city, or specifically each resident of each city, co-opts their contexts differently so that patterns of decision-making reflected in diversification or productive
bricolage may be different.

8.4 Summary

In this study, we take the household economic model as the framework for understanding household labour deployment (Ellis 1998: 6; Ellis 2000b: 57). According to Ellis (1998: 6), “this yields a baseline economic proposition, ignoring social institutions and risk factors, that the household will allocate its labour time so that the marginal returns per unit of labour are the same across different activities, whether on-farm, off-farm or non-farm”. At first glance, the implication of the occupational choice of both the husband and the wife in favour of kangkong as their main occupations is intuitive in that such indicators necessarily affects income dependence. But our regression results suggest otherwise. What appears to be intuitive does not hold true across all cities. The results of the multiple regressions of the three cities, where different indicators of capitals are entered sequentially, have identified the variates playing substantial and significant roles in explaining a household’s dependence on kangkong production for its main income. But the specific variates differ depending on which households are selected: intact vs mixed households. (This study has decided to use the latter.) The possible implication is that among female-headed households in a set of mixed households, the ability to engage other factors of production (or capitals) for the benefit of the household’s key livelihood is limited due to the absence of an important partner (i.e., the husband) in resource and livelihood mobilisation. Moreover, it could also be the case that the amount of time a wife can devote to the maintenance of the production system and the pursuit of a livelihood is also subject to other competing needs on her time.

Several emergent stories are proferred. Firstly, husbands and wives in kangkong households can be generally conceived to have an equal share in explaining the determinants of dependence, although the proportion of involvement of each party differs in each city. That is, the participation, particularly of the wife, is not incidental but an integral part of a livelihood strategy of the household. Secondly, and this is related with the first, each city plays up the role of each key household member differently. For instance, it is the wife who is crucial in Bangkok but shares the role of production with
the husband in Hanoi while, in Phnom Penh, it is the occupational multiplicity of the husband that matters. Thirdly, the explanatory factors of dependence in Hanoi appear to be a reflection of the integrated nature of most of the households' production systems. In Hanoi, the amount of time spent by both the husband and wife in their *kangkong* production is a significant explanatory factor of dependence. That is, their choice of *kangkong* as a productive activity to engage with is a function of a form of specialisation based on diversity. Such specialisation is based on the integration of production systems of which VAC is a prominent example. And, in turn, to specialise in integration is driven by the need to diversify—to carry out productive activities that reflect the potentials of the landscape and seasonal demand. Finally, other livelihood contextual variables (such as the presence of other productive household members, memberships of organisations, credit access, and size of land) do not significantly affect dependence, although some interaction effects are detected. In short, the performance of *kangkong* as a livelihood hinges on the nature of the available human capital, which is defined by ecology, agronomy, and political economy.

We can proffer the view that diversification is deployed by *kangkong* households as a livelihood strategy. Diversification is a "distinguishing feature of ... [urban/peri-urban] survival strategies"; it is "pervasive and enduring"; it is real as shown in actual multiple sources of income; and, it leads over time to occupational specialisation and development (Ellis 2000b: 4). Diversification includes the involvement in different farm, off-farm and non-farm activities by the husband, wife, or other employable household members.

In most of the cases, household diversification does not necessarily imply a move away from farming as implied in the literature, although it might be the case if the opportunities are better. The literatures on diversification and livelihoods abound with exhortations on the role of diversification away from agriculture as an important pathway to lift households out of poverty (e.g., Adi 2005; Ellis 1998, 2000a; Ellis 2000b; Kabeer and Tran Thi Van Anh 2002; Kurosaki 2003; Rigg 1998; Rigg 2001, 2003; Rigg 2006; Rigg and Nattapoolwat 2001; Smith *et al.* 2001; Start and Johnson 2004; Xia and Sim-
mons 2004; Zoomers and Kleinpenning 1996). There are some indications that households in this study are open to other opportunities to earn income. Instead, households move from different production or farming systems, such as seasonal production of different aquatic plants to occasional involvement in rice farming or raising livestock and fish together with kangkong production. Even fishing from the wild is part of some households' livelihood strategies. But the major feature of this diversification is the strong involvement of women in kangkong production. Women are deployed as part of the overall household livelihood strategy. Such strong presence of women in kangkong production in all the cities studied reprises the findings of Kabeer and Tran Thi Van Anh (2002: 146) in Viet Nam that the gender division of labour was not strictly enforced in these cities but are flexible and differentiated between cities.

I found the rural linkage model inadequate in explaining how kangkong makes different livelihood imprints among the three cities in this study for the reasons mentioned above. Instead, an understanding of the ecology and agronomy of kangkong as well as the dynamics of each city is a more fruitful exercise to take. Thus, our goal in the next chapter is to understand the sort of ecological processes that make up kangkong and the agronomic practises pursued by producers to exploit its commercial potentials and its ecology. Then as a way of defining or linking how the exploitation of kangkong and its geographies are related to broader landscape processes, we will look at the political economy of kangkong especially with how the cities as they are right now will potentially affect livelihoods of peri-urban households that are constantly at the cusp of change physically, socially, economically, emotionally, and spatially.
Chapter 9
Ecology, agronomy, and economy

And what is a weed? A plant whose virtues have not been discovered.
- Ralph Waldo Emerson. Fortune of the Republic, 1878

A weed is but an unloved flower. — Ella Wilcox (1850-1919)

We can in fact only define a weed, mutatis mutandis, in terms of the well-known definition of dirt - as matter out of place. What we call a weed is in fact merely a plant growing where we do not want it. — E. J. Salisbury, The Living Garden, 1935

The messages that come out strongly in the previous chapters are that kangkong production

- is a livelihood that accommodates the co-performance of other income activities;
- is gender neutral because it allows for the effective participation of women;
- as a livelihood can be pursued at various scales;
- sustains food security and diversity;
- assists the subsistence of informal settlers in or around cities; and,
- engenders ecological sustainability through the recycling of wastewater in the production system.

How kangkong has been able to achieve all of the above is the goal of the first part of this chapter. The second part looks at the broader processes that underline the future of kangkong production in the cities in this study. This chapter as a whole discusses the situatedness of kangkong production. Three areas will be covered: ecology,

1 All of these quotes were lifted from http://www.quotegarden.com/weeds.html.
agronomy, and economy. Ecology situates kangkong in terms of its environmentally dependent characters which made the production we saw above possible. Agronomy situates household interventions to turn what has been described as a 'weed' into a useful plant. Economy situates both ecology and agronomy in broader landscape perspectives where societal processes define how households are entangled with their production systems. All of these are expressions of what Batterbury describes as the 'interplay of forces' in the landscape wherein the processes are 'scaled' and "interact in a world that is ecologically complex" (Batterbury 2001: 439-40).

9.1 Environmental endowments – water, rivers, and flooding

Our discussion about the seasonality of certain aspects of labour deployment in section 7.4 indicates the underlying motif which we have only noted in passing in section 2.7 and in various other places in this study. That is, water and geography are centrally implicated in kangkong livelihoods, in particular, and the livelihoods of peri-urban households in flood-prone mainland Southeast Asia (Map 1-1), in general. In a regional perspective, "South East Asia is a region where water – not land – is the defining element and where human-water relationship, not human-land relationships, are determining", Rigg (1992: 1) reminds us. This relationship is seen in the cyclical impacts of flooding on livelihoods and the adaptations people and governments have built or created to mitigate its negative impacts. It is imperative to make a diversion at this point to look at broader environmental processes in view of the fact underscored in the previous chapter that the environment moulds the interaction of households, livelihoods and kangkong.

Bangkok, Hanoi and Phnom Penh are located in floodplains which makes flooding an intrinsic part of their landscapes (see Map 8-1 and Map 8-2 for visual illustrations of their locations and river systems). The control and management of flooding in these cities have defined the landscape and the ways in which the land is used. Flooding comes as both a boon and bane to people and their livelihoods in these cities. Paradoxically, "rivers and their floodplains create assets as well as liabilities: resources as well as hazards" (Penning-Rowsell and Tunstall 1996: 495). Flooding is creative when it en-
hances and regulates the productivity of different ecosystems and destructive when it brings devastation to people’s lives and livelihoods.

Around Cambodia, flooding inundates an area between 20,000 to 25,000 km² between May and November each year, but the expanse covered by floodwaters depends on the strength of the wet monsoon. There are four rivers (the Tonle Sap (or Sap River), Bassac River, Upper Mekong River, and Lower Mekong River) meeting in Phnom Penh (Map 4-4). As the southwest monsoon sets in, the water in the Mekong River starts to build up forcing the Tonle Sap to reverse its flow towards the Great Lakes enlarging an area of 2,700 km² during the dry season to 9,000-16,000 km² at the height of the rainy season (Deap Loeung, Degen, and van Zalinge 2003: 4).

Photo 9-1 Scenes in BCE during dry (left) and wet (right) seasons. The picture on the right was taken just below where the biker on the left is. This is the major entry point to the Kbal Tomnub village. The photos were taken from the road. The man on the right with the green bundles is carrying *kangkong* for the market. Care is taken to make sure that the vegetable is not dirtied by the flood water. The boats on the right are used to carry people and commodities around the village. (Photos by: Author)

This flooding process, which begins around Phnom Penh, produces the largest permanent freshwater body in Southeast Asia, the Tonle Sap-Great Lake floodplains. As a result, Cambodia’s inland capture fisheries is considered among the most productive and biodiverse in the world (Deap Loeung, Degen, and van Zalinge 2003: 4). As water from the Mekong River inundates the surrounding floodplain, fisheries habitats are replenished with new nutrients brought in and newly spawned fish species. The behaviour
of different species of fish is tuned in to this cyclical change in water levels, known as the flood pulse, so that spawning is initiated at the onset of the flood and fish larvae are transported to nutrient rich nursing grounds. Newly spawned larvae may be transported as far away as the floodplains of Viet Nam, a distance of 500 km or more. As a result of the flood pulse, major migrations of several fish species occur both at the beginning and end of the flooding period forming a fish migration network linking different habitats. Signalled by the sudden surge of water discharge from the river, fish migrate to the floodplains. And then, as the water recedes, fish migrate back en masse away from the floodplains. It is during this latter period when fishers set up their fishing gear to intercept the mass of migrating fish. Their intimate knowledge of this migration pattern sustains their livelihood. The flood pulse concept is an important model in understanding floodplain river systems (Poulsen 2003: 8). The Mekong River Commission claims that the Mekong River “has one of the most abundant fisheries in the world and is probably the world’s largest river fishery. The annual catch is an estimated 1.5 million tonnes, with another 500,000 tonnes raised in reservoirs and other forms of aquaculture” (MRC 2006: 10-1). We can, therefore, say that the geography of Cambodia and the livelihoods of the people are intimately bound up with flooding. This relationship is summarised in the Mekong River Commission’s\(^2\) Annual Flood Report in 2005:

Hanoi is located within the Red River Delta region (Map 4-2). Although the Red River is the major river traversing through most of the territory of Hanoi, several sub-river systems make up the geography of the city. The Red River is formed by its three main tributaries: the Da, Thao, and Lo Rivers. The Da and Thao Rivers joined at Viet Tri, Vin Phu Province to form the Red River which then meets the Lo River several kilo-
metres downstream of Viet Tri. The Red River has a total catchment area of 169,000 km² of which 82,400 km² are in China, around 1,500 km² in Laos and the remainder in Viet Nam. Its catchment also includes the catchment of the Thai Binh River system, which covers an area of 12,700 km². Part of the Red River bifurcates into the Duong River, its main distributary, which in turn joins with the Thai Binh River downstream. The Delta covers the provinces of Ha Noi, Ha Tay, Hai Hung, Hai Phong, Nam Ha, Ninh Binh, and Thai Binh (Binnie & Partners et al. 1995: 6, 9). Within Hanoi and surrounding areas, the Red River joins with other smaller rivers such as the Nhue and To Lich Rivers. In Hanoi, there is a rapid rise in the water level of the Nhue River after heavy rains which can reach an elevation more than 5 m. Flooding in the Red River Delta occurs around July to August (Hansson and Ekenberg 2002) and begins when an elevation higher than 3.5m is maintained over a period of 10 days together with an increase in the water level of the To Lich River. Hanoi has a very flat topography. Its highest area in the northeast has an elevation of 6-9 masl while its lowest area in the south (Yen So area) has an elevation of 4-4.5 masl (Nippon Koei Co Ltd and CTI Engineering Co Ltd 1995: 6, 16). In August 1996, Hanoi has seen the worst flooding in the last 100 years due to torrential rains (World Conference on Disaster Reduction 2005 : 13).

In Bangkok, flooding is caused by a confluence of several factors including high upland discharge of the Chao Phraya River, high tides at the river mouth and heavy rainfall (Tingsanchali and Manusthiparom 2001). In the Bangkok Metropolitan Region (Map 2-1), of which Nonthaburi is a part, flooding is further confounded by land subsidence, insufficient drainage capacity of the canals (khlongs), and the discharge of farm polders into the canals during heavy rains (Engkgagul 1993: 335). Geospatially, the Bangkok Metropolitan Region is situated 0 to 5 meters above mean sea level within the Chao Phraya Basin. The basin is composed of sedimentary soil deposits in alternating layers of soil, gravel, and clay. The uppermost layer is composed of Bangkok clay formed about 4,000 years ago. This clay is soft and highly compressible which gives the soil low permeability. These characteristics make floods a regular feature especially during the monsoon season (Shibuya, Tamrakar, and Manakul 2003). In the lower part of the basin, inundation stays longer than in other parts due to the co-incidence of heavy rainfall
during July to October and high tide levels in the Gulf of Thailand pushing water upstream (Sukhsri 1999: 15). Furthermore, due to land use changes in favour of built up areas, there is less area of paddy to retain the increasing volume of water (Engkagul 1993: 336).

Flooding has significant implications for the way the landscape of the city is used and appreciated. In response to seasonal flooding, urban drainage systems (e.g. canal networks) were constructed in Bangkok, Hanoi and Phnom Penh. Canals serve to draw water from flooded areas as well as acting as conduits for the transfer and distribution of water from major rivers to water supply and distribution networks. In addition, canals receive and channel waste to sewage lakes and enable the distribution of nutrient rich water to various ponds. It is possible to have an open channel or a closed conduit. In Bangkok, the open channel is popularly adopted by water regulators and irrigation managers due to its many advantages compared to a close conduit system (Thai DCI Co. Ltd. et al. 1990: 5-12). It is due to this open system that different forms of waste may be transferred, contaminating irrigation waters (Salamanca and Rigg In press).

Canals have played a central role in transforming the landscape, first as sources of water for rice production and later for aquatic production, and as channels and repositories of wastes, both industrial and domestic. In the cities in this study, there are different types of canals: raw water canals, irrigation canals, and sewage canals.

Photo 9-2 A (drinking) water canal in Nonthaburi (left). The field site is located to the left of the canal. Right is a wastewater pump in Hanoi. (Photo by: left, Author; right, www.papussa.org)
In Bangkok and the rest of the Central Plains of Thailand, canals became emblematic of the attempts to turn the land into a productive base for agriculture. The history of canal construction can be read as a history of Thailand with their multiple functions of flood maintenance, enhancing trade, communication and transportation, and distributing water (Falvey 2000: 105-7; Hubbard 1977: 71-7; Tanabe 1977). Hubbard (1977: 75) notes that the expansion of the canal system has had particularly strong effect upon two aspects of Thai society. In the first place, the network of canals and streams has determined the settlement pattern of the people in the delta region. Originally, people settled along the natural waterways. As man began to alter the waterways, new areas were accessible, and villages began to appear where before there had been only wide stretches of flat, low-lying grasslands inhabited by the many animals native to the area. The location of Bangkok itself was to a great degree dependent upon a canal dug in 1534. A second effect of the canal projects is reflected today in the large number of people of Chinese ancestry residing in Thailand.

The existence of canals in Bangkok and Hanoi ensured the availability of irrigation water year round and the supply of drinking water to the metropolis and its surrounding provinces and districts. There are two types of canals in Bangkok which we can associate with kangkong production. These are the formerly raw water canals which are no longer used for their original purpose and the irrigation canals. Raw water canals are used to transport raw water from the Chao Phraya River to water treatment plants before distribution to households and industries. This type of water is used for drinking. Raw water canals such as the Chiang Rak Noi canal in Suanprixthai, Pathumthani became irrigation canals. Irrigation canals, on the other hand, serve agricultural functions. Their network is more widespread than raw water canals and each is managed by separate government entities. Raw water canals are managed and operated by the Metropolitan Waterworks Authority under the Ministry of Interior while irrigation canals are maintained by the Royal Irrigation Department.

9.2 A plant 'in its place'

9.2.1 What is a weed?

The quotes at beginning of this chapter are some of the most popular and oft-cited definitions of a 'weed'. Uselessness, nuisance and notoriety come out as their subtexts. Using the work by King (1966: 1-6) on weeds of the world as the basis, Clayton (2003) posits that there is no equivalent term for 'weeds' among ancient near-easter languages such as Egyptian, Sumerian, and Assyrian because all plants were consi-
dered useful. According to the online edition of the Oxford English Dictionary, a weed is currently defined as a "herbaceous plant not valued for use or beauty, growing wild and rank, and regarded as cumbering the ground or hindering the growth of superior vegetation" (Oxford University Press 1989). Accordingly, it came from the Old English weod and was first mentioned in c888 by Aelfred in his Boethius De consolatione philosophiae. King (1966: 5 cited in Clayton 2003: 304) notes that the term is "a singular noun with no evident intrinsic meaning" and therefore "another example of language as accidental usage" so that its definition is based solely on "purely anthropic considerations". Put simply, the term is defined according to its human usefulness so that in Mexico the term for weeds is maleza, literally meaning plants with no use (Vieyra-Odilon and Vibrans 2001: 440). Even in human social relations, weeds have become 'metaphors of displacement' as in the case of slums as weeds in an urban landscape (Cresswell 1997).

Weeds, therefore, according to Cresswell are

[... ] plants that are uncultivated and undesired; they crowd out the cultivated specimens in the garden or farm field. Many plants become weeds simply by being in the wrong place. Weeds (real or figural) are furtively mobile fugitives that colonize available waste ground, and the move on to take over new ground. They also reproduce abundantly. Whereas a garden often implies a sense of order with each plant in its correct place forming a harmonious whole, weeds, through mobility and rapid reproduction, spoil this ordered environment. Weed is also a verb; to weed is to remove useless, harmful, and undesirable plants from the order of the garden or cultivated land. (Cresswell 1997: 335)

From the point of view of human use, a plant becomes a weed when it causes any of the following impacts:

- reduces crop yield;
- reduces crop quality;
- delays harvesting;
- interferes with harvesting;
- interferes with animal feeding;
- causes poisoning;
- taints animal products;
- acts as plant parasites;
- reduces crop health;
- reduces animal health;
- constitutes a safety hazard;
• prevents water flow;
• exhibits allelopathy; and
• impacts on crop establishment (Naylor and Lutman 2002: 2-3).

Kangkong exhibits some of the above characteristics especially in blocking water flow. In lakes, reservoirs or canals, it can interfere with other plant and animal populations in these systems or impede navigation. But I argue, at least in Southeast Asia, that since kangkong is edible and commercially exploited the chances of it becoming a nuisance is limited due to regular cropping for human and animal consumption. Furthermore, there are other nuisance species competing for the same space as kangkong, notably water hyacinth (Eichhornia crassipes) and water lilies (Nymphaea spp). Neither of these species is edible nor saleable. Even without kangkong, waterbodies are endangered of being overrun by similar macrophytes. In addition, kangkong production offers flexible levels of intensification from subsistence or wastewater based systems as in Hanoi and Phnom Penh to commercial systems as in the case of Bangkok.

Naylor and Lutman (2002: 1) clarify that there are many reasons why a plant may be considered useless or a nuisance especially when seen from the perspective of a person’s intention for the space upon which ‘weeds’ occupy. They argue that this “leads to the understanding that crops may at some time also be weeds”. An example would be lawn grasses, which are considered attractive in lawns, but are weeds when they spread to farm lands. Or, what is considered a ‘noxious’ weed in sub-tropical USA is a crop – kangkong – at least among the cities in this study. It is in view of the above considerations that the European Weed Science Society defines a weed as “any plant or vegetation, excluding fungi, interfering with the objectives or requirements of people” or “a plant growing where it is not desired” according to the Weed Science Society of America (Naylor and Lutman 2002: 1). The latter definitions raise interesting questions when applied to the case of kangkong. Does kangkong interfere with the “objectives or requirements of people”? Does it grow “where it is not desired”? Or is kangkong simply a plant out-of-place? Our previous discussions on livelihoods should show that none of these questions is tenable; thus, the conclusion proferred is that kangkong is not a weed. As
Naylor and Lutman (2002: 8) acknowledge: "Clearly, in the right place, a plant species may have properties which are beneficial to man or his activities".

Using a conceptual framework laid out by Baker (1965), Naylor and Lutman (2002: 9-10) summarise the attributes that make up a weed. These attributes differentiate weeds from non-weeds (Sutherland 2004). Some of these attributes are shown in *kangkong* (Table 9-1). For a plant to be considered a weed, however, it does not need to possess all these attributes; a proportion of them is enough. “The agricultural ‘environment’ in which the species exists, and the way farmers manage their land, are just as important”, say Naylor and Lutman (2002: 10).

<table>
<thead>
<tr>
<th>Characteristics of a weed (based on Baker 1965 as cited in Naylor and Lutman 2002: 9)</th>
<th>Kangkong</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>the ability to germinate in many environments</td>
<td>widely possible only within aquatic or semi-aquatic environments</td>
<td>Holm et al. (1997: 412-7); PROTA Online Database</td>
</tr>
<tr>
<td>discontinuous, self-controlled germination and great longevity of seed</td>
<td></td>
<td>Holm et al. (1997: 412-7); PROTA Online</td>
</tr>
<tr>
<td>rapid seedling growth</td>
<td>✓</td>
<td>Holm et al. (1997: 412-7); PROTA Online</td>
</tr>
<tr>
<td>early onset of seed production in a range of environments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>long period of seed production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>self-compatibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>easy cross-pollination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high seed output in favourable circumstances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>some seed production in adverse conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>long and short-distance dispersal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>special means of competition</td>
<td>has ‘labyrinth seeds’ that float for long periods</td>
<td>Austin (2007: 123)</td>
</tr>
<tr>
<td>vigorous vegetative reproduction</td>
<td>✓</td>
<td>Holm et al. (1997: 412-7); PROTA Online</td>
</tr>
<tr>
<td>brittleness of lower nodes or rhizomes</td>
<td>✓</td>
<td>Holm et al. (1997: 412-7); PROTA Online Database</td>
</tr>
</tbody>
</table>

Table 9-1 Attributes of a weed and their presence in *kangkong*

And even if we admit for the sake of argument that *kangkong* is a weed, it is an *aquatic weed* “different from terrestrial weeds in that [...] it is] usually a normal constituent part of the aquatic ecosystem [...] which become weed[s] when they grow to excess” due to factors such as eutrophication and increased storm-water run-off due to urbanisation (Newman 2002: 399). This implies that the problem is not the plant itself but the surrounding environment so that if we want to control the growth of aquatic
'weeds', or the transformation from an 'innocent' plant to a weed, we will have to address land-based sources of pollution, the cause of eutrophication\(^3\). That said, *kangkong* or *Ipomoea aquatica*\(^4\), is generally considered one of the world's major weed species (Holm *et al.* 1997: 412).

### 9.2.2 Distribution and habitat

The genus *Ipomoea* is composed of around 500 largely creeping or climbing species found from salt marshes to mountain tops. *I. aquatica* in particular has the ability to cover areas with different degrees of wetness. Thus, it can take aquatic, semi-aquatic or even terrestrial forms. It is abundantly found in soggy soils such as flooded lowland fields, marshes, and rice field ditches. It is a major creeper along muddy streams or ponds reaching out to water surfaces to form mats with other vegetation. It is found from the tropics to warm temperate zones but is not well adapted to colder environments. During periods of inundation, it is stabilised by its nodal roots which act as anchors in the soil while the creeping and hollow stems float upward when the water rises enabling it to survive floods. Its wild and cultivated varieties are found all over Southeast Asia and Southern China, but not India (Holm *et al.* 1997: 414). It is found in nearly all countries of tropical Africa, from Mauritania and Senegal, east to Eritrea and Somalia, and south to South Africa, and also in the Indian Ocean islands. It is a noxious weed in south-eastern United States. It is cultivated as potherbs in some European cities where there are Asian communities (PROTA Online Database).

In general, the dispersal of species in *Ipomoea* is largely unknown (Austin *et al.* 2001: 523). However, some studies of a few species do provide insights. The ancestry of *I. aquatica* can be traced to India and China and reference to it first appeared in the *Nanfang Zaomu Zhuang*, a botanical work of the 5th century AD (E.N. Anderson, pers. comm., 2006). But using names and their historical origins, Austin (2007: 132) is confident that South Asia and Southern China are the cradle of *I. aquatica*. How it got to

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\(^3\) Eutrophication describes "the biological effects of an increase in concentration of plant nutrients – usually nitrogen and phosphorus, but sometimes such as silicon, potassium, calcium, iron or manganese – on aquatic ecosystems" (Harper 1992: 2).

\(^4\) Older botanical name is *I. reptans* (L.) Poiret. The current name, *I. aquatica*, was given by Forsskal in 1775 after his discovery of the plant ironically in a desert in Yemen (Austin 2007: 123).
Southeast Asia is not known, although we can assume that its dispersal to the region may be linked to the flows of people, ideas and technologies to and through the region from both east (China) and west (India) during earlier historical contacts. Several New World plants, such as *L. batatas*, commonly known as sweet potato and a relative of kangkong, were introduced to India by the Portuguese (Austin 2000: 116). Another relative of *L. aquatica*, *L. nil* has been dispersed from its origin in Africa to India then to China and Japan during pre-Columbian times through human contacts (Austin et al. 2001: 523-4). But *L. aquatica* could just as well have been dispersed to the region through standard pathways of plant dispersal such as transport by birds, oceanic drift, and movement of seeds by air flotation (Carlquist 1967). Certain species of *Ipomoea* are known to have been dispersed through these pathways (Austin et al. 2001: 523). Water dispersal has been known to characterise the distribution of several members of Convolvulaceae (Austin 2007: 123).

### 9.2.3 Properties of kangkong and other medical benefits

The US Department of Agriculture's Food Composition Database, PROTA (Online Database) reports that a 100 gram of raw *kangkong* (only edible parts) offers several nutritional benefits as shown in Table 9-2.

<table>
<thead>
<tr>
<th>Contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>92.5 g</td>
</tr>
<tr>
<td>Energy</td>
<td>80 kJ</td>
</tr>
<tr>
<td>Protein</td>
<td>2.6 g</td>
</tr>
<tr>
<td>Fat</td>
<td>0.2 g</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>3.1 g</td>
</tr>
<tr>
<td>Dietary fibre</td>
<td>2.1 g</td>
</tr>
<tr>
<td>Ca</td>
<td>77 mg</td>
</tr>
<tr>
<td>Mg</td>
<td>71 mg</td>
</tr>
<tr>
<td>P</td>
<td>39 mg</td>
</tr>
<tr>
<td>Fe</td>
<td>1.7 mg</td>
</tr>
<tr>
<td>Zn</td>
<td>0.2 mg</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>6300 IU</td>
</tr>
<tr>
<td>Thiamin</td>
<td>0.03 mg</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>0.10 mg</td>
</tr>
<tr>
<td>Niacin</td>
<td>0.90 mg</td>
</tr>
<tr>
<td>Folate</td>
<td>57 µg</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>55 mg</td>
</tr>
</tbody>
</table>

Table 9-2 Nutritional benefits of kangkong
(Source: PROTA Online Database)

Aside from the importance of *kangkong* as food for humans and animals, its historical medicinal uses have been widely acknowledged in various parts of Asia whether as a laxative, emetic, tonic or as a sleeping aid (Austin 2007: 128). *Kangkong* also has antioxidant properties which have been recently reported (DongJiann et al. 2005; Prasad et al. 2005) while its potential uses to control blood glucose levels are being experimented (Malala-
vidhane et al. 2003; Sokeng et al. 2007). In addition, it has been shown that kangkong leaves contain cytotoxic properties (Sulphorhodamine 2005), which might just be useful in chemotherapy.

9.2.4 The ecology of kangkong

The ideal environments for kangkong to flourish are areas of high temperature, full sunshine, and abundant water. Thus, changes or limitations on these restrict the productivity of kangkong fields. Peak periods of production in the three cities tend to be during wet months, but severe inundation during the wet season also has destructive effects on production. Fertile soils with a high level of organic matter and pH of 5.3 to 6.0 are particularly well-suited to kangkong (PROTA Online Database). Such ecology ensures that eutrophic environments are beneficial. Thus, the use of wastewater in kangkong production is widely practised in Hanoi and Phnom Penh. The free supply of nutrients and water from wastewater sources is a boon to farmers in these cities.

As discussed in section 2.8, the use of waste connects kangkong with the metabolism of the city and thus becomes a prism into the study of spatial change. Wastewater is an important source of freely available nitrogen and phosphorus which kangkong needs for growth (Edwards 2002: 85). The use of wastewater, however, creates a clear dividing line between Bangkok at one extreme and Phnom Penh and Hanoi at the other. Responses from the baseline survey show that producers in Bangkok do not use – or do not perceive themselves using – wastewater; whereas the opposite is the case for Phnom Penh and Hanoi. One can argue, however, that as the sources of water to irrigate farms in Bangkok are canals and other open bodies of water which may be contaminated with different wastes, it is de facto wastewater (Salamanca and Rigg In press). The WHO reckons that the unintentional use of wastewater is “probably increasing” because surface waters used in aquaculture are increasingly polluted and aquaculture in general is spreading (WHO 2006a: 7). The major difference is that Bangkok producers do not consider the water they use as wastewater whereas those in other cities are more open about it. Kangkong responds well to N fertiliser and other minerals which increases yield

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5 This shows that the perception of waste is socially and culturally mediated.
and leaf/stem ratio (PROTA Online Database). Fertilisers and pesticides are widely used in Bangkok systems (Photo 9-3). N-P-K (nitrogen, phosphorus, and potassium) compounds are spread to fertilise the systems and insecticides and pesticides are used to control pests such as Death's Head Moth and aphids (Yoonpundh et al. 2006: 13-5). It is estimated that fields receive 315 kg/ha of fertilisers after the first harvest (Yoonpundh et al. 2006: 8). After harvesting, just before bringing the produce to the market, 'greening' agents are used to maintain the crop's attractiveness to the consumers and, therefore, the price (Interviews, Appendix 4).

Among the three cities, however, the application of both fertilisers and pesticides is particularly high in Bangkok and Hanoi (Figure 9-1). In contrast, Phnom Penh barely use any fertilisers. Only in the third monitoring period were inorganic fertilisers and plant conditioners used, possibly due to the onset of the summer months when the water level in the lake is low and the plants become susceptible to disease. Pesticides and plant conditioners are then applied to control pests and to stimulate the growth of the plant (Kuong, Little, and Leschen 2006: 50). Lime is also widely used in Bangkok especially during farm preparation to control other competing species.
9.3 Health implications of wastewater use

Although the use of wastewater in producing *kangkong* especially in Hanoi and Phnom Penh has beneficial impacts on its growth, it can also have potential negative consequences to human health. However, these consequences tend to be problematic for the producers rather than the consumers of *kangkong* as most of the negative elements of wastewater use are concentrated in the soil. Household members who are regularly in contact with the soil during farm maintenance and harvest are particularly at risk.

Some studies (e.g., Gothberg and Greger 2006; Gothberg, Greger, and Bengtsson 2002; Gothberg et al. 2004) show that heavy metals such as cadmium (Cd), lead (Pb), and mercury (Hg) are known to concentrate in the root systems but not so much on the edible parts of the plant such as the leaves and apices. Although trace metals such as copper (Cu), zinc (Zn), Cd and Pb in wastewater irrigated farms in Hanoi are within internationally permissible standards for now, their accumulation in the soil and increasing industrialisation heightens the chance of a transfer through the food chain to humans (Bjuhr 2007: 33-4). In *kangkong* sites in Hanoi, elemental concentrations⁶ were assessed and found to be generally low; hence, risks to producers and consumers are also

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⁶ These are composed of 39 elements: aluminum, silver, arsenic, barium, beryllium, calcium, cadmium, caesium, cerium, cobalt, chromium, copper, dysprosium, europium, erbium, iron, gadolinium, holmium, potassium, lanthanum, lithium, lutetium, magnesium, manganese, molybdenum, neodymium, nickel, lead, praseodymium, antimony, scandium, selenium, samarium, strontium, terbium, thorium, thallium, thulium, uranium, vanadium, yttrium, ytterbium and zinc (Marcussen et al. 2006: 24).
low (Marcussen et al. 2006). But direct contact with untreated wastewater through various farming activities has been associated with higher incidence of diarrhoea caused by helminth infections in Hanoi as compared to people who had no such contact (Trang, Hien et al. 2007: 28). Furthermore, communities who are exposed to wastewater use also have more skin problems such as dermatitis and fungal infections (Anh, van der Hoek et al. 2007; Trang, van der Hoek et al. 2007).

In BCE in Phnom Penh, the presence of thermotolerant coliform \((10^5-10^7 \text{ThC/g})\)^7 is high indicating faecal contamination. Such contamination results from direct use of the lake for defecation^8 and a huge inflow of contaminated wastewater from the city (Photo 9-4) containing ThC concentrations of \(10^4-10^7 \text{ThC/100 ml}\). Protozoan parasites such as Giardia cysts and Cyclospora oocysts were also reported in kangkong samples from the lake. But risks associated with this contamination are remedied by thorough washing of the plants and cooking such that consumers are not much affected; it is the producers directly in contact with contaminated water who suffer (Anh, Tram et al. 2007: 78). However in terms of the presence of toxic elements such as arsenic (As), Cd, and Pb, the lake can be considered to be slightly polluted as levels of Pb at wastewater intakes are elevated but with low concentrations for As and Cd in the sediments (Marcussen, Dalsgaard, and Holm 2006: 54). Kangkong from the lake is therefore generally safe to eat, but its production poses some health risks to producers.

![Photo 9-4 Sewage water from the city flowing into BCE before (left) and after (right) a pump system was built in 2003 to regulate flow during flooding. There are two major inlets of wastewater into the lake. This is one of them. (Photos by: Author)](image)

No similar studies were undertaken among the kangkong systems in Nonthaburi.

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^7 The WHO sets the standards at \(\leq 10^4\) thermotolerant coliforms /100 ml (WHO 2006a: 37).

^8 Recall in section 5.3.2 that toilet ownership is not widespread in Phnom Penh compared with the other cities.
Instead, we can gather from studies on the water quality of the Chao Phraya River, the main irrigation source of farms in the area, and impacts of pesticide use in the province and other surrounding areas that water used to irrigate *kangkong* fields may have associated health risks. For instance, Greenpeace, the international environmental advocacy group, reported that toxic chemical pollutants, such as organochlorines, are discharged by chemical factories into the Chao Phraya River (Brigden, Labunska, and Santillo 2004). Cadmium was also reported in its water and sediments (McLaren *et al.* 2004). In Nakhon Pathom (Map 2-1), a province adjoining Nonthaburi, aquatic systems have high pesticide residue content originating from the fruit and vegetable farms in the area (Saptapornvanit *et al.* 2004). The presence of these chemicals in irrigation water, especially at elevated levels, can potentially affect the health of both producers and consumers.

### 9.4 Turning a weed into food and then into a crop

Growing up in rural and island Philippines, I had always considered *kangkong* to be a ‘wild’ plant thriving in ditches and rice fields. *Kangkong* is only available if one goes to the field and pick them. It is not available in the local market. It does not keep long so freshly picked *kangkong* needs to be cooked soon after. I did not realise until I was exposed to peri-urban aquatic production in mainland Southeast Asia that it can actually be cultured. With shrimp paste, papaya salad, squid, chilli or garlic, *kangkong* produces a variety of dishes. How *kangkong* came to the table, so to speak, may be understood in terms of how a particular dish developed.

In Thailand, a popular dish in rural areas is *nam phrik long ruea* (Photo 9-5), shrimp paste with chilli, which offers some hints about the voyage of *kangkong* from the swamp to the table. Environment and geography have been defining influence of Thai dishes. Household normally prepare dishes based on what is normally found around. *Nam phrik long ruea* is a rainy season dish traditionally eaten in late afternoon or early evening. The precursor of this dish is a dry-style chilli paste which villagers normally carry along with sticky rice and grilled fish to the field when they go out to collect grass fodder for their water buffaloes or when they pasture their livestock. Along the way, they also collect *kangkong*, especially the purple-colour stem upland variety which grow on
the same field as the grasses (This practise resonates quite vividly in my childhood experience and I can imagine Vietnamese and Khmers also have similar experiences with wild kangkong growing in the same field where they bring their buffaloes to feed). After they have collected enough fodder or their buffaloes are full or just when they are in safe leash for the night, villagers rest and snack on their rice, fish, chilli paste and freshly picked kangkong. This tradition, accordingly, has given rise to nam phrik long ruea, for which kangkong is an important accompaniment (Sukphisit 2002).

The agronomy of kangkong production holds the key as to why it invites the strong participation of women in its cultivation and lends itself to multiple occupations. Most production systems are located around the farmer’s residence. In fact, the residence and the farm form a contiguous plot of land in most instances so that there is immediate access. Except during the new planting season, kangkong production does not demand most of the household’s daily working time. Miss Samli Suksamran, interviewed by the Bangkok Post (Pornpitagpan 1999) says: “Fruit orchards require more labour. Cutting the tips of morning glory is lighter work for me”. Mrs Wandee Yanmapracha, another farmer interviewed by the same newspaper agrees:

The plants don’t need intensive care as they grow fast. They are hardy, growing them is simple. We cut the tips and tie them on bamboo sticks and float them on the river. Within three weeks, we get a harvest. [Pornpitagpan 1999]
As the activity matrix suggests (section 8.1), work can be apportioned through the day, according to task, and between women and men. As freshly harvested kangkong is immediately affected by strong sunlight, it is ideal to harvest the crop in the early morning and transport it to the market not more than three hours after harvest to keep it fresh and unwilted. Packaging is also important (Photo 9-6). This is especially the case for kangkong destined for human consumption. Such timing of harvest allows farmers, especially women, to stay away from the fields during the harsh mid-afternoon sun and to rest or tend to other chores in the household. Mrs Sunee Rudimongkol, a kangkong farmer from Bang Toey subdistrict in the neighbouring province of Nakhon Pathom bared in an interview featured in the Bangkok Post (Pornpitagpan 1999) the reason why she likes working in the morning: “I like working so early. It’s very peaceful and it calms me”. However, wholesale markets for kangkong to feed livestocks, such as pigs, demand less attention. No special packing is needed. In Phnom Penh, buyers come to the field with their trucks to collect their consignments (Photo 9-6).

Kangkong is generally propagated by cuttings, although newer varieties are now propagated by seeds⁹. Harvesting is mostly by cutting off the younger and succulent apices leaving the base to grow and be regularly re-cropped due to rapid rate of regrowth.

⁹ Farming techniques described in this study are stylised to cover the generalities of each site. Details on how kangkong is farmed in each city are available from www.papussa.org.
There are two types of kangkong in Southeast Asia: the traditional or ‘native’ and the white-flowering seed propagated kangkong (PROTA Online Database). In Thailand, these varieties further subdivides into the Chinese variety (upland type), the white variety (aquatic type), the Thai variety (aquatic type), and the green variety (aquatic type).

The Chinese variety is light green in colour with long, pointed and narrow triangular leaves producing white to creamy flowers. This variety is harvested by uprooting the plant, the land left fallow for five to seven days before a new crop is planted. It becomes viny when farmed continuously (Lin and Mon Unpublished). This variety has been improved leading to several commercial varieties such as Yod Pai No 9, Lert Phan, Aeroplane and Pichit 1 (Dissataporn, Jomthaisong, and Thongbai 2005). The white variety has light to dark green, vine-like stems and elongated leaves which propagate by stem cuttings. This is widely cultured in Thailand. The green variety differs from the white variety only by having a bigger leaf area, larger stems, shorter nodes and shorter young tip. The Thai variety or the wild or native variety has a viny purple-green stem with pink to purple flowers (Lin and Mon Unpublished) (Photo 9-7).

Growing kangkong can be done in two ways: floating and non-floating. Both ways are practised in Bangkok and Hanoi while Phnom Penh is exclusively floating. Cuttings are used for planting. In Phnom Penh, seedlings a few weeks old are transplanted...
from nursery areas at the onset of the wet season. These cuttings (Photo 9-8) are normally tied to ropes attached to stakes in order to keep them from drifting away during the rainy season while allowing adjustments to changes in water levels. The stakes also demarcate ownership of the plots. This system essentially allows the plantings to float on the water. Farmers begin harvesting their fields three to four weeks after transplantation or when the *kangkong* reaches the preferred market size (around 50 cm long). Harvests may be done every day or until all harvestable stems are finished. Each household can harvest between 100 – 300 kg per day depending on farm size and available labour (Kuong, Leschen, and Little 2007: 8).

![Photo 9-8 Two ways of planting *kangkong*: floating (left, Phnom Penh) and non-floating (right, Bangkok). (Photos by: Author)](image-url)

In Hanoi, generally shallow water levels allow for plantings to be immediately embedded into the soil. But for the floating varieties in canals and ditches, a system similar to Phnom Penh is also used. In Bangkok, cuttings from seed-sown nursery beds are used. The plantings are arranged neatly in rows. Due to shallow water levels in the paddy fields, Bangkok systems do not use the stakes and rope approach of Phnom Penh. Also, Bangkok systems use several improved cultivars of *kangkong*. Directly sown varieties designed for once-over harvests are available for cropping 21-30 days after sowing.

*Kangkong* begins to flower after two to five months while continually forming new leaves and branches. Flowering can be induced by short days (<12 hours) or stimulated by drought. Flowering, however, signals the renewal of the cultivation system because *kangkong* stems toughen at this stage. Self-pollination occurs in 60-65% of cases, although cross-pollination by animal vectors does occur (PROTA Online Database).
To irrigate *kangkong* fields, both freshwater and wastewater are used. The former tends to be the main source in Bangkok and the latter for Hanoi and Phnom Penh. In section 9.2.4, it was shown that the use of wastewater attunes well to the ecology of *kangkong* as wastewater from urban and industrial drainage, even if already biologically treated, contain 200 times the nutrient concentration of both nitrogen and phosphorus than freshwater, important limiting macronutrients in plants (Harper 1992: 30). In Hanoi, the wastewater used to irrigate farms contains significantly higher concentrations of nutrients than freshwater from river sources. It accounts for 21 to 61% and 31 to 66% of the total measured input for N and K, respectively (Nguyen Manh Khai, Pham Quang Ha, and Oborn 2007: 196, 198).

### 9.5 Yield

No doubt biomass yields from *kangkong* will be very high as it is a prolific vegetable (Photo 9-9) with a very fast regrowth rate. In fact, it has been noted that *kangkong* has the highest yield of all commercially produced leafy vegetables (Wenfang 1996: 1). That said, presenting production yield estimates within a comparative context among the cities in this study is somewhat problematic because the PAPUSSA data obtained yield estimates by recall. As we know, there are significant problems associated with the method of recall itself such as memory problems (Harriss-White and Harriss 2007: 19). Also, available data are estimates only of PAPUSSA field sites, not districts, communes or towns. As such, the yield estimates presented here can only be interpreted as indicative of the potential of the production system and its contribution to the household’s relative gross monetary income stream. Given the nature of the data at my disposal, the aim of the succeeding analysis is to show that *kangkong* production is substantial and an important income source among households.

Analyses by PAPUSSA in Hanoi, specifically with regard to Tran Phu and Bang B villages, showed estimated yields of 4.5 tons fresh weight/ha/yr/HH (Nguyen Thi Dieu Phuong et al. 2006: 41-2). In Phnom Penh, *kangkong* producers in BCE in 2003 had an estimated yield of 5 tons fresh weight/ha/yr/HH (Kuong, Little, and Leschen 2006: 63-4). In Nonthaburi, a yield of 16.4 tons fresh weight/ha/yr/HH was reported (Saelee et al.
Given an average price of a bunch of *kangkong* weighing 500g of USD 0.10, the estimated values of these production figures are: USD 900/yr/HH in Hanoi, USD 1,000/yr/HH in Phnom Penh, and USD 3,280/yr/HH in Bangkok.\textsuperscript{10}

![Photo 9-9 Kangkong fields in Bangkok (left) and BCE, Phnom Penh (right). The rows in BCE can clearly be seen in the aerial photo in Map 4-5 (Photo by: Author)](image)

Outside of the region, similarly high yields are noted in some fields in Hong Kong where a production of 9,000 tons fresh weight/ha/yr has been reported but a really good field may have yields of one metric ton fresh weight/ha/day (Holm *et al.* 1997: 417). In general, however, yields range from 7 to 30 tons/ha/yr depending on the variety (Wenfang 1996: 1). Country or city-level production estimates of *kangkong* presented alongside other vegetables were briefly described in Chapter 1 in relation to the economic importance of *kangkong*. The volume and gross value of *kangkong* production compares rather well with other commercial crops.

### 9.6 Political economy

The production of *kangkong* is not only situated within a limited space of water, ponds and dikes. It is also encapsulated within the broader spatial scale of the city and all the attendant processes and structure – institutional, cultural and otherwise – that define it. Thus, this makes *kangkong* production subject to the influence of the city due to its location. As such, understanding the city will provide an insight into the various

\textsuperscript{10} The price used for this comparison may be an overestimate for Hanoi and Phnom Penh; thus, may only be applicable to Bangkok. Muong (2004) reports a price of USD 0.03/kg in Phnom Penh in 2002. But it should be borne in mind that this price is not based on purchasing power parity (PPP) so differences are likely to occur. That said, the above information should be taken as only a qualitative indication of the values of production.
processes that has shaped and will continue to shape *kangkong* production.

### 9.6.1 City development index

The cities in this study epitomise the best and the worst of urbanisation in mainland Southeast Asia. They are national capitals. One, Bangkok, is a megacity and a 'high-ranked' city (see below) while Hanoi and Phnom Penh are, respectively, transitional economy and low-development cities (Hall 2001: 14).

A megacity has a population of more than 10 million people. A city is considered high-ranked, one of a cluster in the ADB’s Cities DataBook, if it has the highest city product, is in the first three rankings in the CDI (city development index), enjoys the highest connectivity, the highest level of service, and a high level of transparency in governance. A city is transitional when it is opening up to market orientation from a formerly socialist state, resulting in a mixed economy. A low-ranked city is characterised by the lowest CDI, high levels of poverty, large informal sector, and where public services and urban management are weakest (McGee 2001a: 134). Based on the ADB Urban Indicators for Managing Cities publication, Phnom Penh is rank the lowest in terms of city development among the 18 cities compared, but not in terms of connectivity and congestion while Hanoi is somewhere in the middle in all these indexes. Although Bangkok was not included in the analysis, it is likely to be in the top along with Hong Kong and Seoul (Westfall and De Villa 2001) in terms of development and connectivity as well as congestion.

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11 This index is composed of infrastructure, waste, health, education and city product indexes and is supposed to represent the level of development of a city (Westfall and De Villa 2001: 48).

12 This is measured in terms of flights, international phone calls, tourism, headquarters of large corporations, and internet hosts per 1,000 population and shows how connected a city is with the rest of the world (Westfall and De Villa 2001: 49).

13 This is a measure of crowding based on travel time, residential density and population (Westfall and De Villa 2001: 49).

14 There are no reasons provided why Bangkok was not included but we can presume that one of them may be related to how a city is defined as Bangkok is atypical among the cities compared. As has been mentioned earlier, Bangkok in its current planning state is an amalgam of the metropolitan core of Bangkok-Thonburi and the five surrounding changwats of Nakorn Pathom, Nonthaburi, Pathumthani, Samut Prakarn, and Samut Sakorn (Map 2-1). This suspicion is further heightened if we take note of the fact that Terry McGee is the main consultant of the ADB’s Cities Data Book and who originally espoused the idea of extended metropolitanisation.
The CDI illustrates the performance of a city as it correlates well with household income, city product, infrastructure provision, and local government performance. When a city registers a high CDI, it implies that household income, city product, and infrastructure provision are high and increasing, and local government performance is improving (McGee 2001a: 132-3). Both the UN-Habitat’s State of the World’s Cities Report 2001 (UN-Habitat 2001) and ADB’s Cities DataBook (Westfall and De Villa 2001) noted that the CDI is analogous to the well-known Human Development Index (HDI) but offers a “better measure of real city conditions than the national level HDI” as it offers a “meaningful” ranking of cities (Newton 2001: 35) due to the inclusion of factors such as availability of infrastructure, treatment of waste, garbage collection and health of the city economy in addition to typical human development indicators. Thus, the CDI is based on the average of sub-indices of infrastructure, waste, health, education and city product. These sub-indices are, in turn, composed of several indicators that have been normalised to provide a value of 0 and 1. The index covers both urban poverty and governance (UN-Habitat 2001: 117). Admittedly this index is dated and incomplete due to the exclusion of Bangkok, but it offers us an insight into the relative rankings of the cities in this study. Of the 18 cities ranked by CDI in the Cities Data Book, Phnom Penh is

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15 The formulae of these indexes are the following: Infrastructure = 25 x water connections + 25 x sewerage + 25 x electricity + 25 x telephone; Waste = wastewater treated x 50 + formal solid waste disposal x 50; Health = (life expectancy - 25) x 50/60 + (32 - child mortality) x 50/31.92; Education = literacy x 25 + combined enrolment x 25; Product = (log city product - 4.61 x 100/5.99) (Westfall and De Villa 2001: 48).
the lowest with a CDI below 50%. Hanoi is above 60% (Table 9-3) (McGee 2001a: 132-3).
We can imagine Bangkok approaching an index close to Hong Kong in all aspects of the
sub-indices.

9.6.2 The urbanisation of the three cities

The 2005 population estimates of the three cities, or properly called the urban
agglomerations, are shown in Figure 9-2. These estimates use the UN data as there is
no similar dataset at city level in GRUMP.

The existing momentum of population growth resulting from natural increase
and rural-urban migration explains the upward trend, despite falling average rates of
change as shown in Appendix 2. However, the share of these urban agglomerations rela-
tive to each country’s total urban population by 2015 will decline by 2015 to 46.2%,
29.8%, and 17.7% for Phnom Penh, Bangkok, and Hanoi, respectively (Figure 9-2). Still,
Phnom Penh in 2015 will account for nearly 50% of the urban population of Cambodia
because there are no other significant urban centres in the country. In contrast, Thai-
land has Chiang Mai and Nakhon Ratchasima (or Korat) and Viet Nam has Ho Chi Minh
City and Haiphong. In fact, in 2000 Ho Chi Minh City had a higher share of the total ur-
ban population than Hanoi (25% vs 20%), a trend the former will maintain at least until

16 In view of the trends shown in Figure 9-2 that urbanisation is still increasing despite existing major urban
agglomerations contributing declining shares of the growth, we might be seeing a phenomenon where sec-
ondary urban centres, or those with less than 750,000 inhabitants, are playing increasing roles in each
country’s urbanisation. Cohen (2006: 73) notes that future urban growth worldwide is being accounted for
by smaller cities and towns as their combined population is demographically very significant. Further analy-
ysis of the data, especially those concerning different agglomeration units, should bare this out; however,
they are not within the immediate objective of this study.
In terms of their total populations, Phnom Penh, Bangkok and Hanoi continue to account for an increasing share of the national population (Figure 9-2), but the extent to which this is accounted for by either natural increase, rural-urban migration, or administrative change is not clear. The latter may not be a factor at all because projections are made with the assumption that administrative boundaries are the same. In interviews with those involved in municipal planning of Hanoi (Interview, Dr Iwata Shizuo, Appendix 5) and Phnom Penh (Interview, Mr Aunny Ieng, Appendix 6), however, it was evident that the boundaries of these cities may well change. According to Mr Aunny Ieng (Inter-
view, Appendix 6), the boundary of Phnom Penh will be expanded by 30 km from Wat Phnom, a key city landmark on its northern edge, supposedly in 2020 (See Map 10-1). Such an expansion, which will cover the built up areas of Kandal Province, is likely to augment the urban population of the Phnom Penh urban agglomeration, but one which makes good planning sense because the continuity of the built areas is not disrupted by administrative definitions and the true urban spread or sprawl is taken into consideration.

<table>
<thead>
<tr>
<th>Years</th>
<th>Bangkok</th>
<th>Hà Noi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-1955</td>
<td>4.60</td>
<td>8.31</td>
<td>0.67</td>
</tr>
<tr>
<td>1955-1960</td>
<td>4.57</td>
<td>8.31</td>
<td>0.67</td>
</tr>
<tr>
<td>1960-1965</td>
<td>3.67</td>
<td>7.08</td>
<td>2.27</td>
</tr>
<tr>
<td>1965-1970</td>
<td>3.70</td>
<td>7.09</td>
<td>-0.48</td>
</tr>
<tr>
<td>1970-1975</td>
<td>4.23</td>
<td>7.31</td>
<td>-1.40</td>
</tr>
<tr>
<td>1975-1980</td>
<td>4.13</td>
<td>6.49</td>
<td>-1.40</td>
</tr>
<tr>
<td>1980-1985</td>
<td>2.23</td>
<td>1.82</td>
<td>4.40</td>
</tr>
<tr>
<td>1985-1990</td>
<td>2.18</td>
<td>1.82</td>
<td>5.05</td>
</tr>
<tr>
<td>1990-1995</td>
<td>0.73</td>
<td>1.82</td>
<td>6.84</td>
</tr>
<tr>
<td>1995-2000</td>
<td>0.73</td>
<td>1.83</td>
<td>6.55</td>
</tr>
<tr>
<td>2000-2005</td>
<td>0.81</td>
<td>2.09</td>
<td>3.25</td>
</tr>
<tr>
<td>2005-2010</td>
<td>1.09</td>
<td>2.43</td>
<td>3.98</td>
</tr>
<tr>
<td>2010-2015</td>
<td>1.32</td>
<td>2.47</td>
<td>4.24</td>
</tr>
</tbody>
</table>

Table 9-4 Average annual rate of change of capital cities (Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat 2005)

The average rate of change of the population of the three cities in this study is shown in Table 9-4 where estimates dating back to the 1950s and projections until 2015 are shown. The 1980s is a watershed for population change in these cities. First, Phnom Penh’s population made a modest climb in the late 1960s to a substantial decline in the 1970s then to a rebound in the mid-1980s and peaking in the mid-1990s. This trend can be explained in large part by the massive population dispersal to rural areas pursued by the Khmer Rouge regime (Chandler 1996) resulting in the deurbanisation of Phnom Penh. Millions died or perished along the way so that the make up of the population was dramatically altered. Second, both Bangkok and Hanoi experienced a drop in growth rates during the early 1980s. During the period 2000-2005, the average...
rate of change was at slightly above 3% for Phnom Penh, less than 1% for Bangkok, and just slightly above 2% for Hanoi. This gives Bangkok the lowest rate of change among the cities in the study; and in fact, even among the cities in the developing world, according to an interview with Dr Douglas Webster, who at the time of the interview was an urban planning consultant of Thailand’s National Economic and Social Development Board (Interview, Appendix 4). Observations of slower rates of change of urban population is also noted by Cohen (2006: 72) for other mega-cities. He opines that the growth rate of a city’s population usually declines when the scale of the city increases reflecting slower national population growth rates. But Jones writing earlier (2001: 7-8) cautions us on this interpretation as it is based on what he regards as erroneous assumptions. He argues that while the metropolitan core, which is administratively defined, may be growing slowly, the inner zones of the extended metropolitan region tend to grow much faster so that slow growth in the former is negated by the latter as these areas are large enough to push megacity growth by net-inmigration. It can only be said that growth is slow if the whole extended metropolitan region exhibits it after careful study. Another factor he considers is the tendency to undercount population in megacities during censuses. Essentially, therefore, the perceived slow rate of megacity growth arises from a lag in re-drawing city boundaries to take account of urban sprawl.

It would appear from the discussions above that urbanisation as seen in Southeast Asia is a ‘city-based’ phenomenon in that the city or the urban core is the primary driver of urban change. This is true to some extent. However, work by geographers (e.g., Douglass 1991; Ginsburg, Koppel, and McGee 1991; Greenberg 1994; Jones 1997, 2002; McGee 1991) on the region has showed that not all cities exhibit this tendency. The region’s megacities have shown a different characteristic of urbanisation wherein a ‘region’ (i.e., an area composed of different zones, ecosystems, and administrative boundaries, different from ‘region’ in a geopolitical sense) is driving urbanisation, instead of the urban core, leading to what has been described as ‘region-based urbanisation’. Here, intense changes have been situated in what is broadly described as the peri-urban. The process by which urbanisation in this zone occurs falls into the rubric of what is called periurbanisation. The peri-urban is geographically delineated as “areas
occurring outside city cores and adjacent contiguous built-up areas that may extend for
distances up to 100 kilometres from the city core" (McGee 2003: 3). Thus, the peri-
urban is defined both by the intensity of its rural and urban interaction, which is rap-
idely evolving and redefining the boundaries of what constitutes the peri-urban (Adell
1999: 3). This is due to the linkages, or flows, of people, goods, money, information and
waste across rural and urban spaces and the sectoral interactions of various activities
across these spaces so that some rural activities are now found in urban areas (e.g. ur-
ban agriculture) and manufacturing industries are increasingly being located in rural
areas (Tacoli 1998: 3). It follows, therefore, that the nature of peri-urban development is
influenced by a host of factors such as patterns of landownership and transport infra-
structure (Townroe 1996: 26), the availability of marketing channels, population den-
sity, and access to waterbodies. Even the nature of work in the peri-urban may be af-
fected by the patterns that predominate in cities, which are highly specialised and atom-
ised, as compared to more communal and collaborative working relations in rural areas

According to Webster, the changes that underlie periurbanisation are (i) shifting
local economic and employment structure from an agriculturally based to a manufactur-
ing-dominated economy; (ii) rapid population growth and urbanisation; (iii) changing
spatial development patterns; and (iv) rising land costs (Webster 2002b: 8). These em-
bolden the idea of a continuum of different scales and land uses so that a more appro-
priate term should be the "peri-urban interface". This is defined as

a dynamic zone, both spatially and structurally. Spatially it is the transition zone between
fully urbanised land in cities and areas in predominantly agricultural use. It is characterised
by mixed land uses and indeterminate inner and outer boundaries, and typically is split be-
tween a number of administrative areas. The land area which can be considered peri-urban
shifts over time as cities expand. It is also a zone of rapid economic and social change, char-
acterised by pressures on natural resources, changing labour market opportunities and con-
straints, and changing patterns of land use. Intense rural-urban interactions give rise to
numerous flows of capital/investment, commodities, natural resources, people, labour,
knowledge, energy, water, waste and pollution. (Rakodi 1999: 1)

This leads McGee (2003: 3) to claim, rightly, that "peri-urban regions become the
very centre of the local-global nexus and the rejigging of regional urban space". In the
early 1990s, McGee (1991) described a peri-urban space that is distinctive to the mega-
urban regions of Asia, which he termed as 'desakota'. Much of the literature on periur-
banisation considers 'desakota' a model of peri-urban change specifically applicable to
Asian megacities. The notion of a desakota was discussed in section 2.4.

9.7 Summary

In this chapter, I have described the main features of the landscapes in the field sites: water and flooding. These features define the lives of people, plants and animals in these cities. Their continued presence in the landscape enables the production of kangkong in a sustained manner as kangkong is an aquatic macrophyte which is generally considered a weed but now finds its place among the most versatile and popular vegetables in Southeast Asia. A weed is a 'plant out of place'. But in the case of kangkong, it has been shown that such a concept of a weed no longer applies. Instead, kangkong is a plant 'in its place', so to speak, because it has properly taken a role where it matters: on the table, in the food habits, livelihoods, and memories of Southeast Asians, whether expatriate, diasporic or local. To use in a phrase, kangkong has planted itself in the fabric, memories and desires of people in the region. The ecology and agronomy of kangkong explains why it is easily cultivated by peri-urban households and more importantly, the involvement of women in its production. The cultivation of kangkong does not take all of the producers' time as discussed in section 8.1. Most farm activities happen in the morning and by mid-afternoon when the sun is at its highest producers can decide either to relax or prepare for the journey to the market in early afternoon so that the produce reaches the market just in time for the culmination of the afternoon wholesale market in the case of Bangkok. In Hanoi and Phnom Penh, the middlemen or collectors come from other areas in mid-morning so that supply should be ready by then especially if kangkong is destined for the food market. The livestock market of kangkong is less time demanding because no special packing or harvesting is needed.

The history of kangkong is interesting because it lives a dual existence, being a crop in Asia and Africa and being a weed in other warm and moist regions. Kangkong thrives in nutrient rich environments and the use of wastewater connects kangkong production with the metabolism of the city. It is this interweaving of different spaces, resources, and interests that make kangkong both emblematic of and resulting from the geographies of interstitial spaces. In other words, kangkong, its production, and the
households involved in its production occupy 'multiple scales'.

Despite the use of wastewater, especially in Hanoi and Phnom Penh, studies have shown that the consumption of *kangkong* is generally safe. But the producers may be exposed to some problems due to their direct contact with wastewater such as skin and gastro-entistinal problems. However with safer farming practises such as proper washing after using wastewater and wearing of protective clothing, these negative impacts may be minimised.

The exploitation of *kangkong* is set alongside changes in the wider urban environment which function at different geographic scales (cf. Bryant 1995: 257). The physical make up of cities in this study are evolving, splintering and therefore, turbulent. Bangkok is an Asian megalopolis while Hanoi is following a path of massive urban change. Although substantial changes are already happening in the urban fabric of Phnom Penh, the scale of these changes are not yet as pronounced as either Hanoi or Bangkok. Despite being a 'fourth world city' (Shatkin 1998), Phnom Penh will host more changes than other places in the country because it is Cambodia's only commercial centre and the country's capital.

Over the long term, urbanisation will continue and will bring in fresh development challenges to these cities. The processes attending urbanisation will continue to harbour turbulence and ambiguities for peri-urban spaces, in general, and for the production of *kangkong*, in particular. In the next chapter, we will look at the nature and characteristics of turbulence and ambiguities seen within the ambit of trajectories of change.
Chapter 10
Turbulence and path dependence

[

(...) the urban fringe is presented as an arena in which multiple forces at different scales operate on human activity and in which local and individual actors have an important part to play. Bryant (1995: 256)

This chapter looks at the characteristics of the trajectories of change of land, households and production systems given the current state of the political economy of the three cities, existing environmental endowments, and the ecological realities of *kangkong*. Such trajectories of change are also partly driven by the cultural artefacts extant on the landscape such as human institutions, mores, behaviours and attitudes. These define how *kangkong* production unfolds into the future and in the process becoming an important counterpoint to livelihood changes in peri-urban Southeast Asia.

This is so as

Landscapes are always in the process of "becoming," no longer reified or concretized — inert and there — but continually under scrutiny, at once manipulable and manipulated, always subject to change, and everywhere implicated in the ongoing formulation of social life. (Schein 1997: 662)

As such, what we are interested in here is to identify livelihood trajectories as underpinned by the trajectories of the landscape. Trajectory means "a path through time" (Bagchi et al. 1998: 457). So, our first stop is a discussion on the history of livelihoods and land uses and the creation of legacies which subsequent livelihoods benefit from. In other words, we will begin our discussion with the notion of path dependence.

It is noted that these legacies are reflected in notions of rurality and urbanity wherein
the close rural-urban connection is creating a different mindset which is neither totally rural nor totally urban. One manifestation of this mindset is reflected in the aspirations older generations have for their offspring. Then we look at the nature of spatial turbulence as manifested by the changes observed by the households including new types of land uses, the negative environmental impacts they bring, and the rising land prices that characterise all the cities. In this way, we will come to understand the prognoses of the producers concerning the futures of their production systems, while paying attention to the threats or problems that accompany such futures. These prognostications are characterised by ambivalence or ambiguity due to changes observed in the landscape, which in most instances can be characterised as turbulent, as defined in section 2.9, and their perceived potential impacts on people's livelihoods. All these happen within an existing institutional framework characterised by some degree of institutional fuzziness as far as the production of *kangkong* is concerned. Such fuzziness may originate from the fact that the boundaries of the rural and urban are themselves indeterminate.

### 10.1 Path dependence – the history of livelihoods and land uses

The original land use among surveyed households in Hanoi, Phnom Penh and Bangkok tended to be rice which has changed mainly to aquatic plants and land vegetable production\(^1\). All of the farmers interviewed for the qualitative interviews were formerly rice farmers (Interviews, Appendices 4 to 6). Declining productivity and income from rice forced a number of them to change to other more productive occupations such as farming aquatic plants and fish. In the case of *kangkong* farming, if a farmer has a sizeable farm enabling harvest rotation, cropping can be undertaken everyday to yield cash for daily needs. In contrast, rice farming is seasonal. Income from rice farming takes months to materialise. In the meantime, farmers have to rely on savings or other sources of income for their daily sustenance. In Hanoi, the onset of winter means that the yield of cold intolerant species such as *kangkong* declines so that households shift to farming watercress and water dropwort. But the *kangkong* fields are not totally obl-

\(^1\) The shift away from rice production as claimed here should not be interpreted as the end of rice production per se because it still is an important crop in much of rural Southeast Asia. Rice is still a dominant land use but the degree of such dominance is decreasing. Estimates suggest that it occupies two-thirds of arable land in the region (around 38.5 million ha). In Viet Nam, it accounts for 118% of arable land while it is 48% in Thailand (Hill 2002a: 3). The figure for Viet Nam results from multiple cropping.
erated in the interim when growing winter crops. Instead, *kangkong* plants are left in the field while the households are busy tending to their winter production. Production then quickly cycles back to non-temperate production systems when the cold temperature eases. In Bangkok, the shift from rice to other production systems is not only restricted to the field site. For instance, Mr Vichai, a 67 year-old fish farmer in Lumsai, Lumlukka District, Pathumthani remembers his short life as a rice farmer, which ended when he was just 15 years old. He noted:

> It's [rice farming] not enough to live by. Our income was a little more than 10,000 baht or 20,000 baht per year. We had to borrow money for the next crop because the income from the last crop was already finished.

In addition, a lucrative market for topsoil in the construction industry has also aided the move from rice production to aquatic plants and fish. It was noted in interviews that farmers switch to these production systems once they have sold their topsoil and a pit, which can be turned into a pond, is carved out for them. The top soil coming from the farmers' fields are used to fill up low lying areas in preparation for the construction of buildings and housing estates leading to a boom in the market for fill materials, which are increasingly becoming scarce due to demand from many large scale developments (Hara, Thaitakoo, and Takeuchi 2008: 85). In Nonthaburi, the construction of housing estates has been growing for years now (Jongkroy 2006).

Others abandoned rice farming when the land they tilled was taken back by the owners and their ricefields were no longer suitable for rice due to changes in soil quality and flooding regime, such as in the case of BCE (Interviews, Appendices 4). Mrs Siv Sa, a 57 year-old morning glory farmer in Phnom Penh who lost her husband during the Pol Pot regime and had lived in the lake since she was 32 years-old recalls her shift from rice farming to morning glory farming. "I stopped it in 1993. I've farmed morning glory since that time. The reason for change was because the flood lasted longer. There was no dry place in the lake to farm rice", she reasoned.

As discussed in section 8.3, previous forms of resource use have created a legacy in the form of skills, insights, and possibly implements to carry out existing production. The previous experience of households in rice production prepared them for *kangkong* farming because both are in some ways similar production-wise. Although they are bo-
tanically different and their agronomy demands different attentions, previous engagement with rice production has preconditioned *kangkong* farmers to agricultural production. That is, the care and attention given to their production system are based on an intimate knowledge of the ecology of the plants, the potentials of the soil they are grown, and the overall environment within which they are cultivated.

![Photo 10-1 A newly planted field of *kangkong* in Nonthaburi with straight, but wider, rows reminiscent of modern rice farming technique of straight-row planting, 2005. Intentionally left dry as part of farm management. Water will be released after two to three weeks. (Photo by: Author)](image)

10.2 Turbulent spaces

In order to find out how turbulent the peri-urban landscape is in terms of land uses and understand potential directions of change, new developments or changes were monitored\(^2\) within the selected communities chosen for the study in each of the cities. We asked households whether they noticed new development or changes in the land uses around their district or commune. Among the three cities, it is noticeable that Hanoi registers the largest number of observed changes or new developments especially with respect to changes in the spatial landscape such as new roads and bridges, new offices, and new towns. The production landscape of Hanoi is also changing with increase

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\(^2\) Four batches of monitoring occurred every three months between April 2004 to March 2005.
in aquaculture especially in Hoang Mai where it is zoned for aquaculture production resulting in more areas deployed for this activity and the reduction of areas devoted to agriculture production such as rice and vegetable farming (Figure 10-1).

These changes in Hanoi are largely due to the strong interest of the Hanoi People’s Committee in developing Thanh Tri and Hoang Mai Districts into new towns, tourism and aquaculture areas. New bridges and ring roads are built as part of improving Hanoi’s urban transport infrastructure, anticipatory planning of future transport demands of the city, and encouraging dispersal of activities and human settlements away from the city centre, which is already congested. Dr Iwata Shizuo, Programme Manager of the JICA-funded Comprehensive Urban Development Programme in Hanoi Capital City, revealed in an interview that Thanh Tri District will be quickly urbanised as it is within Ring Road No 3 which is planned for urban uses in the next 10 years (Interview, Appendix 5). He further noted that the urban pressure is too strong in Hanoi and that agricultural lands on the fringes of the city are very easy sources of urban land.

Furthermore, the Hanoi People’s Committee is actively developing new urban areas. Some 7.9 million square metres of living space is projected to be developed in Hanoi by 2010. In 2005, 30 of the 50 planned urban areas were constructed and 5 of them have already been completed. These new developments include Ciputra Hanoi International City, a Las Vegas style urban enclave complete with apartment, shopping, and en-
ertainment complexes as well as an international school. It is being developed by an Indonesian property company occupying an area of 405 ha near the West Lake and will accommodate up to 200,000 people when it is fully completed in 2010 (Waibel 2006: 46) (Photo 10-2).

In Phnom Penh, both changes in the production and social landscapes are occurring. The former is manifested in terms of an observed increase in the number of *kangkong* and land vegetable farming activities. Changes in the social landscape in Phnom Penh are increasingly being observed in the number of houses and people living in and on the lake (Figure 10-1). Although it was not probed in the survey, the increase in land farming activities in the lake suggests that more unwaterlogged areas are available. Furthermore, land speculation in Phnom Penh is rampant and extensive, emanating from both licensed estate agents and rogue speculators including politicians (Asian Coalition for Housing Rights 2001: 67; 2004: 13). Interviews (Appendix 6) with producers in Phnom Penh showed that land speculation increased as soon as a road was built on the dike encircling a part of the lake. Mrs Somphom (Interviews, Appendix 6) observed that buyers started coming to their village in 2003, as soon as a national road was completed. She intimated that buying land in her village was “very popular”.

*Photo 10-2 Hanoi’s newest urban complex, The Ciputra Hanoi International City. (Photo from: Waibel 2006: 47)*
over, the Program Manager of a Japanese-funded urban planning project in Hanoi predicted rising land prices as soon as the roads and bridges in Thanh Tri District were completed (Interview, Dr Iwata Shizuo, Appendix 5). In the Nonthaburi field site, land prices have also rapidly escalated over recent years (Jongkroy 2006: 196-203).

It is interesting to note, however, that in about a year of monitoring no significant changes were observed by producers in Bangkok, as shown in Figure 10-1. On this basis, it appears that Bangkok, in general, is less turbulent than Hanoi and Phnom Penh. Could this situation in Bangkok indicate that the overall landscape in this field site is already reaching ‘equilibrium’ or stasis considering that there was an observed change from agriculture to non-agricultural uses? Or could this be due to its distance from the city core? Or is it due to the short monitoring period? These are questions whose answers are only best guesses given the limitation of the data at my disposal.

However, my feeling is that all of these factors connive to create the results we have. For one, works by Askew (2003) and Jongkroy (2006) indicate that land uses are geared towards large-scale housing estates which demand large land areas and the assembly of these lands take a long time to materialise. Mr Vason (Interview, Appendix 4) estimates that 30 to 40% of ricelands has been converted into subdivisions while nearly 100% of the lands along the road have already been sold in NPN. The rest went into kangkong production. We have noted earlier in this chapter that there is a desire to dispose of lands held by the households when the price is right so that more changes are likely to occur once land changes hand from farmers to property developers. Use of land for industrial purposes is not a major factor because Nonthaburi is not a major manufacturing zone; instead, it is the eastern seaboard (Wongsuphasawat 1997: 216) (Map 2-1). If we had a longer monitoring period, or if there was a re-study, a more nuanced picture of the landscape in Nonthaburi would emerge. Proximity from the city core could also be a factor with the intensity of activities declining with increasing distance from the city. Nonthaburi is the farthest from the city core among the field sites in this study, as shown in section 8.2.4 in the discussion of income diversity, distance, and land prices.
10.3 Turbulence and ambivalence

Given the turbulence highlighted above, the future does not, however, unfold uniformly among *kangkong* households. Forty-five percent (45%), 58%, and 49% of respondents from Bangkok, Hanoi, and Phnom Penh, respectively, do not think that there will be changes in the way they farm nor in the nature of their production system in the five years from the date of the survey (i.e., 2004). But to others, some changes, both positive and negative, will occur (Figure 10-2). In Phnom Penh, there is a sense among some of the producers that the future will see a decrease in the area currently devoted to production (21%) and a fall in productivity (7%); yet some of them also see an increase in intensity (10%) and diversification of farmed systems (7%). Since these are projections, we will not be able to tell whether intensification and diversification are responses to area reduction and fall in productivity. What we can say for now is that there is a pervading sense of gloom and struggle to survive in the future, which intensification and diversification may be reflections of the latter.

![Figure 10-2 Direction of change of *kangkong* production in the next five years (Source: PAPUSSA Data)](image)

In Hanoi, there is a prominent opinion that there will be a decrease in the production area (36%) which might necessitate a switch to high value crops or species, a feeling shared by 39% of producers. Other minority opinions seem to corroborate a future of continual struggle to enhance existing levels of production through diversification and intensification.

The case of Bangkok appears to be interesting because ambivalence seems to be defining its trajectory of change. Much of the concern among producers from this city is focused on the size of the production area yet producers have diverging opinions about
it. Some foresee a decrease in production area (28%) while others see an increase (18%). Perceptions of an increase tend to come from those with larger land areas: (Spearman's rho = .38, n = 31, p < .05, two-tailed). There are several ways we may read this. We may look at this trend as a manifestation of the spatial changes happening around the farm and the sort of 'mental calculations' that run through the minds of producers as they think about their future. Those with bigger farms may already be thinking of investing in more lands for kangkong production so as to enlarge their current landholdings. Or this could be an expression of nonchalance among those with smaller landholdings whose previous decisions to dispose of some of their lands conditioned how they see the future of their production system. That is, land disposal is imminent if the price is right.

In the qualitative interviews in Bangkok (Appendix 4), stories of neighbours or relatives selling out their agricultural lands and relocating elsewhere were abundant such that it seems acquisitive real estate companies and housing developers are busy turning Nonthaburi into a major residential hub of Bangkok (cf. Askew 2003; Jongkroy 2006). This is echoed in the findings of Askew (2003) in Bang Khanun and Phimonrat, both sub-districts of Amphoe Bang Kruai and Bang Bua Thong (Map 4-1) in Nonthaburi, respectively, where farmers sell lands to maximise returns at a time when prices are high to pay off debts and invest in land elsewhere while keeping some sections for their children’s inheritance. Thus, Askew argues that

Land is the crucial resource in the task of household reproduction, and access to new opportunities for status and livelihood have been historically tied to the accumulation, preservation and transmission of land. Increasing land prices and new settlements in these districts have been appropriated towards these ends. The capacity to strategically deploy land in the quest for income and status underlies the ways that families in these districts negotiate with, and participate in, the ecological and social transformations around them. The diverse mix of economic activities and household enterprises in these areas highlight these interacting patterns of change. Commitment to agriculture is restricted to an older generation who may look back nostalgically on a simpler past, but urge their children to pursue alternative employment. (Askew 2003: 318)

What we might be seeing in the case of producers in Nonthaburi is, to use a phrase by Holly High in her comment in the New Mandala blog, “a kind of wary hopefulness”. We can read from such wariness an air of ambivalence. While the trajectory of change may be ambivalent, kangkong producers are aware of the threats that will befall their production system (Figure 10-3). The majority of the threats producers (73%) in

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Bangkok are worried about come from future production losses resulting from lack of rain, pollution, and natural disasters such as flooding, which is known to occur in the area (see section 9.1 for discussion about flooding).

![Figure 10-3 Future threats to the production of kangkong (Source: PAPUSSA Data)](image)

Housing estates (*muban chasan*) have spread across the western part of the province since the early 1990s (Askew 2003: 287) (Photo 10-3). These estates constitute the urban uses of Nonthaburi’s land thereby serving a residential function for the urban core. These uses account for 58% of total land uses in the province, which has increased by 13% since 1993 in the process absorbing mainly former agricultural lands. A substantial increase in idle land has also been observed in the province largely due to speculation about future price increases and the lack of interest among children of landowners to work the land (Jongkroy 2006: 96-9) (Table 8-4).

![Photo 10-3 Advertising new housing developments in Nonthaburi, 2004. (Photos by: Author)](image)
In Hanoi, the major threats farmers are worried about are problems with their water sources (92%) and increasing input costs (78%). Farmers see water problems arising in the future due to declining water quantity and quality. During the PCA and SoS, these were raised as key concerns (Institute of Aquaculture - University of Stirling et al. 2003). Other important threats in Hanoi are production losses (42%) and marketing problems (42%). Major sources of production losses are lack of water and poor quality of cultivars. Marketing problems in Hanoi arise due to bad local roads which hinder efficient transport of goods, access to markets, and falling market prices. Changes in land use especially the growth of non-agricultural activities in areas such as Thanh Tri and Hoang Mai where wastewater is used to irrigate crops underlie much of these worries.

For one, the supply of wastewater, which is free and nutrient-rich, will be affected (Nguyen Thi Dieu Phuong and Pham Anh Tuan 2005: 12). For another, there will be increased competition for land so that the highest bidder wins in the end. Since kangkong production is considered subsistent, it will lose out to land uses that are industrial and manufacturing based due to the premium they pay for the land and their perceived greater (and better) contribution to the city economy. At the moment, land use in Hanoi is still predominantly agricultural (Table 10-1) but the transformation of these areas into other uses is on-going (Photo 10-4) (Douglass et al. 2002; Lamb 2004; Leaf 1999; Logan 2000; Nguyen Quang and Kammeier 2002; van den Berg, van Wijk, and Van Hoi 2003; Yeung 2007). The impact of these changes on the future of wastewater-based agricultural and aquatic systems is generally not promising, with some observers (e.g., Edwards 2005a) even predicting a demise. Even among irrigated systems such as found in Thailand, kangkong has the highest variability compared to other vegetables such as Chinese cabbage, tomato, and baby corn (Sootsukon, Dechates, and Wu 2000: 424). But worries about lack of water in Hanoi are the same worries underpinning the production losses we have seen earlier in this section in Bangkok. But too much water also leads to flooding, such as the case of Bangkok, resulting in the destruction of crops as Bangkok systems are not designed to withstand massive inundations in the same manner as Phnom Penh. Recall from section 9.2 that households in Phnom Penh set up their kangkong fields to adjust to increasing water levels by anchoring them to ropes instead
Table 10-1 Land use of Hanoi in 2003 (Source: General Statistics Office 2005:20)

<table>
<thead>
<tr>
<th>Types of land use</th>
<th>Total area, Hanoi (000 ha)</th>
<th>Total area, Red River Delta (000 ha)</th>
<th>Total area, whole country (000 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural land</td>
<td>41.8</td>
<td>850.7</td>
<td>9,531.80</td>
</tr>
<tr>
<td>Forestry land covered by trees</td>
<td>6.6</td>
<td>122.1</td>
<td>12,402.20</td>
</tr>
<tr>
<td>Specially used land</td>
<td>22.6</td>
<td>245.1</td>
<td>1669.6</td>
</tr>
<tr>
<td>Homestead land</td>
<td>11.6</td>
<td>93</td>
<td>460.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>92.1</strong></td>
<td><strong>1,481.20</strong></td>
<td><strong>32,931.40</strong></td>
</tr>
</tbody>
</table>

While rumours abound that the government will take back the land to build new factories, Mrs Che in Hanoi (Interview, Appendix 5) noticed that some lands are already converted while Mr Chung is blasé about the impacts of these new developments on his VAC system. He said: “If the government allows us, we will continue. We are old so we cannot change to other jobs”. However, Mr Da is not at all worried that the government will recover all his land and garden. In fact, he hoped that it would happen. “Because if this area will be industrialised my children can get job in industries. My children have knowledge and I am old enough to retire”, he explained. But for Mr Phuong, the loss of

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4 In spite of this, large flooding still affects households in Phnom Penh as raised in the PCA (Chhouk Borin et al. 2005a, 2005b)

5 Land recovery refers to the return of land accessed through auction or leased from the state prior to the end of the contract period.
land will affect his family and livelihoods so that the best course for his children is to prepare themselves. "Yes, we lose the land so our children must have the skills and knowledge to be able to find work in factory or office. For adults who do not have the skills, it is difficult for them to find jobs. Teenagers need to go to school", he continued (Interview, Appendix 5).

In Phnom Penh, production losses (57%) and increase land use competition (24%) are seen as future major threats. Production losses are thought to arise from inorganic pollution, lack of rain, and theft. Threats from land use competition come from fear of being displaced due to increasing encroachment by non-agricultural land uses and increasing reclamation of the lake (Photo 10-5). Map 10-1 shows the westward expansion of urban development in Phnom Penh, especially along the road leading to the airport. Although this development skirted away from the BCE region, it does have ripple effects for the whole spatial arrangement of the city in terms of providing for the residential needs of the city's inhabitants. Since early 2000, the BCE region has seen substantial changes in its landscape particularly in the increase in residential developments in the area brought about in large measures by the building of new or improvements to existing infrastructure such as the surfacing of roads, improvement in the drainage systems, and new flood control and pumping stations. Several textile industries were also established here bringing in hundreds of manual labourers. Planning the land uses of the city has been haphazard. 'Free' surfaces such as boengs and embankments have been used as residential areas leading to the growth of informal settlements in these areas and along main road axes creating social and environmental problems such as lack of drainage, waste disposal, and traffic congestion (CTI Engineering Co Ltd

Photo 10-5 'Making land' – land reclamation or extension in Phnom Penh in 2005. (Photos by: Author)
and Nippon Koei Co Ltd 1998: 18-19, 41). Predominantly light industries such as textile and garment production, which are either home-based or located in small buildings scattered across residential areas, are found in Phnom Penh (CTI Engineering Co Ltd and Nippon Koei Co Ltd 1998: 19-20).

Map 10-1 Direction of urban development in Phnom Penh (Source: Bureau of Urban Affairs, Municipality of Phnom Penh)

Table 10-2 describes the land uses of the city in 2020 as illustrated in the current master plan. It shows that the city will grow from an area of 375 km² to 452.3 km². Despite this growth, the city still has sizeable agricultural areas as well as other undeveloped areas. The city core covers at present an area of 110 km² (Balmisse and Maisonhaute 2005: 17).

Table 10-2 Current land uses of Phnom Penh as translated from Khmer based on a French document (Source: Bureau of Urban Affairs 2005)

<table>
<thead>
<tr>
<th>Land uses</th>
<th>Area (ha)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peri-urban agriculture area</td>
<td>10,000</td>
<td>22.0</td>
</tr>
<tr>
<td>Residential expansion area</td>
<td>8,800</td>
<td>19.5</td>
</tr>
<tr>
<td>Existing suburb area</td>
<td>6,200</td>
<td>13.7</td>
</tr>
<tr>
<td>Loose density village area</td>
<td>6,000</td>
<td>13.2</td>
</tr>
<tr>
<td>Green park/leisure area</td>
<td>4,700</td>
<td>10.4</td>
</tr>
<tr>
<td>Economic-industrial activity area</td>
<td>3,000</td>
<td>6.6</td>
</tr>
<tr>
<td>Planned city area (1959)</td>
<td>2,000</td>
<td>4.4</td>
</tr>
<tr>
<td>Natural zone</td>
<td>1,400</td>
<td>3.0</td>
</tr>
<tr>
<td>Secondary central and special development</td>
<td>1,100</td>
<td>2.4</td>
</tr>
<tr>
<td>Area for logistical platform/port</td>
<td>900</td>
<td>1.9</td>
</tr>
<tr>
<td>Historical city core area</td>
<td>470</td>
<td>1.0</td>
</tr>
<tr>
<td>Wastewater treatment plant</td>
<td>430</td>
<td>1.0</td>
</tr>
<tr>
<td>Reserve area for public equipment</td>
<td>230</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45,230 (452.3 km²)</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

In 2020, this core is projected to have already expanded and occupied formerly agricultural or empty lands. Recent estimates show that 80% of the city’s land use is natural lake and agriculture while only 20%, or 6,200 ha, is accounted for by urban uses. The city has registered a medium density
population to land ratio at 130 people/ha, although the city core has about 500 people/ha as opposed to 50 people/ha in the suburbs (Municipality of Phnom Penh 2005). Thus, Phnom Penh's urban spaces are not yet as dense as Hanoi or Bangkok.

10.4 Rising land cost

The changes noted above are also accompanied by an increase in land prices, which may be characterised as astronomical if the prices cited in Table 10-3 are taken as indicative. That said, among the study sites, the changes in Nonthaburi in Bangkok appear to be less dramatic compared to either Hanoi or Phnom Penh, particularly when viewed in terms of land speculation by people based outside of the community. In sections 6.2 and 8.2.4, the spatiality of land prices was noted so that land more distant from the city centre will have a lower price than that which is closer (cf., Dowall 1992; Lewis 2007; Wisaweisuan 2001). A spatial price map (Map 10-2) provided by a realty company in Phnom Penh shows that areas away from the city centre have lower prices, at USD 20-50/m² in 2005. Similar estimates at USD 20/m² for an area close to the Boueng Trabek pumping station were provided by Mr Aunny Ieng of the Bureau of Urban Affairs of the Municipality of Phnom Penh. Furthermore, he said that the same piece of land was priced in 2004 at less than USD 10/m² (Interview, Appendix 6). Phnom Penh and its adjacent province, Kandal (Map 4-4), have the highest land prices in the country ranging from USD125 to 250/m² in 1997 (Boreak 2000: 18). The increase in land prices is likely due to a number of factors which include the improvement of infrastructure in the area such as the presence of new roads, dikes, and flood control systems. According to ALMEC Corporation et al. (2007: 9-49), sewerage projects generally raise land prices by 3 to 5% after their completion. This is logical as the presence of infrastructure, amenities and other services raises the market value of the land. Mrs Pam Thi Lan in Hanoi, for example, observed that the price of land next to the main road was 10 million VND/m² while land inside the village was around 5 million VND/m² (Interview, Appendix 5). Similar observations were made by Mrs Somphom in Phnom Penh (Interview, Appendix 6):
land is increasing. For example, now they buy the land for $2,000 to $3,000 per hectare. In the future, they will sell the land for $10,000 to $20,000 per hectare.

In Sainoi in NPN, the price of land has gone up when the road was built in 1977 which was then followed by the mushrooming of housing subdivisions around the early 1990s, according to Mr Pon (Interview, Appendix 4).
Due to the perceived high returns to hedging on the future of a piece of land around the peri-urban zone, land speculation is rampant. Some of the speculators in Hanoi are government officials who are privy of the future land use plans of the districts in the city (Mr Nguyen Van Binh, Interview, Appendix 5). In section 8.3, we have already shown widespread land speculation in Phnom Penh. The rapid turnover of land especially along major highways connecting Nonthaburi and Bangkok is also due to speculation (cf. Askew 2003; Jongkroy 2006). According to interviews, the land in adjacent villages of the field site in Nonthaburi, which are located along the main road from Bangkok, have nearly all been sold to outsiders. Furthermore, another facet in this land disposal in Nonthaburi is the sale of topsoil, an increasing trend in the province, for use in landfilling for housing or building sites. Although this is not the same as land purchase because there is no transfer of ownership, the removal of the topsoil is likely to change the land use of a plot of land as the topsoil is the productive part and a crater is left after it is carved out (Interviews, Appendix 4).

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Site</th>
<th>Previous (Various reference periods)</th>
<th>Present (c2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr Pon</td>
<td>Bangkok</td>
<td>Before 1977: 600 baht/rai</td>
<td>&gt;1 million baht/rai</td>
</tr>
<tr>
<td>Mr Vason</td>
<td>Bangkok</td>
<td>In the past (no date): 70,000 baht/rai</td>
<td>400-500,000 baht/rai</td>
</tr>
<tr>
<td>Mrs Vien and Mr Ng Duc Thanh</td>
<td>Hanoi</td>
<td>No one bought land until 3 to 4 years ago (c. 2005)</td>
<td>10 million duong/m²</td>
</tr>
<tr>
<td>Mrs Nguyen Thi Chong</td>
<td>Hanoi</td>
<td>A few hundred thousand dong in the past</td>
<td>3 million/m²</td>
</tr>
<tr>
<td>Mrs Vu Thi Thuy</td>
<td>Hanoi</td>
<td>300,000-400,000 VND/m² in past</td>
<td>10,000,000 VND/m²</td>
</tr>
<tr>
<td>Mrs Luu Thi Chung</td>
<td>Hanoi</td>
<td>c1995: 700,000 VND/m².</td>
<td>12,000,000 VND/m²</td>
</tr>
<tr>
<td>Mr Cao Van Phuong</td>
<td>Hanoi</td>
<td>c2000: 100,000 VND/m²</td>
<td>14 million VND/m²</td>
</tr>
<tr>
<td>Mr Nguyen Van Rinh</td>
<td>Hanoi</td>
<td>Some hundred thousand dong</td>
<td>c1995: 7.8 million/m²</td>
</tr>
<tr>
<td>Srey</td>
<td>Phnom Penh</td>
<td>1990: $750/1 plot of 60m²</td>
<td>2004: $30 per m²</td>
</tr>
<tr>
<td>Mrs Somphorn</td>
<td>Phnom Penh</td>
<td>1993-1995 land was bought in gold units. It was about 1 dam-leung/ha.</td>
<td>Two to three months later, it was 2-3 dam-leung/ha. Later, it increased to 20 dam-leung/ha. Now, it is sold in dollar.</td>
</tr>
</tbody>
</table>

Table 10-3 Land price estimates in different cities based on interviews with kangkong producers (Appendices 4 to 6).

The topsoil is used to raise large scale housing estates from flooding which we have shown in section 9.1 to be a regular feature of this province especially during the monsoon season.
10.5 Notions of rurality-urbanity and generational aspirations

The rural and the urban as far as the spatial, physical, and emotional existence of kangkong households are concerned is a hybrid. Theirs are lives lived in the interstices. They are rural occupationally, but physically and emotionally urban. They earn a living through daily toil and the abundance of the earth (or shall we say waste?). Yet their lives are increasingly being wired to an urban existence. The nature of infrastructure that support their lives are considered different between rural and urban living. Traffic lights, paved roads, reliable bridges, and, most importantly, electricity are some of the notable differences especially in Phnom Penh where having a light connected to mains electricity is a luxury. Even the lifestyles are considered different. The consensus is that the rural is quiet and the urban is crowded. The rural also has more empty spaces while the urban, although very dense spatially, is plain ‘empty’ (in emotional terms) in a sense that neighbours are inaccessible and the relationships are impersonal (Interviews, Appendices 4 to 6). However in the words of Mr Vason, he used the term ‘empty’ in relation to a space devoid of people: “Life in Bangkok is much more crowded. But here it is very empty. It’s easy to visit other people’s houses” (Interview, Appendix 4).

The nature of the occupation is also another defining characteristic of whether a place is urban or rural. To all producers interviewed, rurality is associated with a strong connection with the land (read: agriculture) so that producers in both Hanoi and Phnom Penh consider themselves to be partly rural and partly urban because they view their agricultural occupation as rural while being aware that their location is urban. Some of them even find it hard to define whether they are located in a rural or urban space because much of their livelihoods is “like rural” yet the city is within sight, and also quite possibly, hearing and smell. The dichotomy is captured in Mrs Pham Thi Lan’s comment (Interview, Appendix 5): “rural is working in pond, farm. Urban is working in factory, company, industry.”

In contrast, the preponderance of rice farming in Nonthaburi is indicative of a rural existence. They do not seem to consider the massive growth of housing subdivi-
sions as part of a process of the urbanisation of their locale. When Mr Pon in Nonthaburi was asked during the interview what he thought was a rural area, his wife who was listening in the corner cut in and offered her unsolicited opinion. She said: “a rural area has a lot of rice farming. A city is more developed; more roads and the roads are smooth” (Interview, Appendix 4).

Gone are the days spending time on the backs of pastured water buffaloes serenaded by chirping insects in the late afternoon. Or being immersed in swamplands, fishing. Swamps, streams, ditches, and canals are no longer the havens of wildlife they used to be. Much of them have become polluted water holes from wastewater emptied out from factories or households as the previous section has shown. Entertainment has, thus, made a drastic change away from rustic joys. To spend time away from the drudgery of home, kangkong farming families troop to the nearest mall, open air markets, restaurants, or karaoke joints (Interviews, Appendices 4 to 6).

One peri-urban dweller, Mr Manu, although not a kangkong farmer himself but an imam in a local mosque, said in an interview that what differentiates a rural from an urban existence is the nature of the toilets they now have. With a hint of nostalgia but said jokingly, he recounted how during his time in the countryside his family had to use the bushes and grasslands as toilets. Now they are afforded the luxury of a seating ceramic flush toilet in immaculate white colour just a few steps from their reception room. This is urbanity to him (Interview, Appendix 4).

But changes on the landscape do not only have impacts on the landscape itself but also on producers. These changes may bring in new lifestyles, new material standards, new desires and new aspirations so that the trajectory of change of kangkong production may also reflect these changes. Already there are indications that this is occurring based on the qualitative interviews. The intention to do something else other than kangkong is palpable, as the interview with Mrs Bunthach from Phnom Penh (Interview, Appendix 6) shows:

Question: Would you encourage your children to pursue kangkong farming?

Mrs Bunthach: I don't want them to get this job; I want them to do other jobs. But I don't own a plot of land. I am renting land from other people. It's difficult for me to farm kangkong on rented plots. When an owner rents land to me, I can continue my production system; but
when he or she doesn’t, I can’t.

Question: But if you have your own land, would you want your children to grow kangkong?

Mrs Bunthach: If I have a farmland and if any of my children are married and have no job or business, then I will give part of my land to them and teach them how to grow kangkong.

Question: From your observation, do the children in the village change their occupation from agriculture to non-agriculture?

Mrs Bunthach: Children with no high education are involved in kangkong production with their parents because they could not find better paying jobs. If they work in construction, it is more difficult and it is not easy to get paid. It is also hard to work under pressure and control. For this generation, some children can study in NGO operated schools, some study in public school, so they can get a higher education, perhaps they do not want to be kangkong farmers anymore.

Mr Nguyen Van Binh in Hanoi (Interview, Appendix 5) is more emphatic when asked what he wants for his children. “I want them to work in factories”, he forcefully stated. Others such as Mr Nguyen Van Kien in Hanoi felt that he cannot force his children to work on the farm even if he wants them to, while Mr Pon in Nonthaburi (Interview, Appendix 4) is more accepting of the fact that his children are already too old (i.e., between 25 to 27 years old) to shift from farming:

Question: Do you prefer to see your children working here or attain higher education and become someone other than being farmers?

Mr Pon: I don’t hope anymore.

Question: Why?

Mr Pon: Too late [...] they’ve grown up already.

Then when probed on what he would feel if his children sold their land and moved out of farming, his response was one of acceptance and resignation that one cannot dictate to ones children: “It depends on them. By that time, I am already dead. I already divided my land into four pieces and kept six rai for me and my wife.” The nature of farm work is a major source of their concern. Mr Ng Duy Thanh of Hanoi (Interview, Appendix 5) considers it “hard, dirty and ugly work”. In fact, he just wants to sell some of his lands to renovate his house. He reckons that young people would be better off if they worked in other occupations, instead of farming aquatic plants, because “they can earn 700,000-1,000,000 VND/month. If they are unskilled labourers, they have to work in the farm and it is poor”.

The above aspirations of members of kangkong households is not at all surprising as similar aspirations are found in other rural areas in Thailand. Rigg’s (2001: 952-3) investigation in a village in Northern Thailand, located hundreds of kilometres from Bangkok, shows that primary and secondary pupils aspired to become somebody except
being a farmer. "[...] just one student out of 38 expressed a wish to work in agriculture [...] [the rest] were looking elsewhere [...] beyond the village", he writes. This and other engagements with the different facets of the village led Rigg (p. 955) to conclude that "people's desires [...] are profoundly different today [...] Patterns of labor force participation change not only through individuals' lives but also between generations". The same generational differences in Bangkok and Hanoi are reflected in kangkong as shown in section 8.2.2.

10.6 Institutional fuzziness, kangkong and the rural-urban divide

The urban and rural dichotomy discussed above is also reflected institutionally in the way urban issues are handled by mainstream government authorities. Agriculture is primarily rural posing a dilemma to urban agriculture.

Urban agriculture has an uphill fight to overcome the view of planners and economists that agriculture is an inappropriate, misplaced use of land in the urban economy and landscape; the belief of sanitary engineers and doctors that it is "unclean" and a health threat to the population; and [...] contrary to the "city beautiful, clean and efficient" ideal. (UNDP 1996: 212)

An example of the impact of this lack of institutional recognition is the absence of production data especially in Cambodia and Viet Nam on kangkong, presumably because the production of kangkong is perceived to be a subsistent activity. There is an attitude, at least in these countries, of the plant as being "there and everywhere" so even talking about it as an area of academic study is sometimes met with a deprecating smile, as if it is a joke to be concerned with such a commonplace plant. Mrs Sunee Suk-samran feels the same way: "Some people see this kind of life as undignified. They consider morning glory a swamp weed, but I've got everything from the plant" (Pornpitagpan 1999). Because kangkong does not figure in agricultural statistics, it has no "identity or validation as a productive sector of the economy" (cf. UNDP 1996: 214). It is only in Thailand where there is a government agency collecting production statistics on kangkong, presumably because it is a commercial crop with economic value and export potential. Having said that, the data collection in Thailand appears to be haphazard and underestimates the true extent of kangkong production.

Desakota development, as happening in the region, has further made the rural-urban dichotomy unhelpful because it neglects those areas that are semi-rural, semi-
urban or those areas where rural-urban interaction is intense. Back in the early 1990s, the ramification of this situation had already been appreciated leading Ginsburg (1991a: 35) to warn that

[This dichotomy needs to be carefully reviewed. It no longer is meaningful as it was, if indeed it continues to exist at all in certain areas. Rather, we need new modes of thought about the evolving regions of intensive metropolitan interaction that seem to be characterizing most Asian countries [...] Therefore, the planning of the Asian city required not only planning for change, since change was rapid, but planning for tributary areas adjacent to the cities, which were becoming rapidly integrated with them.]

Institutional fuzziness is, however, not solely a concern for kangkong production. A whole range of peri-urban aquatic production systems are imbued with fuzzy institutional frameworks. This has been reviewed in Rigg and Salamanca (2006) in the case of peri-urban aquatic production systems, by World Bank (2006a) with regard to the urban planning system in Hanoi, and by the NESDB (1991) on Bangkok. Without repeating what has been said in these publications, I want to highlight the fact that existing institutions still rigidly divide the rural and the urban expressed through sectoral plans (Dixon and Smith 1997: 17; The World Bank 2006a: 32) and this is blind to the depth of rural-urban linkages that define spaces in Southeast Asia (Douglass 1998; Hoang Xuan Thanh, Dang Nguyen Anh, and Tacoli 2005; Kelly 1998; Rigg 1998; Rigg 2003). Instead of thinking in terms of such a divide, it is best to think in terms of the synergies, expressed in terms of enhancing market opportunities for example, of such rural and the urban linkages to counteract the negative externalities of institutional fuzziness (Chowdhury, Negassa, and Torero 2005).

10.7 Summary

This chapter has shown the path through which the development of kangkong production arose. It also shows how the future is marked by different degrees of turbulence, which spatial change brings about. Moreover, the chapter also described the historical involvement of households in rice production. Previous involvement in rice production was not only a characteristic of the trajectory of household livelihoods but also of the spaces within which households were located. Rice production has been part of the Southeast Asian landscape (Hanks 1992). It is argued here that previous engagement in rice production has left legacies which kangkong producers have built on. The
presence of rice production as a predominant use of the land is one characteristic of being rural in Nonthaburi. Such path dependence is one of the features in McGee's desa-kota. How households locate themselves within the the ‘rural-urban divide’ has been explored in this chapter. Most of the households thought that their activity was rural because it was agricultural but located within a space they knowingly consider as urban because it is designated administratively as such and indicated by the amenities, services and infrastructures available. In the urban, work is also defined as being non-agricultural or non-land based so that industrial and office work are considered the domain of the urban such that all producers aspire that their children will move away from agriculture because they reckoned agriculture is ‘hard work’. For the older generations, however, a sense of resignation is felt in that their age prevents them from switching to other jobs especially when changes in the landscape are occurring. To households in Hanoi and Phnom Penh, their location is “half urban and half rural” because their work is agricultural within an urban zone. In the usual urban planning parlance, this is the peri-urban but for McGee, this is the desakota.

Landscape changes seem to be a characteristic of Hanoi and Phnom Penh and not so much of Bangkok, possibly due to distance from the city core wherein the latter is the farthest. This does not, however, mean that no changes are occurring in the field site in Bangkok. Instead, changes may have a longer gestation period such as for example the period between the assembly and consolidation of large land areas for housing estates to finally constructing them or even the process of road building which takes years to finish. Alternatively, perhaps many of the changes in Hanoi and Phnom Penh are recent so that they are still fresh in the memories of households whereas those in Nonthaburi may have already started in the 1990s so that they have become imprinted in the everyday reality of the households and are no longer perceived as ‘new’. This might imply that the perception of landscape changes have a time dimension; after a while, what was ‘new’ becomes commonplace.

Granted that changes are characteristic of the peri-urban landscape, not all households perceived change homogeneously particularly with respect to their kangkong
production. This chapter has shown that there appears to be a division among households in terms of where their production systems are going; some see change, while others do not. This, to me, indicates an ambivalent perception of the impacts of landscape change on their production systems resulting from turbulent spaces. Or that the impacts of landscape change are long in coming in the same manner that the processes leading to such changes also take time. Finally, these changes occur within a fuzzy institutional landscape brought about by the rural-urban divide and its imprint on existing institutions. Admittedly, a lot can be said about the institutional aspects of kangkong production and landscape change but these lie beyond the scope of this study. In effect, this chapter mirrors a view by Bryant (1995: 266) that “[...] within the urban fringe there is a strong differentiation of space both in the context of the agricultural and rural spaces [...] as well as in terms of the social composition and economic bases of the different communities”.
In this concluding chapter, I will bring together the disparate threads discussed in the various chapters in response to the research questions posed in section 3.1 and offer a reflection on *kangkong* and the hybridities of Southeast Asian urban spaces. I will begin this chapter with discussions on the kinds of households involved in *kangkong* production based on the nature of their livelihood strategies. Then I will look at spaces, urbanism and turbulence.

### 11.1 Households and livelihoods

Using a stylized summary of households-cities in this study, we can array their livelihood strategies in terms of accumulation, consolidation, and survival (Bouahom, Douangsavanh, and Rigg 2004; Rigg 1994; White 1991). White and Wiradi (1989: 293) have shown that accumulation is a strategy among rich households with large landholdings while survival belongs to those with either very small landholdings or who are landless so that other income sources are pursued in order to survive. Accumulation as a strategy is based on the use of “surpluses derived from one activity [...] to gain access
to (and higher incomes in) the other" (White and Wiradi 1989: 296). Consolidation, on the other hand, is a strategy among 'middle'-size peasant households to increase earnings for future needs, although the household could survive just as well without the extra income (White 1991: 47). In other words, households in this study are involved in *kangkong* production for different reasons. This means that they have different 'push' and 'pull' factors underlining their desire to produce this vegetable. The pull factors are given and relate to the unique ecological and botanical characteristics of *kangkong* as highlighted in Chapter 9 and the opportunities for different modes of income diversification that such production system offers as discussed in Chapter 8. The 'push' factors are, however, contingent on local contexts whether environmental or developmental as Chapter 9 suggests. As summarised in Table 11-1 based on the results and discussion from the previous chapters, Bangkok tends to pursue accumulation while Hanoi and Phnom Penh, consolidation and survival, respectively. The large size of land deployed and intensity of *kangkong* production defines Bangkok; the integration with other production systems characterises Hanoi; and the degree of informality of households describes Phnom Penh.

In these paths of accumulation, consolidation or survival, three types of resource users may be identified: agrarian entrepreneurs, quasi-peasants, and peasants. Accumulation is the main goal among agrarian entrepreneurs, wherein Bangkok is an example in this study. Among quasi-peasants, a degree of 'survivalism' and an intention to accumulate are twin strategies. Over the long-term, the goal is accumulation. Hanoi households, in this study, are considered quasi-peasants. Peasants are those who are still tied to the land for the majority of their income and the case of the Phnom Penh households is an instance of this. Urban peasants may be the proper classification of Phnom Penh households in view of their location within the boundaries of the city and very close to the city centre.
<table>
<thead>
<tr>
<th>Indicators</th>
<th>Bangkok</th>
<th>Hanoi</th>
<th>Phnom Penh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wealth</td>
<td>Rich(^c)</td>
<td>Medium</td>
<td>Poor</td>
</tr>
<tr>
<td>Housing durability</td>
<td>Durable</td>
<td>Durable</td>
<td>Less durable</td>
</tr>
<tr>
<td>Ownership of durables</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Car ownership</td>
<td>High</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Toilet ownership</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Land size</td>
<td>Large(^a)</td>
<td>Small</td>
<td>Small</td>
</tr>
<tr>
<td>Land ownership</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Nutrient inputs</td>
<td>High fertiliser use</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Informality</td>
<td>Formal</td>
<td>Formal</td>
<td>Informal(^d)</td>
</tr>
<tr>
<td>Farm income dependence</td>
<td>Highly dependent</td>
<td>Highly dependent</td>
<td>Very highly dependent</td>
</tr>
<tr>
<td>Non-farm income(^e)</td>
<td>Medium dependent</td>
<td>Highly dependent</td>
<td>Low dependence</td>
</tr>
<tr>
<td>Dependence on kangkong</td>
<td>Medium to high</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Involvement of women</td>
<td>High(^b)</td>
<td>Joint with husband(^d)</td>
<td>Joint with husband</td>
</tr>
<tr>
<td>Occupational multiplicity</td>
<td>Low to Medium</td>
<td>High</td>
<td>Low(^f)</td>
</tr>
<tr>
<td>Farm water source</td>
<td>Freshwater(^g)</td>
<td>Some freshwater but mostly wastewater(^h)</td>
<td>Wastewater(^i)</td>
</tr>
<tr>
<td>Intensity of production</td>
<td>High(^i)</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Notes:

\(^a\)The size of land used in kangkong production in Bangkok is substantially larger than in the other cities (section 6.2).

\(^b\)The role of the wife in Bangkok noticeably 'disappears' when we assume that the household is intact. In this case, it is the size of the landholding that determines dependence (section 7.2).

\(^c\)Our wealth index shows that Bangkok is 'wealthier' than other cities. The size of the landholdings is correlated with wealth at the level of cities. Other indicators also support this conclusion including housing durability, ownership of consumer durables such as refrigerators, access to piped water, vehicle ownership especially cars, and other housing indicators (section 5.1.3).

\(^d\)In Hanoi, the spouse in partnership with the husband continues to play an important role. If the wife and the husband are primarily involved in kangkong production, dependence is increased, but it decreases when the age and education of the wife increases (section 7.1.2).

\(^e\)In Phnom Penh, the occupational multiplicity of the husband accounts for income dependence on kangkong. But this only happens, I suggest, because a few households in this city are female-headed and their well-being is significantly lower because the husband is not around to assist in income generation. In fact, when we ran the regression for intact households, degree of dependence on kangkong is significantly explained by the occupational multiplicities of both the wife and the husband (sections 7.1.3 and 7.2).

\(^f\)There is a general sense that the process of producing kangkong is more commercial and intensive in Bangkok compared to the other cities. The production of kangkong in Hanoi is linked with other household production systems. The production in Phnom Penh is small-scale and not intensive (section 7.4).

\(^g\)The water used to irrigate Bangkok fields from canals directly connected to a river and hence, can be classified relatively as 'clean'.

\(^h\)In Hanoi, the source of water is wastewater supplied through canals connected to the city's sewers, although non-wastewater sources are also available to some farms.

\(^i\)In Phnom Penh, productions systems are located in a sewage lake receiving the majority of the sewage from the city (Chapter 1).

\(^\)Informality of settlements can be ascribed to Phnom Penh households because they are located in a state-owned land in a lake. Reports of tenurial problems among these households are emerging (section 8.2).

\(^i\)In addition to farm work, non-farm work is sizeable in Hanoi while off-farm is important in Bangkok. Phnom Penh households are heavily dependent on farm work especially kangkong production whereas Hanoi and Bangkok have diversified to other systems and sectors (section 8.2).

Table 11-1 A stylised livelihood system for kangkong production based on key themes or characteristics emerging from this study

Agrarian entrepreneurs are resource users who are already endowed with agri-
cultural skills and inputs and who opportunistically pursue particular agricultural enterprises based on perceived potential economic benefits. They could very well undertake other agricultural activities because of their existing land and financial endowments but decide on a particular one due to its apparent comparative advantage. In other words, path dependence underlines the choice of a particular activity. Path dependency implies that certain practices and propensities towards certain farming practices, which are pre-formed through earlier associations with broadly similar production systems, create legacies that can be drawn upon when making production choices. Such path dependency (and to an extent tenacity despite the challenges and opportunism) underpins the occupational trajectory of Mr Booncherd Kondun, who was previously a lotus farmer, a middleman, *kangkong* producer, and now an organic vegetable grower.

Mr Kondun grew up in a primarily rice producing household. Little, based on his interview with Mr Kondun, notes that

> His early mobility and exposure to slightly different ideas was clearly important in establishing experience in dealing with other products and marketing networks. Confidence, an established record in trading and a variety of outside experience made him the natural candidate for further external training from the perspective of both those in the community and outsiders. (Little 2005)

In other words, agrarian entrepreneurs are the *nouveaux riches* who possess capital and willingly pursue new market opportunities for their products and skills (cf Franklin 1962) or, to use van der Ploeg et al.'s (2000: 401-2) phrase, a reorientation of the farm to the "logic of the market". However, the agrarian entrepreneurs we see among *kangkong* households in Bangkok are not the same as the agrarian entrepreneurs in Rigg's (2005: 180) typology where they are classed as 'professional farmers' because the degree of professionalization in *kangkong* production is limited. For one, there is no tight linkage with an international market, although some companies such as KC (Kamphaengsaen Commercial) Fresh Co Ltd, are now exporting 'organic' *kangkong* to European markets (Photo 11-1) (Sitadhani 2005). These companies are, however, based in other parts of Bangkok and were not present in the field site. Furthermore, the companies do not specialise in the export of *kangkong*. They are vegetable exporters in general and *kangkong* is just one of the export items they carry. For another, technological sophistication to the point of replacing labour with machines as in the case of the combine
rice harvester in rice harvesting is absent in *kangkong* production. Harvesting *kangkong* is still heavily dependent on sheer human power.

![Photo 11-1 Kangkong (KC Fresh Brand) exported from Thailand and sold in Leicester Square Chinatown, UK, 2007. The products are vacuum packed to keep their freshness. A bunch costs £1.50. (Photos by: Author)](image)

To understand quasi-peasants, one would have to look at what constitutes a ‘peasant’. According to Bernstein and Byres, the qualities that constitute a ‘peasant’ are:

- household farming organized for simple reproduction (‘subsistence’), the solidarities, reciprocities and egalitarianism of (village) community, and commitment to the values of a way of life based on household and community, kin and locale (and harmony with nature, a motif revived and privileged by current ‘green’ discourses). The qualities of an essential ‘peasantness’ can be constructed in formal theories of peasant behaviour [...] and in sociological and cultural(ist) conceptions of what makes peasants different and special (contrasted explicitly or implicitly with proletarians on one hand, market-oriented and entrepreneurial ‘farmers’ on the other). Such essentialist constructions acknowledge the relations of peasants with other social groups and entities – landlords, merchants, the state, the urban in general – and typically view them as relations of subordination and exploitation that also define the peasant condition [...] [EMPHASIS MINE] (Bernstein and Byres 2001: 6)

Deviations from the above ‘essential’ characters of a peasant make up a ‘quasi-peasant’. For instance, Craton (1979: 121) characterised slaves who switch from slavery to work in an estate at certain times of the year on their own volition as ‘quasi-peasants’ while Rigg (2005: 181) proposes that ‘quasi-peasants’, at least in Europe, arise out of state subsidies to the peasantry such as social security provision, including health, education and retirement benefits so that peasant life is no longer inherently one of perpetual bondage to the land as a source of welfare. In our case here, Hanoi households are described as becoming ‘quasi-peasants’ because their way of life, although still largely farm-based, is increasingly being untied from the land. We can read the increase in non-farm occupations among the off-spring generation in this city as one indication
of such a trend. Phnom Penh households, on the other hand, are still largely ‘peasants’ because farming the land with household labour is still the norm. That is, urban agricultural production upon which kangkong production is a major part is neither an alternative nor complement to paid employment, but the main employment itself. The existence of absentee landlords, which include the state because much of the land in the lake is public, and the threat of land grabbing and eviction point towards what Bernstein and Byres (2001) describe as “relations of subordination and exploitation”. The interests of Phnom Penh households are subordinated to the interests of elite classes such that they are socially, ecologically, and spatially excluded and only subsist around the peripheries on the excesses or metabolic by-products of the city. According to Wood (2003: 464),

Embodyed within the notion of "peasant" is weakness and vulnerability in the social and cultural conditions through which needs have to be met. Poor urbanites are thus like peasants in being weakly positioned in relation either to the state or different markets (commodities, labor and services). They require networks and patron-brokers to link them more successfully to essential opportunities in these state and market domains.

11.2 Spaces, urbanism and turbulence

In Chapter 9, I presented the ecology and agronomy of kangkong as well as its broader natural and political environments. These are presented as a way of proving the claim that the social and economic roles of kangkong are made possible because of the presence of both intrinsic and extrinsic factors. The intrinsic ones relate to the plant itself and how it spreads in its environment while the extrinsic ones concern the broader milieu to which kangkong is embedded and circulates. In other words, the terroir is important in understanding how kangkong links with the geographies of interstitial spaces. And in this process of embedding and circulation, geographical relationships are established so that a plant, well recognised as a weed botanically and continues to be, metamorphosise into a commercial crop, a favourite dish, staple in rural diets, a reminder of ‘home’, and emblem of the spatial histories of key cities in mainland Southeast Asia. Such metamorphosis and continued ‘transubstantiation’ in terms of its use (i.e., from weed to crop) enables kangkong to store spatial histories while being a product of the landscape itself.
When I say a 'product' of, I am referring to two senses. Firstly, *kangkong* is being sustained and grew out of the metabolism of the city in the case of Hanoi and Phnom Penh. Secondly, the case of Bangkok results from a huge demand from the market so that commercial farming was in order. The use of the metabolic metaphor in the first point has not gone uncriticised, however. Gandy (2004) contests that such a metaphor privileges an 'organicist' and 'functionalist' interpretation of urban change without any regard for how spaces and their corresponding functions are historically produced. What this essentially means is that there is too much emphasis on a 'scientistic' framework (i.e., that cities are functioning ecosystems capable of homeostasis and self-regulation) which omits ways in which spaces are, in fact, socially produced. Gandy (2004: 364), however, admits to the usefulness of the concept especially in terms of understanding the "complex interactions between social and bio-physical systems that allow the modern city to function", such that he counsels that

If the idea of urban metabolism can be disentangled from its organicist and functionalist antecedents, however, it can serve as a useful point of entry for a critical reformulation of the relationship between social and bio-physical processes. A dialectical or hybridized conception of urban metabolism can illuminate the circulatory processes that underpin the transformation of nature into essential commodities such as food, energy and potable water: the idea of metabolism in this sense derives not from any anatomical or functional analogy but from an emphasis on the interweaving of social and biophysical processes that produce new forms of urban or "metropolitan" nature in distinction to the rarefied realm of nature which remains dominant within much urban and environmentalist discourse. A scientistic model is replaced by a historically driven conception of urban nature which is rooted in the political dynamics of capitalist urbanization as a contested and multi-dimensional process of urban change. (Gandy 2004: 373-4)

As explained in detail in the methodology section, this tendency was remedied in this study by consciously employing historical and social contexts as immanent tools of analysis and discussion. What appear to be ecological and functionalist texts are just the matter-of-fact presentation of biophysical processes that do exist essentially as they are. It is in the analysis that interweaves the social and the biophysical that depth and accuracy are attained. In Chapter 10, I showed that the domain of *kangkong* production is a microcosm of how broad changes are occurring in the spaces where such production systems are currently found.

*Kangkong* as a livelihood has been shown to be unincidental to a poor, destitute and desperate existence. It provided an opportunity to which people in need of livelihoods exploited and turn it around commercially reaching commercial success in Thai-
land where the plant is genetically improved to satisfy growing local and international demands. It has been a productive substitute to rice production in both Bangkok and Phnom Penh and a key crop in integrated production systems in Hanoi.

How kangkong represents Southeast Asian urbanism is first captured etymologically in its name. Rumphius, a botanist, who wrote *Herbarium Amboinense* between 1741 to 1750 said that the Malay word 'kangkung' means 'it is restless', although this could not be confirmed from modern sources (Austin 2007: 126, 131). Despite such lack of confirmation, we can gather from the biology and ecology of this species that 'restlessness' is exhibited in various ways. We have seen in our botanical exploration of kangkong that it spreads wildly and has colonised warm and moist environments. It is reported to have "escaped" from cultivation in Florida earning it a negative image as a 'noxious weed' (Schmitz et al. 1988: 9-10). Austin (2007: 126) quotes Heyne (1927) to have written: "Het wordt vermenigvuldige met stukken van de stengels en beslaat spoedig een groote plaats" [It multiplies rapidly with pieces of the stems covering a large place in a short time].

In a way, this ties with the spatial transformation of mainland Southeast Asia, a second representation of kangkong and urbanism, where rice producing areas gave rise to a space where the juxtaposition of agriculture and non-agricultural activities are obvious and intense. In the desakota geographies explored by McGee and the consequent formulation of extended metropolitanisation, 'restlessness' of the landscape is a prominent theme as shown in Chapter 10. It is also a marker of the turbulence we discussed in section 2.9. Peri-urban areas in mainland Southeast Asia are undergoing dynamic changes, always on the cusp of becoming, like kangkong that colonises its wetland environments. But such restlessness is not only manifest in the history and ecology of the plant nor of the interstitial spaces it colonises. It is also reflected in the households inhabiting these spaces and which are exploiting the livelihood opportunities kangkong offers so that kangkong becomes, in Balée's (1988: 48) term, a 'vegetational artefact' of the changing landscape. As the landscape changes, people adjust and exploit opportunities created by the changing landscape and these new activities become 'signatures in land-
scape' (cf. Crivos et al. 2007). There is no denying, however, that, despite these opportunities, current patterns of spatial change in the region have resulted in problems of planning, regulation, and the delivery of services (cf. Dixon 1999: 204). What I am saying here is that households have found a way of turning what is essentially a bad situation (e.g., wastewater in Hanoi and Phnom Penh) into a productive opportunity.

Ironically, *kangkong* while representing the same restless rubric is also a metaphor of the rural, the journey, and the return to home as the stories highlighted in Chapter 1 show. One of the modes upon which remembrance and reminiscence of home among Asian diasporic communities in the West is imagined or re-enacted or re-experienced is through the flavours and earthiness of *kangkong*. In a sense, memories are reminded from what was unique and familiar. In poems and speeches, both political and personal, *kangkong* as a place and its consumption is an allegory for the swamp and poverty. Even campaigns on child labour use *kangkong* as a trope to paint the familiar. The International Labour Organisation in 1996 sponsored a best practise initiative to stop child labour in Thailand by addressing attitudes on child migration through a play eponymously called *Phak Boong*.

[...] it tells the tale of two turtles who decide when drought strikes their home to go off to look for a legendary inexhaustible and wonderful field of the vegetable. They encounter a variety of dangers along the way, including a vicious crocodile, and after meeting a much scarred turtle who has literally lost his shell attempting to reach the El Dorado, eventually decide to return home. Designed for young primary-school pupils, it is obviously meant as an allegory to discourage the concept that the city and its bright lights and reported attractions are the place to find riches and happiness. (Bennett 1998)

Spatially, the vicissitudes of *kangkong*’s existence and how it represents Southeast Asian urbanism are underlined by restless spaces and livelihoods. To understand these, we have to return to McGee’s concept of *desakota* which was introduced in section 2.4.

Among the three study sites, studies by various scholars (e.g., Greenberg 1994; Jones 2001; Jones 2002; McGee and Greenberg 1992; Parnwell and Wongsuphasawat 1997; Webster 2002a, 2002b) have shown that Bangkok does, indeed, fit the template of *desakota* Type 2 (Figure 2-2). The same cannot, however, be claimed for Hanoi and Phnom Penh in view of the fact that they are not megacities and do not exhibit the same degree of extended metropolitanisation as Bangkok. But this study argues that these
cities, at least among *kangkong* households, exhibit characteristics of incipient *desakota* types in terms of changes in the social, economic, and environmental dynamics of their peri-urban spaces\(^1\). These changes are manifested in the splintering and *ad hoc* mixing of land uses, penetration of non-agricultural activities, changing characteristics of labour, changing nature of employment and sources of income among agricultural households, and widening transportation links. Although there are strong indications that these spaces may not develop into full-pledge *desakota* areas in the same manner as Bangkok and, instead, they will be absorbed into the urban core, they have shown signs of extended metropolitanisation. Here, extended metropolitanisation is meant to refer to the process by which the urban penetrates into a countryside with an already dense population and transforming rural spaces (Wongsuphasawat 1997: 207-9). This view of the *desakota* comes from a macro perspective. That is, taking the region (i.e., the peri-urban space around major cities) as a reference point. I argue that this is just one way of understanding spatial change in mainland Southeast Asia. Another way is to look at what happens on the ground.

*Kangkong* and the resulting production/livelihoods offer an opportunity to explore how micro perspectives can inform our understanding of spatial change. It occupies both interstitial and primarily agricultural spaces. It offers a flexible production system which enables those who occupy marginal lands or informal settlements to survive. It also widens the possibilities of existing urban agriculturalists to diversify their mix of farmed crops in a manner that is not too financially demanding because *in situ* nutrients in the form of wastewater work just as well. On the other hand, it also gives those with the necessary endowments (e.g., land, skills, and inputs) a livelihood system that is amenable to commercial scales of production. In Southeast Asia, *kangkong* production spans from a pot to a puddle to a pond to hectares of prime agricultural land. In other words, *kangkong* weaves through different spaces either by biological design or human interventions.

\(^1\) Similarly, Dixon and Smith (1997: 15-7) have pointed out that globalisation, a transactional revolution, and structural change “have interacted to produce EMRs and nascent EMRs throughout the region, some of which have been developing for several decades, other of which are relative fledglings. But all have emerged within their own particular environmental, cultural and political contexts and, as a result, exhibit individual features.”
The state of *kangkong* production in Bangkok is made possible by occupational path dependence, good infrastructure, technology, sizeable market, and reliable sources of water. The factors reversed the ecological characteristics of *kangkong* from being a weed and opportunistic species to a commercial crop. The cumulative impacts of these factors explain the trajectory of exploitation in Hanoi and Phnom Penh. The resulting producing classes might be described in terms of 'agrarian entrepreneurs' in Bangkok, 'quasi-peasants' in Hanoi and 'peasants' in Phnom Penh who are variously pursuing strategies of accumulation, consolidation, and survival.

To understand how *kangkong* mirrors Southeast Asian urbanism and foreground the geographies of interstitial spaces, we need to look at the features of *desakota* and how each is exemplified in our exploration of the life and times of *kangkong*. McGee (1989: 93) and Ginsburg (1991a) set out the main features of *desakota* areas which have been discussed in detail in section 2.4. These features also broadly correspond with Webster’s (2002b: 8) main characteristics of periurbanisation. Each of these features is the subtext in various places of our previous discussions. In Table 11-2, I have ticked off those *desakota* features exhibited in *kangkong* livelihoods. As shown, all *desakota* features are mirrored in *kangkong* livelihoods. Thus, the claim of a link between *kangkong* and the geographies of interstitial spaces are satisfied (Figure 2-1).

---

2 The last feature should be understood in terms of the notion of rurality-urbanity and aspirations discussed previously wherein the lives of *kangkong* households are fluid and mobile, and not so much in terms of the demographic characteristics of peri-urban households. This disclaimer is made from the perspective of Browder et al.’s (1995: 319) claim that the demographic characteristics of peri-urban areas are defined by three migratory processes: direct rural-to-peri-urban migration; step-wise inter-urban migration; and intra-metropolitan migration, from the urban core to its peripheries. In general, migration to the peri-urban zone is enticed in part by national economic structural change where jobs, especially those related to manufacturing, are expanding, particularly in peri-urban areas. Textile and garment companies in Phnom Penh and Hanoi are attracting labour from the city and the countryside, swelling the in situ peri-urban population. The same case is observed in Bangkok’s extended metropolitan region where large manufacturing industries have stimulated migration of labour to meet the labour demands. However, migration is only one factor as far as population growth is concerned. Annexations, boundary changes, and transformation of rural areas as urban settlements expand are others (Douglass et al. 2002: 1-1; United Nations Population Division 2002: 13). It is not a case of one or the other; instead, it is the combination of these factors that lead to population growth and the concomitant settlement transition. The presence of informal settlements in peri-urban areas indicates the level of rural-urban migration, as it has been shown that informal settlements are important receivers of new migrants to the city. Increasing informal settlements imply possibilities for social, housing, and social problems. It also shows the extent to which planning systems and governance are adequately responding to these problems (Westfall and De Villa 2001: 50-6). Among the cities in this study, Phnom Penh had a higher proportion of households who were not born in their current place of residence. This finding mirrors the result of the 1998 Census where 73.4% of the city's population were migrants from other provinces and some from outside Cambodia (National Institute of Statistics).
Desakota features

<table>
<thead>
<tr>
<th>Previous existence of population involved in wet rice cultivation</th>
<th>Kangkong</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing diversity of non-agricultural activities</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Shift in main income source away from agriculture</td>
<td>✔</td>
<td>Not so much in Phnom Penh</td>
</tr>
<tr>
<td>Heightened levels of both positive and negative externalities coming from the juxtaposition of agricultural and non-agricultural activities</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Increasing feminisation of labour</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Rising land costs</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Increasing diversity of non-agricultural activities</td>
<td>✔</td>
<td>Not so much in Phnom Penh</td>
</tr>
<tr>
<td>Shift in main income source away from agriculture</td>
<td>✔</td>
<td>Not so much in Phnom Penh</td>
</tr>
<tr>
<td>Increasing fluidity and mobility of households</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

Table 11-2 Desakota features and *kangkong* livelihoods

### 11.3 Policy implication and further plans

The policy implications of the importance of interstitial spaces to livelihoods have already been prescribed in several PAPUSSA policy briefs as shown in Appendix 7. The same policy prescriptions can be made for *kangkong* livelihoods so that we do not need to repeat them here. Instead, I want to emphasise, based on the findings on this study, the importance of recognising *kangkong* production, especially in Hanoi and Phnom Penh, as a viable livelihood. It is on this basis that it should be enshrined in development policies to protect the producers from potential health impacts of wastewater use. It is also shown in this study that ‘micro’ or ‘local’ perspectives can enhance our understanding of spatial change in Southeast Asia, but the analyses carried out here only offer some indications of the potentials that lie ahead. Follow up activities should be done to build on what has been started including the re-analysis of the data using a different approach, comparison with other production systems and deeper engagement with the political economy of *kangkong* production. On re-analysis, this study has relied heavily on multiple regression to identify factors that explain why the households in this study consider themselves dependent on *kangkong* production for their main income. The data
that went into the statistical analysis came from surveys. Data from qualitative interviews and participatory community appraisals was also used to deepen the analysis. Given the many opportunities available in the existing dataset to understand other aspects of peri-urban livelihoods, exploring the data using other techniques is in order. One technique is the use of qualitative comparative analysis (QCA) to look at household livelihood strategies. Developed by Ragin (1987), this tool offers a powerful perspective on the analysis of a configuration of cases in a rigorous experimental manner. Recent advances of QCA include further refinements of the technique using multiple values in multivariate QCA and the use of fuzzy logic in fs/QCA (Ragin 2000). Computer programs are also now widely available to assist in the analysis such as TOSMANA (Cronqvist 2005) and fs/QCA (Ragin, Drass, and Davey 2003). A comparison of the results of the regression with QCA offers a more nuanced interpretation of the importance of contexts in understanding livelihoods in peri-urban areas.

Another possibility is to look at how transnational forces and urban plans affect the trajectory of change of kangkong production. For instance, does the growth of FDI-invested activities in peri-urban areas in the cities in this study have corresponding effects on the livelihood trajectory of kangkong (cf. Fuchs and Pernia 1989; Kelly 1998; Leaf 2002; Nguyen Thi Binh Minh 2002)? Or what happens when urban planning in cities becomes less congenial to kangkong production and partial to industrial land uses? These are areas which were not explored in this study for lack of space but are important in understanding the survival of households dependent on kangkong. Such approached could add insights into the political economy of kangkong production, which is admittedly given limited attention in this study. This might feed further into finding ways of positioning kangkong production, in particular, and peri-urban aquatic/agriculture production, in general, within urban planning frameworks of each city in this study because it is a viable use of peri-urban lands. Highlighting the limitations and opportunities in current planning paradigms, policies, and regulations are some of the ways forward.

Furthermore, comparing kangkong with other aquatic production systems in in-
terstitial spaces will also refine the importance of livelihood contexts. A similar regression model developed used in this study could be applied in the case of water mimosa, for example, which is also widely farmed in peri-urban areas in all cities in this study. We might also need to compare kangkong and rice production within the same location to identify their income and other welfare impacts so that the importance of kangkong production compared with other land or aquatic-based peri-urban livelihoods is established. This also has the added benefit of helping to understand the historical antecedents of kangkong production especially in the case of Bangkok and Phnom Penh. Although these are just a sample of the activities that might be undertaken to take forward the insights gained in this study, their outcomes would contribute to our understanding of what London (1987: 28-9) calls the ecological and political-economic determinants of spatial change.

11.4 Conclusion

This study has shown that studying a plant and the households involved in its production is a useful exercise in understanding the articulation of spatial change and social spaces. Kangkong is grown in or around cities; it exploits opportunities afforded by changing landscapes; it is a staple in the diet in the region; it provides an important livelihood to economically diverse households; it derives its fame or notoriety, depending on how one looks at it, from its association with waste, particularly wastewater; and its existence is emblematic of the paradoxical growth of Southeast Asian cities and the concomitant geographies of interstitial spaces. Kangkong, thus, holds a pivotal or strategic position and an entry point for the study of desakota urbanism. The notion of desakota can be read in the production of kangkong. It also highlights the fact that there are opportunities afforded by the nature of settlement change in Southeast Asia, turbulent though it may be. These opportunities are in large part a reflection of the environmental endowments of each locality. Furthermore, it has been shown that kangkong serves both subsistence and commercial purposes. Hanoi and Phnom Penh are examples of the former while Bangkok, of the latter. Kangkong affords a useful opportunity for livelihood engagement because its demand is wide, commercially and geographically. In reflecting
the myriad processes on the ground, we may speak of *kangkong*, borrowing a phrase by Nick Papadimitriou (fugueur 2006), as a 'storage vat of regional memory'. As such, this study follows after Askew (2003), Brookfield et al. (1991), Bryant (1995), and Koppel and Hawkins (1994), among others, in giving salience to the role of 'local agency' in understanding spatial change such that if we are looking for examples of how ongoing spatial change is occurring in Southeast Asia and how it is burdening livelihoods, we do not need to look too far. By looking down, so to speak, we will learn some essential facts.
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Roy, J. and B. Crow. 2004. "Gender relations and access to water: what we want to know about social relations and women’s time allocation." Internet: http://works.bepress.com/ben_crow/1/


Appendices

Appendix 1


<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average annual rate of change of the percentage rural</td>
<td>Average exponential rate of change of the percentage rural over a given period. It is calculated as ( \ln(\text{PRt}/\text{PRO})/n ) where ( n ) is the length of the period and ( \text{PR} ) is the percentage rural. It is expressed as a per cent.</td>
</tr>
<tr>
<td>Average annual rate of change of the percentage urban</td>
<td>Average exponential rate of change of the percentage urban over a given period. It is calculated as ( \ln(\text{PUt}/\text{PUO})/n ) where ( n ) is the length of the period and ( \text{PU} ) is the percentage urban. It is expressed as a per cent.</td>
</tr>
<tr>
<td>Average annual rate of change of the rural population</td>
<td>Average exponential rate of growth of the rural population over a given period. It is calculated as ( \ln(\text{RPt}/\text{RPo})/n ) where ( n ) is the length of the period and ( \text{RP} ) is the rural population. It is expressed as a per cent.</td>
</tr>
<tr>
<td>Average annual rate of change of the total population</td>
<td>Average exponential rate of growth of the population over a given period. It is calculated as ( \ln(\text{Pt}/\text{Po})/n ) where ( n ) is the length of the period and ( \text{P} ) is the population. It is expressed as a per cent.</td>
</tr>
<tr>
<td>Average annual rate of change of the urban population</td>
<td>Average exponential rate of growth of the urban population over a given period. It is calculated as ( \ln(\text{Up}/\text{UPO})/n ) where ( n ) is the length of the period and ( \text{UP} ) is the urban population. It is expressed as a per cent.</td>
</tr>
<tr>
<td>Average annual rate of change of urban agglomerations</td>
<td>Average exponential rate of growth of the population of urban agglomerations over a given period. It is calculated as ( \ln(\text{PUAt}/\text{PUAO})/n ) where ( n ) is the length of the period and ( \text{PUA} ) is the population of urban agglomerations. It is expressed as a per cent.</td>
</tr>
<tr>
<td>Capital cities</td>
<td>The designation of any specific city as a capital city is done solely on the basis of the designation as reported by the country or area. The city can be the seat of the government as determined by the country. Few countries designate more than one city to be a capital city with a specific title function (e.g., administrative and/or legislative capital).</td>
</tr>
<tr>
<td>City proper</td>
<td>A locality defined according to legal/political boundaries and an administratively recognized urban status that is usually characterized by some form of local government.</td>
</tr>
<tr>
<td>Metropolitan area</td>
<td>Includes both the contiguous territory inhabited at urban levels of residential density and additional surrounding areas of lower settlement density that are also under the direct influence of the city (e.g., through frequent transport, road linkages, commuting facilities etc.).</td>
</tr>
<tr>
<td>Percentage of the total population residing in urban agglomerations</td>
<td>Population residing in urban agglomerations as a percentage of the total population.</td>
</tr>
<tr>
<td>Percentage of the urban population residing in urban agglomerations</td>
<td>Population residing in urban agglomerations as a percentage of the total urban population.</td>
</tr>
<tr>
<td>Percentage rural</td>
<td>Rural population as a percentage of the total population.</td>
</tr>
<tr>
<td>Percentage urban</td>
<td>Urban population as a percentage of the total population.</td>
</tr>
<tr>
<td>Rural population</td>
<td>De facto population living in areas classified as rural. Data refer to 1 July of the year indicated and are presented in thousands.</td>
</tr>
<tr>
<td>Total population</td>
<td>De facto population in a country, area or region as of 1 July of the year indicated. Figures are presented in thousands.</td>
</tr>
<tr>
<td>Urban agglomeration</td>
<td>Refers to the de facto population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries. It usually incorporates the population in a city or town plus that in the sub-urban areas lying outside of but being adjacent to the city boundaries.</td>
</tr>
<tr>
<td>Urban agglomerations annual growth rate</td>
<td>See: Average annual rate of change of urban agglomerations</td>
</tr>
<tr>
<td>Urban population</td>
<td>De facto population living in areas classified as urban according to the criteria used by each area or country. Data refer to 1 July of the year indicated and are presented in thousands.</td>
</tr>
</tbody>
</table>
Appendix 2

Urban annual growth rate and annual rate of change of percentage urban in countries in this study (Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat 2005)
Appendix 3

Attachments and reflexivities

As shown in Figure 3-1, the data used in this study came out of the Production in Aquatic Peri-Urban Systems in Southeast Asia (PAPUSSA) project to which I had the studentship. Financial support for PAPUSSA came from the European Union through its International Scientific Cooperation Projects (1998-2002) (INCO, Contract number: ICA4-CT-2002-10020). The project ran from 2002 to 2006. The specific objectives of PAPUSSA were:

- Undertake a multidisciplinary situation appraisal of aquatic food production system at 4 sites in 3 Southeast Asian countries, raise awareness of their role and benefits and conduct an institutional assessment;
- Risk assessment of existing aquatic food production system and opportunities for enhanced management to reduce risks assessed in stakeholder consultation;
- Describe the role of aquatic food production system in primary stakeholder livelihoods, assess vulnerability context and workshop outcomes;
- Assess social characteristics of aquatic food production system and relate to spatial features, identify environmental tensions/conflicts, describe marketing and consumption patterns and policy implications of trajectories of change;
- Verification of occupational and consumer health hazards at 2 pilot sites identified in consultation with stakeholder, monitoring of interventions to reduce such risks and revised health risk assessment for modified aquatic food production system;
- Enhanced management strategies tested at pilot sites and preliminary assessment of livelihoods impacts made, identification of high potential strategies and appropriate dissemination pathways identified;
- PRA undertaken at 2 representative pilot sites, case-studies for individual households and aquatic food production system, in-depth analysis of local and national policy context and description and mapping of production, marketing and consumption sequence; and,
- To inform and stimulate interaction amongst stakeholders, ensure the integration of outputs, feed stakeholder perceptions into the research process, disseminate outcomes widely in appropriate formats and raise awareness amongst stakeholders.

In view of these objectives, work packages (Box 1) were designed to deliver the related outputs. Different partners were involved in each work package. European institutions lead work packages 1, 2, 4, 7 and 8, while Southeast Asian partners lead WPs 3 and 6. The Southeast Asian partners were key research stakeholders on fisheries in
each city. The Research Institute for Aquaculture-1 in Hanoi is the primary fisheries research institution in Northern Viet Nam while Nam Long University, Kasetsart University and the Royal University of Agriculture were the primary research and academic institutions for agriculture, fisheries and forestry university in South Viet Nam, Thailand, and Cambodia, respectively. These institutions provided a strong background and knowledge on aquatic production systems in each city.

<table>
<thead>
<tr>
<th>Work Packages</th>
<th>Work Package Title</th>
<th>Lead Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP 1</td>
<td>Situation appraisal</td>
<td>University of Stirling</td>
</tr>
<tr>
<td>WP 2</td>
<td>Public health and hygiene monitoring</td>
<td>KVL, Denmark</td>
</tr>
<tr>
<td>WP 3</td>
<td>Production system and livelihood monitoring</td>
<td>Research Institute of Aquaculture-1, Hanoi; Nam Long University, Ho Chi Minh City; Kasetsart University, Bangkok; Royal University of Agriculture, Phnom Penh</td>
</tr>
<tr>
<td>WP 4</td>
<td>Social, policy and institutional monitoring</td>
<td>Durham University</td>
</tr>
<tr>
<td>WP 5</td>
<td>Public health and hygiene pilot</td>
<td>KVL, Denmark</td>
</tr>
<tr>
<td>WP 6</td>
<td>Production systems and livelihood pilot</td>
<td>Research Institute of Aquaculture-1, Hanoi; Nam Long University, Ho Chi Minh City; Kasetsart University, Bangkok; Royal University of Agriculture, Phnom Penh</td>
</tr>
<tr>
<td>WP 7</td>
<td>Social, policy and institutional pilot</td>
<td>Durham University</td>
</tr>
<tr>
<td>WP 8</td>
<td>Dissemination</td>
<td>University of Stirling</td>
</tr>
</tbody>
</table>

Box 1 PAPUSSA Work packages

The University of Durham was specifically involved in WPs 4 and 7, which the PhD studentship was designed to deliver. But while the work packages were designed to be delivered by a lead contractor, actual implementation demanded involvement of Durham in most of the packages to respond to evolving realities. Thus, Durham was involved in WP 1 by providing training, follow up, review and analysis of participatory community appraisals. Durham was also involved in WPs 3 and 4 in the design, monitoring, and analysis of the baseline and monitoring surveys. As a result of this involvement with PAPUSSA, the PhD was designed to take into consideration the project deliverables and to create added value to work being done in the project and particularly in providing deeper sociological and geographical perspectives. I was based at the Asian Institute of Technology, a regional contractor of PAPUSSA, in Bangkok during the duration of the fieldwork, which spanned a period of three years. Being based in Bangkok pro-
vided important and strategic opportunities for the research as Bangkok is one of the sites of the study, has flights to all the other cities, good infrastructure, and is the regional headquarters of well-known international organisations such as the United Nations, WWF and IUCN.

<table>
<thead>
<tr>
<th>Cities</th>
<th>Institutional analysis</th>
<th>Market analysis</th>
<th>State of Systems Report</th>
<th>Surveys</th>
<th>PCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanoi, Viet Nam</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1 baseline and 3 monitoring surveys</td>
<td>Duc Tu Village, Duc Tu Commune, Dong Anh Province Hoang Liet, Dong My Khuyen Luong Village, Tran Phu Commune, Thanh Tri District</td>
</tr>
<tr>
<td>Phnom Penh, Cambodia</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1 baseline and 3 monitoring surveys</td>
<td>Duong Village, Prek Phnauv Commune, Pongneileu District, Kandal Province Phum Muy Sangkat Sras Choak, Khan Daun Penh Kbail Tumnob, Boeung Cheung Ek Thnout Chrum, Boeung Cheung Ek</td>
</tr>
<tr>
<td>Bangkok, Thailand</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1 baseline and 3 monitoring surveys</td>
<td>Lumsai village, Lumsai Sub-district, Lumlukka District, Pathum Thani Province Suan Prik Thai Village, Muang District, Pathum Thani Province Nong pao ngai Village, Nong pao ngai Sub-district, Sainoi District, Nonthaburi Province</td>
</tr>
</tbody>
</table>

Box 2 PAPUSSA Outputs for the cities covered in this study

PAPUSSA produced the outputs shown in (Box 2). Four PCAs for each city were undertaken by partners based on the training I and others in the team provided. The partners who undertook the PCA had no previous experience with participatory appraisal techniques so that the training was provided within a span of one week, including field exercises. The training sessions in each of the cities were conducted during October 2003 and the actual PCAs were carried out immediately after the training exercise so that draft reports were available by December 2003. These PCAs became the bases for a national meeting, known as the State of the System (SoS) meeting, to assess the state of the systems and to validate the result of the PCAs³. The SoS meetings were attended by representatives of the PCA communities, market representatives, local government officials, and national government officials from health, environment, fisheries, urban planning and agriculture ministries. Reports were produced following the SoS

³ Refer to Figure 3-1 for the flow diagram of how each stage in PAPUSSA flows to another.
meetings, translated into the local language, and published.

Depending on the interpretation by project partners of the actual situation on the ground, wealth ranking exercises and gender stratification were selectively employed to determine the PCA groups. In some situations, wealth became the basis of the groupings while it was gender and production systems for others. In short, there was no single approach adopted by all cities in determining groups for the PCA. This is just as well as it reflects the different dynamics in each city. In Hanoi, for example, the PCA in Duc Tu Commune was carried out separately between VAC and fish farming groups. However, project partners decided to stratify group membership by wealth and then by gender in Hoang Liet Commune producing a better-off men and women’s group, a worse off men and women’s group, and an aquatic plants grower and fish farmers group. The situation was different in Phnom Penh and Bangkok where PCA groups were only stratified by gender as each of the villages was known to specialise in a particular production system.

After the SoS, PAPUSSA partners met towards the middle of December 2003 to plan future activities and to select sites. For this research, the PCAs and the SoS reports were useful in providing an overview of the aquatic food production systems in each city and their social, political and economic contexts. The PCA set the stage for identifying sites for further detailed studies. Four sites in each city were identified. Each site represents a particular resource system. Based on the assessment of local researchers familiar with the systems and the communities involved in peri-urban aquatic production, a sample of around 200 households was selected in each city for household baseline and monitoring surveys. This sample was decided to be representative of the systems in each city by partners of PAPUSSA and aquaculture experts during a meeting held in December 2003 in Hanoi.

Having the PhD attached to a larger and wider project provides a wealth of opportunities. First, research of this kind affords access to diverse knowledges, perspectives and skills which multi-disciplinary, multi-national, and multi-country research brings. There were experts on aquaculture, fisheries biology, fish genetics, fish diseases,
health, sociology, and human geography in the project. The interaction that ensued has
been beneficial. Second, the research provided access to a huge amount of data drawing
on a comparative and cross-country research framework. This has enriched the analysis
in ways which would not otherwise have been possible. Regular validation of learnings,
insights and evolving perspectives was done during discussion and interaction with
various partners and experts. Finally, access to the field and logistics were ably facilitat-
ted by national partners.

Just as productive opportunities were opened up as a result of this arrangement,
it however also pointed to several constraints. First among these constraints was the
time needed to carry out both the PhD and the project. While they were complementary
and the project was supposed to inform the PhD, balancing the amount of time needed
to complete both tasks was daunting. Initially, both the project and the PhD were ham-
pered by administrative changes in the project which led to late hiring of staff and a
failure to plan and coordinate activities among the different partners. Second, coordinat-
ing field activities became complicated especially when the politics of different institu-
tions were problematic. In certain cities, two institutions needed to coordinate their ac-
tivities in the field as they were working with the same communities although looking at
different issues. It took a certain amount of negotiation and discussion for them to agree
on common areas to sample and means of approaching the communities. Third, be-
cause of the time, resources and efforts needed to cover all the cities, email communica-
tion was relied on. Project coordinators were only present in the field during important
coordination meetings and field activities. In most instances, the project depended on
the willingness and thoroughness of the partners to carry out their assigned tasks. This
did not happen and personal follow ups needed to be made. Arranging flights and the
amount of time it takes to visit all the sites meant that some activities were delayed. In
situations where activities were left with the partners to undertake by themselves, the
quality suffered. This problem became very important in the conduct of the surveys. The
proper translation of the questionnaire into the national languages taking into consid-
eration nuances in the use of the terms presented challenges. Some questions were mis-
interpreted and therefore not translated properly. Codes for questions should have been
anticipated if proper field testing had been carried out. Instead, serious questionnaire limitations were noted during data entry and some compromise was introduced.

Recapitulating my role in PAPUSSA, I was involved in: providing training for the PCA and monitoring its implementation; the design, implementation and monitoring of surveys; questionnaire design; data cleaning, management and analysis; capacity building; assisting the conduct of meetings and writing of reports; and, troubleshooting some management issues in the field. Such involvement entangles me to a “set of social relationships” defining my positionality so that the ‘production’ of data was not a solitary exercise. It is in this view that transparency of the research process is the best way forward. The flow diagram in Figure 3-1 shows the activities carried out under PAPUSSA and those conducted separately for the PhD. I have also properly referenced the data used from PAPUSSA.
Appendix 4

List of individuals interviewed in the qualitative interviews in Bangkok

<table>
<thead>
<tr>
<th>Bangkok</th>
<th>Place</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Dr Douglas Webster</td>
<td>Team Leader Planning for Sustainable Urbanization Project Office of the National Economic and Social Development Board Krung Kasem Road, Pomprab</td>
<td>22 July 2003</td>
</tr>
<tr>
<td>Farmers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mr Boonched Kondun</td>
<td>Nonthaburi</td>
<td>21 Sept 2004</td>
</tr>
<tr>
<td>3. Organic farmer</td>
<td>Nonthaburi</td>
<td>22 Mar 2005</td>
</tr>
<tr>
<td>4. Mr Manuwan Mohamad</td>
<td>Suanpriathai, Pathumthani</td>
<td>22 April 2005</td>
</tr>
<tr>
<td>5. Mrs Teemu Jaewae</td>
<td>Suanpriathai, Pathumthani</td>
<td>23 April 2005</td>
</tr>
<tr>
<td>6. Mr Yong Tanom Suk</td>
<td>Suanpriathai, Pathumthani</td>
<td>26 April 2005</td>
</tr>
<tr>
<td>7. Mrs Samran Buakan-thong</td>
<td>Suanpriathai, Pathumthani</td>
<td>26 April 2005</td>
</tr>
<tr>
<td>8. Mr Pon Kongdun</td>
<td>Nongpraangai, Nonthaburi</td>
<td>27 April 2005</td>
</tr>
<tr>
<td>9. Mrs Pew Thaiket</td>
<td>Nongpraangai, Nonthaburi</td>
<td>02 May 2005</td>
</tr>
<tr>
<td>10. Mrs Penpan Chew-nawin/Mrs Yean Suthichai</td>
<td>Lumsai, Pathumthani</td>
<td>03 May 2005</td>
</tr>
<tr>
<td>11. Mr Vichai Suthikongka</td>
<td>Lumsai, Pathumthani</td>
<td>03 May 2005</td>
</tr>
<tr>
<td>12. Mrs Ravee Pethin</td>
<td>Lumsai, Pathumthani</td>
<td>03 May 2005</td>
</tr>
</tbody>
</table>
## Appendix 5

### List of individuals interviewed in the qualitative interviews in Hanoi

<table>
<thead>
<tr>
<th>Hanoi</th>
<th>Place</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farmers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Different farmers</td>
<td>Hoangliet and Dong My communes</td>
</tr>
<tr>
<td>2.</td>
<td>Mr Ng Duy Thanh</td>
<td>Bang B Village, Hoang Liet Commune, Hoang Mai District</td>
</tr>
<tr>
<td>3.</td>
<td>Mrs Vu Thi Thuy</td>
<td>Bang B Village, Hoang Liet Commune, Hoang Mai District</td>
</tr>
<tr>
<td>4.</td>
<td>Mrs Luu Thi Chung</td>
<td>Bang B Village, Hoang Liet Commune, Hoang Mai District</td>
</tr>
<tr>
<td>5.</td>
<td>Mrs Nguyen Thi Ngo</td>
<td>Khuyen Luong Village, Tran Phu Commune, Hoang Mai District</td>
</tr>
<tr>
<td>6.</td>
<td>Mr Cao Van Phuong</td>
<td>Khuyen Luong Village, Tran Phu Commune, Hoang Mai District</td>
</tr>
<tr>
<td>7.</td>
<td>Mr Nguyen Van Binh</td>
<td>Khuyen Luong Village, Tran Phu Commune, Hoang Mai District</td>
</tr>
<tr>
<td>8.</td>
<td>Mrs Pham Thi Lan</td>
<td>Thon 2 Village, Dong My Commune, Thanh Tri District</td>
</tr>
<tr>
<td>9.</td>
<td>Mr Nguyen Van Kiem</td>
<td>Thon 5 Village, Dong My Commune, Thanh Tri District</td>
</tr>
<tr>
<td>10.</td>
<td>Mr Pham Ngac</td>
<td>Thon 3 Village, Dong My Commune, Thanh Tri District</td>
</tr>
<tr>
<td>11.</td>
<td>Mrs Nguyen Thi Che</td>
<td>Dong Dau Village, Duc Tu Commune, Dong Anh District</td>
</tr>
<tr>
<td>12.</td>
<td>Mr Do Quang Chung</td>
<td>Duc Tu 1 Village, Duc Tu Commune, Dong Anh District</td>
</tr>
<tr>
<td>13.</td>
<td>Mr Do Van Da</td>
<td>Duc Tu 2 Village, Duc Tu Commune, Dong Anh District</td>
</tr>
<tr>
<td><strong>Organisations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Dr Iwata Shizuo</td>
<td>Program Manager, Comprehensive Urban Development Programme in Hanoi Capital City</td>
</tr>
<tr>
<td>15.</td>
<td>Mr Nguyen Hong Tien</td>
<td>Vice Director, Department of Urban Infrastructure, Ministry of Construction</td>
</tr>
<tr>
<td>16.</td>
<td>Mr Pham Bau</td>
<td>Research Officer, Research Institute for Aquaculture 1 Hanoi</td>
</tr>
</tbody>
</table>
# Appendix 6

## List of individuals interviewed in the qualitative interviews in Phnom Penh

<table>
<thead>
<tr>
<th>Place</th>
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</tr>
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<tbody>
<tr>
<td>Architect and Urban Planner Deputy Chief of Cabinet and Director of Bureau of Urban Affairs Municipality of Phnom Penh</td>
<td>10 November 2005</td>
</tr>
<tr>
<td>Head, Inland Fisheries Research and Development Institute</td>
<td>14 May 2005</td>
</tr>
<tr>
<td>Kbal Tomnub Village, Boeung Tompun Commune, Meanchey District, Phnom Penh</td>
<td>10 May 2005</td>
</tr>
<tr>
<td>Kbal Tomnub Village, Boeung Tompun Commune, Meanchey District, Phnom Penh</td>
<td>11 May 2005</td>
</tr>
<tr>
<td>Kbal Tomnub Village, Boeung Tompun Commune, Meanchey District, Phnom Penh</td>
<td>11 May 2005</td>
</tr>
<tr>
<td>Thnout Chrum Village, Boeung Tompun Commune, Meanchey District, Phnom Penh</td>
<td>12 May 2005</td>
</tr>
<tr>
<td>Thnout Chrum Village, Boeung Tompun Commune, Meanchey District, Phnom Penh</td>
<td>12 May 2005</td>
</tr>
<tr>
<td>Duong Village, Prek Phnov Commune, Ponhealoeu District, Kandal Province</td>
<td>13 May 2005</td>
</tr>
<tr>
<td>Duong Village, Prek Phnov Commune, Ponhealoeu District, Kandal Province</td>
<td>13 May 2005</td>
</tr>
<tr>
<td>Duong Village, Prek Phnov Commune, Ponhealoeu District, Kandal Province</td>
<td>13 May 2005</td>
</tr>
<tr>
<td>Duong Village, Prek Phnov Commune, Ponhealoeu District, Kandal Province</td>
<td>13 May 2005</td>
</tr>
<tr>
<td>Boun Village, Chraing Chamres Commune, Reussey Keo District, Kandal Province</td>
<td>17 May 2005</td>
</tr>
<tr>
<td>Boun Village, Chraing Chamres Commune, Reussey Keo District, Kandal Province</td>
<td>17 May 2005</td>
</tr>
<tr>
<td>Phum Mouy Village, Sras Chork Commune, Daun Penh District, Phnom Penh</td>
<td>17 May 2005</td>
</tr>
</tbody>
</table>
Appendix 7

PAPAUSSA Policy Briefs

These policy briefs are available in www.papussa.org and are issued in four series. These are:

A. Integrating aquaculture into urban planning and development
   • Incorporating aquaculture in city development and land use plans
   • Securing access to land
   • Promotion of safe re-use of urban wastewater in aquaculture
   • Strengthen institutional support and coordination

B. Managing health risks to develop wastewater into a valuable resource and asset
   • Separating industrial and domestic wastewater
   • Providing low-costs wastewater treatment systems
   • Applying proper protection measures in production and marketing
   • Improve institutional coordination

C. Improving public health and safety
   • Research need to assess actual health risks
   • Set and monitor water and product quality standards
   • Adapting farming systems to production conditions
   • Ensuring market hygiene

D. Promoting sustainable production and marketing
   • Promoting environmentally sound production
   • Exploring potential of (new) production and marketing systems
   • Supporting producer organizations
   • Incorporating aquaculture in training and extension programmes
Appendix 8

Kangkong and the blogosphere

From the Philippines to Indonesia to Singapore in today's modern world, the English-language weblogs are abuzz with reviews and ruminations of the flavours and promises of a kangkong dish. In "Insanitiesmyinsanities", a blog entry reads:

gilligan's adobong kangkong, though, was an instant hit for me. it was not your usual carinderia-aa-kanto adobong kangkong instead, they chopped the kangkong stalks in 1/3 of an inch sizes giving the kangkong the crunch it would never have if you cooked it whole stem and leaves included...preparing adobong kangkong is as easy as cooking it. it is also a very cheap and nutritious veggie alternative. it is quite a puzzle, for me, how restaurants can charge Php P80 to Php P120 for a plate of adobong kangkong when you can buy a bunch of kangkong at your local palengke for only Php P5.00!!! the thing is, you can make 3 - 4 plates of adobong kangkong with that one bunch! but what puzzles me no end is why people are buying it at such an outrageous amount of moolah! and again, it is best that we leave that to be told some other time. (budge.wordpress.com 2007) [emphasis mine]

Another blogger in Singapore rants about a similar food experience:

Then they serve the chicken wings and the baby squid ahead of everything else. They were not good. It took some time before the fried rice, chili crab and sambal kangkong were served. The fried rice is nothing sensational, the chili crab does not taste good and the meat of the crab is stuck like silly and was very difficult to get to. My sister said it's probably over cooked. The only slightly good food that we ordered is the sambal kangkong. It was okay compared to the others. But I figured I can go to the food court at Queensway near IKEA and that sambal kangkong is definitely better. (sathe923-its-a-wonderful-life.blogspot.com/) [emphasis mine]

Its allure has even captivated another blogger in New York, who wrote in his blog, "DumplingJunkie", an interesting precis of kangkong as a plant and food:

According to Gabriel Miller-Phillips, noted expert on Southeast-Asian gourmet specialities, the tastiest leafy green of all is something called "kangkong." When I heard this, I ran to the internet to look it up, and was somewhat amused to discover that kang kong is among our shadier vegetables. First of all, it goes by a huge number of names .... Second, it's one of the world's most popular vegetables because it will grow more or less anywhere that's warm and wet. And third, it's pretty much illegal in this country.

It's classified as a "federal noxious weed" for the simple reason that, should it gain a foothold in any warm and swampy environment, it will clog waterways, crowd out other plants, and generally make a nuisance of itself and wreak havoc upon a complex ecosystem. The Florida Department of Natural Resources, on its website, warns us (in both English and Vietnamese) that possession of kang kong is punishable by a $500 fine and up to 60 days in jail. But it

---

4 I understand that some scholars may find the use of blogs in an academic work inappropriate. However, I argue, to the contrary because blogging has, to my mind, revolutionised intellectual exchange by making scholarly discussions more democratic and accessible as shown in, among others, The New Mandala, a blog on Southeast Asia hosted by the Research School of Pacific and Asian Studies at the Australian National University. It is a veritable staging area for debates on critical issues of mainland Southeast Asian studies. For example, issues on Burma and Thailand are well covered in this blog and there have been lively exchanges as the thread in this link (http://rspas.anu.edu.au/rrmap/newmandala/2007/11/01/interview-with-professor-david-chandler/) shows.

5 Some of the popular kangkong dishes are: rau muong xao toi voi chao (Water Spinach Stir-fried with Garlic and Fermented Bean Curd, Vietnamese); phak boong faedaeng (fried kangkong, Thai); Adobong kangkong (stewed kangkong, Filipino); and kangkung belacan (kangkong in dried shrimp paste, Malay). More dishes and recipes can be found on the internet (e.g., www.vietworldkitchen.com and http://holvbasi1.word12ress.com/).

6 A local Filipino dish usually referring to chicken or pork stewed with vinegar, soy sauce, and garlic.

7 Literally means street food in Tagalog.

8 Philippine peso

9 Means a wet market in Tagalog.
also mentions that it's "grown illegally in Florida as an oriental food vegetable."

... Many restaurants in NYC (where it's legal to grow, since our cold winters prevent it from becoming entrenched) offer it on their menus, either in its common Vietnamese preparation (called "Rau Muong Xao Toi," in a savory garlic sauce) or in its usual Malaysian form ("Kangkong Belacan," sautéed with unspeakably stinky shrimp paste). I sampled it this afternoon at Nha Trang One (87 Baxter St., btw Canal and Bayard) and was pretty impressed. It's very similar to spinach, with a hollow stem, and a rich "greeniness" to the flavor. Not dark or muddy in taste at all, the way spinach can sometimes be. And it was dressed with a thin, slightly salty soy and garlic sauce that set it off nicely. It was especially good dotted with the pungent chili sauce served alongside it in a too-small dose (though I realize I probably prefer more heat than most). (dumplingjunkie.blogspot.com 2007) [emphasis mine].

The above shows that the life and times of kangkong also permeates the everyday imagination of various individuals in different parts of the world united by their encounter of a plant and a dish. In other words, kangkong resonates quite strongly in the culinary adventures of these individuals.
Appendix 9

Guide for the qualitative interview

Rationale

- To deepen the analysis of AFPS livelihoods especially on issues concerning uptake and trajectory by understanding the life histories of key household members. In a sense, we are trying to understanding the biographies of the landscape, the system, and the households.

- In particular, the interviews will be used to gather insights that will feed into the analysis of the mode of peri-urban changes, both at the level of the household, systems, and landscape, based on the angles and lenses posed below:

<table>
<thead>
<tr>
<th>Angles and lenses</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>A fixed area of peri-urban space</td>
<td>Aquatic food production is squeezed out by an advancing urban frontier, emerging conflicts between land uses and activities, and new planning guidelines that hinder aquatic production. Remnant systems may persist.</td>
</tr>
<tr>
<td>Aquatic food producing household 1</td>
<td>Cultural change, manifested most strongly at the generational level, coupled with growing difficulties of making a living in aquatic production (pollution, rising land prices, new planning controls...) forces the household to shift into new livelihoods and sell a portion of their land. They continue to occupy a portion of their former farm, but it is a farm no longer.</td>
</tr>
<tr>
<td>Aquatic food producing household 2</td>
<td>Cultural change, manifested most strongly at the generational level, coupled with growing difficulties of making a living in aquatic production (pollution, rising land prices, new planning controls...) forces the household to sell their land and move to a new location where they are able to establish themselves as aquatic producers anew.</td>
</tr>
<tr>
<td>Aquatic food production system</td>
<td>The advancing urban core, and the economic (high costs of labour, rising land prices), environmental (pollution, conflicts with other activities), legislative (more coercive planning context), and cultural (changing working preferences among urban population) challenges associated with urbanization displaces the system outwards either progressively in a relatively smooth process of advance or as a leap over a considerable distance.</td>
</tr>
<tr>
<td>Advancing peri-urban zone</td>
<td>The peri-urban zone, with its component aquatic food production systems, advances outwards in line with urban development. Changes reflect other factors: new technologies, changing dietary preferences; competition from other areas and countries; and the changing structure of the aquatic food production system, for example.</td>
</tr>
</tbody>
</table>

Objectives

- To understand the life histories of selected household members from the earliest they could remember;

- To understand the historical, social, economic and social contexts surrounding the uptake and performance or reproduction of AFPS livelihood;

- Specifically, to figure out the important developments in the land and the household associated with such reproduction;

- To understand the strategies employed by the farmers to adopt to changes in their landscape

Materials to bring to the field

- Timeline from the PCA
Filled up index cards for social network analysis. Interview question sheet/aide memoire

A list of at least 10 pre-selected and ranked respondents.

Bring along a print out of each HHs' baseline and monitoring survey with a summary of key characteristics – size of HH, land, system, when they settled etc. Possibly use this to start the interview: 'I see that you began fish farming in 1995. Can you explain to us how this came about...?' The interview should proceed from the highest rank to the lowest. Appointments should be made and time of interview to be agreed on.

Tape recorder, tapes, and batteries

Gifts

Camera

Field diary

Might not be possible but if the KU team or from some prior research you can get some any press cuttings or material from the internet concerning the previous history of the village it might be quite productive to take along – if not especially with older people is it also worth asking them if they have any old cuttings or even photographs of the village before ... the factory came?/ when they just grew rice/ before morning glory etc – just to break the ice a bit and also engender a pride in the person interviewed

**Selection criteria**

- **Length of residence**: 10= highest
- **Sex**: 2 male and 2 female / village
- **Relation to HH head**: HH head
- **Production system**: 2 plants and 2 fish/village (12 interviewees/city)
- **Migration status**: 2 migrants and 2 non-migrants/village
- **Size of production system**: 2 large and 2 small/village
- **Main activity**: producers/farmers

**Suggested Introduction**

Good afternoon. My name is xxx and this is xxx. We are researchers from the xxx working on a project examining livelihoods and aquatic production systems in peri-urban areas. You may remember that a team came to survey your household x months ago. This is the final part of the project and we would like to draw on your time and knowledge one more time.

Thank you very much for giving us the opportunity to talk to you. We have asked for this final conversation so we can better understand, in detail, the changes that have happened in your locality and livelihood. We have selected you in particular in view of your knowledge of this village and the changes that have occurred. We will be asking questions about changes in land uses in your area, your 'village lands' or your 'land holdings', changes in your household, and changes in your livelihood. We are asking these questions because we want to understand what happened in your village, your household, and livelihood especially during a time of great change. These questions will deepen our understanding of aquatic livelihoods based on areas located around cities. If you don't mind, we will tape this conversation so that we can review later what you said. Please let us know if this will be a problem for you. Please be assured that we will not identify you in person or use anything that you will say other than for the purpose of the research. Please feel free to end this in-

---

10 This is a surrogate measure indicating familiarity with the area of residence on the assumption that the longer a person stays in the place the higher his or her familiarity of the place will be (Beesley 1999:04).
Questions to explore

- Start by drawing up a timeline for the household then show the interviewee the timeline done during the PCA. This will be used as a template to begin fleshing out the 'why' of what happened. It would also mean that you can concentrate on the questions that are likely to yield an interesting response.

- What are the major livelihood changes the household went through the year as far as the respondent could remember? Were there major land use changes too?

- Is your family traditionally rice farmers? Do you also have siblings or children who are rice farmers?

- Is your family traditionally fish farmers? Do you also have siblings or children who are fish farmers?

- What were your occupational histories including that of your parents, siblings and children?

- Is there a specific trend towards non-agricultural/aquacultural occupation in your household? What is/are the reasons for this trend? Is this trend desirable?

- What is your preference for your children's education? How do you want your children to become? Do you think agriculture or aquaculture based occupations like you do now offer security for your children? Why?

- Do you consider yourself living in a rural or urban area? If rural, why? If urban, why?

- What determines a rural and an urban area?

- If you are currently rural, when do you see yourself moving towards the urban?

- If already urban, did at a certain point in your life you spend in the rural? Which do you prefer?

- What do you think are the characteristics of a rural lifestyle? An urban lifestyle?

- Is AFPS, a rural or urban lifestyle?

- Which lifestyle is your children following? Are these lifestyles good? (See Angles and lenses for theoretical background of these questions).

- Since you started practicing AFPS, have you improvised, changed your system of growing fish or plants? What are these changes? Why did you introduce these changes? From whom did you learn these changes?

- Have you noticed a time in your village when land sale occurred in larger quantities? When was this? Why was this happening?

- If the price of the land increasing? By how much? What is the current price?

- Perhaps allied to above you could explore with the person the history of others who had sold up all of their land and moved – approx numbers where did they go to – what % (if any) who did this relocated and began an aquatic farming system again – in a new location – if few or you can ask anyway how relevant or easy is it for people HHs in the village to relocate to other areas to carry on aq plants or fish culture – what constraints or benefits are there (from the govt?) to do this – is there any linkage here with "designated green" areas in Bangkok Metropolitan Dev Plans?
- Have you been involved in home gardening before? Since when? Was this before you were involved in rice and fish farming? What kind of fruit trees do you have in your garden?

- If no longer involved, what is the reason?
BASELINE QUESTIONNAIRE

THIS PAGE FOR REFERENCE ONLY. NEED NOT BE PRINTED.

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Codes</th>
<th>Page/s</th>
</tr>
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<tbody>
<tr>
<td>Metadata</td>
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<tr>
<td>Province codes</td>
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<tr>
<td>Interviewee details</td>
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<td>3</td>
</tr>
<tr>
<td>Household details</td>
<td>HH1-HH10</td>
<td>4-5</td>
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<td>Occupation codes</td>
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<td>Migration issues</td>
<td>M1-M13</td>
<td>7-8</td>
</tr>
<tr>
<td>Institutional issues</td>
<td>IB1-IB9</td>
<td>9</td>
</tr>
<tr>
<td>Housing and infrastructure issues</td>
<td>H11-H122</td>
<td>10-11</td>
</tr>
<tr>
<td>Land issues</td>
<td>HL1-HL18</td>
<td>11-12</td>
</tr>
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<td>Water issues</td>
<td>W1-W7</td>
<td>13</td>
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<td>Economic issues</td>
<td>E1-E3</td>
<td>13</td>
</tr>
<tr>
<td>Credit</td>
<td>C1-C5</td>
<td>14</td>
</tr>
<tr>
<td>Production systems</td>
<td>PS1-PS12</td>
<td>14-15</td>
</tr>
<tr>
<td>Health and consumption issues</td>
<td>HC1-HC21</td>
<td>16-18</td>
</tr>
<tr>
<td>About the future</td>
<td>FT1-FT5</td>
<td>18-19</td>
</tr>
</tbody>
</table>

Note when translating:
Always keep the same coding system as this is standardized across all cities. Our database is also designed with this system in mind. The codes should not changed. Use the "other" code to add more codes and then number accordingly following the last number in the choices.
The PAPUSSA project is a joint development project funded by the European Union and currently being carried out in 4 cities in Southeast Asia: Bangkok, Phnom Penh, HCMC, and Hanoi.

<table>
<thead>
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<th>Baseline Questionnaire Code</th>
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<tr>
<td>Community code (e.g., 01-99)</td>
</tr>
<tr>
<td>Household code (01-99)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Person Interviewed:</td>
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<td>Address:</td>
</tr>
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<td>Questionnaire rejected? Why? (Note: No need to enter in DB)</td>
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<table>
<thead>
<tr>
<th>Interview date and time</th>
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<tr>
<td>Language used by respondent</td>
</tr>
<tr>
<td>Time at start of interview</td>
</tr>
<tr>
<td>Time at end of interview</td>
</tr>
<tr>
<td>Interview completed</td>
</tr>
<tr>
<td>Call-back required on question #s:</td>
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<tr>
<td>Call-back date and time</td>
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| Interview checked by, date |
| Data-entry/coding by, date |
| Data-entry checked by, date |

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<tr>
<td>1... March-April Baseline</td>
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<tr>
<td>2... March-April Monitoring</td>
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<tr>
<td>3... June-July Monitoring</td>
</tr>
<tr>
<td>4... October-November Monitoring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community code:</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-99 Use community/village codes listed separately</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household code:</th>
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</thead>
<tbody>
<tr>
<td>01-99 Begin numbering households from 01 in each village</td>
</tr>
<tr>
<td>Nationality codes</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>1: Thai</td>
</tr>
<tr>
<td>2: Cambodian</td>
</tr>
<tr>
<td>3: Vietnamese</td>
</tr>
<tr>
<td>4: Burmese</td>
</tr>
<tr>
<td>5: Lao</td>
</tr>
<tr>
<td>6: Chinese</td>
</tr>
<tr>
<td>7: Others</td>
</tr>
</tbody>
</table>

**Nationality**

Name of HHH if different from the person interviewed

**Ethnicity**

**Religion**

**Religion codes**

1: Buddhist
2: Muslim
3: Catholic
4: Hindu
5: Cao Đài
6: Protestant
7: Other Christian groups
8: Other

**Ethnicity codes**

1: Kinh
2: Khmer
3: Thai
4: Chăm
5: Chinese
6: Burmese
7: Lao
8: Muong
9: Nung
10: Hmong
11: Dao
12: Gia Rai
13: E-de
14: Other
15: Foreigner
16: Unspecified

**Complete this part only after the interview!**

Where any outsiders present during the interview (excluding small children)?

Who are they?

Main production system (check HS43)

Wastewater/non-wastewater

Baseline Questionnaire, p.03
<table>
<thead>
<tr>
<th>Number</th>
<th>NAME</th>
<th>Sex</th>
<th>Age</th>
<th>Education</th>
<th>Marital status</th>
<th>Is [NAME] present?</th>
<th>[NAME] is not in the house now, where is he/she?</th>
<th>What were their reason/s for being away?</th>
<th>What are their 3 main occupations in order of importance in terms of income?</th>
<th>OCCUPATION CODES</th>
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Baseline Questionnaire, p. 05
MI-M13. Migration
ASK THIS QUESTION TO THE HOUSEHOLD HEAD OR THE INTERVIEWEE

M1. Were you born in the district/community/village [i.e. CURRENT PLACE OF RESIDENCE]?

YES
NO


M7. Where were you living in the year you moved? What is the reason/s for moving to this current location [CURRENT PLACE OF RESIDENCE]?

1. FARMING
2. FARMING AQUATIC VEGETABLES
3. FARMING LAND
4. SELLING FISH
5. SELLING OTHER VEGETABLES
6. SELLING AQUATIC VEGETABLES
7. RAISING LIVESTOCKS
8. FORCED RELOCATION
9. NATURAL DISASTER/CALAMITIES/FIRE
10. ADVENTURE/CHANCE
11. FAMILY CONFLICT
12. LOOK FOR WORK
13. JOIN THE ARMY
14. FOLLOW OR JOIN FAMILY
15. VISITING RELATIVES
16. OTHER

M8. What work are you currently involved in?

1. FARMING
2. FARMING AQUATIC VEGETABLES
3. FARMING LAND
4. SELLING FISH
5. SELLING OTHER VEGETABLES
6. SELLING AQUATIC VEGETABLES
7. RAISING LIVESTOCKS
8. JOIN THE ARMY
9. FOLLOW OR JOIN FAMILY
10. VISITING RELATIVES
11. OTHER

M9-M16. (To probe in CURRENT PLACE OF RESIDENCE)

M17. What is the current location you live in as of the interview?

M18. AGE IN YEARS

MI-M13. Child Migration Status
ASK THIS QUESTION TO THE HOUSEHOLD HEAD OR THE INTERVIEWEE

M19. Were you born in the district/community/village [i.e. CURRENT PLACE OF RESIDENCE]?

YES
NO

M20. Where are you from? when you left your place of birth for the first time to live somewhere else?

M21. Where were you living in the year you moved? What is the reason/s for moving to this current location [CURRENT PLACE OF RESIDENCE]?

1. FARMING
2. FARMING AQUATIC VEGETABLES
3. FARMING LAND
4. SELLING FISH
5. SELLING OTHER VEGETABLES
6. SELLING AQUATIC VEGETABLES
7. RAISING LIVESTOCKS
8. FORCED RELOCATION
9. NATURAL DISASTER/CALAMITIES/FIRE
10. ADVENTURE/CHANCE
11. FAMILY CONFLICT
12. LOOK FOR WORK
13. JOIN THE ARMY
14. FOLLOW OR JOIN FAMILY
15. VISITING RELATIVES
16. OTHER

M22. What work are you currently involved in?

1. FARMING
2. FARMING AQUATIC VEGETABLES
3. FARMING LAND
4. SELLING FISH
5. SELLING OTHER VEGETABLES
6. SELLING AQUATIC VEGETABLES
7. RAISING LIVESTOCKS
8. JOIN THE ARMY
9. FOLLOW OR JOIN FAMILY
10. VISITING RELATIVES
11. OTHER

M23-M26. (To probe in CURRENT PLACE OF RESIDENCE)
## MIGRATION CONT...

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<tr>
<th></th>
<th>M7</th>
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<th>M10</th>
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</table>

**Baseline Questionnaire, p. 08**

---

**WE WILL RETURN TO QUESTIONS ABOUT YOUR PRODUCTION SYSTEMS LATER. ALLOW ME TO MOVE ON TO OTHER QUESTIONS.**

Baseline Questionnaire, p. 08
**IB14B9, INSTITUTIONS**

Ask for each household member over 16. Try to suggest likely groups and to get as complete a response as possible. Use the household number in HH1.

### Question 81

**Are any members of the household involved in any organization?**

<table>
<thead>
<tr>
<th>HH ID #</th>
<th>IB4</th>
<th>IB5</th>
<th>IB6</th>
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<tbody>
<tr>
<td>IB2</td>
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<tr>
<td>HH3</td>
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</table>

1. **FARMERS' ORGANIZATION**
   - **What is the name of the organization?**
   - **What is the member's position or status in the organization?**
   - **If so, roughly how much time does s/he spend per week on that group?**
   - **What are the benefits of membership?**
   - **What are the obligations of membership?**

   - **1.** Farmer ORGN
   - **2.** Women's Union
   - **3.** Youth Union
   - **4.** Veterans ORGN
   - **5.** Red Cross ORGN
   - **6.** Gardener's ORGN
   - **7.** Fish Farmers ORGN
   - **8.** Joint Co-operation Committees
   - **9.** Credit Union
   - **10.** Rural DEV Bank
   - **11.** Community Cooperative Group
   - **12.** AGR SOC TOR
   - **13.** Farmers' Market
   - **14.** Others

### Question 87

**Have you had to deal with any government agencies in the last three months?**

- **YES**
- **NO**

<table>
<thead>
<tr>
<th>IB7</th>
<th>IB8</th>
<th>IB9</th>
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- **For what reason or concern did you approach or deal with them?**
  - Use codes in IB8
- **How did you deal or approach them?**
I WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT YOUR HOUSE.

<table>
<thead>
<tr>
<th>Hi1</th>
<th>Hi2</th>
<th>Hi3</th>
<th>Hi4</th>
<th>Hi5</th>
<th>Hi6</th>
<th>Hi7</th>
<th>Hi8</th>
<th>Hi9</th>
<th>Hi10</th>
<th>Hi11</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long have you lived in this house?</td>
<td>In what year did you come to live in this house?</td>
<td>Do you or your family own this house?</td>
<td>Do you family own this land on?</td>
<td>If not, who does?</td>
<td>If not, who does?</td>
<td>How did you acquire the plot?</td>
<td>How many families live in this house altogether?</td>
<td>Predominant construction materials</td>
<td></td>
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<tr>
<td>YES</td>
<td>NO.</td>
<td>YES</td>
<td>YES</td>
<td>1 FAMILY-RELATIVE OWNS</td>
<td>2 FRIEND OWNS</td>
<td>3 LANDLORD</td>
<td>SAME CODE AS H4</td>
<td>YES</td>
<td>NO</td>
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<td></td>
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<td>4 OTHER</td>
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</table>

INTERVIEWER SHOULD EXAMINE THE HOUSE AND FILL IN RESPONSES FROM OWN OBSERVATION.

- 10 SEMI-OPEN OR INCOMPLETE
- 20 CARDBOARD, CLOTH OR PLASTIC
- 21 CARDBOARD
- 22 SACKING
- 23 NYLON SHEETING
- 24 POLYTHENE SHEETING
- 30 THATCH OR WATTLE
- 40 EARTH
- 41 MUD-BRICK
- 42 SOIL-CEMENT BLOCK
- 50 WOOD
- 60 PREFABRICATED BOARDING OR PANELS OR CORRUGATED IRON
- 61 ASBESTOS SHEETING
- 62 PLYWOOD SHEETING
- 63 PLASTERBOARD
- 64 CORRUGATED PLASTIC
- 65 CORRUGATED IRON
- 70 BRICK OR CEMENT-BLOCK
- 71 FIRED BRICK
- 72 COMPOSITE BLOCK
- 73 CEMENT BLOCK
- 80 CEMENT/CONCRETE

Baseline Questionnaire, p. 10
## HOUSING AND INFRASTRUCTURE, CONT.

<table>
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<th>HL12</th>
<th>HL13</th>
<th>HL14</th>
<th>HL15</th>
<th>HL16</th>
<th>HL17</th>
<th>HL18</th>
<th>HL19</th>
<th>HL20</th>
<th>HL21</th>
<th>HL22</th>
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<td><strong>What is your source of light?</strong></td>
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<td>1. MAINS ELECTRICITY</td>
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<tr>
<td>2. TAPPED ELECTRICITY FROM ANOTHER HOUSE</td>
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<td>3. KEROSENE</td>
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<td>4. CANDLES</td>
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| Do you have a toilet? Where? |
| 1. NONE |
| 2. NOT WITHIN THE PLOT BOUNDARY |
| 3. OUTSIDE |
| 4. INSIDE |
| 5. OTHER |

| Do you share toilet with other household(s)? |
| 1. YES |
| 2. NO |

| What type of toilet is it? |
| 1. TOILET CONNECTED TO MAIN DRAINAGE |
| 2. TOILET CONNECTED TO SEPTIC TANK |
| 3. LATRINE |
| 4. BUCKET |
| 5. HOLE OVER WATER/STREAM |
| 6. HOLE IN THE GROUND |
| 7. OTHER |

| Does the house have mains electricity and light? Where? |
| 1. MAINS ELECTRICITY |
| 2. TAPPED ELECTRICITY |
| 3. KEROSENE |
| 4. CANDLES |
| 5. OTHER |

| Is any of this land located outside the village? Where? |
| 1. NONE |
| 2. NEIGHBOURING VILLAGE |
| 3. NEIGHBOURING PROVINCE |
| 4. ANOTHER CITY |
| 5. ANOTHER COUNTRY |
| 6. OTHER |

| How much land does the household own? |
| 1. TOTAL SIZE OF PLOT/S |
| 2. NEIGHBOURING VILLAGE |
| 3. NEIGHBOURING PROVINCE |
| 4. ANOTHER CITY |
| 5. ANOTHER COUNTRY |
| 6. OTHER |

| How much? |
| 1. TOTAL SIZE OF PLOT/S |
| 2. NEIGHBOURING VILLAGE |
| 3. NEIGHBOURING PROVINCE |
| 4. ANOTHER CITY |
| 5. ANOTHER COUNTRY |
| 6. OTHER |

| Has the land area that the household owns changed over the last 5 years? |
| 1. YES |
| 2. NO |

| If yes, what are the changes? |
| 1. TOTAL SIZE OF PLOT/S INCREASED |
| 2. TOTAL SIZE OF PLOT/S DECREASED |

---

**Baseline Questionnaire, p. II**
I WOULD NOW LIKE TO ASK ABOUT THE LAND YOU AND THE HOUSEHOLD ARE CURRENTLY USING.

At the moment, if owned, what type of document do you have to show that you own this plot?

- NONE
- OCCUPANCY LICENSE
- LEGAL TITLE
- PAPER FROM PERSON WHO SOLD LAND
- DEED
- OTHER

If owned, how much land is OWNED, RENTED/LEASED OR A COMMON PROPERTY RESOURCE?

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<th>TOTAL</th>
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</table>

How did you acquire the plot that you owned?

- BOUGHT
- INVADED/SQUATTED
- INHERITED/GIVEN LICENSE
- RESETTLED
- USE RIGHT GIVEN BY LOCAL LEADER
- RECEIVED FROM DECOLLECTIZATION
- AGRARIAN REFORM
- OTHER

<table>
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<tr>
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<th>HL12</th>
<th>HL13</th>
<th>HL14</th>
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Baseline Questionnaire, p.12
### W1-W7, WATER

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<tbody>
<tr>
<td>What type of drinking water supply does your household normally use?</td>
<td>How often do you use this?</td>
<td>Who supplies you?</td>
<td>What do you use this type of water for?</td>
<td>Do you treat the water supply you use?</td>
<td>How often do you treat it?</td>
<td>How do you treat it?</td>
</tr>
<tr>
<td>ALLOW UP TO THREE CHOICES</td>
<td>1 ALWAYS</td>
<td>1 GOVERNMENT</td>
<td>1 BATHING</td>
<td>1 YES</td>
<td>SAME CODE AS W2</td>
<td>ALLOW UP TO THREE CHOICES</td>
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<tr>
<td>1 OWN TAP CONNECTED TO MAINS</td>
<td>2 MOST OF THE TIME</td>
<td>2 PRIVATE COMPANY</td>
<td>2 DRINKING</td>
<td>2 NO, <strong>E1</strong></td>
<td>1 BOILING</td>
<td>1 OWN TAP OR STANDPIPE</td>
</tr>
<tr>
<td>2 PUBLIC TAP OR STANDPIPE</td>
<td>3 OCCASIONALLY</td>
<td>3 OWN SUPPLY</td>
<td>3 TOILET PURPOSES</td>
<td>2 USE FILTER</td>
<td>2 PUBLIC TAP OR STANDPIPE</td>
<td>4 WASHING CLOTHES</td>
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<td>3 WELL</td>
<td>4 OCCASIONALLY</td>
<td>4 COMMON VILLAGE SUPPLY</td>
<td>4 PREPARING MEALS</td>
<td>3 ADDING CHEMICALS</td>
<td>3 WASHING CLOTHES</td>
<td>5 WASHING COOKING UTENSILS</td>
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<td>4 BOREHOLE</td>
<td>5 NEVER</td>
<td>5 OTHERS</td>
<td>5 PREPARING MEALS</td>
<td>4 OTHERS</td>
<td>5 OTHERS</td>
<td>6 LIVESTOCK</td>
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<td>5 RIVER OR STREAM</td>
<td>6 OCCASIONALLY</td>
<td>6 COMMON VILLAGE SUPPLY</td>
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<td>6 PURCHASE BY TANK/BUCKET UTENSILS</td>
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### E1-E3, ECONOMIC

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<tbody>
<tr>
<td>What are your HH main income earning activities last year? ALLOW THREE CHOICES</td>
<td>What was their percentage contribution to your overall income last year?</td>
<td>Do you have older children or other relatives or friends who are not living with you, but send money from time to time to help maintain this household?</td>
</tr>
<tr>
<td>1) %</td>
<td>2) %</td>
<td>TOTAL</td>
</tr>
<tr>
<td>1)</td>
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<td>1)</td>
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<tr>
<td>2)</td>
<td>2)</td>
<td>2)</td>
</tr>
<tr>
<td>3)</td>
<td>3)</td>
<td>3)</td>
</tr>
</tbody>
</table>

**ACTIVITIES CODES**

1. FARMING-LIVESTOCK
2. FARMING-VEGETABLES
3. FARMING-FISH
4. SELLING-FISH
5. SELLING-VEGETABLES
6. SELLING-LIVESTOCK
7. REMITTANCES
8. CASH GIFTS
9. NET PROFITS FROM OWN ENTERPRISE
10. RENT FROM LODGERS
11. HIRED LABOUR
12. FACTORY WORK
13. DRIVER
14. OTHERS

**E3**

1. YES
2. NO

Baseline Questionnaire, p. 13
### C1-C5. CREDIT

<table>
<thead>
<tr>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Have you borrowed money in the last 12 months to invest in your aquaculture production system?</strong></td>
<td><strong>If you did borrow money in the last 12 months, who did you borrow money from?</strong></td>
<td><strong>For what production system?</strong></td>
<td><strong>For what specific activity or need in your production system was the credit for?</strong></td>
<td><strong>If you did not borrow money, what was the reason?</strong></td>
</tr>
<tr>
<td>1 YES</td>
<td>2 NO</td>
<td>ALLOW THREE CHOICES</td>
<td>ALLOW THREE CHOICES</td>
<td>ALLOW THREE CHOICES</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>BANK</td>
<td>COMMUNITY OR ROTATING SAVINGS SCHEME</td>
<td>CREDIT COOPERATIVES</td>
<td>STORE OR SHOP</td>
<td>NGOs</td>
</tr>
<tr>
<td>MORNING GLORY/WW</td>
<td>MORNING GLORY/NWW</td>
<td>HYBRID CATFISH/LAUGHTER HOUSE WASTE</td>
<td>MIMOSA/MORNING GLORY</td>
<td>PANGASIUS WW</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>PURCHASE NETS</td>
<td>PURCHASE FEEDS</td>
<td>PURCHASE CAPITAL EQUIPMENT</td>
<td>PURCHASE MEDICATIONS</td>
<td>PURCHASE CHEMICALS</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>OTHERS</td>
<td>OTHERS</td>
<td>OTHERS</td>
<td>OTHERS</td>
<td>OTHERS</td>
</tr>
</tbody>
</table>

### PS1-PS16, PRODUCTION SYSTEMS

**NOW LET US TALK ABOUT YOUR PRODUCTION SYSTEMS...**

<table>
<thead>
<tr>
<th>PS1</th>
<th>PS2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Do you grow land vegetables?</strong></td>
<td><strong>Do you have livestock?</strong></td>
</tr>
<tr>
<td>1 YES</td>
<td>1 YES</td>
</tr>
<tr>
<td>2 NO</td>
<td>2 NO</td>
</tr>
</tbody>
</table>

Baseline Questionnaire, p. 14
### Production System

**What equipment do you use for your fish and aquatic plants farming activities?**

- Gill nets
- Seine nets
- Hand tractor
- Electric generator
- Boat
- Aerator
- Pesticide sprayer
- Four wheel tractor

**How many of this [equipment] do you have?**

- Owner
- Rented in
- Rented out
- Shared with others
- Communal
- Other

**What is the ownership status of this [equipment]?**

- Own
- Rented in
- Rented out
- Shared with others
- Communal
- Other

---

**Production System in C3**

- How many cropping did you have from your production system last year?
- When did you start being involved in this system?
- What is the size of each of this system?

**Estimated Yield**

- Field
- Unit
- Cropping
- Unit
- Area
- Unit

**Income**

- Field
- Unit
- Cropping
- Unit
- Year
- Area
- Unit

---

**How is it supplied?**

- Allow three choices

<table>
<thead>
<tr>
<th>Type of Holding Facility/water body</th>
<th>Main Water Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Earth Pond</td>
<td>1. Pumped</td>
</tr>
<tr>
<td>2. Tank</td>
<td>2. Gravity</td>
</tr>
<tr>
<td>4. Cage</td>
<td>4. Seasonal Rainfed</td>
</tr>
<tr>
<td>5. Wastewater</td>
<td>5. Groundwater</td>
</tr>
<tr>
<td>7. Lakes</td>
<td>7. Enclosure</td>
</tr>
</tbody>
</table>

---

**Have you or any other HH members been involved in any training related to your APPS?**

- Yes
- No

**If yes, what were these trainings on?**

- Fish Farming
- Hatchery Operation
- Aquatic Plants Management
- Pesticide/Fertilizer Application
- Marketing
- Other

---

**Refer to production system codes in C3**

**Production System**

- PS3
- PS4
- PS5

**Production System in C3**

- For each of your specific production system, what are your main water sources?

### Baseline Questionnaire, p. 15
I WOULD LIKE TO ASK YOU SOME GENERAL QUESTIONS ABOUT HEALTH AND CONSUMPTION...

HC1. Have YOU or YOUR HOUSEHOLD MEMBERS been working with wastewater in your production activities?  
\[
\begin{array}{ll}
\text{YES} & \text{NO, >>HC6}
\end{array}
\]

HC2. What do you think is a "wastewater"? How do you define it? 

HC3. What source of wastewater, if any, does your household work with? CHOOSE ONE OR MORE OPTION

HC4. Does your HH use non-wastewater along with wastewater in irrigating your fields and ponds?  
\[
\begin{array}{ll}
\text{YES} & \text{NO}
\end{array}
\]

HC5. When you were working in the farm or pond, which part of your body is in contact with the wastewater? [CIRCLE AND CHOOSE ONE OR MORE OPTION]

- FEET
- FEET TO KNEES
- FEET TO UPPER LEG
- FEET TO WAIST
- FEET TO LOWER TORSO
- FEET TO UPPER TORSO
- FEET TO SHOULDERS AND ARMS
- WHOLE BODY
- HANDS
- HANDS AND LOWER ARMS
- HANDS AND WHOLE ARMS
- HEAD
- FACE
- BACK
- BUTT
- OTHER

Baseline Questionnaire, p. 16
### HEALTH AND CONSUMPTION, CONT.

<table>
<thead>
<tr>
<th>HC6</th>
<th>HC7</th>
<th>HC8</th>
<th>HC9</th>
</tr>
</thead>
<tbody>
<tr>
<td>What aquatic vegetables does your household consume? <strong>ASK RESPONDENTS TO LIST THEM DOWN</strong></td>
<td>Using a scale of 1 to 10, with 10 as the highest, please rank these vegetables according to the most eaten.</td>
<td>Which among these aquatic vegetables does your household consume primarily uncooked?</td>
<td>To your knowledge, which of these aquatic vegetables are produced in wastewater/nonwastewater?</td>
</tr>
<tr>
<td>Morning glory</td>
<td>Morning glory</td>
<td>Morning glory</td>
<td>Morning glory</td>
</tr>
<tr>
<td>Water mimosa</td>
<td>Water mimosa</td>
<td>Water mimosa</td>
<td>Water mimosa</td>
</tr>
<tr>
<td>Water dropwort</td>
<td>Water dropwort</td>
<td>Water dropwort</td>
<td>Water dropwort</td>
</tr>
<tr>
<td>Lotus</td>
<td>Lotus</td>
<td>Lotus</td>
<td>Lotus</td>
</tr>
</tbody>
</table>

**HC10**

To your knowledge are the fish consumed by your household produced primarily in farms, fields or ponds using wastewater?

- [ ] Yes
- [ ] No

**HC11**

Does your family eat the following types of food?

**CHOOSE ONE OR MORE OPTION**

- Raw fish
- Salted fish
- Fermented fish
- Half-cooked fish
- Well-cooked fish
- Don't eat fish

**HC12**

When do you wash your hands?

**READ ALOUD THE OPTIONS ON THE RIGHT, >>>>>>>>>>

- Before eating
- After eating
- After using the toilet
- After working with wastewater
- Before prayers
- Before going to bed
- Before handling the children
- Do not wash hands
- Other

*Baseline Questionnaire, p. 17*
HEALTH AND CONSUMPTION, CON'T

In the last month have you or any of your household members have any of these health problems?

<table>
<thead>
<tr>
<th>HEALTH PROBLEMS</th>
<th>HOUSEHOLD STATUS</th>
<th>HOUSEHOLD MEMBERS</th>
<th>HEALTH PROBLEMS</th>
<th>CAUSE</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoea</td>
<td>Head</td>
<td>01 Head</td>
<td>01 Head</td>
<td>Self-treatment</td>
<td>Stay home</td>
</tr>
<tr>
<td></td>
<td>Spouse</td>
<td>02 Spouse</td>
<td>02 Spouse</td>
<td>Visit a traditional healer</td>
<td>Consult a modern doctor</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>03 Child</td>
<td>03 Child</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>04 Others</td>
<td>04 Others</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>05 Others</td>
<td>05 Others</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<tr>
<td></td>
<td>Other</td>
<td>06 Other</td>
<td>06 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td></td>
<td>Other</td>
<td>07 Other</td>
<td>07 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td></td>
<td>Other</td>
<td>08 Other</td>
<td>08 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td>Other</td>
<td>09 Other</td>
<td>09 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td>Other</td>
<td>10 Other</td>
<td>10 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td>Other</td>
<td>11 Other</td>
<td>11 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td>Other</td>
<td>12 Other</td>
<td>12 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
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<td></td>
<td>Other</td>
<td>13 Other</td>
<td>13 Other</td>
<td>Consult a modern doctor</td>
<td>Consult a traditional healer</td>
</tr>
</tbody>
</table>

FT16. ABOUT THE FUTURE

How do you think your own production system will change in the next 5 years?

- No change
- Increase production area
- Decrease production area
- Increase intensity
- Decrease intensity
- Diversify production system
- More government support
- Change to high-value species
- None

Baseline Questions p. 18
### ABOUT THE FUTURE, CONT...

<table>
<thead>
<tr>
<th>Production system</th>
<th>What do you think are likely to be the three main threats/problems that your fish farming/aquatic plants culture will face in the next 5 years? OPEN CODE</th>
<th>What in your view are the best ways of dealing with them? OPEN CODE</th>
<th>System Code in C2</th>
<th>Main Problems</th>
<th>Best Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 1</td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td>System 2</td>
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<td>System 3</td>
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</tr>
</tbody>
</table>

Any other comments or options you would like to raise which have not been asked in this survey?

Thank you very much. We will come back in 3 months time.