The impact of intermediate means of transports (IMTs) on agricultural production and marketing in coastal Ghana: evidence from a pilot IMT action research project

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THE IMPACT OF INTERMEDIATE MEANS OF TRANSPORTS (IMTs) ON AGRICULTURAL PRODUCTION AND MARKETING IN COASTAL GHANA: EVIDENCE FROM A PILOT IMT ACTION RESEARCH PROJECT

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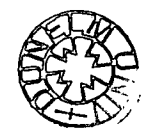
M. A.R. THESIS

November 2004



THE IMPACT OF INTERMEDIATE MEANS OF TRANSPORTS (IMTs) ON AGRICULTURAL PRODUCTION AND MARKETING IN COASTAL GHANA: EVIDENCE FROM A PILOT IMT ACTION RESEARCH PROJECT

By

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November 2004

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Thesis title: The impact of Intermediate Means of Transports (IMTs) on agricultural production and marketing in coastal Ghana: evidence from a pilot IMT action research project

ABSTRACT

Transport is a critical input for agricultural production and marketing. The past three decades have been challenging for the development of efficient transport systems in developing countries. Huge funds and efforts have been devoted to the conventional transport sector but this has clearly had limited impact on accessibility or mobility. Most farmers continue to depend on walking and headloading to move their produce between farms and markets. This hinders the development of agriculture and efficient marketing systems. Intermediate Means of Transports (IMTs) are now seen by many development agencies as a viable option that could induce greater mobility and improve accessibility and help improve agriculture, marketing and other livelihood means in developing areas.

The purpose of this study is to examine the influence of IMTs on agricultural production and marketing in rural areas, focussing on Gomoa District in the Central Region of Ghana. The study examines the impact of a small action research project which involved introduction of selected IMTs in off-road villages. It examines the influence of IMTs over a twenty month period on farm size, location, distribution, productivity patterns, labour and gender issues, utilising a mix of qualitative and quantitative methods.

The study observed some IMT influence on labour productivity, labour availability and mobility, farm location and distribution, cropping pattern, marketed output and access to markets, though a relatively longer period of time is required in order to fully assess their impact than was available to this study. The impact of IMT on farming was influenced by social relationships, physical characteristics of the villages, including physical access conditions, and the economic and financial conditions of farmers. The influence of IMTs on crop marketing was larger in areas where routes to markets are poor, distance to markets are short, conventional transport service are poor and load volumes are large.

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DECLARATION

I, Frank Owusu Acheampong, the author of this study confirm that this thesis has been produced by myself and it has not been submitted in any previous application for a degree. The work reported within was executed by myself and all information cited and sources contacted are acknowledged at the appropriate point in the text.

STATEMENT OF COPYRIGHT

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DEDICATION

To Millicent Owusu Acheampong my beloved wife

and

our expected child Nana Acheampong.

ACKNOWLEDGEMENT

The road had been rough, the wind had been turbulent and the journey had been far longer than anticipated. The thesis had been unduly delayed by severe ill-health but for the mighty hands of God, His healing power, mercies and grace, this is how far I have come to. To God be the glory and my utmost thanks.

I owe a debt of gratitude to my supervisors, Dr. Gina Porter and Dr. E. A. Oughton, for their time, encouragement, guidance and assistance at all stages of the thesis. Dr. Porter is to a great extent responsible for my interest in the subject matter. She will always be remembered for innumerable things, but above all for sharing with me her wisdom and vast experience in rural transport and rural livelihoods and for providing me the opportunity to generate funds for this study. Thank you for helping me to recognise the real impact of transportation on rural development and also for supporting me in diverse ways toward the realisation of this dream. I shall always be indebted to you. Dr. E. A. Oughton offered a great deal of support throughout the study period. The thesis has been shaped by her intellectual insight and constructive and critical comments. Not having real field experience in Ghana, she provided invaluable suggestions and comments which greatly contributed to the logical and coherent presentation of facts and ideas in this thesis and a lay persons understanding of this document. I greatly appreciate all your contributions. Have my heart felt gratitude.

I further acknowledge the collective effort of the Department of Geography, University of Durham for providing me with a base, legitimacy and support to carry out this study. I would like to acknowledge the effort of DFID Crop Post Harvest in funding the larger rural transport project out which this thesis was borne. I would also like to express my gratitude to Tim Donaldson of DFID Crop Post-harvest whose understanding and foresight made it possible for me to undertake this study. Special mention should be made of the Churches Commission for International Students, Sir Ernest Cassel Education Trust and the University of Durham Hardship fund for providing me financial support during difficult times. Many other people also contributed in diverse ways toward the successful completion of this thesis but space will not allow me to mention them in turn. To all such people goes my sincere thanks.

Finally, my fondest thanks goes to my wife and soul mate Millicent Owusu Acheampong for her support, patience, inspiration and encouragement and the many sacrifices she made throughout this thesis.

ABBREVIATIONS

ADRA	Adventist Development and Relief Agency
DDP	District Development Plan
DFID	Department for International Development (UK)
DFR	Department of Feeder Roads (Ghana)
FAO	Food and Agricultural Organization
IFRTD	International Forum for Rural Transport and Development
ILO	International Labour Organization
IMT(s)	Intermediate Means of Transport(s)
ISBN	International Standard Book Number
MDG(s)	Millennium Development Goals
MTADP	Medium Term Agricultural Development Plan
MOFA	Ministry of Food and Agriculture (Ghana)
NGO(s)	Non-Governmental Organization(s)
NMT(s)	Non-Motorised Transport(s)
PRA	Participatory Rural Appraisal
SMT(s)	Simple Motorised Transport(s)
SSATP	Sub-Saharan African Transport Programme
TCARC	Technical Centre for Agricultural and Rural Cooperation
TRL	Transport Research Laboratory, UK
UK	United Kingdom
VIP	Village Infrastructure Project

GLOSSARY OF WORDS

Abunu	A system of sharing crops/farm between a tenant and landlord under which the crop/farm is divided into two and each party takes one half.
Abusa	A system of sharing crops/farm between a tenant and landlord under which the crop/farm is divided into three equal parts; the tenant takes two-thirds and the landlord takes one-third.
abusua panin	The head of a clan
Akan	*This is a collective name for a group of people who live in the middle and part of southern Ghana. The Akan is made up of people of different dialects.*
Clan	The clan tells the matrilineal linkage of a person. Within the clans are found extended families. There are seven different clans within the Akan customary system.
Fanti	The *Fantis* are a sub-group of the *Akans*.
Gari	A cassava flake. It is processed by peeling and grating the cassava and then packaging the dough into a sack, squeezing it to drain the water from it and allowing it to stand for one to three days to ferment. It is then fried into a flake.
Kenkey	It is made from dried maize. The maize is soaked over-night and ground into a flour. The flour is soaked (and may be fermented) and wrapped in leaves and cooked for some hours.
Nnoboa	The *nnoboa* is a group of people who have come together to contribute labour for activities on their farms on rotation basis. They may also take up paid jobs from other farmers and share the proceeds/income generated.
Pole	It is the unit of measure of land in the study area. 1 pole is equivalent to 1.125 acres
Trotro	a mini bus for providing commercial services
Susu	Susu refers to a rotation credit whereby a group of people come together to contribute money over a period of time and share the proceeds according to how much each member contributed.

CHAPTER ONE

INTRODUCTION

1.1 Background

This study considers the potential role of Intermediate Means of Transport (IMT) in improving agricultural production and marketing in coastal Ghana. Many studies emphasize that rural road access and on-farm transportation services are particularly critical for modernization and commercialization of agriculture (Arno, 1986; TCARC, 1988; Doyen, 1994 and Open et al., 1997). The World Bank (1993) identified that poor road conditions and associated high transport cost were the single most important factor affecting the ability of subsistence farmers to enter the market economy. Access problems in developing areas, including coastal Ghana, impact greatly on agricultural production and marketing.

In spite of these observations, transport infrastructure and services remain poor in most developing areas. The provision of rural roads is a highly rated priority of many villagers in the developing world including Ghana (Fricke and Kochendorfer-Lucius, 1990) although it is difficult to fulfil. It is practically impossible to provide all rural settlements with an all-season access road. In areas where roads exist, conventional transport services are often limited and unreliable. Furthermore, the larger sizes of most commercial vehicles do not satisfy the subsistence and marketing needs of the majority of small farmers.

Conventional transport constraints have limited many farmers to head porterage, mostly by women. Head porterage is laborious, costly, and less efficient and so adds to production and marketing costs (McCall, 1985; World Bank 1993; Porter, 1998).

The situation calls for an alternative approach to rural transport development and IMTs are increasingly seen by donors and researchers as part of the solution to transport problems in subsistence farming systems. The promotion of IMTs has become an integral part of many governmental and donor development programmes in developing countries. In Ghana this includes the World Bank's Village Infrastructure Project and the DFID livelihoods programme (Both still ongoing).

However, in spite of the current focus on IMTs, few studies have examined their effects on farm productivity and crop marketing. Studies of transport-agricultural linkages have focussed on road infrastructure and conventional transport services. In addition, few studies have also examined the specific nature and extent of marketing constraints facing off-road settlements (Ahmed and Hossain 1990, Airey and Barwell, 1991). The studies that do provide in-depth analysis of conditions in off-road and roadside settlements are those by Porter (Porter 1988,

1993, 1995, 1997, 1999a, b, 2002). Porter (1999) concluded that restricted access to markets was a serious underlying constraint to livelihoods improvement in the central region of Ghana. The study suggested a multi-strand strategy for remedying the situation, including the need to explore the potential role of IMTs (ibid). It was out of the findings and a recommendation from this study that a larger DFID IMT and livelihoods action research project (R7575) was set up.

1.1.1 Transport and development

Technology is seen as an essential aspect of human activities and, hence, of development. For instance transport and Information Communication Technology (ICT) have been mentioned as major facilitators of development and globalisation and crucial inputs for the attainment of the Millennium Development Goals (MDGs) set by world leaders in 2000 (Allen and Thomas, 1999; McGrew, 2001; Wilson and Heeks, 2001, UN Millennium Project, 2005). It is appreciated that physical access and mobility are embedded within each of the Millennium Development Goals (MDGs) – combating poverty, hunger, disease, illiteracy, environmental degradations and discrimination against women – and fundamental to their successful achievement (UN Millennium Project, 2005). For instance a recent UN report and the commission for Africa report on the MDGs highlight the need for improved transport infrastructure and efficient operations of transport service in many developing countries as a necessary condition to the attainment of the MDGs (Commission for Africa, 2005; UN Millennium Project, 2005). Many of the recommendations for improving school enrolment and reducing child and maternal mortality and for reducing poverty and hunger suggest investment in transport infrastructure and services (World Bank, 2004). Both the multilaterals and bilaterals donor agencies are beginning to incorporate transport into their poverty reduction strategies. The question is, what are the appropriate mechanisms for providing improved access and mobility to the poor to help facilitate the development process.

Studies have emphasised the need to build upon indigenous knowledge and technology in developing areas (Gannon and Liu, 1997; World Bank 1999; Wilson and Heeks, 2001). Referring specifically to the transport sector, Gannon and Liu (1997) recommended that efforts should be made to build on the innovative actions already underway in the rural transport projects. This enables technology interventions to build on what is already there and hence encourages adaptation rather than introduce something completely new (Wilson and Heeks, 2001). For similar reasons Participatory Technology Development (PTD) approach has been promoted in recent years (Platt and Wilson 1999, Wilson and Heeks, 2001). This approach draws heavily on the general argument in favour of participatory approaches to development interventions which seeks to empower the supposed beneficiaries (who are usually the poor people). The participatory approach gives the beneficiaries a say and hence ownership of the

planning and implementation of the intervention and enables development partners to learn crucially about the social, cultural and economic context – this makes the intervention effective. Schumacher's (1973) and Wilson and Heeks (2001) suggested making available a technology that recognizes the economic boundaries and limitations of poverty – an intermediate or appropriate technology that shares people-centred view of development. The notion of appropriate technology is that it gives the people or communities the options to choose a pro-poor technology which would have a profound effect on society (Wilson and Heeks, 2001). Appropriate technology also gives control to individuals and communities at local level.

Nevertheless, the complexity and variations in social, cultural and economic set up of societies within which technology is embedded call for steering of technological and/or developmental processes (Wilson and Heeks, 2001). This view sees the action for development as taking place within a system of inter-related arena (social, cultural, economics and technological arenas) where action in one arena has an impact in each of the others (Allen and Thomas, 2001; Wilson and Heeks, 2001).

Development and/or poverty reduction interventions (e.g. schools, health clinics, nutritional programmes and social services) are embedded in a broad range of socio-economic activities to which transport services provide crucial intermediate and complementary input for their effective delivery (Gannon and Liu, 1997). For this reason the Gannon and Liu (1997) suggests that transport improvement toward poverty alleviation should identify the poverty profile of the population affected by the project, assess the relevant market structures, integrate well with other sectoral interventions and estimate the likely distribution impacts. Transport projects are expected to contribute to poverty reduction through their indirect impacts on economic growth or direct impact on personal welfare of the poor. It is argued that improved access and mobility and people's willingness to travel improves their access to information, diversified livelihood opportunities, enhances their knowledge of ways of doing things and hence enhances their abilities to improve their livelihoods (IFRTD Email Discussion Group, May 2005). This is particularly true for rural areas where access to knowledge, information and physical inputs from external sources is very limited.

It is recommended that the MDGs for Sub-Saharan Africa needs to focus on smallholder farmers in particular and rural development in general (UN Millennium Project, 2005). Rural Africa offers the greatest potential for near-term growth, through increasing agricultural production and processing (Commission for Africa, 2005). Unlocking these require appropriate technology including adequate rural transport infrastructure and services to permit

farmers to obtain inputs and advice and to sell their crops a remunerative prices (Commission for Africa, 2005). Any such intervention should recognise gender specific needs within the farm family, especially to help empower women who are marginalised in the subsistence production systems (Anderson, 1985; Moser, 1993). Many of these development and poverty reductions debates were incorporated into our current transport project and details of these could be found in chapter three.

1.1.2 Some current issues in transport geography

Accessibility provides an important link between mobility and spatial dynamics (Priemus et al., 2001). Spatial dynamics involve the actual use of space and changes in spatial policy (Priemus et al., 2001). Farrington and Farrington (2005, p. 2) articulate Moseley's (1979a, p.58) definition of accessibility to be "the ability of people to reach and engage in opportunities and activities". The word 'reach' implies spatial separation which may be overcome by mobility and transport use or by means other than movement. Philip and William (1984) argue that accessibility is one of the most distinct features to interpreting the experience of social groups living in rural areas. Accessibility levels vary between different populations with different values and norms and also by population density, pattern of settlement and services provision and income levels, among others. Nutley (1998) states that accessibility can be measured by reference to origin or destination location or by social group, taking account of means of access (travel, mobile service or internet, etc)

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The conceptualisation of (rural) accessibility involves many dimensions of significance of which transport is only a part (Moseley, 1979b). Moseley (1979a) contends that the central focus of concern in rural accessibility issues and an issue of immense importance to policy formulation and evaluation must be "opportunities" but not "behaviour" since current travel pattern is constrained by transport supply situation. In this regard Farrington and Farrington (2005) considered the normative form of accessibility where the concept is seen as having the potential to address and provide a framework for market failure – the extent to which the market constraints accessibility to a degree that may be seen as unacceptable in a societal and political context. Nevertheless, the behavioural aspects of accessibility, such as travel patterns and travel time, still remain significant, particularly, when considering empiricisms. The colourful and broader complications of accessibility levels facing a group of people living within a defined location can be quantified by measuring the opportunities available to them and their ability to reach them by transport or other means (Farrington and Farrington, 2005).

Cloke, (1984) in assessing the provision of transport services in Britain argues that it is clearly impractical to provide public transport at high enough frequency and low enough cost to

eliminate poor levels of access in rural areas. This implies access deficiency cannot be removed completely. In principle not all needs may be met, particularly as service producers do make a trade-off between social cost and benefits (Farrington and Farrington, 2005). However, Esping-Andersen (1999) argues that some level of mobility guarantee is required so that it can guarantee all citizens against entrapment, whether of a social or spatial character. Access deficiencies are the result of many factors, including people's time budgets, household commitments, physical capabilities and attitude to participation (Social Exclusion Unit, 2003)

The accessibility discourse has entered policy debates about social exclusion, economic exclusion and social justice. Setting accessibility as a goal is a potentially powerful driver of policy because it requires that policy sectors interact (Farrington and Farrington, 2005). Recent policy views show a more holistic and integrated sectoral approach on accessibility rather than focusing mainly on mobility (transport) aspects. Incorporating accessibility into constructs of social justice and into policy-making design should therefore recognise dimensions such as space and location, social, economic and environmental sustainability, integrating with the structural view of the causes of social exclusion and empowerment through participation.

Hay's (1995) discussion of equity, fairness and justice in geography identified "access across space" as essential and pervasive issue in achieving social justice in the geographical context. Social justice is concerned with a fair distribution of and access to basic needs (Plant, 1998). Farrington and Farrington (2005, p. 2) argue that "greater social justice cannot be achieved without greater social inclusion, which requires that people have access to a set of activities regarded as typical of their society. Greater social inclusion, they added, require greater accessibility which often (but emphatically not inevitable) implies mobility and transport use". However, accessibility is not a sufficient condition for social inclusion and social justice, but it is a necessary one.

Social inclusion is taken to represent participation of people in society and this is converse to social exclusion which is represented by non-participation across life-shaping activities (See Philo, 1995; Hine and Mitchell, 2001; Farrington and Farrington, 2005). Lack of accessibility creates social exclusion which in turn creates an unjust society. Accessibility can affect participation and hence distribution of benefits and burdens. For instance there is the observation that poverty has persistently concentrated in particular places and this has been a justification for spatially focussed policies in recent years (Glameier, 2000; Mohan, 2003). One major aspect of rural transport where policy, planning and provision has neglected over the years is the gender differences in travel and transport (Law, 1999; Hall et al., 2003). This has resulted in inequitable distribution of opportunities and burdens among men and women.

Gender and transport is explored in detailed in Chapter three. Spatial targeting policies are pursued as a complement to universal welfare programmes (Hill et al., 2002). In general, it is illustrated that decision making processes and public policy may strengthen or weaken the inter-relationship between mobility and spatial dynamics (Banister, 1983; Priemus et al., 2001).

1.1.3 The larger project and the study area

This thesis forms part of a larger DFID-funded rural access and transport research project (R7575) in coastal Ghana. The larger study has involved the introduction of some selected IMTs in off-road villages and the monitoring of their use and assessment of their impact in the area over a period of two years. The purpose of the larger project was to assess the potential of IMTs for improving farm to village and/or market access in off-road areas in coastal Ghana.

The larger project focused on two districts in Ghana's Central Region – Gomoa District in the coastal savanna belt and Assin District in the rain forest belt. Four villages in Gomoa and one in Assin had been studied under an earlier market access research project (R7149) by the same research team in 1998 – 1999. These were also the main focus of this larger project. The villages were selected by virtue of the fact that they are located off the main road, have access problems to major facilities and transport services in the area are poor. The villages were selected following a district survey and consultations with a wide range of local people, including district assembly staff and some government ministries. The selection of the villages was therefore not my independent decision but that of the entire research team.

My thesis and my field activities on the larger project principally relate to agriculture and marketing and related transport activities. The importance of this thesis to the larger project lies in the fact that agriculture and marketing are the major sources of livelihoods for the people in Gomoa district.

My thesis focuses mainly on the Gomoa settlements – Lome, Abora, Sampa and Adabra – for many reasons. First, the Gomoa settlements formed the main focus of the larger project (R7575). Second, because of the massive time input required for this component of the project the research team decided to restrict data input into SPSS (and thus full quantitative data analysis) to the four Gomoa villages. Third, the Assin District was left out of the thesis owing to its different agricultural production background. Aworabo, the main Assin village studied by R7575, is a predominantly cocoa producing village, located in the forest belt and so has characteristics different from those of Gomoa villages.

1.1.4 Farming, marketing and transport activities in Gomoa district

The major economic activities in Gomoa district are arable farming, fishing and trading. Bush-fallowing cultivation with limited use of modern inputs is widespread. Farming is mainly rain-fed and labour intensive. Both men and women engage in farming but men generally (though not always) cultivate larger acreages than women. The bimodal rainfall pattern supports two cropping seasons per annum (the major season, planted in March-May and the minor season, planted in September-October). The main crops grown are maize, cassava, plantain, cocoyam, pepper and tomato. Maize, cassava and pepper are the major cash crops in descending order of importance. Tree cash crops such as citrus, oil palm and cashew have grown in importance in recent years. According to the District Development Plan (DDP, May 1996) maize occupies the largest acreage, though yields are below the national average (Young 1998). Unreliable rainfall, lack of credit for farmers, fluctuation in agricultural prices, high input costs and poor roads and high transport cost are some of the major constraints inhibiting the realisation of the full agricultural potential of the district (DDP, May 1996).

Trading is the second major economic activity and it is commonly undertaken by women. It is the main source of cash income for most women. Women market their own and their husbands' produce as well as purchasing other items from markets for resale in their village areas. A few men participate actively in trading activities and may even earn a large proportion of their income from it. Buying, storage and resale of maize and pepper are the main trading activities of such male traders.

The male population resident directly along the coast principally engages in sea fishing while most women along the coast are fishmongers. Some male farmers in the hinterland hunt game and this earns them a substantial amount of money. Local artisan industries are not common except for a few auto mechanics and welders along major roads, and basket weavers and blacksmiths mostly in off-road areas.

The main sources of labour for farm work in the district are family and hired labour (individual, communal and *nnoboa*[1]). Labour shortage is a problem in many parts of the district. This is partly due to the out-migration of the youth of the area to work in more lucrative areas such as cash crop cultivation in the forest zone and to major urban centres to work as traders or labourers. Young (1998) estimates that 16% of the active labour force in the district migrates regularly to the forest zone to cultivate cash crops.

[1] The *nnoboa* is a group of people who have come together to contribute labour for activities on their farms on rotation basis.

1.1.5 Major constraints to farming, marketing and transport activities in the study villages

This section draws on observations and conclusions drawn from an earlier project (R7149) in the same area by the same research team and a background review prepared prior to the commencement of R7575. Farming and trading are the main economic activities in all four of the study villages. The farming, marketing and transport activities within these villages do not differ from the general district pattern described above. Farming and marketing activities in the villages are constrained by many factors. These include poor transport services and the heavy dependence on head porterage, unreliable rainfall, non-availability of land, labour and funds and limited storage and processing facilities (see section 3.1.2 to 3.1.6 for detailed discussion of farming, marketing and IMT/vehicle availability in each village).

Transport conditions in the villages are very poor. Major roads to the villages are unpaved and graded periodically, though grading often falls behind schedule. The roads deteriorate rapidly during the rainy season and their condition is generally poor for a greater part of the year. Commercial transport services in the villages are irregular, unreliable and expensive. This delays the transport of loads to market and on many instances people have to headload commodities to market or the nearest paved road. The frequency of vehicle visits is relatively higher on market days than non-market days. Conventional vehicle and IMT ownership is limited in the villages.

Major transport activities include taking loads from farm to village and/or markets. Travel and transport for farming and other activities are generally by walking and headloading. Most farms and other facilities are accessible only by footpaths. Women and children are the principal agricultural load transporters between village, farm and market, though men usually assist in the major maize harvest. Fieldwork in R7149 indicated that the majority of loads carried are relatively small, with most loads below 25kg. The hiring of porters for the transport of farm produce and construction materials is common in two of the study villages, Lome and Sampa.

The major crops grown – maize, cassava and vegetables – are bulky and perishable and present a significant transport challenge particularly in moving crops from farm to village. Large volumes of produce are generated during major harvests and transport activities tend to peak at these periods. Unfortunately, load transport in such periods is generally constrained by labour shortage and poor access routes linking villages to farms.

Trips to market or the nearest paved road junctions are usually by conventional transport (*trotro*[2], taxi or mammy wagon) or by walking and headloading. Trips to markets are constrained by poor access routes, limited conventional transport services, relatively longer distances to markets and major road junctions (3.3 to 23 km among study villages) and dependence on walking and headloading in some cases.

Several non-transport factors influence the pattern of travel and transport in the study area through their effect on farm production. The availability of funds for the purchase of farm inputs including transport facilities and services is very limited in the area. This has limited many farmers to the use of family resources for which they have free rights. This places a major limitation on the pattern of farm production and farmers' participation in crop marketing.

The main sources of labour are family, communal labour and hired. Farm labour availability differs among the villages with periodic labour shortages occurring in the land preparation, planting and harvesting season. Hired labour is expensive and farmers largely depend on free family labour. Free communal labour is also available for carrying maize or cassava at the main harvesting periods.

Many people have free right to the use of family land. However, there is usually a limit to the size of family land available to farmers. Some farmers acquire hired land either by cash payment or crop sharing. Hired land is expensive and scarce in some instances and many farmers cannot afford it. Land can thus limit the size of farm production and location.

The area has a bimodal rainfall pattern which supports two cropping seasons in a year – the minor and major seasons. However, the rain is unreliable in some years and at some places. This influences the cropping pattern and yield among the villages. The major season farms are usually bigger than minor season farms.

1.2 Problem Statement and wider relevance of the study

The discussions above indicate that farming and marketing in the study villages, and coastal Ghana as a whole, are constrained by many factors. Physical access and transport services limit both farm production and marketing activities. Conventional transport does not satisfy the transport needs of most subsistence farmers while head porterage does not provide sufficient capacity for improving farming and marketing. IMTs have been suggested by researchers and

[2] *Trotro* is a mini bus for providing commercial services

donor agencies as appropriate transport technology for mitigating transport problems in such a context.

However, several issues remain unclear regarding the potential for IMTs in subsistence farming systems such as those found in coastal Ghana. The questions are: can IMTs improve agricultural productivity and produce marketing in off-road villages? Would the impact of such improvements differ between IMT owners and non-owners and male and female farmers? If so, in what ways? What factors in the farming systems of the area may contribute positively to any observed improvements in farming and marketing brought about by the availability and uses of IMTs? What factors may restrain the realisation of the full potential of IMTs in improving agricultural productivity and marketing in the area?

Promotion of IMTs is a major current issue in rural Ghana and other Sub-Saharan African countries including the World Bank VIP programme. Most studies of IMTs in Ghana have been conducted in the three Northern Regions with very few studies elsewhere. Moreover, none of these studies deal in substantial detail with the impact of IMTs on agricultural production and marketing. This study provides detailed quantitative and qualitative assessment of the influence of IMTs on agricultural production and marketing in southern Ghana. The study will enable practitioners and policy makers to understand the potential of IMTs in influencing farm production and marketing in southern Ghana and to identify some of the constraints that could inhibit the realization of the full potential of IMTs in improving farm production and crop marketing activities. It also provides some insight into the gender implications of the availability and use of IMTs in subsistence farming systems such as those in Ghana.

1.3 Objectives of the Study

Within the objectives of R7575 (see section 1.1.1) this thesis aims to identify the role of IMTs in developing local agriculture and marketing.

The specific objectives are the following:

- To examine the nature of agricultural production within the study villages, comparing major farming, marketing and transport characteristics among the study villages.
- To examine the influence of IMTs on agricultural productivity between IMT owners and non-IMT owners and the factors that contributed to observed patterns of change.
- To examine the relationship between use of IMTs, gender and the pattern of agricultural production.
- To examine the relationship between use of IMTs and labour use and crop marketing between beneficiaries and non-beneficiaries.

1.4 Organisation of the Study

The study is organized into five main chapters. Chapter one comprises the introduction, problem statement and relevance, objectives and organization of the study. Chapter two reviews literature on past and current debates in transport infrastructure development and service provision and its relation to agricultural production and marketing in the developing world, placing particular emphasis on Ghana. It also contains a review of studies on the actual and potential roles of IMTs in improving rural agriculture and marketing and gender perspectives in rural transport issues in developing countries. Chapter three describes the study villages and methodologies used for the field data collection and the data analysis. The fourth chapter analyses and discusses the baseline data with respect to relevant farm, market and transport features in the study villages at the start of the project. The analyses and discussion of the end survey data and subsequent comparison with the baseline data is presented in the fifth chapter. The last chapter provides the summary, conclusion and recommendations for the study and also enumerates some of the potential areas for future research into the adoption and use of IMTs in the study area or areas with similar characteristics.

CHAPTER TWO

LITERATURE REVIEW

LINKAGES BETWEEN TRANSPORT AND AGRICULTURE

2.1 Introduction

This chapter reviews literature on linkages between transport infrastructure and services on the one hand and agricultural production and marketing on the other. The first part highlights the state of transport infrastructure and services in developing countries in general and Ghana in particular and how this has impacted upon agricultural development. The second part of this review examines various studies that have been done on IMTs and discusses how they have helped to overcome some of the transport problems that the conventional approach failed to provide solutions to. The actual and potential contributions of IMTs to efficient resource utilization in terms of the area cultivated, cropping pattern, labour and other input use, marketing and post-harvest losses is reviewed. The gender role in agriculture and use of transport is then discussed in relation to the earlier discussion. This review draws on an extended literature review conducted by Porter (2003) on IMTs in Ghana. Porter's work and this thesis both form part of larger transport and access project (R7575) in Ghana.

2.2 Infrastructure and constraints on agriculture

2.2.1 Pattern of infrastructure development in Africa and other developing countries

Infrastructure is one of the major constraints limiting agricultural production and marketing in developing countries and within this the road system has been very important. Dawson and Barwell (1993) noted that the expansion of the road network (mostly feeder roads) and improvement in other transport infrastructure received a lot of attention in the late 1960s and the 1970s. The overall aim of this, they consider, was to improve accessibility to growing urban centres and among communities (ibid). Road development was regarded as the instrument to 'catalyze' economic development through its so-called market-widening effect (Howe, 1997). For many developing economies, transport was the largest single sector for investment in the 1970s and 1980s (Dawson and Barwell, 1993). In the 1980s and 1990s there was huge financial support from the World Bank and International Development Agencies toward transport investment (in rural and urban roads, ports, railways etc.) (ILO, 1979; Dawson and Barwell, 1993; Bramberger and Lebo, 1999; World Bank, 1999). In addition, up to 40 per cent of the public expenditure of developing countries was devoted to transport infrastructure investment (Button, 1993).

In spite of this effort, a survey of 85 developing countries conducted by the World Bank in 1987 revealed that the backlog of economically warranted main road rehabilitation was some

US$41 billion (Owen, 1987). In the views of Dawson and Barwell (1993) and Hine (1993) developing economies lacked the funds to construct and maintain standard road infrastructure needed to support motor vehicles. This failure in construction and investment has been maintained in present day Ghana. According to Annang-Siaw (interview, 2002) Ghana has about 25,000 km of feeder road network out of which only 12,000 km is maintainable, leaving a backlog of 13,000 km yet to be constructed or reconstructed.

Generally, there are three issues involved in the provision of efficient transport services: one is that the roads and vehicles are not sufficient, two is that the roads are not necessarily being built where they are needed and three is that when the quality of roads is poor transport may still be very expensive. Rural transport conditions in Sub-Saharan Africa are remarkably poor, even by comparison with Asia and Latin America (Platteau, 1996, Ahmed and Hossain, 1990). Africa in general has a lower road density compared to other regions or continents (Riverson et al., 1991; Hine, 1993). However, road building alone is insufficient to guarantee economic development. The failure of the conventional transport approach to consider the essentially localized nature of rural transport needs, and the capacity of rural people to utilize such facilities has been documented by Edmonds and Relf (1985), Dawson and Barwell (1993), Barwell (1996), Tengey et al. (1999) and Leinbach (2000). According to Urasa (1990) and Fernando (2000) the conventional transport approach does not consider the actual, real needs of small-scale producers and rural households and in particular has failed to identify the needs of women.

In many instances, modern transport methods are available but limited to a minority of the people (Edmonds and Relf, 1985). A study in Malawi for instance found that, owing to a lack of vehicles in the country, the construction of an intensive road network facilitated travel but failed to induce greater mobility (Relf and Dixon-Fyle, 1988). Expensive conventional transport, aging trucks and lack of spare parts have been cited as some of the major problems facing the provision of reliable transport services (Araka et al., 1989). Vehicle maintenance cost (spare parts and repair) is over five times as expensive in Africa as Pakistan and this difference is only partly explained by low road surface quality in Africa (Platteau, 1996). Consequently the approach failed to address the problem of rural mobility (Ellis, 1997) leaving headloading - mostly by women – as the dominant mode of transporting goods to and from households in rural Sub-Saharan Africa (McCall, 1985; Doran, 1990, Pankaj, 1991; Dawson and Barwell, 1993). Owing to these and other constraints road infrastructure may not make the needed impact on agriculture and other economic activities.

2.2.2 Transport infrastructure and transport services as constraints

The general lack and poor state of transport infrastructure and services constrains agricultural development and market participation. Howe (1990) specified the constraints to include waste of time and energy, poor traffic flow, higher transport costs, poor farm-gate prices, increased input prices and decreased marketing activities.

i. Time and energy

Transport and accessibility influence agriculture and marketing through trip times and energy use. Hine (1984) observed that availability of roads makes trips faster, safer and easier to reach new places and allows for bigger loads be carried. The poor state of roads and off-road transport services has the effect of severely reducing the timeliness and quantities of agricultural inputs and outputs that are moved to and from the village (Beynon, 1992). A study by Open et al. (1997) noted that journeys to market and farm became more time consuming when access was poor.

ii. Transport charges

High transport charges is one way through which poor infrastructure and associated services constrain agricultural production and marketing. Transport charges per unit distance are mostly substantially higher along unpaved roads than along an equivalent length of paved road in the same region (Porter, 1999). Minten and Kyle (1998) found that transportation cost on average is twice as expensive on bad roads as on paved roads. These lead to decline in producer shares and increasing transportation shares of final prices where roads are poor (ibid). In Zimbabwe, transport costs constituted 15 per cent of small-scale farmers' budget compared to 5 per cent for large-scale farmers due to the fact that small-scale farmers do not own vehicles, they are served by worse roads and are, on average, farther away from marketing facilities (Araka et al., 1989).

iii. Seasonality and transport services

Transport infrastructure in tropical countries deteriorates fast under the influence of high rainfall. Roads in tropical Africa are highly liable to flooding during the rainy season and also develop potholes in the dry season and hence rapidly become unsuitable for use (Platteau, 1996; Wagner, 1986; Porter, 1999). A World Bank study in developing countries found that the regular, reliable and economic transport services offered in rural areas rarely extend beyond the all-weather motorable road system (Riverson and Carapettis, 1991). Most drivers will not take their vehicles along roads in bad condition since vehicles deteriorate rapidly

following extensive use on poor roads (Beenhacker, 1987; Levy and Malone, 1988; Porter, 2001b).

In Ghana the World Bank's Village Infrastructure project (VIP) (1997) reports that in rural areas access to markets is severely constrained for most farmers as feeder and access roads are in poor condition, with only a small percentage passable year-round. A recent survey of road conditions in Ghana, classified only 2% of roads in Central Region as 'good' compared to 67% classified as poor and 31% as 'fair' (Wilbur Smith and Associates, 1998 in Porter, 1999). Porter (1999, 2002, and 2003) has discussed the road conditions in detail. She states that access in off-road areas is often difficult, particularly in the wet season when dirt roads and tracks become totally impassable. She added that grading of roads can have a remarkable impact on access but was quick to point out that rapid deterioration of newly graded roads can occur within one wet season (Porter, 2003) and transport services become poor again. She observed that motorised transport was regular and frequent along major paved roads in Central Region of Ghana but off-road transport services were extremely poor.

iv. Nature of transport demand

The nature of transport demand in Africa follows a pattern which does not suit the use of conventional transport. The demand is characterised by small loads, low population densities, scattered rural settlements and farms, long time periods taken for loading and unloading and long waiting times at markets (Dawson and Barwell, 1993; Porter, 1998; Starkey, 2000). Most rural transport activity is dominated by subsistence tasks requiring frequent movement of small loads over relatively short distances, rendering the use of motorized transport impracticable (Pankaj, 1991; Panjak and Coulthart, 1993; Ellis and Hine, 1995). Hine (1993) states that rural Africa has lower population density, extensive forms of agriculture, relatively smaller loads and longer trip distances than Asia. The longer travel distances make headloading an inappropriate means (McCall, 1985). It is also argued that the low population density and the extensive farming across sub-Saharan Africa creates a general lack of a critical mass of transport demand and this presents a formidable challenge to conventional transport planning approaches (ibid; IFRTD rural transport services e-mail discussion group, Oct/Nov 2000).

Hine's (1993) description of transport demand in Ghana supports this suggestion. He observed that in Ghana trip distances between farms and villages are too short and the demand too dispersed for motorised trucks to be used economically. Tengey (2001) noted that in rural Ghana agricultural travel and transport, domestic travel, travel to services and social visits tend to take place within a 20-30 miles radius, with 90 percent of such journeys occurring on foot along footpaths and earth tracks from farm to village. The fieldwork R7149 (May 1998 – April

1999) indicates that the majority of loads carried per trip per person in the Central Region of Ghana are below 25kg. These loads, unless amalgamated, do not make the use of conventional transport feasible.

The review so far shows that road and motor vehicles have had limited impact on people living off-road and many transport analysts are of the view that the 'highway-and-car' approach alone will not be able to meet the total transport needs of rural Africa (Dawson and Barwell, 1993). This failure of the conventional transport model is attributed to its top-down planning approach and the underlying conceptual focus with its greater emphasis on market rather than subsistence production. Head porterage continues to be the major means for transporting loads from farms to villages and/or markets in rural Ghana and other Sub-Saharan countries (Howe and Barwell, 1985; Hine, 1993: Porter, 1998: Al-hassan et al, 1999; Tengey et al, 1999). Nevertheless, head porterage is costly, laborious, time consuming and inefficient. The current approach to rural transport planning and development in developing countries therefore emphasizes greater use of intermediate transport technology – IMTs and NMTs (Dawson and Barwell, 1993; Panha et al, 2000; Starkey, 2000; White et al, 2000; Starkey et al, 2001). IMTs and NMTs have been suggested to be more economically feasible (Hine et al., 1983b; Ellis and Hine, 1995; Leinbach, 2000). The remainder of this chapter reviews the potential of IMTs in overcoming rural transport constraints and improving agricultural production and marketing and livelihoods in developing countries in general and Ghana in particular.

2.3 IMTs as a means of overcoming constraints

It has been argued that many of the constraints in rural transport would be relaxed if appropriate means of transportation intermediate between walking/headloading and cars/pick-ups/trucks such as bicycle trailers, handcarts or rickshaws could be locally developed and promoted (Platteau, 1996). The use of IMTs to improve overall transport capacity at relatively low cost, to reduce isolation, drudgery and time spent on transport and travel and to induce increased economic activities and to alleviate poverty, especially in rural areas had been suggested by Barwell and Hathway (1986), Urasa (1990), Malmberg Calvo (1992, 1994a), Dawson and Barwell (1993), Barwell (1996), Connerley and Schroeder (1996), Howe (1997), Ellis and Hine (1998), Porter (1998, 1999, 2003), Tengey et al., 1999; Panha et al., 2000; Starkey (2000) and Starkey et al (2001). IMTs may also provide a valuable complement to the existing motorised transport system (Beenhakker, 1987). The IMT approach explores the livelihood pattern of people to be served by the transport system and develop mobility and access schemes that are more attuned to their needs and the resources available (Kaira, 1983; Riverson et al., 1991; World Bank, 1997). A comparison of IMT, conventional transport and head porterage shows some of the potential gains that could be made from IMT adoption.

2.4 Comparing IMTs with conventional transport and head porterage

2.4.1 Transport service costs

The relative cost of different modes of transport depends closely on the size of load and distance to be travelled (Hine, 1984). A study in Indonesia by Rogers (1983) established that transport by one-tonne light trucks is twice as expensive as by ox-cart. In other developing countries, however, transport by animal drawn carts and pack animals are three to four times more expensive than motor vehicles (Hine, 1993). Ellis and Hine (1995) discovered that, using headloading for Ghana and animal drawn cart for Pakistan and Zimbabwe (based on commonest mode of transport in each country), rural transport charge in Zimbabwe was just under three times higher over 5 km distance and twice as high over 20 km than Pakistan, while the difference rose to six times in Ghana. Using data collected from a number of countries in Africa and Asia, Ellis and Hine (1998) concluded that IMTs have a comparative economic advantage for short distances and light loads, making them ideal for small-farm, around-village and 'feeder' transport tasks in rural areas. Their study observed that bicycles have the lowest operating costs at short distances and where the need for transport is low. The ox cart has the lowest cost option over a 10 km distance until the load reaches 250 tonnes per annum. Motorised transport only becomes cheaper than ox carts when loads are high and distances longer.

In Ghana, headloading may be very expensive. For instance Hine (1993) found that the cost of headloading for a 10 km journey in Ghana was fifteen times the cost of moving the same load by truck. In an earlier study Hine (1984) calculated headloading in Ashanti Region of Ghana to be 12.5 times as expensive as motor vehicle. Given these high charges and the non-availability of conventional transport services, the use of own and/or hired IMTs including bicycle taxis could play a major supportive role in off-road areas (Grieco et al., 1996; Porter, 2003). The cost of using certain types of IMTs in Ghana could be far lower than bus costs. For instance Amponsah et al. (1996) noted that in Ghana the push truck has far lower costs for moving large loads than motorised trucks. Cost comparisons strengthen the case for multiple transport systems, with intermediate local transport solutions complementing the larger, consolidated, long-distance transport systems.

2.4.2 Suitability for subsistence tasks

The commonest forms of IMTs in Ghana and other Sub-Saharan African countries are four-wheeled pushcarts (known in Ghana as 'trucks'), two-wheeled handcarts, bicycles and bicycle trailers, tricycles, motorcycles, power tillers, animal drawn carts and wheelbarrows (Starkey, 2000; Porter, 2003). Advantages of specific IMTs vary but may include their relatively low purchase cost, potential for small-scale/decentralised manufacture, relatively lower

maintenance requirements, suitability for small to medium size loads and shorter to medium distance travel and ability to operate on poor/narrow tracks (Starkey, 2000; Starkey et al., 2001; Porter, 2003). Amponsah et al. (1996) also noted the manoeuvrability of the push truck in congested areas and narrow alleys where motorised vehicles were unable to go. These attributes suit the nature of subsistence transport demand described in the previous section. In Porter's (2003) view, IMTs can make an enormous contribution to meeting agricultural transport needs in the contexts where demand for transport is often heaviest - i.e. production and harvesting.

In northern Ghana, Burkina Faso and many sub-Saharan Africa countries, substantial loads are often carried by bicycle, generally using a carrier over the rear wheel (Porter, 2003). Dennis and Howe (1993) estimated that the bicycle has about five times the load carrying capacity of human porterage (i.e. perhaps 50 kg at 8-10 km/hour, compared to 25 kg at 3-4 km/hour). Beenhakker et al. (1987) states that bicycles in India are used to carry up to 80kg of compact, non-bulky commodities. The full potential of bicycle use in Ghana still remains unrealised, especially among women and in regions outside the country's northern region (White et al., 2000). Porter (1999) cites cases from studies in Central Region of Ghana where push trucks had been hired out to convey fuelwood, cassava, maize and construction materials, some over a distance of 7 km. Tractors and power tillers are found in various studies in south Asia, Pakistan, Zimbabwe and Ghana to be used mostly for transport rather than field production (Binswanger 1978 and Ellis 1997).

2.4.3 Potential for non-farm income generation and trips

The crucial significance of off-farm employment and income diversification for household security in Africa has been emphasised by various studies (Bryceson and Jamal 1997; Barrett et al. 2001; Gladwin et al. 2001). Hine (1984) found that villages with good access gain more of their income from non-agricultural activities such as food marketing, food processing and provision of rural services. It is suggested that IMTs can make a significant impact on non-farm income generating activities and other social activities (Porter, 2003). IMTs also facilitate personal travel and improve people's access to school, clinics, banks and other facilities, outside ideas and information (Leyland 1996, Porter 1997, 2003).

2.4.4 The state of and limitations to IMT adoption and uses

In spite of the potential of IMTs to overcome constraints in rural areas, their adoption and uses have been low in Sub-Saharan countries compared to Asian countries (Porter, 2003). The low adoption of IMTs in Sub-Saharan Africa have been attributed to low transport needs (Platteau, 1996), lower population density, longer distance to markets, low agricultural and non-

agricultural incomes, weak industrial base and institutional and cultural factors (Ellis, 1997). Starkey (2000) and Starkey et al. (2001) argue that transport technology adoption and distribution are partly explained by differences in farming systems, topography, culture and transport needs.

Separate surveys of IMT ownership and use pattern in Ghana reveal that there are more IMTs in the northern sector (northern savannah zone) than the southern sector (forest and coastal savannah belts) of the country (Anchirinah and Addison, 1998; Tengey et al., 1999; Anchirinah and Yoder, 2000). Porter (2003) also argues that the low population density and the longer distance to farms in the north may contribute to the relatively high use of bicycles in the region. The lower use of IMTs in the forest belt is attributed to unsuitable terrain, rainfall, vegetation and tsetse-fly (Howe and Barwell, 1987). Porter (2003) further explains that the current limited diffusion of IMTs to rural areas in Ghana is partly a function of cost, operating difficulties on narrow footpaths and the restricted market for IMT services in villages where unpaid family and communal labour are widely available. Across the Gomoa district IMT ownership and use was very low and seemed to be mostly concentrated in wealthier settlements on the paved road (Porter, 1999; 2003).

2.5 The potential contribution of IMTs to efficiency of resource use

The potential for IMTs to help address the imperative of increased agricultural productivity and improved food security in Sub-Saharan Africa has been recognised by a growing number of donor agencies and NGOs since the late 1980s (Porter, 2003). Accessibility in general, and IMTs in particular, can influence agricultural production and productivity through their effect on area cultivated, crop type and cropping pattern, labour availability, the use of other inputs and the gender division of labour. The remainder of this chapter reviews the effects of accessibility and potential impact of IMTs on these characteristics.

2.5.1 Area cultivated

Both theoretical and empirical studies suggest a positive relationship between farm size and technology adoption (Feder et al, 1982, 1985). Unfortunately, the literature on the effect of IMT adoption on farm size is very limited. Studies by Muller (1986), Starkey et al. (1991), Loffler (1994) and Starkey (2000) on successful performance of IMTs in Africa found that IMTs can stimulate production. A transport study in Tanzania (Sieber, 1998) found that donkeys and bicycles have very strong impacts on agricultural production as they enable farmers to cultivate bigger fields and use more fertilizer through their load-carrying potential. In Ghana potential benefits of the introduction of efficient IMTs include an estimated increase in food production of 20% (Howe and Barwell 1987).

2.5.2 Crop types and cropping pattern

The evidence of accessibility and transport on cropping pattern is rather mixed. Road improvement is found to increase the area where food is sold and induces changes in the types of crop that are cultivated for sale (Minten and Kyle, 1998). For example Ellis and Hine (1985) found that the provision of reliable and convenient means of transport and the reduced real transport charges following road improvement may served as an incentive to increase food production. Similarly, studies by Ellis and Hine (1985) and Windle (2002) found subsistence food crop production to be markedly lower in roadside villages than off-road villages. A three-nation case study (India, Kenya, Sudan) by Open et al. (1997) observed that when rural access is poor the area under commercial crops decreases and that of food crops increases. Wagner (1986) in a study in Northern Cameroon found that road building motivates farmers to adapt the existing farm structures to combine production of exportable crops and traditional staple foods for the local market. Similarly, Fricke and Kochendorfer-Lucius (1990) found in Ivory Coast that new cash crops emerge as an area opens up. They argue that cost advantages along main roads encourage the cultivation of food crops for markets in the vicinity (Fricke and Kochendorfer-Lucius, 1990).

In some instances road projects defy positive expectations and may not always have a positive influence on the nature and level of economic activities (Fricke and Kochendorfer-Lucius, 1990). A road impact study in Nepal by Blaikie et al. (1979) found that the road development encouraged agricultural imports rather than exports and also induced very limited adoption of new technologies and new crops. Windle (2002) found that in the Sarawak state of Malaysia the construction of new roads did not change the most dominant crop produced (rice for both consumption and sale) produced, though there was an increase in other food crops produced. She attributed this to two factors acting in opposite directions – the availability of off-farm employment and access to a market for food crops in the vicinity of the improved road. Leinbach (2000) explains that road development, as in Ghana and Nepal, failed to induce the needed change because government machinery was not organized to support peasant agriculture and poverty was so severe that farmers could not risk innovation. This explanation supports the recommendation that road investment should be planned in conjunction with other development inputs (Hine, 1984) such as a revolving fund to offer loans to villages for purchasing non-motorised transport vehicles (Ndumbaro, 1995).

In Ghana there have not been many studies of the influence of transport infrastructure and services on farm size and cropping pattern. There is also not enough literature directly linking IMT uses to crop type and cropping pattern and farm size. However, the potential for IMTs to reduce transport cost, increase transport capacity, improve access to markets, increase time and

energy spent at farms etc., implies that IMT use could impact on cropping pattern and area cultivated. This study takes an in-depth look at this issue.

2.5.3 Distance to fields and farm distribution

The distance to the field, spatial distribution of farm plots and load volume greatly influence transport needs in agricultural production systems (McCall, 1985). A study in Tanzania observed that most lands lay idle owing to the low level of road connectivity and the fact that most land is far from the transportation line (Ndumbaro, 1995). Hine (1993) noticed that in the Ashanti Region of Ghana most cultivable lands are relatively farther from motorable roads or tracks than the rural communities themselves. This poses a major challenge to the transport of farm loads.

McCall (1985) observed that distance takes on increasing significance in African peasant agriculture. He observed that the degree to which excessive home site to field distance hinders peasant farming depends on the extent to which farming has adapted to longer trips either through intensification or modified travel pattern. According to McCall (1985) access problems are also caused by high levels of land fragmentation where the average home to plot distance may be small but aggregate travel per season may be very high. He estimated trip frequency of 150 to over 400 trips per year per person from home sites to farms in rural Africa. He suggests agricultural intensification, permanent satellite settlements and/or the use of some improved means of transport as potential options for overcoming the distance constraint in peasant farming systems. McCall's observations and suggestions were based on the most available and widely used mode of transport (walking and headloading) in peasant agriculture.

2.5.4 Labour availability

Transport and accessibility influences not just the evacuation of crops, but also physical inputs and the provision of services. Hine (1993) noted that labour, which is the largest and most important farm input, usually walks from house to farm. McCall (1985) identified land fragmentation and excessive journeys to work as factors affecting the quantity and quality of agricultural labour inputs. He estimated that loss in time for cultivation over the working day, due to time spent walking to distant fields, could amount to 20% where fields are located 4 km from the homestead, and 50% for fields at a distance of 10kms. In Sub-Saharan Africa enormous amounts of time and effort are also expended headloading. Riverson and Carapetis (1991) estimate that on the basis that a headload typically weighs around 30 kg and that yield is around 10,000 kg per ha for cassava and 1,900 kg per ha for maize, it takes 167 person-days to load one acre of cassava from farm to village, and 32 person-days per acre of maize. Thus

the transport burden could be enormous for smaller households that cultivate larger acreages of bulky crops.

Judicious uses of IMTs could make the load transport faster and easier and save some time which could be used for other activities, including farm production. In a Ghana case study Urasa (1990: citing Doran 1989) notes that of an anticipated twelve hours per week saved through improved transport, 57% (6.8 hours) of that time would be spent on directly productive work, 35% (4.2 hours) on housework and 8% (0.9 hours) on leisure. Porter (2003) argues that time savings from increased transport efficiency in village-farm access could have a substantial impact on agricultural productivity. The uses of bicycles and donkeys were found to reduce the time consumption of farmers, especially men, for various activities (Sieber, 1998). It is documented that the adoption of improved appropriate farm transportation technology can improve timeliness of planting (Le Moigne, 1979), improve the use of fertilizer and manure and enhance cultivation and harvesting practices (Herdt, 1983, Open et al., 1997; Adeoti, 1998).

2.5.5 Access to inputs and services

Generally transport availability and accessibility have been shown to have a positive relationship with the use of modern inputs and services provision. Open et al. (1997) observed that when rural access is poor, use of commercial inputs such as fertilizer and pesticide generally decreases. Fricke and Kochendorfer-Lucius (1990) found that settlements off the main traffic axis have poor or even total lack of access to agricultural services, modern means of production and information. Tekle (1989) in his study of the Ada Woreda region of Ethiopia noted that lack of transport facilities negatively affects the timeliness of credit and inputs delivery and other services rendered by co-operatives to smaller farmers. A study in Ghana reports that the number of farmers that have an extension contact increased from 17 per cent to 50 per cent following improvement of roads in the area (DFR, 1997).

IMTs can facilitate the work of agricultural services providers, particularly in places where roads are poor and/or conventional transport services are not reliable. There is evidence of the use of bicycles for similar services in Ghana by ADRA motivators for health promotion work, for the Ghana 2000 census enumerators and motorbikes used by the Agricultural extension officers for farmer contacts (Porter, 2003). IMTs could also enable farmers to transport purchased inputs from local markets to village or farm. In northern Ghana the bicycle is generally used for carrying loads to market and bringing inputs back to the village (Porter, 2003). A study in Tanzania by Sieber (1998) observed that the load-carrying capacity of donkey carts and bicycles enables farmers to use more fertilizer.

2.5.6 Market access

Transport infrastructure and services have significant influence on market development (Teckle, 1991). Transport influences the physical size of market, marketed output and market prices.

i. Market size

Porter (1995, 1998) observes that markets located on newly constructed or rehabilitated roads tend to expand while those located away from the same roads tend to diminish or even die altogether. Nyame (1982) on a market accessibility case study in Nzema area of Ghana made a similar observation. He reports that market size is greatly influenced by its accessibility to a good road network and that markets that are well linked tend to expand at the expense of those that are not well linked. A study in Northern Ghana reports a market that collapsed as the road to this market town deteriorated and traders stopped patronising the market (DFR, 1997). IMTs can impact on the market size by providing reliable transport services between market and villages or between rural markets and main access roads to traders and farmers who participate in such markets.

ii. Trips to market and market participation

Good access improves farmers' participation in markets. Some studies have pointed out farmers' greater desire to sell at markets rather than at home. For instance the study by the DFR (1997) in Northern Ghana reports of increased number of traders on the corridors of the improved roads but farmers preferred to send their produce to the market for sale rather than sell to traders at the village. This is partly because prices are usually better at markets and farmers have better knowledge of prices and stronger bargaining power at the markets (Acheampong, 1999). In spite of the advantage gained in selling at market Hine et al. (1983b) found that in Ghana 57 per cent of small-scale farmers sold the major part of their crop surplus at their homes compared to only 24 per cent who sold their surplus at the local market. Constraints such as longer distance to markets, unreliable transport services and high transport cost, may compel them to sell at home.

Walking and headloading, particularly by women, have been documented to be a major means of transport by which people and produce reach market in Ghana and other Sub-Saharan countries (Fricke and Kochendorfer-Lucius, 1990; Porter, 1999, 2002, 2003). A study of a periodic market in Ivory Coast estimated that 98 per cent of the people claim to have travelled to the market on foot (Fricke and Kochendorfer-Lucius, 1990). Araka et al. (1989) reports that in Nigeria some women have to travel 20 km on foot carrying loads in baskets to the nearest market.

Evidence of IMTs being used to transport loads to market has been reported by various studies. In south-east Nigeria women use bicycles to carry sacks of cassava and plantain to market (Olukoya 2001, cited in Porter 2003). White et al. (2000) report bicycles being used in Volta Region to carry loads across the Ghana-Togo border, by traders moving between local markets. A study by Buabeng et al. (1999) shows a greater use of NMT for transporting produce and people to market in northern Ghana. Other studies that have observed the use of IMTs to markets include Tengey et al. (1999) studies on transport and gender in Ghana, Howe (2001) and Iga's (2002) study of bicycle taxis in Kenya and Uganda and Porter's (2003) review of IMTs in Ghana.

Both tractor and power tiller have been identified to provide good alternatives to conventional transport on poorer quality roads, especially over relatively shorter distance of less than 50 km (Crossley and Cheesman 1990: cited in Ellis 1997). According to Anchirinah and Yoder (2000) the power tiller has been successful in Ghanaian villages where conventional transport services are poor and there is ample opportunity for goods transport services. IMTs can provide reliable and cheaper transport services and opportunities for transporting loads of varying sizes.

iii. Perishability

Many studies report high levels of produce losses owing to the poor condition of rural roads and unreliable transport services. Separate studies by Araka et al. (1989) and Open et al. (1997) observed that poor rural road conditions and/or the lack of transport services cause produce to remain longer in transit and that this increases crop losses. It is estimated that of an annual 15 million bags of maize harvested in Zambia 1 million bags were ruined by rains owing to lack of transport (Araka et al., 1989). Oxfam (1993) reports that farmers in Tanzanian had a good harvest in 1992 but they were able to market only a small part of their crops because of the collapse of transport infrastructure.

Hine et al. (1983) found that 16 per cent of farmers in Ashanti Region of Ghana had personal experience of produce becoming rotten before they could sell it and some farmers attributed this in part to poor road conditions. The VIP reports of high post-harvest losses in Ghana due to severe transport constraint and low capacity of on-farm storage and processing (World Bank, 1997). Porter (1999) also reports produce deterioration and losses in Central Region of Ghana due to the unreliability of transport services, the impassability of some roads and late arrival at markets. Arno, (1986) noted that transport and commodity handling technology, when effectively adapted to local rural conditions, could reduce losses by 10-30 percent.

IMTs can provide all-weather transport to markets through their ability to manoeuvre in poor road conditions. Acheampong (Field trip R7575) reports of a situation in Kenya where four wheeled pick-ups got stacked on flooded and muddy roads and failed to reach the market while animal drawn carts and bicycle taxis carrying passengers and/or loads manoeuvred through the mud and eventually reached the market. IMTs can provide reliable and valuable transport service under conditions where conventional transport cannot operate and thus reduce the amount of produce lost in transit. IMTs also have larger transport capacities than human head porterage and so can speed up the removal of harvested produce.

iv. Food prices variation associated with transport

Food price variation is caused by the availability and quality of road infrastructure, transport services and charges and many other factors (Acheampong, 1999; Minten and Kyle, 1999 and Porter 1999). Ahmed et al. (1987) found that farmers in Africa on the average receive between 30-50 percent of the final product price compared with 70-85 percent by their counterparts in Asia and attributed this partly to the great disparity in the transport system between Africa and Asia. In a study conducted in Zaire, Minten and Kyle (1998) observed that the producer share is made up of 35 to 41% of the wholesale price. Similarly, MOFA (1991), Fricke and Kochendorfer-Lucius (1990) and Platteau (1996) also observed smaller farmers' shares in the final produce price in Sub-Saharan Africa.

Hine (1984) estimated that the reduction of headloading cost resulting from converting a 5 km stretch of footpath to motorable track between village and market increased farm gate prices by 11 per cent. Hine et al. (1983b) estimate that at 100 km distance from Kumasi, maize prices could be just over 6 percent lower for villages located on the main road but there was a much steeper decline in price for villages which can only move produce by head porterage. Hine (1984) argues that road improvement induces response in agriculture and farm gate price through reduction in the cost of moving loads to market. A study by MOFA (1991) revealed that under poor road conditions transport costs account for about 70 percent of the difference between the farm gate price and the retail price. Anyinam (1994) reports that agricultural prices in some remote rural areas dropped because of increased transport cost associated with road deterioration.

The above discussions suggest that poor transport conditions affect produce prices and farmers' margin through increased transport costs. IMTs can provide a reliable alternative means for transporting produce to market at a relatively lower cost in areas with poorer access. IMTs are usually based at the village and farmers can pre-arrange for their services before the market day. This will enable farmers to arrive at markets early enough to catch most buyers in

order to obtain good prices. The market survey of Central Region in Ghana (Porter and Acheampong, May 1998 – April 1999) reveals that IMTs could enable farmers to stay relatively longer at markets and sell their produce without rush through fear of missing the last bus to the village. This will give farmers the confidence and patience to negotiate for better prices. There is thus some potential for IMTs to improve people's access to markets and therefore to achieve a better price, though potential will vary from place to place according to local conditions.

2.6 Gender perspectives

The dominance of headloading – mostly by women – as the major mode of transport in rural Sub-Saharan Africa has been recognised by various studies (Moore, 1979; McCall, 1985; McCall, 1985; Doran, 1990, Pankaj, 1991; Dawson and Barwell, 1993; Ellis and Hine, 1995; Peters, 1999). Porter (2003) describes women's multiple role and labour contribution to farming, transport, marketing and household activities in Ghana's Central Region as overwhelming. She states "Women are the principal agricultural produce traders, visit the market once or twice a week to sell their own and their husbands' produce and return home with other purchased items. They also participate greatly in farming and other household activities, including carrying of water and fuelwood for domestic use" (Porter, 2003 pp).

According to Porter (1999, 2002, 2003) the enormous amount of time and energy expended for headloading goods in West Africa impacts mostly on women and children. Many other studies including Bukh (1979), Doran (1996), Grieco, Apt and Turner (1996), Tengey et al. (1999) and Starkey (2000) have also emphasized the enormity of the transport burden borne by women. Philpott (1994) estimated that African women may spend over 4 hours per day solely on transport and move approximately 50 kg per day. A gender-wise comparison provides a better indication of the enormity of women's transport burden. Howe and Barwell (1987) suggest that in Ghana the average adult female devotes almost three times as much of the working day to transport as the average male: at least 19 hours per week. Peters (1999) observed that women in Africa transport three times more ton-kilometres per year than men. Women in Africa are typically responsible for over 70% of the time spent on transport and over 80% of the effort (Urasa, 1990). Similarly, Leyland (1996) suggests from review of a series of African surveys that women typically account for about 65% of all household time spent in transport activities and 66-84% of all effort; they undertake 71-96% of all domestic travel.

Despite the acknowledgement that the brunt of the transport burden is borne by women, female specific transport needs and preferences are hardly taken into account in subsequent transport schemes (Urasa, 1990; Bryceson and Howe, 1993; Buaben et al., 1995; Doran, 1996;

Fernando, 2000; Tengey, 2001). Such observation has been made with some recent IMT promotion schemes. For instance projects to promote bicycle trailers and wheelbarrows for women in Ghana and Tanzania respectively failed to understand women's needs and wants before the project implementation began (Howe, 1989; IT News, 1989; World Bank, 1992; Kauffman, 1993; Salifu, 1994; Relf and Nkwizu, 1998). Unsurprisingly, these projects did not achieve their intended objectives. In the Ghana case, the trailers were found to be too heavy for women and also too expensive (trailer costs 200,000 cedis [about $40] in 1999). Similarly, most women in Madagascar could not raise $60 and $5 to purchase a handcart and a local wheelbarrow respectively (Starkey, 2001b).

An account by Peters (1999) indicates that the existing transport systems are not adequately geared towards the needs of women and that men's ownership and use of transport facilities far exceeds those of women. Porter (2003) reports that in the Central Region of Ghana most IMTs in the study districts are owned and used by men with no evidence of that they lend them to their wives. The low levels of transport devices owned and/or used by women in developing countries can be explained by their limited access to information, capital, credit, cash incomes and profitable transport activities and cultural limitations (Starkey, 2000). See also Flanary (2003) for more on the cultural limitations to women's use of certain forms of transport in northern Ghana. More recently the call for studies with increased gender sensitivity and women's involvement in rural transport planning, design and provision as their focus has been growing (Fernando, 1997; Bramberger and Lebo, 1999; Peters, 1999, Porter, 1999; Tengey, 2001; Starkey, 2000; White et al., 2000).

It is argued that IMT schemes, if properly targeted, may have the potential to provide women with opportunities to access multiple livelihood strategies (including farming and non-farming sources) and at least offer a potential part-solution to their porterage problems (Porter, 2003). Barrett et al. (2001:316) suggest as much as 40-45% of average household income may already come from non-farm sources, 'despite the persistent image of Africa as a continent of "subsistence farmers." Grieco et al. (1996) also suggests bicycles would have great economic value for women petty traders but are quick to point to cultural barriers, infrastructure dangers, lack of capital and the design of the bicycles. However, White et al. (2000) report that the number of women cycling in northern Ghana has expanded substantially in the last five to seven years. It is reported that with the availability of IMTs, children and sometimes men, also contribute a lot to the household transport activities through the use of IMTs for various activities which hitherto were performed mostly by women through head loading (Kwakye and Sharon, 1994; Porter, 2003). McCall (1985) argues that men's share of transport is increased

though with little extra physical effort when and where improved means of goods transport have been introduced in the form of pack animals and tractors.

2.7 Conclusion

The review above has shown that there exists a huge transport burden in the agricultural production systems in Africa as a whole and Ghana in particular. Unfortunately the conventional transport system cannot cater for most of these transport needs. The transport infrastructure and services conditions in Africa are poor with insufficient resources for their expansion and improvement. This has led to the retention of head porterage as the dominant mode of transport and women as the main transporters.

IMTs are now seen as the low-cost transport option with the potential to reduce the transport burden in subsistence systems such as those prevailing in much of Africa. It is anticipated that IMTs could provide reliable transport services, reduce transport cost, save time and energy and promote both agricultural transport and marketing and non-farm income generating activities. They could impact positively on agricultural production and marketing through the expansion of cultivated area, a change in cropping pattern, improved labour availability, increased market participation and improved produce prices. The impact of IMT schemes on women could be relatively higher since they bear the brunt of the rural transport burden. However, thorough research needs to be conducted on promotion, adoption and uses of IMTs to ensure that the needs of the potential beneficiaries are fully catered for and that the anticipated potentials are realisable. This study seeks to contribute by examining the impact of IMTs on various agricultural production and marketing features in the Central Region of Ghana.

CHAPTER THREE

THE STUDY AREA AND RESEARCH METHODOLOGY

3.1 The Study Area

3.1.1 Introduction

The district and villages description draws on fieldwork I conducted for R7149 and R7575. It describes the conditions of the district and the study villages at the start of R7575 in the year 2000. However, detailed description of farming, marketing and transport conditions in the villages is reserved for chapter four.

3.1.2 Gomoa District

Gomoa district is the largest in Central Region in terms of population and number of communities. The district was carved out of the former Gomoa-Efutu-Awutu-Senya district in 1988. It is located at the middle of Ghana's coastal belt, between Accra and Cape Coast. Figure 3.1 below shows the location of the Gomoa district and the study villages. The district has a gently rolling topography, mostly under c. 350 feet but with occasional hills of up to c. 750 feet. The climate is characterised principally by a bimodal rainfall distribution and a mean annual rainfall of 70-90 cm along the coast, and 90-110 cm in the northernmost area (Porter, 1999). The vegetation cover is purely coastal savannah: tree density decreases as one approaches the coast. Adjacent to the coastline and stretching for a few kilometres inland is an area covered by grass with sparsely distributed smaller trees species. There are few rivers but many streams that flow across the district.

Gomoa is one of Ghana's poorest coastal districts (Hewawasam et al. 1996 cited by Porter, 1998). It has a total population of 194,792 (106,378 females and 88,414 males) (2000 National Census). Settlements are generally nucleated. The Gomoa land is owned and predominantly occupied by Gomoa people, a sub-group of Fantis. A relatively smaller numbers of people from other tribes are also resident in the district. The administrative capital of the district is Apam, a fishing town. It is situated at the coast, about 3 km off the main Accra – Cape Coast road. Fig 3.1 shows the location of the Gomoa district and the study villages. Description of the study villages in terms of size, housing, population, social structure, major economic activities and accessibility are provided in the following sections.

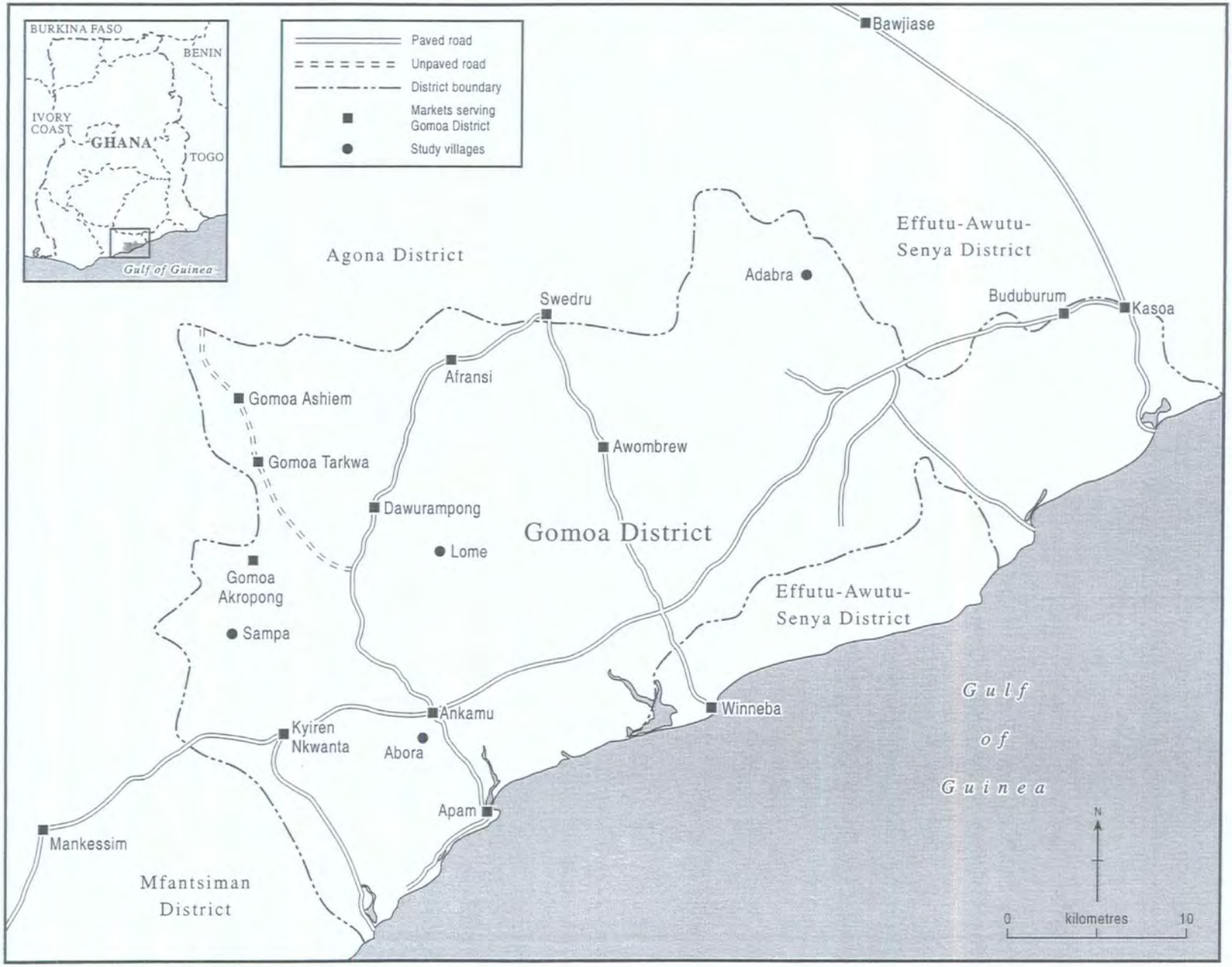


Figure 3.1: Gomoa district showing the study settlements

3.1.3 Lome

Lome is the largest of all the study villages. It is located to the north of the Accra – Cape Coast road and 4.5 km from the main Apam – Swedru road. It has a population of about 2000 and appears to be the wealthiest of all the study villages as indicated by the type of houses constructed. The houses are built of blocks, bricks or mud and roofed with corrugated iron sheet. The inhabitants are mainly Fantis with very small proportions of other ethnic groups. Christianity is the dominant religion, followed by Islam.

The social structure of the village shows a hierarchical order with the stool at the top and seven clans[3] under it. Land in Lome is owned and controlled by the clans. Some clans in addition have some common tree crop farms, especially cocoa, probably started by individual elders in the past.

Farming is the main economic activity of the village. Many crops are cultivated for home consumption and a few for sale. Main sources of labour are family, communal and hired. Other farm inputs are obtained freely or paid for in cash or in kind. Some people have built on-farm temporary settlements (see Appendix I fig A1 and A2) where they spend one or more weeks during the cultivation, harvesting and some other periods to work on their farms. Some people also store their maize at these temporary settlements. Trips to farm are usually on foot and loads are transported through headloading, mostly done by women and children. The hiring of porters especially by men is common at Lome. See 4.2.1, 4.3.1, 4.4.1, 4.5.1, 4.6.1 and 4.7.1 for more detail on farming in Lome.

After farming, trading is the next major economic activity and is mostly undertaken by women. Women also undertake processing of *gari, kenkey* and palm oil (see 4.8.1 for further detail). Men engage in hunting, masonry and carpentry activities. Some men and women also rear livestock and earn income from it. Other sources of income are remittances from relatives in the cities and the forest belt.

The main market serving the village is at Dawurampong, a small town located on the Swedru – Apam road and 5.5 km from Lome. Access from Lome to Dawurampong is along a narrow unpaved road. In 2000 there was no vehicle based at this village though there were about 10 bicycles, all owned and mainly used by men. Vehicles that visit the village usually come from nearby villages located on the paved road, especially from Dawurampong.

[3] The clan tells the matrilineal linkage of a person. Within the clans are found extended families. All the seven different clans of the Akan customary system are present in Lome.

There are three grinding mills within the village and all processing activities take place at the village. The main sources of water are ponds and wells at the immediate outskirts of the village and pipe-borne water within the village. Acute water shortage occurs in some dry seasons and people may travel a distance of about 5 km by trotro, taxi or on foot to obtain water from nearby villages. There is a nursery, primary and junior secondary school at the village, though a few children travel to a private primary school in a distant village: they can only travel there when transport is available (and thus tend to go to school only 3 days each week). The nearest banking facilities are located at Dawurampong, but few residents have a bank account. Some people obtain loans from other people in the community but the interest rate is reportedly high. People travel a distance of about 23 km or more to obtain medical care at Swedru or Apam, though a clinic at Dawurampong caters for minor ailments. Inter-village trips for all these services are mostly made by trotro or taxi.

In 2000 three unpaved roads, from Nduem and Dawurampong, Abonko and Oguan, led to Lome. Though all three roads were poor, the main road from Nduem was relatively better and the most used. The Nduem road is graded about once every one to three years. The other two roads are rarely graded and are impassable by conventional vehicles. Organised communal labour is used to weed the sides of the roads and fill potholes during the January and August festivals. Men do the weeding and fill potholes with gravel and stones collected by the women.

3.1.4 Abora

Abora is the smallest and the poorest of the four study villages. It is located 3.3 km south of the Accra – Cape Coast road and it is about 5 km from the coast. It has a population of about 260 with females forming nearly 60% of the total. A high proportion of the population consists of elderly people and young children. The inhabitants are mainly Fantis, a larger proportion of who belong to one clan. Christianity is the dominant religion in the village. The types and state of buildings within the village is an indication of the poverty level of the people. Houses are built of mud and brick, roofed with corrugated iron sheets and very few are plastered. Most buildings are in a dilapidated state and some are in a state of near collapse. Beside or within some buildings are cribs for storing maize.

Farming is the main economic activity at the village. Among the four study villages, Abora has the largest land area per capita. Land in the village is communally owned. The main sources of labour are family and hired. Labour is very scarce and expensive at the village. Most other farm inputs are obtained freely from people's own or relatives' farms. The rain is very unreliable and a major constraint to farming. Sections 4.2.2, 4.3.2, 4.4.2, 4.5.2 and 4.6.2 provide further detail on farming in Abora.

Sale of fuelwood, charcoal, pestles and fish-smoking sticks is a major source of income for the inhabitants of Abora. Some women buy other commodities in smaller quantities from markets to sell at the village. See 4.8.2 for details on trading in Abora. A few women engage in the preparation and selling of *kenkey* while some men earn money through game hunting. Many people, particularly the elderly, receive remittances from their relatives in the cities and the forest belt. Access to credit is very limited in Abora. A very few people –mostly outsiders – give credit in some production seasons to farmers. This is repaid with produce after harvest.

There is no school at the village and children have to travel 2 – 4 km to the nearest villages to attend school. They also have to travel 3.3 km to the nearest village to grind maize and other foodstuffs. The main sources of water at the village dry up in the dry season. People therefore make about 2 – 4 trips daily over a 4 km distance (one way) to the nearest village to obtain water in the dry season. The nearest health centre is Apam, a distance of 5 km by foot along the most direct access footpath. The people have little excess money to save. Only about 5 people living at the village in year 2000 saved money at a bank, the Akyempin Rural Bank, located about 26 km away.

In 2000 the only road leading to Abora was in very poor condition with a portion of the road becoming flooded after major rainfall. This deterred many vehicle operators from driving to the village. All other access routes to nearby settlements, market and farms are footpaths. Abora is 4.8 km from Apam, the main market centre and the district capital. There are no regular transport services into the village. Travel and transport to market, the nearest paved road and other places are mostly by walking and headloading. In 2000 there were only 3 people who owned bicycles, two of which were broken. One woman owned a taxi but this was based at the nearest village on the paved road.

3.1.5 Sampa

Sampa is the second largest of the study villages. It is about 7 km from the main Accra – Cape Coast road. Sampa has a population of about 1100 people and has approximately 120 detached houses. The houses are built of blocks, bricks or mud and roofed with corrugated iron sheets. Cribs for storing maize are found inside or at the back of some houses. Sampa is inhabited by Fantis with a few people of other ethnic background. Most of the inhabitants are Christians with a few Muslims and those who practice traditional religions. All seven different clans are represented at the village but their numbers differ greatly.

Farming is the main economic activity at Sampa. Most land at the village is owned and controlled by various clans and smaller proportions by the stool and some individuals. The main sources of labour are family and hired. Free communal labour is also available for carrying maize at the main harvesting period. People obtained other farm inputs from their own stocks or freely from friends and relatives. Most farms are accessible by footpaths and some by road. Head porterage is the major means of transporting farm produce and inputs, water and fuelwood to the village. Porters are available at the village but are mainly hired for carrying building materials such as sand and stones. See 4.2.3, 4.3.3, 4.4.3, 4.5.2, 4.6 and 4.7.3 for more detail on farming in Sampa.

There is no major economic activity besides farming. A very few women undertake trading and food processing activities while some men engage in masonry, carpentry, blacksmithing and hunting. A few men also burn and sell charcoal. The masons and carpenters migrate temporarily, especially in the quiet periods for farm activities (May-August and October-January) to other villages, towns and cities to do construction jobs. Some people receive remittances from their relatives in the cities and the forest belt.

The main sources of water are a borehole and a river located within 100 metres to 1.5 km depending on the location of the house at the village. There are two grinding mills at the village but neither of them has a cassava grater. *Gari* processors therefore have to travel to Ohua, a village of about 5 km away along a footpath from Sampa, to bring in a mobile grater. The grater is usually dismantled and headloaded by the operator and the person requesting the services. Nursery, primary and junior secondary schools are located within the village. The nearest health centre is located at Gomoa Adaa, a distance of about 6 km by road.

Sampa is served by Kyiren-Nkwanta market, located by the Accra – Cape Coast road. The 7 km unpaved road to the market is also the main access road to Sampa. Portions of the road are graded occasionally but the rate of deterioration is rapid owing to the poor grading and the high annual rainfall. Sampa is also accessible by another road through Akropong. Only taxis provide commercial services from the Kyere-Nwanta market/junction to the village while *trotros* visit occasionally on market days.

3.1.6 Adabra

Adabra is located 7.2 km to the north of the Accra – Cape Coast road. It is made up of a main village and four satellite villages. The distance between the main village and the satellite villages ranges from 0.25 to 1.00 km. Most inhabitants of the main village are Fantis whilst the satellite villages are inhabited by migrant Ewes. The entire village has a total population of

about 500 people. Activities and relationships in the village are largely organized by tribes rather than clans. The people are mostly Christians with a few animists. The houses are smaller in size and mainly built of mud and roofed with thatch. This might be taken as an indication of poverty, but among the Ewes this is not the case. They are migrants from the Volta Region who visit their hometowns regularly and may go and settle at home at some point in time. As a result they prefer to build better houses at their hometowns instead of Adabra.

Farming is the main income generating activity. The people have both major and minor season farms. The minor season rains are sometimes disappointing and this discourages people from making larger farms at this season. Land is owned and controlled by the chief of the village and people from Amuanda and Akraman, nearby villages. Main sources of farm labour are family, hired and *nnoboa*. The *nnoboa* system is usually practiced by male groups. The major sources of other farm inputs are people's own stock, purchase and gifts from relatives and friends. The major mode for transporting loads from farm to the village is head porterage.

Trading and the processing of *gari* and cassava dough, mainly by women, are major income generating activities. The women travel a distance of 23 km to Kasoa, the nearest market, to sell produce. There are four *susu*[4] groups at the village. Patronage in these *susu* is very high, especially among the male Ewes. The *susu* is a major source of cash credit for both contributors and non-contributors.

The main sources of water at the village are a borehole and a pond. These are located within the village or a distance of 50 – 500 metres for the main village and up to a maximum of 1.5 km for the satellite villages. A nursery, primary and junior secondary school located within the main village serve the satellite villages as well as the two nearest villages. There are 3 grinding mills at the village, one at the main village and two at the satellite villages. The people travel a distance of about 9 km to obtain medical care from the nearest clinic at Kwanyako.

Adabra is joined to the main Accra – Cape Coast road by 7.2 km of unpaved, rough surface road. The road deteriorates rapidly during the rainy season. One satellite settlement is served by a 400-metre track from the Adabra–Akoti Junction road. The remaining satellite settlements are accessible mainly by 100 – 200 metres paths from the first satellite. The relative locations of these satellite villages are shown in Appendix I figure A7 and A8.

[4] Susu refers to a rotation credit whereby a group of people come together to contribute money over a period of time and share the proceeds according to how much each member contributed.

The commonest mode of transport for trips to the junction is taxi and direct trips to market are by *trotro* or mammy wagon. These larger vehicles visit the village only on market days. In 2000, two people owned one taxi each, but neither vehicle was based at the village. A few people owned bicycles but some had broken down.

3.1.7 Comparison of the study villages

There are some variations in many features among the study villages. Table 3.1 below illustrates variations between the study villages in terms of demographic, organisational and other related features. The observed variations among the villages have the potential to influence farm production, marketing and related transport activities.

Table 3.1 Comparison of the demographic and organizational features of the study villages

Features	**Settlement**			
	Lome	**Abora**	**Sampa**	**Adabra**
Population	About 2000	260	About 1100	4 – 500
Age structure of population	Balanced	High proportions of children and elderly	Balanced	High proportion of youth and middle age people
Ethnicity	Mainly Fantis	Mainly Fantis	Mainly Fantis	Fantis and Ewes
Religion	Mostly Christians followed by Muslims	Mainly Christians	Mostly Christians and a few Muslims	Mostly Christians and a few Animists
House types	Mud, brick & block with iron sheets	Dilapidated mud and brick houses with iron sheets	Mud, brick & block with iron sheets	Mainly mud, unplastered with thatched roofs
Temporary settlements	Present	Not present	Not present	Not present
Satellite settlements	Not present	Not present	Not present	Present
Migration	A little temporary out-migration	High out-migration	A little temporary out-migration	High in-migration by Ewes
Wealth status	Richest of all survey villages	Poorest of all survey villages	Average among survey villages	Average among survey villages
Credit availability at village	Available through wealthy individual	Very scarce	Scarce, but available from a few individuals	Available through (Ewe-dominated) *susu* groups
Main economic activity	Farming	Farming	Farming	Farming
Other economic activities	Some female traders & male artisans	Mainly sale of fuelwood; hunting by men	Some women traders, a few male artisans	Trading by most women
Rearing of livestock	Common	Not common	Not common	Not present
Remittances	Common	Common	Common	Not present
Organization of social activities	Mostly along clan lines	Mostly at community level	Mostly at community level	Mostly along ethnic lines
Decision making within village	Decisions taken by chiefs, elders and clan heads	Decisions taken by chief and elders mainly.	Decisions taken by chief and elders mainly.	Decisions taken by chief and elders and tribe heads.

3.2 Action research: integrating with the R7575 project design

The larger project (R7575) involved many activities for the research team, the people in the study villages, staff of the district assemblies, government ministries and NGOs. The activities included individual and group discussions on transport and access issues, their preferences for IMT types, farming, marketing and other socio-economic activities at the villages. Others included initial IMT attitude interviews, traffic counts, load weighing, a general baseline survey and village level workshops. There were also consultative group meetings with people from government ministries and district assemblies to discuss a range of issues on rural transport.

IMTs were supplied to some individuals on credit (see section 3.4.2) and a control group of non-beneficiaries were selected from each village (see section 3.4.3) and monitored alongside the beneficiaries over a two year period. The monitoring included the use of tools such as IMT diaries, farm surveys, PRA (seasonal transport calendars using preference ranking; see Pretty, 1995), time budgets exercises (involving direct observation and recall, travel diaries), life histories, in-depth interviews on intra-household decision making and IMT impact, focus group discussions, a second IMT attitude survey, load weighing, traffic count and interviews with children.

The thesis involves a baseline survey of farming, marketing and related activities, a series of quarterly surveys, an end survey, mapping of farms and linked routes and monthly transport and food price data collection. All these activities had to be regulated in such a way that they fed into the log-frame of the larger project which determined the pace of data collection for this thesis.

Although integrating the project activities with the specific thesis schedule was difficult, it undoubtedly broadened my understanding about activities in the study areas and helped improved my data collection techniques and precision. Some similarities between the larger project and the thesis are that both placed much emphasis on qualitative data, the same set of beneficiary and control groups was used to evaluate the impact of the IMTs and both had repeat surveys taking place at similar time periods. The group interviews, wealth ranking exercise and other activities undertaken in the base year for R7575 provided important contextual information. There was also the opportunity for me to draw on qualitative data that had been collected by other project team members at the villages since they all form part of one larger project and issues investigated cover the same time period and communities. Some of this extra project data has been used to enrich the discussions in this thesis.

3.3 Contribution of the candidate to the larger project

These days not many researchers go to the field to undertake such detailed and long period of survey owing to time and other resources constraints. I (the candidate), however, spent a very long period of time on the field to undertake detailed observations and in-depth surveys of transport and related development issues in the study. This committed role greatly enriched the findings of the project. As a result this study contains a lot of rich information which otherwise may not be found in many other studies. Owing to this sacrifice this study has contributed to knowledge by providing such a detailed observation and analysis of transport issues in rural Ghana and other developing areas. I was the major investigator responsible for the component of the research project that examined the linkages between transport and agricultural production and marketing. In this role I collected and analysed data and wrote up the entire report relating transport and access to changes in farming and marketing systems in the form of this thesis. My co-ordinating role and participation in other activities of the project really helped to shape the results of the study.

3.4 Utilising a mixed method approach

The larger research project developed a diverse set of methods (principally, but not wholly, qualitative), for monitoring IMT use and its impact in the study villages, on the basis that a multi-method approach would provide beneficial triangulation of data. A series of PRA exercises, as stated in 3.2 above, were undertaken at intervals through the monitoring period. These were undertaken with groups of women and men in each village, but not restricted to the IMT beneficiaries and non-beneficiaries.

Similarly, my thesis basically employs the qualitative approach to survey and analysis, but also incorporates a quantitative component. The quantitative component involved data collection relevant to certain parameters such as the level of production, inputs use, produce prices, transport charges and uses of IMTs. Dependence on quantitative methods alone has been criticised for not being able to explain fully the complexity and dynamics of human activity (Batterbury, 1997). Consequently, qualitative methods were used extensively as they allow for detailed probing around issues which are not amenable to quantitative assessment, such as the social and cultural situations of the people we worked with.

Miles and Huberman (1994) describe qualitative data as a source of well-grounded, thorough exploration, rich descriptions and detailed explanations of processes working in complex local systems. Qualitative research is based on discovery but not proof (Denscombe, 1998) and as such it is flexible and lends itself to different social systems, although it is important to maintain the objectives and lines of action. It makes use of a multi-method approach and

diverse techniques to generate information from diverse sources. It helps to capture the realities of the system (Mitchell, 1989). The approach is thus appropriate for the complex social and cultural environment within which the project took place.

The use of PRA tools made it possible to elicit the views of the people in the rural areas regarding their understanding of rural access and their experience relating to their farm production, marketing and non-farm activities. The choice of various IMTs provided, mode of distribution, and data collection processes, all depended essentially upon village level participation. This encouraged understanding of the project among the people in the villages and thus their willingness to co-operate. The presence of the broader IMT project encouraged cooperation from respondents, their spouses and other household members in my research.

All interviews took place in two closely related dialects, Fanti Twi and Asante Twi, the language in the study area and my own language. This, together with my long field research experience and familiarity with the study area ruled out the need for translators or research assistants. I was able to undertake detailed conversation and in-depth probing, which improved the quality of the data and helped to avoid some of the common biases in PRA (Kapila and Lyon, 1994 and McCraken and Narayan, 1997).

My extended period of research in the area persuaded the people to see me as an insider rather than an outsider, a quality recommended for PRA studies. It enabled me to understand some of the ground situations and also encouraged respondents to discuss the situation as they really saw it, as opposed to providing fabricated responses. However, care was taken to try to avoid carrying along my own preconceived ideas or prejudice by not posing leading questions that would generate predetermined answers (McCraken and Narayan, 1997). The busy schedule of farmers and their early departure to the farm compelled me to pre-arrange meetings with respondents. Most of such meetings were scheduled for non-farming days or early mornings or late evenings of farming days.

3.5 The surveys

3.5.1The baseline survey

The baseline survey was carried out between April and October 2000, before the introduction of the IMTs. It involved a survey of a large cross-section of the inhabitants of the study villages. The large sample size was to gather as much general information about the communities as possible. The questions covered demographic patterns, agricultural production, marketing activities and non-farm activities. A copy of the checklist used for the baseline survey is provided in Appendix IV questionnaire IVA.

3.5.2 Selection of IMT beneficiaries

The beneficiary group is a set of farmers in the four study villages who directly acquired IMT(s) through the R7575 project, either individually or as a group. The groups comprised men and women of different age categories. After a series of individual and group meetings, one workshop was organised in each of the study villages during which different types of IMTs were introduced and both men and women allowed to test-drive them. People were then offered the opportunity to select and apply for IMTs of their choice on credit. Earlier work had suggested that lack of credit was a major barrier to acquisition and use of IMTs in the study villages. The application for IMTs was open to all residents of the study villages but preference was given to female applicants. No further short listing of applicants was necessary after the first round of applications, since their number fitted the financial provision available in the project. The beneficiary group was made up of 46 respondents in total from all four villages. All beneficiaries chose to acquire IMTs individually, with the exception of Abora where two separate groups acquired a power tiller and push truck. The table below shows the distribution of beneficiaries and the types and number of IMTs supplied among the study villages.

Table 3.2 Distribution of IMTs among the beneficiaries.

Settlement	Number of beneficiaries			IMTs selected														
				Push truck			Bicycle			Wheelbarrow			Handcart			Power tiller		
	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C
Lome	8	7	0	7	7	0	1	0	0	0	0	0	0	0	0	0	0	0
Sampa	4	2	2	4	2	0	0	0	0	1	0	2	0	0	0	0	0	0
Adabra	7	8	0	5	6	0	3	1	0	0	0	0	0	0	0	0	0	0
Abora	2	8	3	2	8	0	0	0	0	0	0	0	0	0	9	0	0	1
Total	46			35			4			3			1			1		

Note: M = males, F = females, C = community or community group

3.5.3 Selection of a control group

A control group of non-beneficiaries was required for both qualitative and quantitative approaches and assessment. The control group was a carefully selected group, with each member bearing close resemblance to a particular IMT beneficiary in the same village – the beneficiary counterpart. This was to allow comparison of the impact of IMTs on agricultural production and marketing activities and the general livelihoods of both beneficiaries and non-beneficiaries. The number of control group members equals that of the beneficiary group. The control group members did not acquire any IMT under the project and were people who did not own any IMT from any other source. They were also not direct relatives of IMT

beneficiaries, though they could access the services of IMTs by loaning or hiring them from the owners. Appendix V shows a comparison of each beneficiary with his/her control counterpart

The beneficiary group formed the basis for the selection of the control group, in that some basic attributes of beneficiaries were used as basis for the selection of the control group members. The key factors considered in the selection of the control group were settlement, residence, sex, age, family size, land tenure arrangement, food farm size and types of crops grown, size and types of cash crops grown, other income generating activities, livestock ownership and remittances. The selection of control counterparts was done with the help of the baseline data collected at the beginning of the project, a wealth ranking exercise, direct observation and through advice and assistance from members of the study communities. Through my long period of work in the village I had a good knowledge of the communities and this was an added advantage in the selection of the control group. In a very few instances where the baseline data failed to provide a suitable control counterpart, key informants in the communities were able to propose appropriate partners. These proposed people were then interviewed using the baseline survey checklist, after which a suitable respondent was selected and paired with the appropriate beneficiary. The independent applications for IMTs and the ensuing selection of the control group members following the process outlined above enabled me to circumvent as far as possible the problem of elite bias (Kapila and Lyon, 1994).

3.5.4 Quarterly survey

As part of the monitoring process for R7575, quarterly farm surveys were undertaken with the IMT beneficiary and control groups. These quarterly surveys helped to review ongoing developments in each village. It particularly helped to follow and track farming and marketing activities that occur at weekly, monthly or quarterly intervals such as sale of produce, transport activities and other farm related activities. Each survey covered the last 3 months of activities of respondents. These data covered the period January 2001 to February 2002. The data collected covers the following in considerable detail:

- Farm level production and uses of farm produce,
- Intra-village travel and transport including transport of farm produce, fuelwood, water, farm inputs etc.,
- Marketing activities including locations of sales, frequency of trips to markets, produce prices, mode of transport and transport charges.
- Use of IMTs and labour,
- Non-farm activities.

The information from the quarterly surveys is not reported in detail in this thesis, though it helped inform analysis of the end survey data set. A sample of the quarterly survey questionnaire is provided at appendix IV questionnaire IVC.

3.5.5 The End Survey

This was a repeat of the baseline survey, though some additional questions not included in the baseline survey were added. It involved the use of a semi-structured questionnaire to review some of the information collected in the baseline survey plus other general information from respondents. This survey was conducted between February and April 2002 with all beneficiaries and the control groups. The major issues captured by this survey include:

- Individual personal and household characteristics,
- IMT ownership and uses, and factors that influenced the choice and subsequent uses,
- Farm features including farm size, distance to farms, crops grown, nature of access to farm and tenure arrangements,
- Earnings from non-farm and farm activities
- Influence of IMTs and other transport types on agricultural production and marketing.

The aim of this survey was to review changes in the farming and marketing systems and related activities since the baseline survey was conducted in February 2000 and to assess the contribution of IMTs to changes. The survey also looked at other factors that contributed toward these changes. The qualitative data contributed greatly to this judgement since it was not something that could be estimated solely from the survey data alone. A copy of the end survey questionnaire is provided in Appendix IV questionnaire IVB.

3.6 Focus Group Discussions

Focus group interviews were employed at various stages of the study. At the outset of the study, interviews were held with various separate groups of chiefs and their elders, farmers and traders in the communities. Group numbers were usually between 4 to 10 people and included both mixed and single-sex groups. The aim was to obtain an initial picture of the various farm and non-farm activities as well as transport issues in the villages.

Subsequently, group interviews were held with opinion leaders, elders and farmers on other issues pertinent to the study. These incorporated a wealth ranking exercise, discussions about land ownership and tenure issues, produce prices and transport charges and paths and roads maintenance. Some meetings were not planned long in advance but were set up when an issue arose which required explanation and discussions. Some meetings simply involved a couple and their children, and were conducted to deliberate on issues not clearly explained by individual interviews.

3.7 Direct observation

This involved personal observation, participation in some events in the villages, and general conversation and discussion with community members. Participation assisted greatly in the case of mapping farms and connecting routes, where I had to follow some people to farm as well as walking along most of the major farm routes to examine their feasibility for the use of IMTs. Direct observation was also necessary in examining the nature of produce exchanges, marketing and transport issues. This helped me to gain deeper understanding into the very fabric of the rural world in which I was operating, created effective rapport, allowed me to cross-check the actual situation with responses received from interviewees and capture other activities of respondents which did not come out during scheduled interviews.

3.8 Mapping cultivated fields and routes linking them to the village

This activity was undertaken for all beneficiary and control group members. The activity was to enable me have a good knowledge of the distribution of cultivated plots among respondents in each village. It also aimed at assessing the possibility and difficulty of using IMTs on routes to these cultivated fields in both wet and dry season, in line with the potential for the use of IMTs. It was done through direct interview of farmers. However, occasional trekking of farm routes was necessary since some farmers found it difficult to estimate distance and location. One major activity that greatly assisted the mapping exercise was a reconnaissance survey of roads and farm tracks linking selected villages in the Gomoa District by Engineer Annang Siaw of the VIP as part of the broader project. I participated in that survey. Assistance was also sought from opinion leaders and other members in the respondents' household. Further probing continued over a major part of the study period to improve the precision of the mapping.

3.9 Data analysis

Large amounts of data were generated through the field research some of which were largely unstructured. Such data does not lend itself to analysis by statistical techniques and interpretations. However, efforts were made to transform, categorise and label data for SPSS analysis (Cook and Crang, 1995 and SPSS Base 10.0 User Guide, 1999). The categorisation and labelling allows for manageability, clarity and comparison of data and helped to establish relationships among a set of individual farmer attributes and farming and marketing features. However, coding was limited to quantitative data and a few qualitative responses. Most qualitative information was not amenable to coding and was mainly read through and used to support the quantitative analysis.

The major farm features examined using SPSS were:

Land ownership: The relationship between respondent and the owner(s) of cultivated plots.
Land *tenancy arrangement*: The type of arrangement, including form and level of payment and duration of use of land, between the farmer and landowner regarding the use of land.
Number of farms: The number of separate plots cultivated by individual farmers over a given time period.
Farm/plot size: The size of separate cultivated plots in poles.
Total farm size/Total landholding: The total land area in poles cultivated by a farmer in a year.
Distance to farm: The distance in kilometres between respondent's village and cultivated plot.
Farm distribution: The distribution or location of separate plots with distance from village.
Crop type and cropping pattern: The types of crops cultivated and the pattern of planting on the field – monoculture or intercropping.

Changes in the farming system between the base year and the end year were examined in terms of changes in the above listed factors. Other factors explored included changes in farm location, marketing location, yield and labour availability etc. Factors that influenced changes in the farming system were examined and the possible contribution by IMTs isolated and discussed further.

SPSS analysis was mostly restricted to descriptive statistics, cross-tabulations, frequency counts, percentages and transformation into tables and graphs. Data were analysed as unordered or ordered variables and were subsequently presented in tables and charts/graphs. In many instances tables were constructed for IMTs beneficiaries and control group and males and females against the above list of features and dichotomous responses (yes/no; change/no change) recorded. The Pearson chi-square test statistic was used to examine the relationship between IMT ownership, village and sex of respondent and farm features and changes over time.

3.10 Difficulties and opportunities

The good inter-personal relationships I was able to develop in the villages greatly enhanced the data collection process. Frequent visits and friendly interactions since 1998 meant that people were not threatened by my presence. There was no obstruction from males whose spouses were involved in the study.

My fluency in Fanti enabled me to take part in informal discussions and appreciate the responses from the people and led to the generation of credible data from multiple sources.

The provision of IMTs under this project encouraged co-operation. In addition, the opportunity the project offered for non-beneficiaries in the communities to acquire IMTs, when the first batch of beneficiaries had completed their repayments, also encouraged greater participation among the villagers as a whole. However, it is recognised that this could have triggered some false responses from a section of the people in their bid to impress so as to benefit when the next IMT distribution occurs.

There were some limitations in the use of the participatory methods and triangulation. The process generates a lot of information part of which was not relevant. The data therefore have to be read/listened to/sorted to iron out the significant parts. This took an incredible amount of time. The diverse sources of information produced a large unorganised data set and this made it difficult to select particular tools/techniques for analysis. For instance some information/data did not fit into any category. Some of these unorganised data did not lend themselves to statistical analysis and testing. The information was difficult to manage and interpret. The validation, categorization, ordering and interpretation of the data is sometimes influenced by the researcher's personal judgement. In the field certain people who are out-spoken, particularly male respondents, dominated group discussions while other people do not contribute at all. This has the potential to present the view/ideas of the few influential/out-spoken people in the community – hence the information obtained may not be a fair representation of the actual community situation.

Lack of record keeping by farmers made it very difficult to elicit information from farmers. Interviews took a long time and recall problems required the use of various additional techniques, including talking to children and spouses and direct observation, to further explore the issues under consideration.

Difficulty in constantly explaining to people the objective and conduct of the research and the need to avoid raising expectations of further external intervention and assistance arose through the project. Most people had the perception that once IMTs came in through this study, there was the likelihood that other benefits such as cash credit could follow. This is perhaps inevitably a difficulty of undertaking research in a "project" context.

The last issue was the difficulty in contending with the tension and demands posed by my academic work and the associated thesis preparation on the one hand and the project funder's requirements on the other hand.

CHAPTER FOUR

THE BASELINE SURVEY

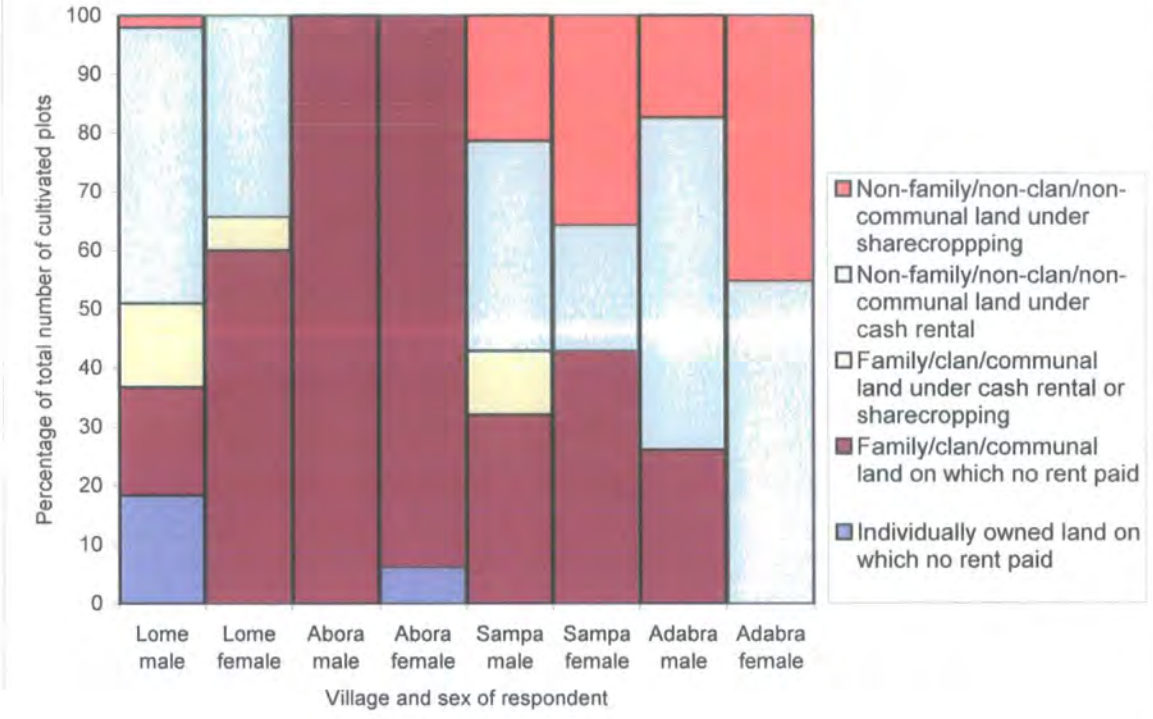
4.1 Introduction

This chapter describes and compares the farming and transport systems in the study villages. Quantitative data from a baseline survey carried out at the beginning of the R7575 project (2000) are used to support a set of qualitative information collected from a cross-section of men and women in all the study villages. Generally, farming systems in the villages are described in term of land allocation and tenure, distance to farms and distribution of farms, cultivated area, cropping pattern, farm transport, farm labour, transport and produce marketing. These issues are compared by village and gender and their implications for transport demand and supply in the villages are assessed. It must be noted that in this section the entire baseline survey data was used to draw broad and general conclusions but, for the purpose of comparison with the end survey, specific figures quoted in this discussion refer to data and analysis based on the respondents only (beneficiary and control group). This chapter does not focus on comparisons between the beneficiaries and the control group since the groups were chosen to match as closely as possible and no differences are expected between the two groups. Comparison is therefore made of the two groups only when statistical tests show significant differences and selection made these differences unavoidable.

4.2 Land Allocation and Tenure

Land availability and associated tenancy arrangements have a major influence on the scale of agricultural production, particularly in subsistence systems. In the study villages land is largely owned and controlled by clans and extended families and stools (chiefs and their elders). Only a few individuals own pieces of land. The main forms of tenancy arrangements in the area are free-hold mostly for family/clan and communal lands, and cash payment and/or sharecropping for hired land. The nature of the tenancy agreement has important implications for the adoption of farm innovations including IMTs. For example, in instances where the contract is very short, farmers are likely to be reluctant to invest in fixed infrastructure such as the development of routes for the use of IMTs. The cost and availability of land can also limit the scale of production of many farmers and this does not permit farmers to realise the full potential of an adopted technology. The remainder of this section describes the types of land ownership and tenancy arrangements in each study village and how these may influence transport use. Fig 4.1 shows the land ownership and tenancy arrangements in each village.

Fig 4.1. Graph showing the ownership and tenacy arrangements of cultivated plots in base year



4.2.1 Land allocation and tenure in Lome

Land allocation for farming, construction and other purposes is done independently by clan heads. Clan members are usually given portions of the clan land to farm without charge while portions are rented out to non-members and in some cases to clan members who require extra land. Some extended families and a few individuals also have their own land. Such lands are assigned to families or individuals by the clans and this is passed on from one generation to another. As shown in fig 4.1, most people in Lome use family/clan and hired lands. Hired land and clan/family land form 45% and 43% respectively of all separate plots cultivated by respondents in the base year. Free use and Cash payment are the commonest form of tenure: 50% and 39% of all respondents' farms in the baseline period were under free use and cash rent respectively. Sharecropping is not widespread in Lome.

The survey reveals that more women use clan/family land than men. This is due to the fact that some women use land that has been hired by their husbands. However, the general response among people was that both men and women have equal right to the use of clan lands (baseline survey 2000). For instance 66% of female respondents used family land without charge compared to 52% of males.

Men hire more land than women. This is due in part to the fact that men are relatively richer than women and so can afford to rent land. The cost of hired land is dependent on the distance and maturation period of the crop to be planted. Prices of plots used for maize production (six months contract) are often one-third to half the price of lands used for the production of cassava, vegetables and other annual crops (one year or longer contracts). For instance in 1999 farmers paid ¢5 – 10,000 (cedis) for a pole of land used for maize production and ¢15 – 30,000 per pole of land used for cassava and vegetable production. The village elders and clan heads usually fix the rent rate at the beginning of the production year.

Sharecropping, commonly practiced by farmers who cultivate long maturing crops, reveals two major patterns. Under one system the farmer pays cash at the prevailing land rate for the first year only and the remaining years are free. The farmer then keeps all the annual crops but shares the perennial crops (the main crops) into two equal halves with the tenant and landlord taking one half each (*abunu*). Men predominate in these types of tenure since they cultivate most tree crops. Under a second system the farmer pays a fee lower than the prevailing land rate (*a dash*). The farmer either keeps half (*abunu*) or two-thirds (*abusa*) of all cultivated crops (annual and/or perennial) and gives the rest to the landlord.

4.2.2 Land allocation and tenure in Abora

All land in the village is owned by the community and controlled by the stool (chief and his elders). The very few people who indicated the ownership of their cultivated land as family land are people who either by themselves or their extended families have used land at a particular location for generations and as such consider it theirs. Farmers tend to keep and rotate plots they have farmed over the years and so there are no yearly re-allocations of land. Land allocation by the chief and his elders is necessary only when someone needs land at an entirely new location or when a new user comes to settle at the village.

Cash payments and sharecropping are totally non-existent in Abora. All people at the village have the right to use land freely. Farmers simply pay a bottle of schnapps to the chief and his elders to gain the right to use any piece of land, whatever its size. Once the *dash* is paid, an individual can farm on the land as long as s/he wants. However, an additional bottle is required when an individual wants to move to land at an entirely different location.

Abora has high land availability per capita by Gomoa standards and both men and women have equal access to land. The land availability and the opportunity to use land freely are important advantages, in particular because of the high level of poverty in the village. It allows farmers to keep all their separate farms at one location and this has positive transport

implications. Having all farms at a given period at one location allows farmers to switch labour between plots on the same day, reduces load fragmentation or allows amalgamation of loads and hence reduces the number of trips per farmer and saves time and energy. Farming at the same location for several years means that farmers can continue to use the same routes for years. They can therefore afford to expand such routes to allow for the use of IMTs, knowing that route development in one year is an investment and will enable them to use IMTs in many successive years.

4.2.3 Land allocation and tenure in Sampa

The commonest forms of land ownership in Sampa are family/clan land or hired land (cash or sharecropping). For instance 43% and 57% of all plots cultivated by respondents at the base period were family and hired (cash and sharecropping) respectively. People generally have free right to the use of family/clan lands. Land is thus largely freehold, cash renting or sharecropping. Land rent rate depends on the duration of the contract, type of crop to be cultivated and distance to plot. In 1999 a pole of land was rented for ¢20,000 (cedis)[5] for one year. A few people, usually men, pay cash rent or sharecrop for using family land mainly for the cultivation of long maturing crops but the rent is far smaller than that paid by non-family members. The sharecropping system in Sampa is similar to that observed in Lome. Land under sharecropping is mostly for the cultivation of long maturing crops.

Land is generally available at Sampa for farming and this implies people can relocate their farms to take advantage of IMT availability. However, the relocation may involve a switch from free hold to cash rent/sharecropping or vice versa and this could limit the degree of relocation to some extent. Men could switch with relative ease owing to their relatively sound financial position which can enable them to hire more plots than women.

4.2.4 Land allocation and tenure in Adabra

Land in Adabra is owned and controlled by the chief of the village and people from nearby villages (Amuanda and Akraman). The right to the use of land is mostly by cash rental or sharecropping. Only a limited number of Fantis have free right to the use of land. For instance 56% and 33% of all plots cultivated by respondents in the base year were under cash rent and sharecropping respectively. Only 11% of all cultivated plots were family owned. The ratio of male–female plots under sharecropping is very low compared to cash rent. This is partly due to males' relatively sound financial background compared to females.

[5] The cedi is the currency used in Ghana. ¢10,000 was equivalent to £1.00 at the time of the survey

Land is scarce and expensive in Adabra, hence the recourse to sharecropping and intensive cultivation. The shortage of land is due to the heavy Ewe in-migration to the village, the lease of large acreage of land to two commercial farmers for the production of pawpaw and pineapple for export and difficulty on the part of farmers in locating and approaching landlords most of whom live outside the village. Unlike Lome and Sampa, most plots under sharecropping in Adabra are for the production of annual crops. In this case the farmer pays the initial fees (usually a dash) to the landlord. The farmer then keeps half (*Abunu*) or two-thirds (*Abusa*) of the produce and gives the rest to the landlord. The cash rent rate varies greatly across the village, even for plots with similar characteristics. This is partly because negotiations with landlords are done individually rather than collectively by the farmers, though other factors such as land quality, distance to plot and the duration of tenancy are also factored into the rent rate. Thus the rate obtained by an individual farmer depends on his/her bargaining ability. For instance during 1999 farmers paid ¢40,000 – 100,000 per pole of land per annum for plots at same location.

The general scarcity of land at the village has many implications for increasing production and the adoption of IMTs. The shortage of land has confined farming to few locations of the village and compelled some farmers to cultivate distant plots. IMTs could serve a useful purpose by enabling farmers to undertake bulk carting (with push truck) or make faster trips (with bicycles). The scarce land issue could constrain farmers from relocating their farms to more IMT-accessible locations or from expanding their cultivated acreages in order to take advantage of the IMTs. This leaves farmers with the option of intensifying their cultivation to try and improve land productivity and to use IMTs to convey the increased output.

4.2.5 Comparison of land allocation and tenure systems among the villages

The land ownership and tenancy arrangements in the villages are diverse and this is likely to present different challenges to agricultural production and transport use in the villages. Table 4.1 below summarises the differences in land situation among the villages (See Appendix III Tables A21, A23, A25 and A27 for number of farms under various land ownership and tenancy).

In a nutshell, the land tenure system in Lome, Sampa and Abora appears more organised than in Adabra. The scarcity of land and the high rent in Adabra could reduce the impact of IMT adoption on farm cultivation than in the other villages. The system in Abora would be expected to promote IMT adoption more than the other villages, all other factors being equal, since all the farmers in the village have the liberty to move production to accessible locations that will allow the use of IMTs.

Table 4.1 Comparison of land ownership and tenancy features among the study villages

Criteria	Lome	Abora	Sampa	Adabra
Land availability	Available	Readily available. Has largest land per head	Available	Limited available and expensive.
Land ownership	Mostly clan and a few individual	Mostly communal and a few individual	Clan, extended families and stool	Individual external landlord.
Land tenure	Mostly cash and free use and few sharecropping	Mainly free	Equal proportions of free use, cash rental and sharecropping	Mostly cash rental and sharecropping
Fixing of land rent	By village and clan elders	N/A	By village and clan heads	Between individual farmers and landlords
Land allocation	By clan heads	By village heads	By stool, clan and family heads	By individual land owners
Level of land rate	Average	Cheaper	Average	Expensive
Variability in land rent rate	Similar	N/A	Similar	High variability
Land use form	Bush fallow at individual and clan level	Bush fallow by individual farmers	Bush fallow by families and individuals	Bush fallow by individual landlords
Crops under sharecropping	Long maturing crops	N/A	Long maturing crops	Annual crops

4.3 Farm distance and distribution

The number and distribution of cultivated plots may contribute greatly to the need for transport. The distance from village to farm or between separate farms of an individual contributes to the time and energy required for travel and transport. Longer distances could make use of head porterage impracticable. Similarly, the greater the number of farms per person the greater the transport burden. Apart from adding to the volume of loads, additional numbers of farms also result in load fragmentation, increase the number of trips per person, and the time and energy expended. Having contiguous farms or the use of a common route to separate farms allows for produce amalgamation and bulk carting by IMTs such as handcarts, or by motorised vehicles where practicable. It also allows for the use bicycles to make quicker round trips to many farms. Figure 4.2 and 4.3 show the number of and distance to cultivated plots in the base year.

Fig 4.2. Graph showing the proportion of respondents who cultivated particular number of plots in the base year

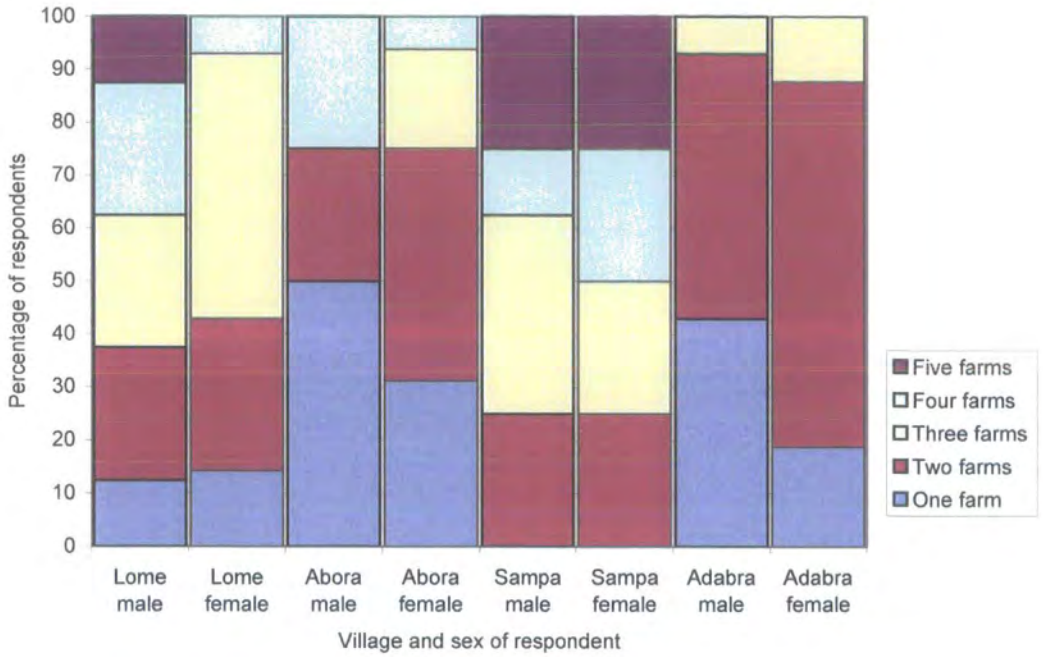
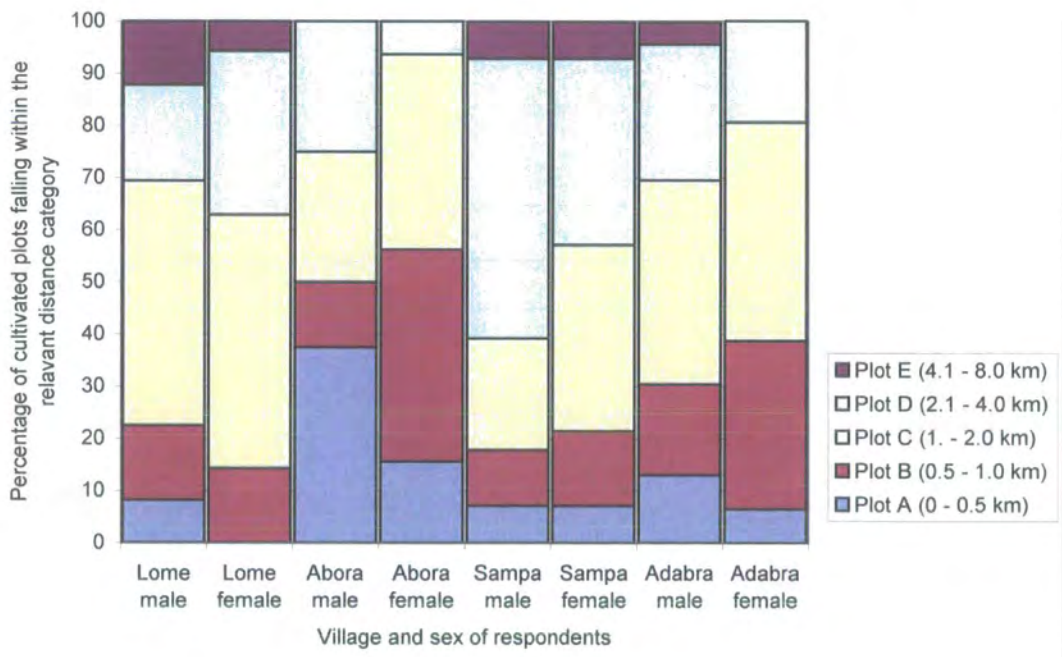


Fig 4.3. Graph showing distance from village to plots cultivated by respondents in the base year



4.3.1 Farm distance and distribution in Lome

Most farmers in Lome make two or more farms in a year and the village has an average of three farms per farmer. For instance only 13% of respondents made one farm in the base year compared to 60% who made three or more separate farms in the same period. This is made possible by the availability of land and the relatively sound financial status of people in Lome. Analysis by gender shows that men make more separate farms than women. For instance 38% of men cultivated four or five separate farms in the base year compared to only 7% of women in the same period. Separate farms belonging to an individual are not often contiguous and in some instances they may be far apart and involve the use of separate routes. It may be difficult to make a single trip round all the farms, especially on foot.

In Lome farms may be located as close as the back of the houses to as far as 8 km. Most farms (72%) are within a distance of 1.1 to 4 km from the village. The farthest plots are usually the largest and are largely cultivated with maize. Men dominate in the cultivation of such distant plots. The longer distance to farms and the many number of farms per farmer present a major transport challenge. The pattern of farm distribution suggests many trips per person, fragmented loads and increased time and energy required to make round trips to all farms.

4.3.2 Farm distance and distribution in Abora

In Abora the majority of farmers own one or two farms and the village has an average of two separate farms per farmer. The baseline survey shows that 75% of farmers cultivated one or two plots. This is due to the extreme poverty and non-availability of labour in the village. Both male and female farmers in the village cultivate an average of two separate plots in a year. Separate farms belonging to the same individual are usually not farther than half a kilometre apart and are contiguous in many instances. This is encouraged by the widespread communal land ownership at the village. It is thus easier for Abora farmers to make a single trip round all their farms since farms are fewer and closer to one another.

The average distance to farms in Abora is one of the shortest in Gomoa. Approximately 85% of plots surveyed in the base year were located within 2 km radius from the village. No farm was located more than 4 km from the village. People usually farm at one location over a longer period of time. Farming is concentrated along a few routes and this makes it easier to maintain the routes. The majority of farms in Abora are located to the north of the village. This is the result of the poorly drained black cotton soil located to the south. This black cotton soil does not support agricultural production activities in the village under the existing technology and the low rainfall. Nonetheless, there is still enough land available for all those willing to farm. The farm distribution suggests that amalgamation of loads is feasible and use of larger IMTs

would be feasible between separate farms of the same farmer or between farms of different farmers.

4.3.3 Farm distance and distribution in Sampa

Farmers in Sampa cultivate many separate plots with an average of three to four farms per person. All respondents had two or more farms with 75% of them cultivating three or more plots in the base year. The availability of land and relatively sound financial position of farmers are major contributors to this situation. There is no major difference in the number of farms owned by men and women. The many number of farms per person and the similarity in number of farms owned by males and females is due to the fact that many people in the village farm jointly with their spouse. Separate plots cultivated by an individual may be far apart, making a single round trip to all farms difficult: this is particularly the case for farms located behind the Okye River. This river cuts across many farmlands in Sampa and can only be crossed at specific points during the wet season, thus forcing people to make separate trips to individual farms. Farmers are forced to detour through a nearby village.

Land for cultivation starts from the immediate outskirts of the village and stretches to a 7 km radius. Most farms (74%) are located within a 1 to 4 km radius from the village. Women tend to cultivate plots closer to the village than men. For instance 61% of plots cultivated by male respondents were located beyond 2 km from the village compared to only 39% of female respondents' plots. The longer farm distances make evacuation of produce by headloading difficult and time consuming. IMTs could provide a faster and bulk carting service.

4.3.4 Farm distance and distribution in Adabra

Farmers in Adabra cultivate fewer plots than those in the other villages. The average number of farms per person is about two and 90% of respondents cultivated one or two separate plots in the base year. No respondent cultivated more than three plots. This is largely due to the limited availability of land in the village. Farms are not generally close together, though trips to separate farms may involve the use of the same route. Most farms are located to the west of the village (the Akwakyire farmstead) where the chief owns a vast area of land. The female farmers make many more separate farms than their male counterparts. This is due in part to women's willingness to cultivate land under sharecropping.

Distribution of farms starts from the immediate outskirts of the village to about 6 km radius from the village. About 76% of plots cultivated by respondents in the base year were located within a 2 km radius from the village. Owing to the scarcity of land some farmers have farms in other nearby villages. Such farms could be as far as 6 km from Adabra and often involve

part journeys along the road. Not much variation exists in the distribution of farms between males and female. The distribution of farms suggests that trips less dispersed and would allow amalgamation of loads if transport is available. IMTs would be very helpful in this situation, particularly where farm trips involve part journey along roads.

4.3.5 Comparing farm distance and distribution among the villages

Table 4.2 shows the differences in farm distribution among the villages (see also Appendix Tables A1 and A2 for actual distance to farms). Farm distances and distribution suggest a higher transport burden in Lome and Sampa than in Abora and Adabra.

Table 4.2 Comparison of farm distance and distribution features among the study villages

Criteria	Lome	Abora	Sampa	Adabra
Average number of farms	2.9	2.0	3.5	1.8
Relative location of separate farms of same individual	Farther apart and along separate routes	Generally closer and contiguous and along same route	Closer or farther apart. May be along separate routes	Closer or farther apart but usually along same routes
Location of major cultivated fields	Dispersed. Most farms within 1–4 km radius	Confined to a few locations. Most farms within 2 km radius	Dispersed. Most farms within 1–4 km radius	Less dispersed. Most farms within 2 km radius
Relative distances to farms	Longer	Shorter	Longer	Shorter
Longest distance to farm (km)	8	3	8	4.2

Crop transport activities are expected to be more dispersed in Lome and Sampa than in Abora and Adabra. Produce amalgamation will be easier in Abora and Adabra than Lome and Sampa. Collective maintenance of farm routes is more likely between Abora farmers than their colleagues in the other villages.

4.4 Farm size and total landholding

The sizes of separate farms and total farm size greatly influence the amount of transport activity in farming systems. Generally, the larger a farm is, the greater the amount of load it generates. Figure 4.4 shows the proportion of cultivated plots which falls into a given size category. Figure 4.5 shows the proportion of respondents whose total cultivated area falls within a given size category.

Fig 4.4. Graph showing the sizes of separate plots cultivated in the base year

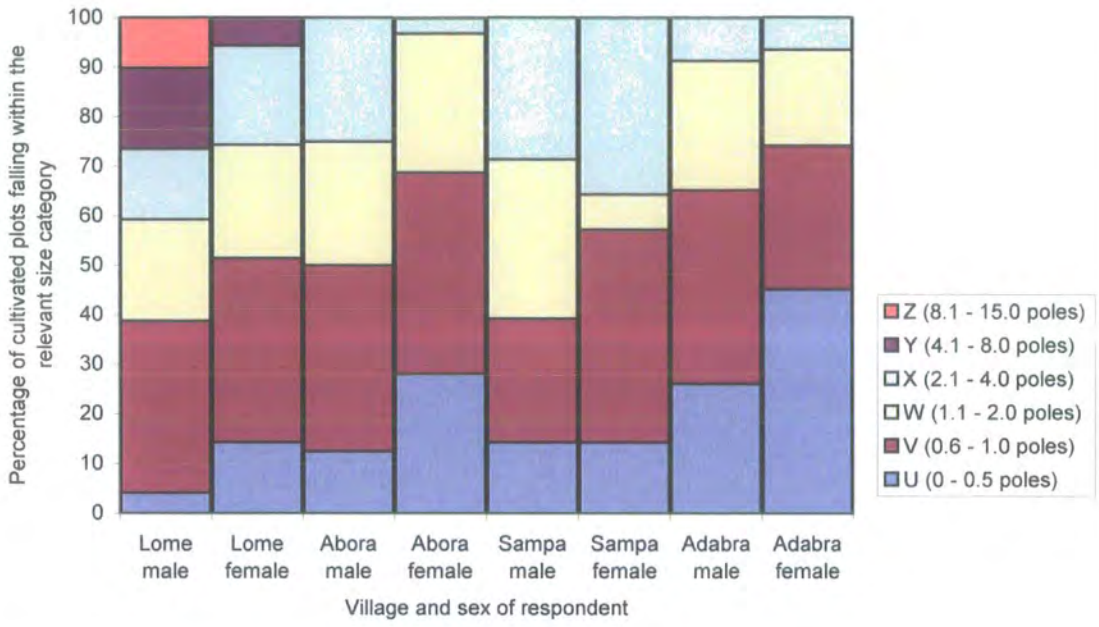
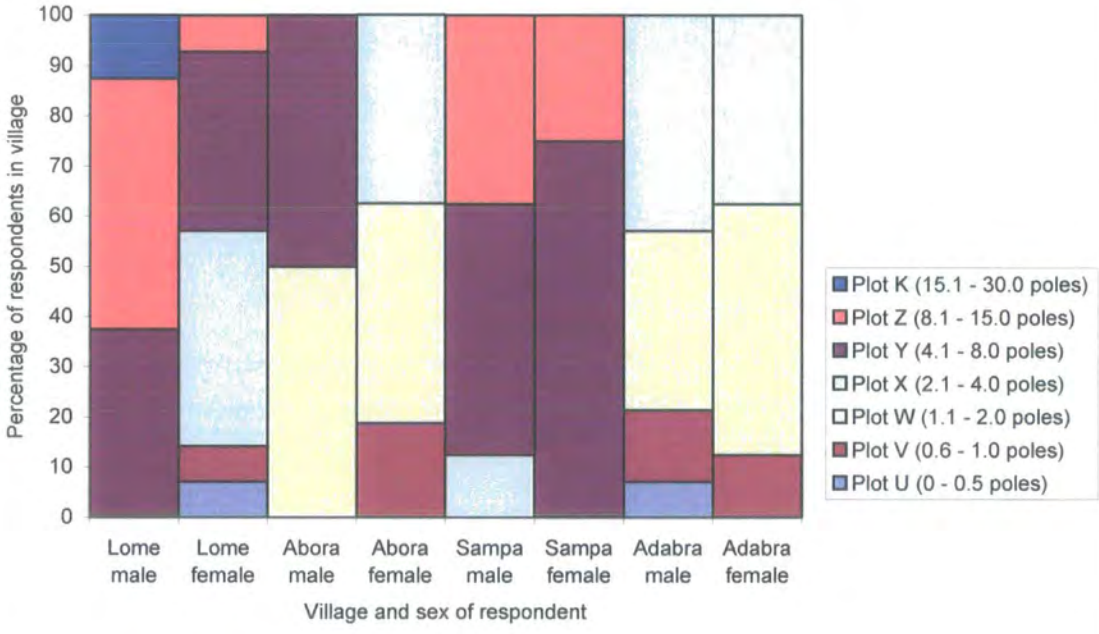


Fig 4.5. Graph showing the total cultivated area of respondents in base year



4.4.1 Farm size and landholding in Lome

Farmers in Lome generally cultivate large acreages by Gomoa standards. Approximately 60% of separate farms of respondents exceed one acre in size and only 8.3% are below a half pole. On average, men work bigger farm plots and cultivate larger total area than women. The

average plot size cultivated by men is 3.5 poles compared to 1.8 poles of women. Fig 4.5 shows that all men cultivated a total area greater than 4 poles whereas 42% of women cultivated a total of 4 poles or more. The average landholding per male farmer is 10.7 poles compared to 4.5 poles of women.

The male–female differences in the cultivated area is due to men's ability to clear larger plots, men's relatively sound financial situation, the gender division of labour within the farm family and the fact that men need to generate more income to support the family. All things being equal, load volumes per plot and per farmer are likely to be greater on males' farms than females'. Women generally spend more time on their husband's farms (including time and energy use to carry loads) than the men spend on their wives' farms and this limits how much women can cultivate on their own. IMTs could encourage bulk carting, reduce trip time, make load transport less strenuous and may encourage active male participation on the transport of farm produce. The time and energy saved could be channelled into farm and other activities.

4.4.2 Farm size and landholding in Abora

Farmers in Abora make small farms by Gomoa standards. Factors such as labour shortage, the high average age of the population and extreme poverty do not allow them to make bigger farms. No single farm plot in Abora is greater than four poles in size and as many as 93% of all separate farms do not exceed two poles. The total area of farmland cultivated by individual farmers in the village is also not big. In the base year 90% of respondents cultivated a total area not exceeding 4 poles.

Separate plots and total land area cultivated by men are on the average larger than those of women. Male respondents cultivated an average plot size of 1.7 poles while females cultivated an average of 1.1 poles. Furthermore, the average landholding of male farmers was 3.5 poles compared to 2.1 poles of women. The larger acreage cultivated by men is due to men's ability to clear larger plots, since farmers in the village depend largely on family labour. The load transport burden on men's farm is likely to be higher than those of women. IMTs could enable farmers to undertake bulk carting particularly during major harvests.

4.4.3 Farm size and landholding in Sampa

Separate farms in Sampa are generally not big. Most separate farms (55 %) are 1 to 4 poles in size and the remainder are under 1 pole. The sizes of plots cultivated by men and women are similar: men and women cultivated average plot sizes of 1.8 and 1.7 poles respectively in the base year. Unlike individual plot sizes, farmers in Sampa cultivate bigger total land area. Ninety-two percent of respondents cultivated a total area exceeding 4 poles. The average

landholdings for male and female farmers are also similar. Male farmers cultivated an average of 6.3 poles while female farmers cultivated 6.0 poles in the base year. The similarity in the average sizes of separate plots and total land holdings between men and women is also due to the fact that many people in Sampa make joint farms with their spouses. The small sizes of separate farms means that transported loads per plot are likely to be small while the large total land holding implies a large transport burden per person. Loads are fragmented and will make the use of larger capacity transport devices uneconomical unless loads are amalgamated.

4.4.4 Farm size and landholding in Adabra

Separate farms in Adabra are relatively small in size. None of the farms cultivated in the base year exceeded four poles in size and 70% of separate farms did not exceed 1 pole in size. Men make relatively larger separate farms than women. For instance men cultivated an average plot size of 1.2 poles compared to 1.0 pole by women in the base year. Farmers' total landholdings are also small and no farmer cultivates more than 4 poles. Men also cultivate relatively larger land area than women. The average landholding per male farmer in the base year was 2.0 poles compared 1.9 poles by women. Farm sizes in Adabra are greatly influenced by the scarcity of land. The small farm sizes and total landholding result in smaller produce volumes and therefore a relatively small transport burden per farmer. IMTs could further reduce the transport burden.

4.4.5 Comparison of farm sizes and landholding among the study villages

Generally, farmers in Lome and Sampa cultivate larger farm size and total land area than their counterparts in Abora and Adabra. Table 4.3 and Appendix III Tables A9, A11, A13 and A15 show the size of plots and landholdings of farmers in the base year. The smaller farm sizes in Abora relate to labour scarcity and poverty while those of Adabra are largely due to scarcity of land. The relative availability of land and labour in Lome and Sampa together with their relative wealthier status enables them to make comparatively large farms. From the discussions above it is expected that load volumes per farm or per farmer in Lome and Sampa will be greater than in Abora and Adabra. IMTs could make a contribution to the transport activities in all villages, particularly in Lome and Sampa where available resources would enable farmers to increase production.

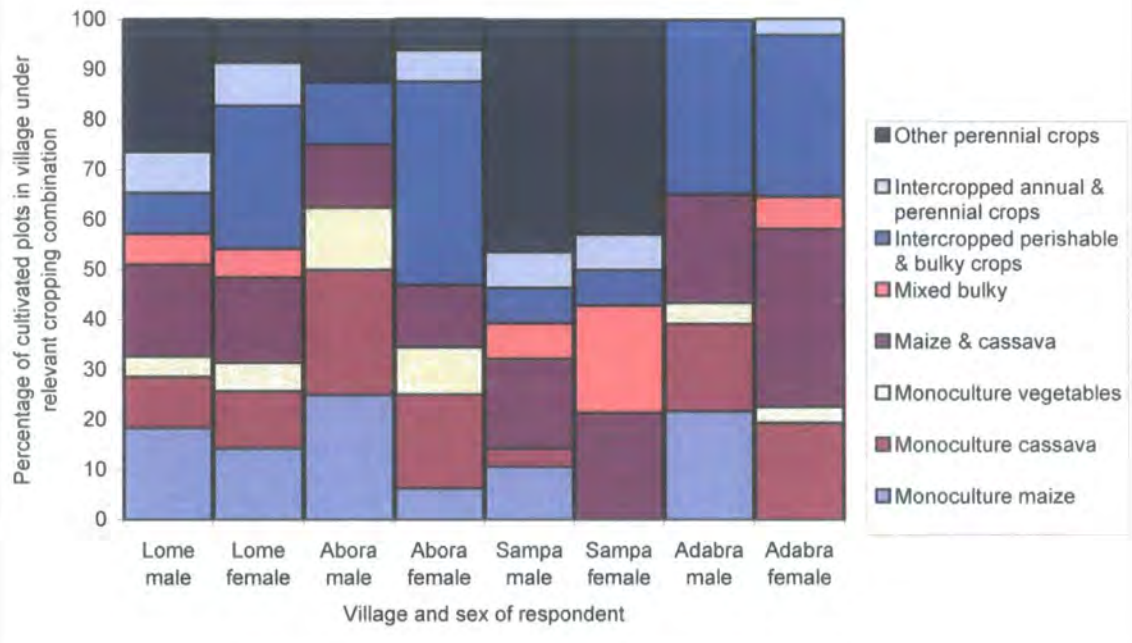
Table 4.3: Comparison of farm sizes and landholding among the study villages

Farm feature	Lome	Abora	Sampa	Adabra
Sizes of separate farm (poles)	Mostly large: 2.8 average	Mostly small: 1.2 average	Small to medium: 1.8 average	Mostly small: 1.0 average
Total land holding per person (poles)	Large: 7.8 average	Small: 2.4 average	Large: 6.2 average	Small: 2.0 average

4.5 Cropping pattern

The cropping pattern also influences the transport demand in a settlement. Bulky crops usually generate heavy loads which require more time and energy to convey. The level of perishability of crops also determines the urgency with which produce has to be evacuated and as such the reliability of the transport system required. Cropping pattern in the study villages depends on the farmer's requirements, number of plots cultivated and the location of the plots. Both bulky and perishable crops may by found on a single piece of land. Figure 4.6 shows the cropping pattern among the study villages.

Fig 4.6. Graph showing the percentage of cultivated plots in base year under various cropping combinations



4.5.1 Cropping patterns in Lome

The rainfall in Lome favours both the major season and minor season farms. Farmers practice intercropping more than monocropping: intercropping occupied 68% and monocrops occupied 32% of all cultivated plots in the base year. Maize and cassava are the major crops cultivated at the village and they made up 76% of all separate plots cultivated in the base year either as monoculture or as intercropped with other crops. Other crops include plantain, cocoyam, pepper, tomato and garden eggs, cashew, oil palm and citrus. The diverse range of crops is favoured by land availability, favourable rainfall, availability of streams for manual irrigation and the relatively wealthier status of farmers. Vegetables form the main highly perishable crops and they occupy 21% of all separate plots. Long maturing tree crops also occupy 27% of individual plots either as monocroped or intercropped. Maize plots are usually the largest and

farthest from the village: some exceed 10 poles in size and over 6 km away from the village. This has encouraged the creation of temporary settlements where farmers stay at peak labour input periods (February–May and September–October). The duration of stay at such settlements differs but can be as long as 3 months. Vegetable production takes place along stream banks, though there is a tendency among farmers to keep it as close to the village as possible in order to be able to make regular and frequent visits.

Men cultivate more long maturing tree crops (35% of male-cultivated plots) than women (17% of female-cultivated plots). On the other hand women cultivated more vegetable (34% of female-cultivated plots) than men (12% of all male-cultivated plots). Many women who plant tree crops are those who farm jointly with their husbands. The production of tree crops is capital intensive and may require cash payments for land, seedlings, labour and fertilizer. Men are usually in a relatively stronger financial position to afford these. These crops are major sources of income to the farmers and also serve as security for the future.

4.5.2 Cropping pattern in Abora

The limited rainfall in Abora mainly favours the major season's cropping and has virtually reduced cropping to once a year. The rainfall also favours a narrow range of crops and contributes to the low agricultural productivity in the village. The main crops are cassava, maize and pepper. Few farmers cultivate garden eggs, tomato, cashew and oil palm. The low rainfall does not favour the production of plantain, cocoyam and yam. Intercropping is practiced more widely than monoculture with 60% of all plots planted with a mixture of two or more crops. Maize and cassava monocrop or intercrop occupied 83% of all plots. Vegetables production, especially pepper which is sometimes grown as a cash crop, is also high and is cultivated on 45% of all respondents' plots. The common tree crops at the village are cashew and oil palm and they constitute some 13% of respondents' farms.

Generally men cultivate more maize than women. Women on the other hand cultivate more vegetables and more cassava than men. The difference between the quantities of maize and cassava planted by men and women is not seen in terms of the number of plots but by the size of cultivated plots. On the other hand the difference in the level of vegetable production between men and women could be observed in terms of number of plots. Vegetables occupy 50% of women's plots and 25% of men's plots. Though maize serves as both a food and cash crop, it is the most important cash crop at the village. Men's greater involvement in maize production is to enable them to earn more income to take care of their families. More women practice intercropping than men. Most produce from women's farms primarily goes into direct family consumption and so they cultivate all the staple crops.

4.5.3 Cropping patterns in Sampa

Sampa has a bimodal rainfall pattern which supports both major and minor season cropping. However, the major season farms are usually bigger and exhibit greater crop diversity than minor season farms. The minor season farms are mostly for maize and cassava. The greater crop diversity is encouraged by land availability, the presence of the Okye River for irrigation and the relatively wealthier status of farmers. Intercropping is the commonest practice in Sampa and this is partly due to the fact that farming is largely subsistence. Maize and cassava are the major cash crops and staples in Sampa accounting for 55% of cultivated plots. Other food crops are plantain and cocoyam while oil palm, citrus and sugar cane are grown as cash crops. Tree crops occupy 42% of all separate farm plots at the village. Only 7% of all plots are cultivated with vegetables. Pepper is the most important vegetable for both consumption and commercial purposes. Other major vegetables are tomato and garden eggs.

Most couples in Sampa farm together. As a result the disparity in cropping pattern between men and women does not reflect the male–female differences in agricultural production systems as found elsewhere in the district. The major difference between men and women is that only men (14% of all male plots) practiced monoculture in the village.

4.5.4 Cropping patterns in Adabra

Farmers in Adabra make both major and minor season farms. However, minor season farms are usually smaller because the minor season rains are sometimes disappointing. Both monoculture and intercropping take place, though a larger proportion of separate plots (about 72%) are intercropped. Major crops cultivated are maize, cassava and pepper. Other crops such as garden eggs, tomato, groundnuts and plantain are grown in limited quantities. Over 90% of all separate plots contain cassava and/or maize either as monoculture or intercrop with other crops. Tree crop cultivation is not common in the village and only 2% of all plots are cultivated with oil palm. This is partly due to the scarcity of land. Because land is scarce at the village, people do not assign specific locations to particular crops. The major difference in the cropping patterns between men and women is that more plots belonging to men (43.4%) are under monoculture compared to 22.3% of women's plots.

4.5.5 Comparison of cropping pattern among the study villages

Generally men cultivate more monoculture plots than women. Also more men are involved in the cultivation of maize and long maturing tree cash crops than women whereas more women cultivate vegetables and cassava than men. This is principally dependent on male–female roles within the household. In many instances produce from women's farms are directly used for home consumption. Conversely, men's financial obligation within the farm families makes it

imperative for them to cultivate more crops that have higher market value. Table 4.4 below and Appendix III Tables A17 and A19 show the major differences in the cropping pattern among the villages.

Table 4.4: Comparison of cropping pattern among the study villages

Farm feature	**Lome**	**Abora**	**Sampa**	**Adabra**
Cropping system	Both intercropping and monoculture	Mostly intercropping	Mostly intercropping	Mostly intercropping
Cropping regime	Both major and minor season cropping	Mainly major season cropping	Both major and minor season cropping	Both major and minor season cropping
Crop diversity	High	Low	High	Fairly high
Rainfall by Gomoa standard	High	Very low	High	Average
Food production levels by Gomoa standards	High	Very low	Average	Average
Growing of maize and cassava by Gomoa standard	Very high	Low	Average	Average maize, very high cassava
Growing of vegetables	High	Low	Low	Average
Growing of tree crops	Much cashew and oil palm; some citrus	A few cashew, oil palm and cassia	Much oil palm, citrus & sugarcane	Very few oil palm
Crop type by distance from village	Maize at distant plots, vegetable and tree crops closest plots, other crops anywhere	No clear pattern	Vegetables and sugar cane along river banks, other crops anywhere	No clear pattern
Point of storage of maize	Both at village and farm	Mainly at village	Mainly at village	Mainly at village

The large volumes of cassava and maize produce in Lome and Adabra imply that the farm-related transport burden is higher in these villages than Abora and Sampa, all things being equal. Transport problem in Lome is compounded by the fact that the largest fields for maize production are located far from the village. Large capacity IMTs and fast moving IMTs could play useful roles in the evacuation of bulky and perishable crops respectively in the area.

4.6 Farm labour

Labour is an important factor in the farming system of the villages since production is not mechanized. Labour is required for initial land preparation, planting, weeding, harvesting and evacuation of produce. The form of labour chosen is determined by the relative availability of family labour, cost of hiring, cash availability and the quantity and type of job to be done. Family labour usually comprises the farmer, spouse, children and sometimes, extended family member(s). Spouses usually help each other on their farms. A loose division of labour exists in

the farm family. Men engage in land clearing, felling of trees, weeding and harvesting whilst women commonly plant, re-weed, harvest and carry produce. Children follow a similar gender division of labour. However, men and women's roles are not mutually exclusive. Where spouses make separate farms, each of them may perform all these tasks.

4.6.1 Farm labour in Lome

Labour is available but there are often temporary shortages during the land preparation, planting and harvesting periods. Farm labour consists principally of family and hired labour. Hire labour is provided by individuals and some organised church groups. Both men and women use much family labour since it is often free or (sometimes) paid for by a gift in kind. When female family labour is not available men tend to hire porters or solicit help from other women in the village for portering tasks. Labour shortage is usually encountered in the land preparation and harvesting periods.

4.6.2 Farm labour in Abora

People in Abora mostly depend on family labour and smaller amounts of hired labour. Labour is very scarce and expensive. This is due to the high average age of the inhabitants caused by the high out-migration of youths, especially males, to the urban centres or to places of greater agricultural potential. Few people can afford hired labour owing to the high labour cost and the high level of poverty. People who hire labour, especially women, do so mainly for the initial clearing which is a particularly strenuous task. In some instances people have to obtain labour from nearby settlements. Communal labour is available occasionally for planting, harvesting and transport of maize.

4.6.3 Farm labour in Sampa

People in Sampa obtain labour from both family and hired sources. Farm labour is not so scarce in Sampa compared to the other villages, though shortages sometimes occur in the land preparation, planting and harvesting season. Hiring of labour is common for initial clearing and bulk harvesting which are particularly strenuous tasks. Communal labour is available occasionally for planting, harvesting and carting of maize.

4.6.4 Farm labour in Adabra

The main sources of farm labour are family, hired and nnoboa. The nnoboa groups also take paid weeding contracts for other people. Many men belong to such groups because it makes the work more interesting and quicker. Most people use family labour: they hire labour only when the task is enormous or requires special skills. Free communal labour is generally not available in Adabra.

4.6.5 Comparison of farm labour among the study villages

Table 4.5 below shows the differences in labour characteristics among the villages. The scarcity of labour and the free communal labour have the potential to influence the intensity of use of IMTs in opposite directions. While the scarcity of labour can encourage greater use of IMTs for transporting crops, the free communal labour has the potential to discourage farmers from using IMTs and conventional transports which require cash payment.

Table 4.5 Comparison of farm labour characteristics among the study villages

Criteria	Lome	Abora	Sampa	Adabra
Labour availability	Seasonal shortage	Perennial shortage	Seasonal shortage	Seasonal shortage
Main type of farm labour	Family and hired, few church groups	Mainly family, few hired	Mostly family, some hired	Hired, family or *nnoboa*
Availability of free communal labour	High available	Moderately available	Moderately available	Scarce

4.7 Farm related transport tasks

Agricultural transport tasks include carting of planting materials and other inputs to farm and evacuation of harvested produce to granaries or directly to market. The evacuation of crops is the largest transport burden in the study villages. Labourers usually walk to farm and many other inputs are not bulky. Head porterage, mostly by women, is the major means for carrying loads between village and farm. Women will carry loads to and from both their own and their husbands' farms. The nature of transport tasks in each study villages is described below.

4.7.1 Farm related transport in Lome

Owing to the relatively larger farm sizes, longer distances to farms and the large-scale cultivation of maize and cassava (both bulky crops) farmers in Lome face a huge transport burden. The bulky nature of maize, the longer distance to maize plots and the limited period (August – October) within which the bulk of maize in the village is harvested creates a huge labour demand, given that head porterage is the major means of transport used. This creates a labour shortage, which compels some people to store maize on cribs at farm or in temporary settlements until labour becomes more available for headloading and the maize is needed for sale or for consumption. About 40% of respondents store maize at their farm at least for some part of the year: some are reluctant to leave it there because of an increasing threat of theft.

Though cassava is the heaviest crop, its harvest can be regulated and extended over a long period to such an extent that it does not coincide with periods of peak labour demand. Planting materials are obtained locally from farmers' own stock, friends, relatives, the District Agricultural Extension Office and ADRA (an NGO). Fertiliser is not commonly applied: small

amounts obtained from ADRA are used mainly on tree crops. Cassava sticks, plantain suckers and seedlings of tree crops are the largest inputs transported. Fuelwood collection for household consumption also constitutes a major transport task.

Most farm transport activities take place along narrow footpaths. Physical barriers such as unbridged streams, seasonally muddy and flooded spots and hilly spots are present on these footpaths. These make it difficult to use four-wheeled transport devices on the paths. Women and children bear the greatest transport burden within the household, though men usually assist in the major maize harvest. Men hire porters more often than women because they make larger farms and also have more funds to do so. The principal task of paid female porters is carrying maize from more distant farms to the village. They are paid in cash or in kind. Other people, especially women and children who are not commercial porters, also assist their neighbours and receive produce in return. A few farmers hire *trotro* or tipper trucks to convey their maize from distant farms to the village during the main harvest. This involves the use of motorable routes which are 2 -3 times longer than the direct footpaths to the farms. Vehicle charges along such routes are usually higher than along standard unpaved village roads and few people with farms in such locations can afford to use them.

4.7.2 Farm related transport in Abora

Farm related transport tasks are low in Abora compared to the other study villages. This is due to the low level of production. Maize and cassava present the largest on-farm transport burden. Other produce conveyed in smaller quantities are pepper, garden eggs and tomato. Cassava sticks are the largest farm inputs but do not present a major transport burden to most farmers. They are usually conveyed between previous and current plots which are close for most farmers. However, a few farmers obtain cassava sticks from nearby villages and for such farmers it is a major transport problem. Other inputs conveyed from village to farm are seed maize, vegetable seeds and tree crops seedlings. These are obtained from the farmers' own stock, relatives, friends, ADRA or Apam market. Fuelwood and charcoal are the largest loads conveyed by farmers in Abora (see section 4.8.2).

Most farms are accessible only by narrow weedy paths. Head porterage is the main mode for carrying farm load and it is largely performed by women and children. Men assist only in the transport of maize. The participation of children in maize porterage is often more substantial than that of women. During the major maize harvest season in August-September, men and women assist one another to carry maize from farm to village. This reduces loss and spoilage from rodents, unexpected rains or pilfering. The relatively low volumes of maize harvested by farmers make it possible to convey all produce soon after harvest.

4.7.3 Farm related transport in Sampa

The carting of cassava, maize, citrus, oil palm and sugar cane constitute the largest farm loads. The bulky nature of these products, the relatively long distance to farms and the large acreages cultivated by farmers make the transport burden greater. Planting materials are largely obtained locally from farmers' own stocks, friends and relatives or purchased from external markets. A handful of people also obtain improved seed maize and fertilizer from ADRA. Cassava sticks, sugar cane heads, oil palm and citrus seedlings are the most bulky inputs.

Head porterage, mostly by women and children, is the major means for transporting loads from farms. Men only assist during the maize harvest. Friends and relatives assist one another in transporting maize and sometimes cassava. Hired porters are available at the village but are mostly hired for carrying building materials such as sand and stones. Only orange and sugar cane traders based at the village or outside the village hire porters to carry these crops from farms to the roadside or village.

Most farms are accessible either mainly by footpaths or by a combination of footpath and road. Unbridged river, flooded/muddy and hilly spots are the commonest physical barriers found on farm routes. The most fertile land in the village area is behind the Okye River, about 4 km or more from the village. The river valley becomes flooded during the major rain season (March – June) and impedes access to this land. It can be crossed only with a small raft made by a local farmer but many people who have farms beyond the river are afraid of using the raft and take a detour route through Gomoa Brofo, doubling the length of the journey. This lengthy journey greatly increases the transport burden of the farmers.

4.7.4 Farm related transport in Adabra

The fact that farms are relatively small, closer to the village and most farms are located along a few routes indicates that the transport burden between farm and village is relatively limited by comparison with the other villages. Cassava and maize form the bulk of the on-farm load. Maize is mainly stored at the village because people are able to convey all their produce to the village within the harvest period. Cassava sticks are the heaviest inputs transported. Farmers obtain inputs from their own stock, relatives, or purchased from the village or Kasoa market.

The major mode of transport for carrying produce from farm to the village is head porterage. In a very few cases, a push truck from a neighbouring village was used. Produce is usually carried by women and children within the household. Occasionally people obtain assistance from their neighbours for carrying produce, particularly cassava, during the major harvest seasons. Most transport activities are concentrated on two major footpaths which serve the

largest farmsteads. These routes are relatively broad at the immediate outskirts of the village and narrow down about a kilometre from the village. The routes can thus accommodate a four-wheeled IMT to a shorter extent (probably not beyond 1.2 km).

4.7.5 Comparison of farm related transport in study villages

There exist large farm-related transport tasks in all the villages. Table 4.6 shows the differences in farm-related transport activities among the study villages. While farmers in Lome, Sampa and Adabra transport a lot of crops their counterparts in Abora transport a lot of fuelwood. The use of footpaths for farm-related trips and transport activities and the presence of physical barriers on such routes limit the use of four-wheeled IMTs and conventional transport.

Table 4.6: Comparison of farm related transport among the study villages

Feature	Lome	Abora	Sampa	Adabra
Relative volume of crops transport	Largest of all 4 villages	Smallest of all 4 villages	Second largest of the 4 villages	Only larger than Abora
Relative volume of fuelwood transported	Large	Largest of all 4 villages	Large	Large
Availability of labour at peak harvest period	Very scarce	Very scarce	Scarce	Scarce
Hiring of porters	Common (for maize, cassava and few construction materials)	Not common	Common (for construction materials and few crops	Not common
Planting material sources	Within village, NGO and external market	Mainly from within village	Within village and NGO	Within village and external market
Topography	Relatively flat with isolated hills	Relatively flat	Some hills	Relatively flat
Physical barriers on routes to farms	Unbridged streams, narrow paths, muddy spots	Narrow paths	Hilly and muddy spots, unbridged river, narrow paths,	Narrow paths

4.8 Market access and patterns of trade

Trading is the largest activity in the study villages after farming. The sale of farm produce is undertaken by farmers themselves or by specialised traders. Accessibility to markets greatly influences the location of sale and the price of produce. When physical access is good and transport services are also reliable, efficient and relatively cheap, many farmers may take their produce to the market when prices are relatively good.

4.8.1 Market access and patterns of trade in Lome

Trading in Lome is usually undertaken by women. Women sell produce from both their own farms and their husbands'. The major crops sold are maize, cassava and vegetables. Raw and processed crops are sold at the village when the quantity is small and at Dawurampong market when the quantity is large. Few people sell their produce at the major market town of Swedru due to the relatively long distance (about 23 km) and the additional transport charges involved. Some wealthy villagers, both men and women, purchase maize from other local farmers during the harvest period and resell in the lean season at the village or at external markets. Cassava is sometimes sold on the field before harvest and transported by the trader. This saves farmers the time and cost of harvesting and headloading the produce to the village or market.

Itinerant traders usually visit the village in lean seasons and this saves farmers the time and cost of travelling to the market. However, farmers do obtain better prices in the lean season when they sell at the external market. Traders do not visit the village in the peak season and farmers have to take produce to external market to sell. There is usually a glut in the peak season and farmers obtain poor prices.

People travel to the market by taxis, *trotro* or on foot. It is easier to obtain transport from Lome to market at the peak harvest seasons and market days than in the off-season period and non-market days. Taxis are slightly more expensive than *trotros*. Transport charges for loads are not fixed but the people at the village generally complain that they are expensive. Very few vehicles visit the village and this has given the drivers the power to charge whatever they please. The drivers and passengers will bargain but the drivers usually have the final word.

4.8.2 Market access and patterns of trade in Abora

Trading is the second major income generating activity after farming. Fuelwood is the major commodity traded by the inhabitants. All people at Abora in one way or another sell fuelwood, though women's involvement is greater than that of men. This is the most demanding transport activity in the village. Men who participate make their trips before dawn, in order not to be seen by others. Other men also assemble their fuelwood at the village and traders from Apam or Ankamu come to buy at the village. A number of people also sell charcoal, pestles and fish smoking sticks at Apam and other nearby town.

Some women buy and sell other commodities such as fish, *gari*, bread, and salt. These are brought from Apam market (4.8 km away) when people are returning from their fuelwood selling trips. Only two female traders make special trips to distant markets such as Mankessim and Kasoa to buy goods for sale in the village. These specialized traders always have to hire a

taxi from the main road junction at Ankamu to the village when returning from their trip. A few women also engage in the preparation and selling of *kenkey*, which requires them to travel to Ankamu (3.3 km away) to grind maize. Some men hunt game and they usually head load or convey the meat by bicycle to Ankamu or by the main Accra – Cape Coat roadside for sale.

The only road which serves Abora was in poor condition at the time of the baseline survey (see section 3.1.4). It once became flooded and blocked the access of a company vehicle that used to visit the village to buy pepper for export. This forced the villagers to headload their pepper to the Apam Junction for sale to the company.

There are no regular transport services into the village. People travelling to the village by road either have to walk or hire a taxi at a cost of ¢4–5000 per single journey. People with large loads to or from the village have to hire a taxi from the junction. All direct trips to Apam are on foot along a footpath. People visit the market at Apam on Tuesdays, Fridays and Sundays. Individuals may make up to 5 trips per week over a distance of 5 km or more (single journey) with heavy loads of firewood or pestles etc.

4.8.3 Market access and patterns of trade in Sampa

Farmers sell their crops at the village or Kyiren-Nkwanta market. The major crops sold are maize, cassava, pepper, citrus, sugar cane and palm nuts. A few women undertake trading and food processing activities such as *gari, kenkey* and oil palm. There are about 3 major (women) traders who buy crops in bulk for resale at external markets. There is a small market inside the village where people sell produce in small quantities.

Taxis provide the majority of commercial services from the village to the main Accra – Cape Coast road junction and the Kyeren-Nkwanta market. In general the frequency of vehicle visits to the village is low and irregular but more vehicles come in on market days than non-market days. The infrequent transport services sometimes force people to walk to the Brofo junction, a distance of 2.8 km, to board a car or they may walk all 7 kms to Kyiren-Nkwanta market. A few traders visit Mankessim market, which is one of the largest in Central Region, to sell produce such as maize, citrus and palm nuts and buy items such as fish, bread, sugar and cloth to resell at the village. Trotros visit the village occasionally on market days to convey people to Manskessim. Transport charges are usually high by comparison with nearby communities with better access. Thus it often does not make sense to travel to the market unless there is plenty of produce for sale. Instead villagers often sell to the few traders resident in Sampa who bulk produce for sale elsewhere.

At the time of the baseline survey taxis charged ¢1500 per person and ¢1500 – 2000 for a mini bag of maize over a distance of about 7 km to the market. *Trotros* charged 3000 cedis per person over a distance of about 40 km but were usually unavailable for local journeys.

4.8.4 Market access and patterns of trade in Adabra

Trading is the second most important economic activity after farming and is carried out mainly by women. The women usually send processed cassava (dough and *gari*) and raw maize to the Kasoa market (23 km away) twice every week to sell. Many women visit the market regularly to sell crops from their own farms, husbands' farms and produce purchased at the village. This creates a high transport demand on market days. There is no point designated for marketing activities within the village. People usually sell items such as fish, meat, farm produce, drinks and processed food in their homes or hawk them round the village.

Taxis run through the village on their way from Kwanyarko to the Akoti Junction (Accra-Cape Coast road). Direct trips to market, however, are made by *trotro* or mummy wagon only on market days. By the time these vehicles reach Adabra they may be full, since they will have already picked up people and loads from 5 other villages. More vehicles visit on market days and in the main harvest season. About 2 –5 *trotros*/mummy wagons visit the village each market day. Owing to vehicle non-availability on some market days, some people walk or use taxis to the Akoti junction and then board *trotros* from there to Kasoa market. The inhabitants of the satellite villages headload crops to the main Adabra – Akoti road to obtain a vehicle.

Taxis charge ¢1500 from Akoti Junction to Adabra village and ¢1000 in a reverse direction over the same distance of 7.2 km. This is because the junction is their main terminal and they charge a flat rate of ¢1500 to Kwanyarko, the final destination. The trotro charges ¢1800 per person and ¢3000 per mini bag of maize or gari over a longer distance of 23 km. Owing to the few vehicles plying this road they are usually overloaded, especially on market days.

4.8.5 Comparison of market access and patterns of trade in the study villages

The pattern of trade and magnitude of transport problems to markets differ among the villages. Table 4.3 summarises the marketing and transport features in the villages. Abora is the closest to a paved road but it faces a severe transport problem. This makes the vehicle charge per km to Abora the most expensive. It is easier to obtain a vehicle for external travel in Lome followed by Adabra and Sampa in decreasing order but none visits Abora unless it is hired. Journeys made along unpaved roads are many times more expensive than on paved roads (see R7149 Final Technical Report). Taxi charges are higher than *trotro* in all the villages. *Trotros* have a higher passenger and load capacity and lower running cost per passenger.

Table 4.7 Comparison of marketing and accessibility features among the study villages

Criteria	Lome	Abora	Sampa	Adabra
Distance to nearest paved road (km)	4.5	3.3	7	7.2
Distance to main market centre (km)	5.5	5	7	22
Presence/absence of village market	Present	Absent	Present	Absent
Point of sale of maize	Mostly at nearest market; some at village	Mostly at nearest market; some at village	Mostly at village; a few at nearest market	Mostly at nearest market; some at village
Food processing	Some	None	Some	Plenty
Vehicles based in the village at night (may operate elsewhere in daytime)	3 trotro 1 taxi	1 taxi	None	None
Conventional transport availability	Good on market days, otherwise poor	Very poor	Poor	Fairly good on market days (may full up before reaching Adabra)
Means of transport to market if funds available	*Trotro* and taxi	Head porterage	Taxi	*Trotro* or mammy wagon
Transport charge	Expensive	Very expensive	Expensive	Expensive
Taxi charge (¢) per km to nearest paved road	178	1364	214	208
Trotro charge (¢) per km to nearest market centre	156 (unpaved section) 82 (paved section)	Not available	75	82

The pattern of trade and transport suggests that IMTs could play a useful role in moving produce from villages to markets. However, the IMT impact will vary among the villages depending on conventional transport availability and charges and transport needs.

4.9 Conclusion

The baseline discussions reveal characteristics broadly typical of many subsistence farming systems. Farmers cultivate many plots which are widely dispersed, distances to farms vary greatly, plot sizes are relatively small, a wide variety of crops are cultivated, intercropping is common, there is limited use of improved farm inputs, farm cultivation is labour intensive and farmers sell a limited proportion of their crops. (There is however, some variation in these farm attributes among the study villages). These features generate dispersed and small load volumes and a high number of trips per farmer. These characteristics do not suit the dominant modes of transport – walking and headloading and conventional transport – in the area. Walking with headloads which is the dominant mode for village to farm transport and not uncommonly also for village to market transport is laborious, slow, has small loading capacity,

labour intensive and may not facilitate a round trip to all cultivated plots within a limited time period. Conventional transport operations in such system may be associated with high operating costs, long waiting time and under-utilised capacity. Conventional transport services in the area are also inadequate, unreliable, expensive and largely limited to travel and transport between villages or villages and markets. The major transport modes thus place major limitations on farming in the area and constraint farmers from improving their farms. The major farm features as summarised below indicate that there appear to be a great potential for the use of IMTs in the area.

The discussions show that many farms are located far away from the villages, particularly in Lome and Sampa. The long distances between farm and village or between farms of the same person result in the use of enormous amount of time and energy for trips to farm. IMTs such as the bicycle, push truck and power tiller could reduce the time and energy spent on such trips. IMT availability can even encourage the cultivation of more distant plots if such plots have some relative advantages. The on-farm use of IMTs requires the availability of more accessible routes and farmers may relocate their farms to more IMT-accessible locations. In the case of the study villages where farm routes, mostly footpaths, are relatively broader only up to a few kilometres from the villages, people who want to use IMTs to transport produce would cultivate more plots closer to the village and fewer plots farther from the village.

Farmers in the study villages generally cultivate two or more plots in a year. Such plots are often not contiguous and may be accessible by different routes. This generates many trips leading to a higher aggregated travel per person per year. This wastes time and energy as noted by McCall (1985). The nature of IMTs could make travel and load transport faster, less costly, and less strenuous and facilitate round trips to such fragmented farms. IMTs may also encourage load amalgamation and bulk transport between farm sites and village. In instances where the cultivation of separate plots is necessary based on certain farm features or advantages, the IMTs could make such changes relatively easier.

The average plot size and total landholding of many farmers in the study villages are not large. IMTs, particularly carts, could provide suitable carting capacity for such cultivated areas. IMTs may influence the cultivation of larger plots per farmer by providing larger capacity for transporting the increased load.

The types of crops cultivated in the villages are diverse and include both perishable and bulky crops. Bulky crops are cultivated in larger quantities than perishable crops. Bulky crops generate larger loads while perishable crops require timely and frequent trips to farm. Fast

moving IMTs such as bicycles may be associated with the cultivation of highly perishable crops by facilitating frequent trips to farms. Large capacity IMTs such as carts, trucks and tillers on the other hand may be associated with the cultivation of bulky crops by facilitating bulk carting. IMTs may also influence the crop mix and quantities cultivated by farmers.

The high labour demand caused by reliance on head porterage has the potential to reduce the level of farm production. Increased use of IMTs could arguably reduce labour requirements for transporting loads. This could free some labour (time and energy) originally used in headloading. Such labour could be used to expand and/or modify production. IMT could also make the evacuation of crops faster and hence reduce losses that occur through delayed transport.

Fast moving IMTs for personal transport (such as bicycles) can also improve labour mobility and facilitate higher trip frequencies to farms. This can encourage the cultivation of labour intensive crops such as vegetables which require frequent trips to farm for activities such as watering and harvesting of crops.

Unlike trips to farms, personal and load transport between the study villages and markets are largely by conventional transport (*trotro*, taxi and mammy wagon), with the exception of Abora where walking and headloading is the dominant mode. The unreliability of conventional transports in the villages and the drudgery associated with head portering posse major limitations for trips to markets. IMTs could offer a relatively faster and larger loading capacity than walking and headloading. In areas where a good conventional transport service is available IMTs can complement it by enabling farmers to transport loads to more accessible locations where conventional transport is available.

IMTs through their effect on farm production could influence marketed output and the type of crops sold. Also by improving access and mobility, IMTs can influence the location where farmers sell their produce, including increased farmers' participation in external markets.

The potential for IMTs in influencing farming and marketing may not only differ between IMT owners and non-owners but also between men and women. IMTs may have remarkable influence on the farming and transport activities of a particular gender group whose activities are constrained by the lack of suitable transport facilities and services. Male farmers, based on their relatively sound financial position, may make changes in their farms which hitherto were not possible based on the limitation posed by the use of head porterage. Women, on the other hand, may benefit from IMT availability through reduction in the time and energy they use to

carry crops, fuelwood and other loads. Part of the time saved may be used directly to make changes on the farms.

The next chapter examines changes in the farming system in the study village approximately 20 months after the introduction of IMTs into the villages. It assesses the contributions made by IMTs toward the perceived changes in the farming and market systems. The chapter also considers other factors that may have contributed to the effect of IMTs. The chapter will focus on those areas where IMTs are expected to make some impact.

CHAPTER FIVE

THE END SURVEY: COMPARING THE IMPACT OF IMT ON AGRICULTURAL PRODUCTION AND MARKETING IN THE STUDY VILLAGES

5.1 Introduction

This chapter examines the changes which occurred in the farming and marketing systems in the study villages between January 2001 and February 2002. The first section examines changes in the farming system between IMT beneficiaries and the control group, the second section examines changes in the faming system between men and women and the third section examines the relations between IMT availability and labour issues. The last section is devoted to the role of IMTs in improving marketing activities – changes in marketed output, access to markets, crop prices and other issues. Though the selection of the control group ensured that no control group member was a direct relative of any beneficiary, it is important to bear in mind that some control group members borrowed or hired IMTs from time to time. Hence it is possible for IMTs to impact on the activities of both beneficiary and control group.

5.2 Comparing villages and IMT beneficiaries and control group

5.2.1 Change in farm location

The availability of IMTs was one of a number of factors influencing farmers' decision to move farms. The particular importance of IMT depends upon social relations and physical characteristics of the villages. One physical condition that influenced the increased cultivation of plots closest to the villages by people who wished to use IMT to transport produce was the broader width of footpaths at the immediate outskirts of the villages (*see section 4.2*). One farmer who cultivated plots closer to the village with the aim to use the IMTs to transport loads said "*Our farm tracks are very narrow and have uneven surfaces. The only good sections of major footpaths that can accommodate the push truck are the immediate outskirts of the village before many people branch off to their farms. I made two contiguous farms closer to the village and along a major footpath so that I can use the push truck to transport my load.*" *(Lome, beneficiary, male, interview September 2002).*

Over the study period there was an increase in proportion of farms located within 1 km radius from the village centre across all four villages and a reduction in proportion of plots beyond 1 km from the villages. Overall the proportion of farms within 1 km distance from the villages increased from 30% in the base year to 50% at the end survey across all study villages. The beneficiaries recorded a larger increase in number of plots within 1 km radius than the control. Figure 5.1 to 5.5 show the changes in proportion of farms within relevant distance categories from the villages. Appendix I figure A1 to A8 show the location of farms in the end year. Appendix III Table A1 and A2 show the distance to base year and end year farms respectively.

Over the study period 62% respondents (27 beneficiaries and 30 control) did not change the location of their farms while 22% respondents (13 beneficiaries and 7 control) changed the location of their farms. The remaining 16% (6 beneficiaries and 9 controls) made some farms at their previous farm locations and made other farms at entirely new locations. Individual discussions with farmers revealed eight beneficiaries and two control group members who wholly or partly changed the location of their farm because of the IMT availability. There were three beneficiaries and one control from Lome, three beneficiaries and one control at Adabra and one beneficiary each from Sampa and Abora who changed their farm locations to take advantage of the IMTs. All the beneficiaries were push truck owners who wished to load their IMTs with produce from farm to village and had therefore selected more accessible farm locations where they could use the truck.

Fig 5.1. ALL VILLAGES: Graph showing changes in distance to plots cultivated by all respondents across all study villages between base year and end year (percent end year plots minus percent base year plots)

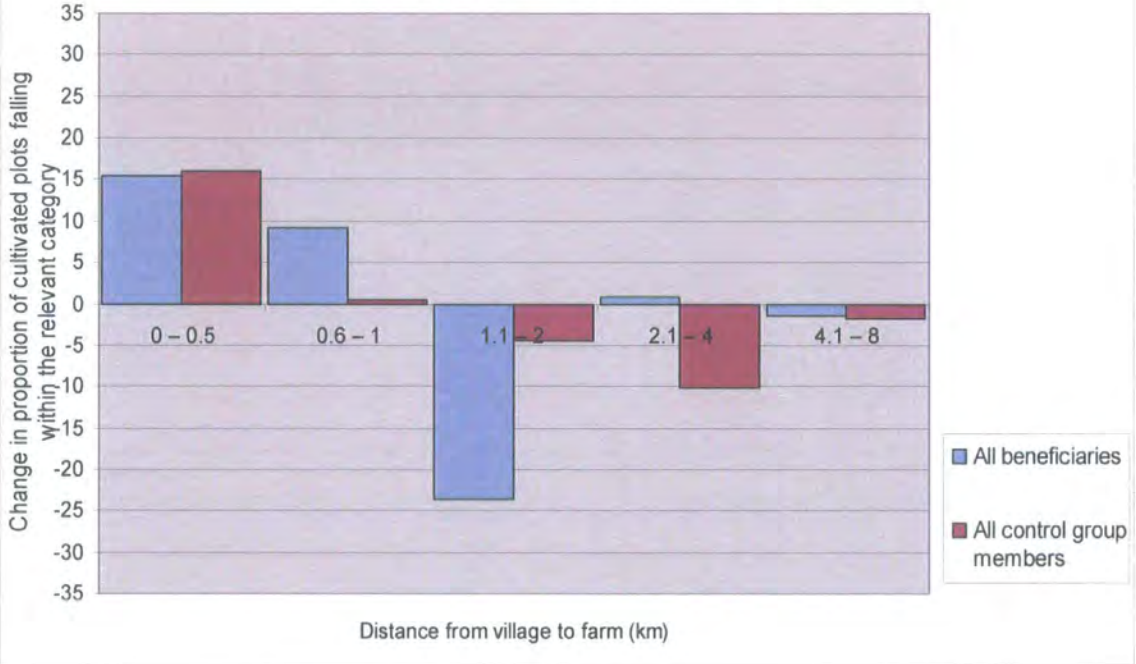


Fig 5.2. LOME: Graph showing changes in distance to cultivated plots among all respondents in Lome between base year and end year (percent end year plots minus percent base year plots)

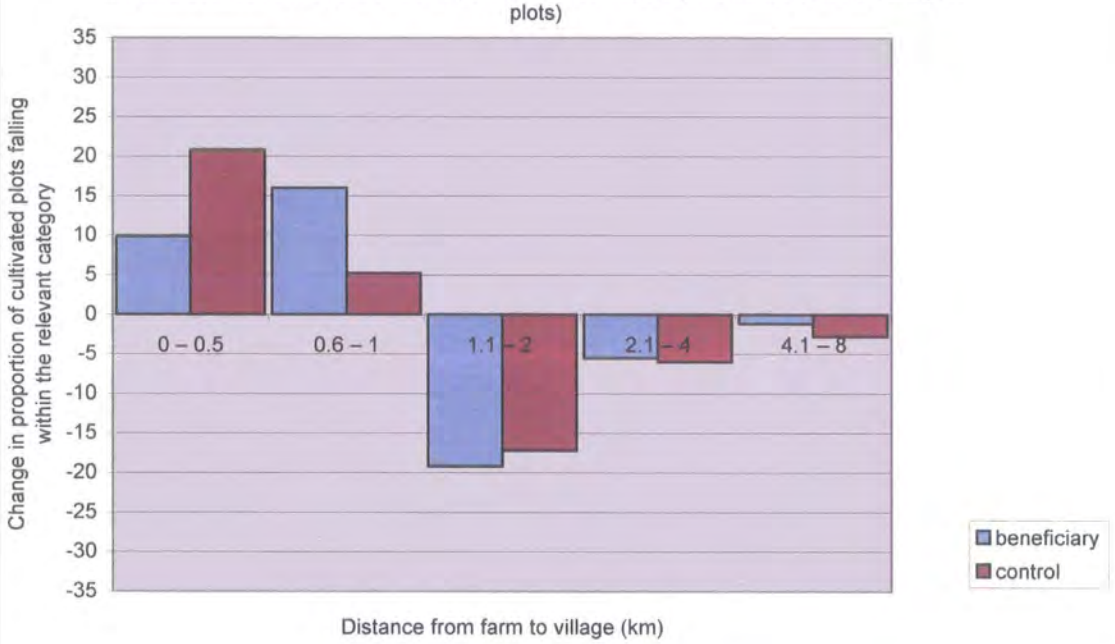


Fig 5.3. ABORA: Graph showing changes in distance to cultivated plots among all respondents in Abora between base year and end year (percent end year plots minus percent base year plots)

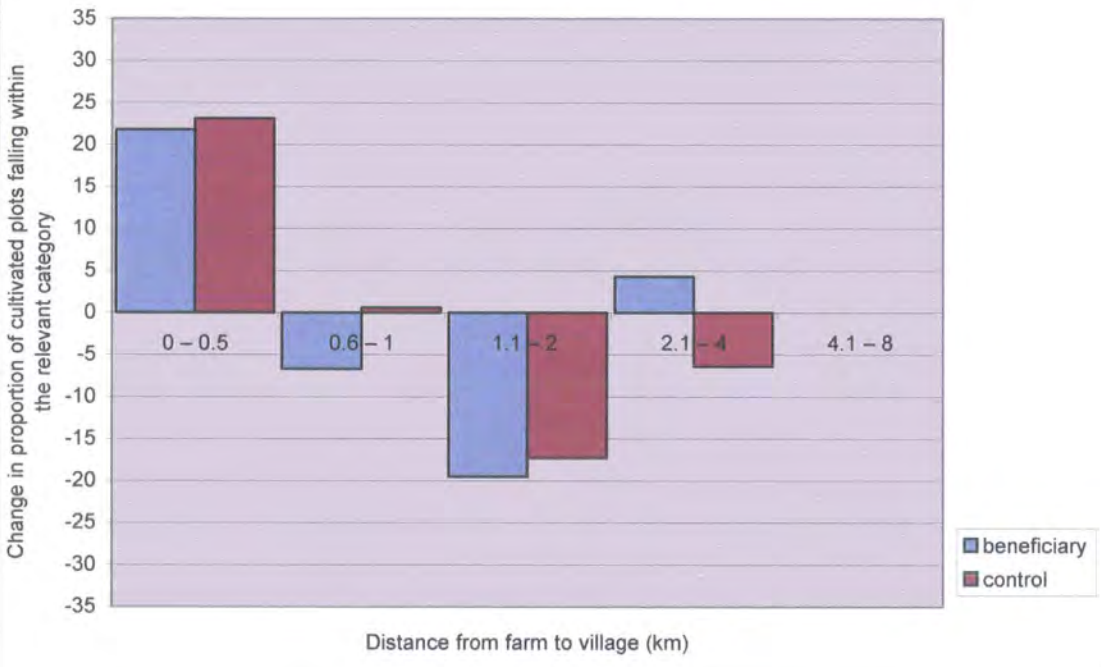


Fig 5.4. SAMPA: Graph showing changes in distance to cultivated plots among all respondents in Sampa between base year and end year (percent end year plots minus percent base year plots)

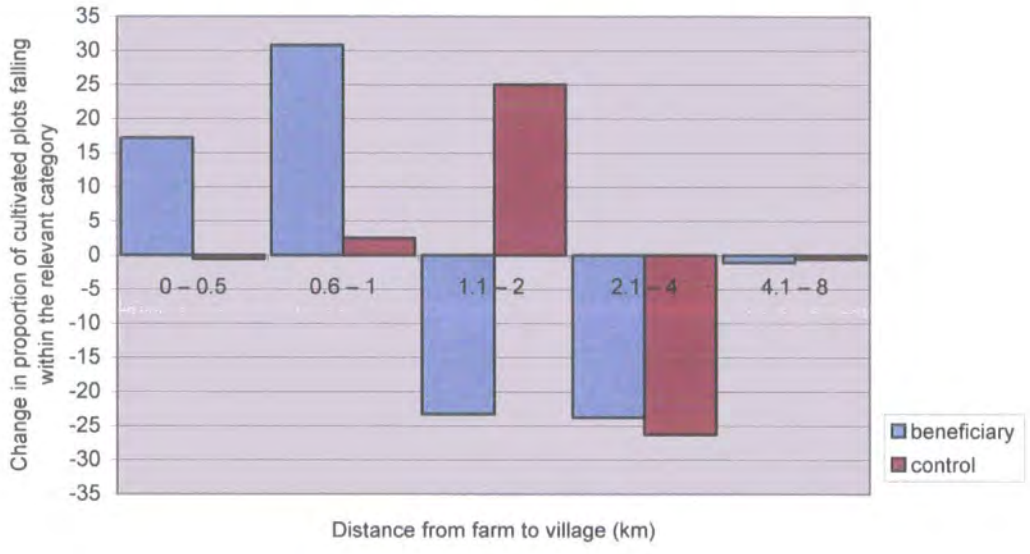
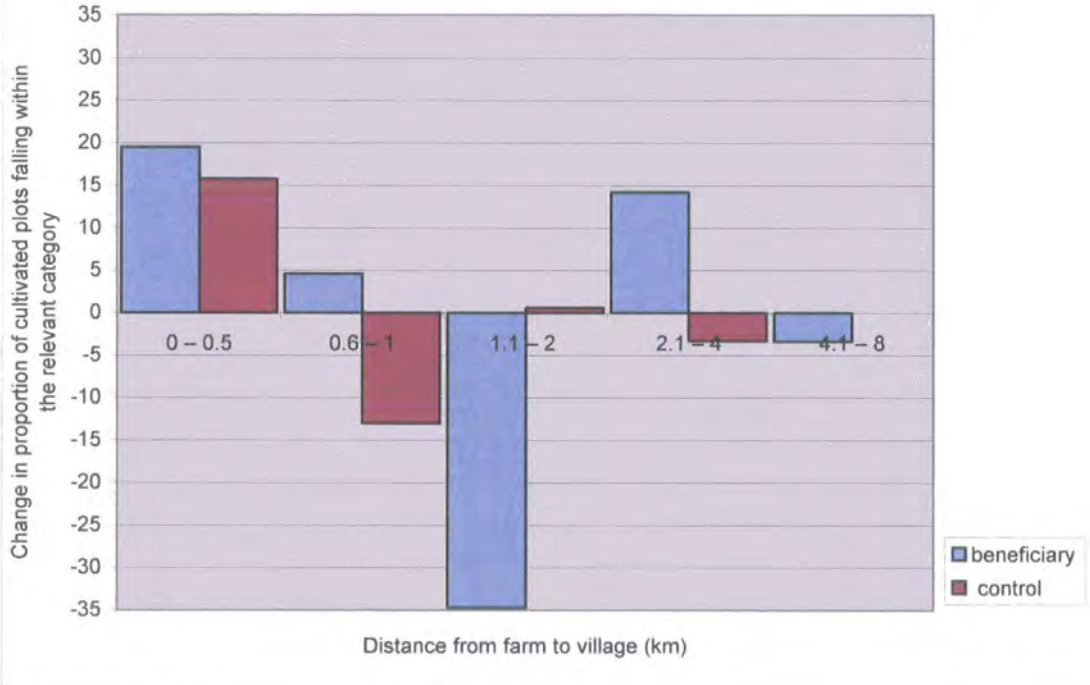


Fig 5.5. ADABRA: Graph showing changes in distance to cultivated plots among all **respondents** in Adabra between base year and end year (percent end year plots minus percent base year plots)



The qualitative information collected provides additional information on these moves. For instance, a woman truck owner said "*I made one farm in front of an unbridged stream so that I*

can take the push truck there to convey produce" (Lome, beneficiary, female, interview, February 2002). Another woman observed, "*I cultivate a lot of cassava and maize which are very heavy. I always have to headload these produce when harvested. Because of the push truck I cultivated a large plot in a nearby village. This farm, though far from our village, it is located by the roadside and I use the push truck to transport load to my house." (Adabra, beneficiary, female, interview April 2002).*

In each village there was an increase in the proportion of farms within 1 km radius from the village and a decrease in the proportion of farms beyond 1 km over the study period. However, the beneficiaries in Adabra and Sampa recorded larger increases in the proportion of farms closest to the villages than their control counterparts, while the control in Abora recorded a larger increase than the beneficiaries. There was no difference between the beneficiary and control groups in Lome.

Adabra is the villages where the push truck was most used for farm transport, particularly by the beneficiaries. The control had to pay for the use of the push truck and this could not motivate some control members to cultivate plots at IMT-accessible locations like their beneficiary counterparts. Poverty and scarcity of land also constrained many farmers from changing the location of their farms in order to take advantage of the available IMTs. One farmer stated, "*Land is very expensive in this village and most of us can afford just a little. We also have to pay cash whenever we take push truck from the beneficiaries. However, we do not have money and so many of us continue rely on headloading. In future if our economic situation improves and we make bigger farms we will think of loaning push truck from the beneficiaries." (Adabra, control, male, interview July 2002).*

In Lome and Abora by contrast, there are strong extended family relations and social ties. This has given people in the villages some free right to the use of their neighbours' facilities including labour and individual owned IMTs. This is a major motivation for the control group in Lome and Abora to cultivate plots in accessible areas in order to take advantage of their neighbours' IMTs. One control group member said, "*My friend collected a push truck and I can use it to transport my load for free. I farmed at the same location with him and his children used the push truck to convey all my maize for me." (Lome, control, female, interview, March 2002).* However, there are some farmers in Lome who also cultivated plots closer to the village for reasons such as land availability and increased cultivation of perishable crops. The situation in Sampa could not be attributed to the direct use of IMTs for trips to farm. Farmers who changed the location of their farms in Sampa largely cited the land issue as the reason for change.

The proportion of farms beyond 2.1 km radius from the villages decreased for beneficiary and control group in each village, except in the case of Abora and Adabra beneficiaries. Adabra's case is peculiar and largely influenced by the land issue and IMT availability. Owing to the scarcity of land, particularly over the past two years, some farmers acquired land in nearby villages for farming. One farmer said "*We no longer obtain land to cultivate in this village. There is land available in some of the nearby villages. However, owing to the long distance involved we could not go and farm in these nearby villages, particularly as we have to headload all produce. We cultivated land in Papase Village (4 km from Adabra) this year because the trip to the farm is largely along the road and my husband and the children can easily use the push truck to convey load in large quantities." (Adabra, beneficiary, female, interview August 2002).* The Adabra beneficiary case indicates that IMT availability can influence the cultivation of distant but IMT-accessible plots if such plots have comparative advantage over plots closer to the village. Some Adabra control members on the contrary could not cultivate plots in nearby villages owing to the longer distance involved and the fact that they have to pay for the use of their neighbours' IMTs. One farmer said, *"I had wanted to make a farm at Desum village (about 6 km from Adabra) but it is far. The bike could make trip to such farm faster and the push truck could make load transport faster and easier. Unfortunately, I could not take any of the IMTs and people at the village charge very high for the hiring of their IMTs which I cannot pay. It is also not possible to use the taxi since they do not come frequently, usually full when they pass our village and charge even higher than the push truck." (Adabra, control, male, interview August 2002).*

IMT availability has some important implications even in situations where IMTs were not the main reason for change in farm location. This helped to reduce the number of trips through load amalgamation and bulk transport from separate plots. One farmer said "*This year I made some farms closer to the village and some farther from the village. I hired the land closer to the village for the cultivation of oil palm and cashew. My wife and children headloaded maize from the distant farm to the one closer to the village. We then combined maize from the two farms and used the push truck to convey all" (Lome, beneficiary, male, interview June 2002).* A female farmer also said "*The prices of tomato and pepper were very good last year and so I hired a plot along a river bank (away from my usual farm location) for the cultivation of these crops. Unfortunately, the harvest of the vegetables coincided with the major maize harvest. Fortunately for me, the vegetable plot is closer to the village and accessible by IMTs and so my husband and his friends used our push truck to transport the vegetable in bulk, though the push truck availability was not the primary reason for increasing the cultivation of vegetables this year" (Lome, beneficiary, female, interview February 2002).*

The changes in farm location were not exclusively attributed to the IMT availability. The foregoing discussion indicates that availability of land and funds, crop prices and suitability of soil/land for particular crops also influenced farm location. Other factors that influenced farm location over the study period are crop diversification, land rotation, change in soil fertility pattern, presence of pests, labour availability, tenancy agreement, improved produce prices, and other accessibility factors. A farmer said "*I changed location because I decided to produce more cassava this year and so moved to a land which is suitable for cassava production" (Adabra, beneficiary, female, May 2002).* Some farmers in Adabra changed location because their previous plots were seized, as noted in section 4.2.3. Other farmers deliberately kept plots at distant locations to reduce pilfering.

Those who did not change the location of their farms gave similar reasons as listed above. The right to the free use of family/communal land, particularly in Lome and Abora, was a major reason that motivated some people to remain at the same location. Many farmers stated that *"I have free access to the use of family/communal land. I cannot vacate it and hire land elsewhere."* Some farmers gave multiple reasons for not changing the location of their farms. A farmer said, "*I farm there always because the land is very good, closer to the village and I do not pay anything for using it. There is no need to change to another location where I will have to pay for the use of such land" (Lome, control, male, interview February 2002).* Scarcity of land also restrained some farmers in Adabra from changing the location of their farms. One farmer said, "*I always farm at the same place because land is scarce at the village and so once I get a place to farm I try to remain there for years" (Adabra, beneficiary, female, interview March 2002).* Also in Sampa, recent flood incidence has compelled some people to stop farming on lands beyond the river, though very fertile. A farmer said "*We have a vast fertile land behind the river and it extends as far as the Olefreku village. Many people have stopped farming this land in recent years owing to heavy floods which usually last for months. The few of us who continue to farm this land sometimes have to make a detour through Brofo which means more than a doubling of the distance to farm. Many people therefore farm any small plot they could get in front of the river as well as land at other locations in the village." (Sampa, control, male, interview April 2002).*

The block form of bush fallow practised in Lome was a major reason many people changed their farm locations. One farmer said "*The landlords rotate the use of the land to allow the vegetation to regenerate. During the fallow period I find land elsewhere to cultivate" (Lome, beneficiary, male, interview February 2002).* Some people cited the suitability of the land for some crops, particularly maize and vegetables as the main reason for always farming at a particular location. A farmer said "*I cultivate maize mainly and that land is good for maize*

production. Many people in this village have their maize farms at that location" (Lome, beneficiary, female, Interview April 2002).

5.2.2 Changes in number of farms

Closely linked with the changes in farm location are the changes in number of plots cultivated by farmers. There was an increase in the number of plots cultivated by farmers over the study period. The average number of farms per farmer increased from 2.4 to 3.1 over the study period. There was a general increase in proportion of farmers who cultivated three or more separate plots and a decrease in those who cultivated one or two. Figure 5.6 to 5.10 show changes in the proportion of beneficiaries and control who cultivated particular number of plots over the study period. Appendix III Table A5 and A6 also show the proportion of farmers who cultivated particular number of plots in the base year and end year respectively.

In general, the control group recorded a larger increase in number of separate farms than the beneficiary. The average number of separate cultivated plots per control member increased from 2.3 to 3.1 plots while those of the beneficiaries increased from 2.5 to 3.2. The largest increase in number of farms was recorded in Adabra (66%), followed by Lome (25%), Abora (15%) and then Sampa (14%) in decreasing order. In each village the total number of plots cultivated by both beneficiary and control group increased except in Abora. In Abora the number of plots cultivated by the control increased by 47% whereas those of beneficiaries decreased by 4%.

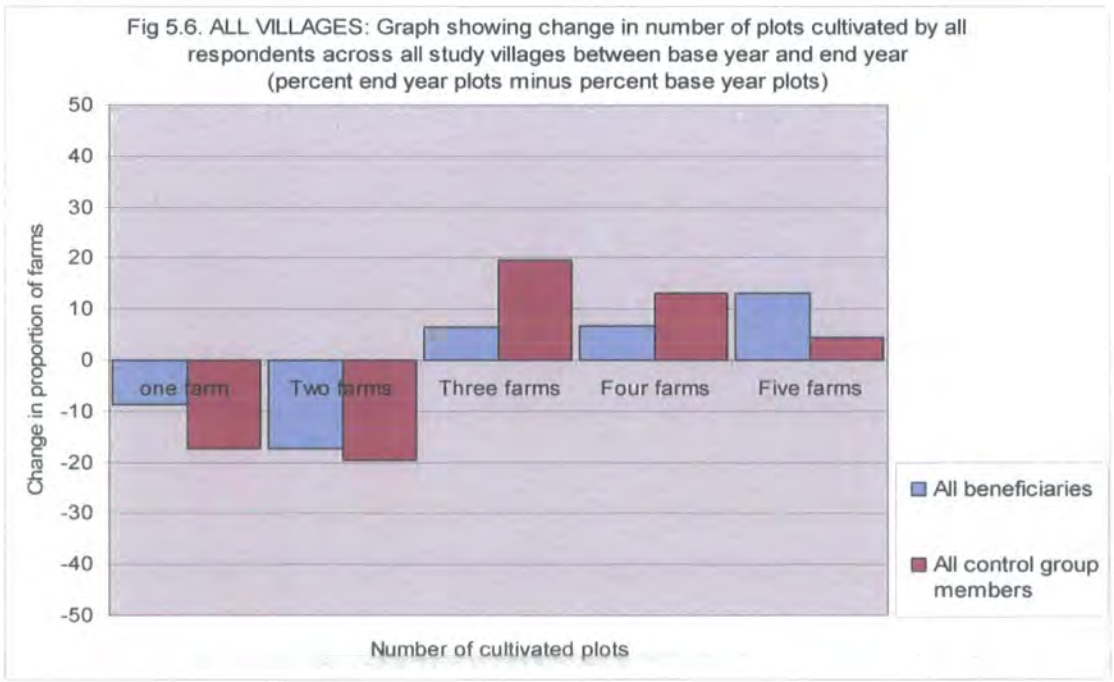


Fig 5.7. LOME: Graph showing change in number of plots cultivated among all respondents in Lome between base year and end year (percent end year plots minus percent base year plots)

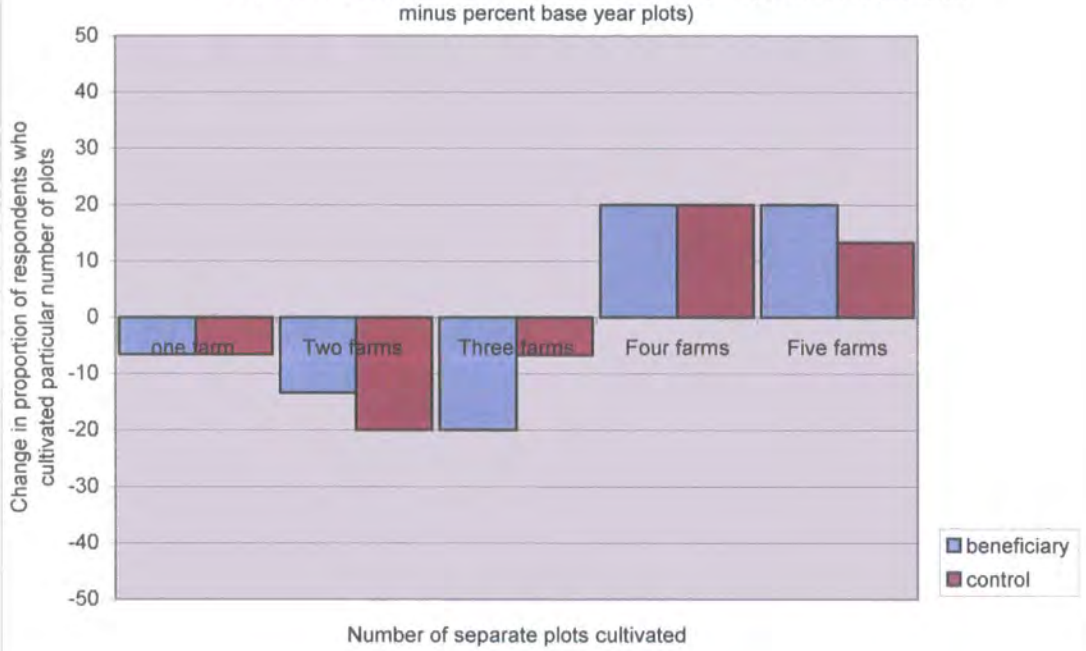


Fig 5.8. ABORA: Graph showing changes in number of plots cultivated among all respondents in Abora between base year and end year (percent end year plots minus percent base year plots)

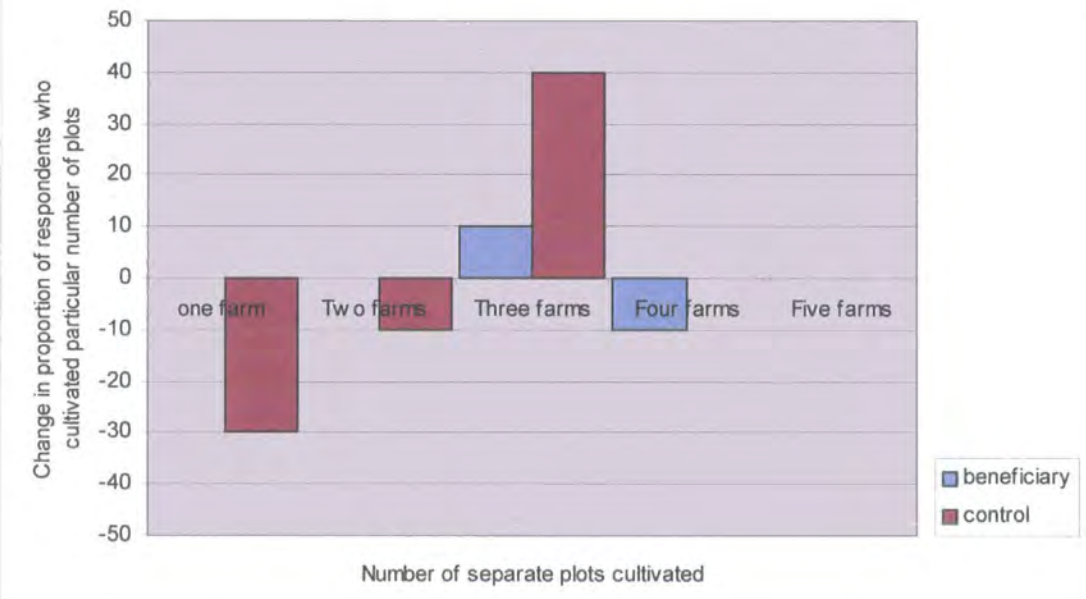


Fig 5.9. SAMPA: Graph showing changes in number of plots cultivated among all respondents in Sampa between base year and end year (percent end year plots minus percent base year plots)

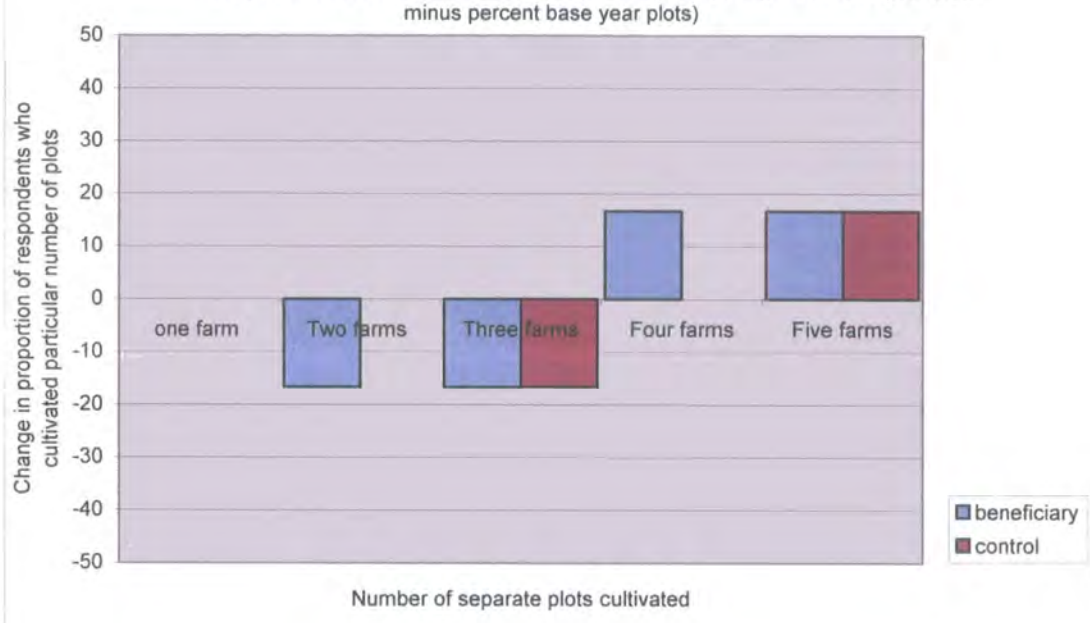
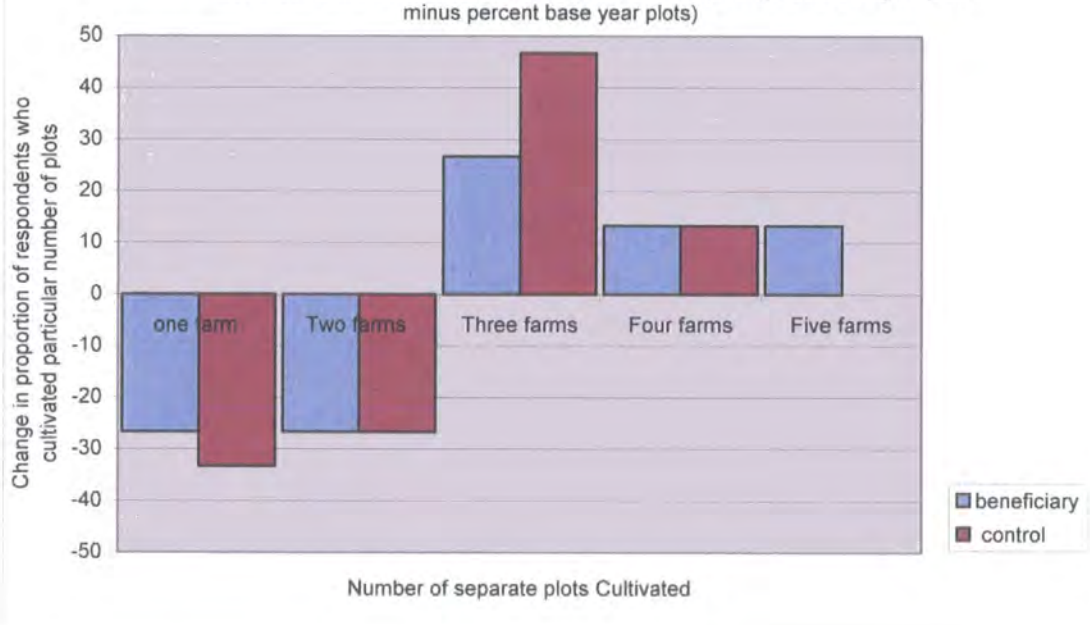


Fig 5.10. ADABRA: Graph showing changes in number of plots cultivated among all respondents in Adabra between base year and end year (percent end year plots minus percent base year plots)



The increase in number of farms was influenced by a number of factors including IMT availability. The qualitative data suggests that some farmers cultivated more plots owing to the availability of IMTs. A bicycle beneficiary in Adabra said "*Each year I make one or two contiguous farm but this year I made three separate farms at two different locations. One is*

farther away and two are very close to the village. The bicycle makes it easy for me to visit all the farms on a day. Some days I make two trips to the farthest farm. The bicycle enables me to come home in the hot afternoon to take a rest and go back later in the day (Adabra, beneficiary, male, interview, April 2001).

Not only fast moving IMTs but also large capacity IMTs do influence farmers' decision to increase the number of cultivated plots. One push truck owner said "*In my farming history I have never made many farms like this year. For the first time in my life I made five separate farms and this is partly due the push truck I bought. I acquired land suitable for different crops at different locations because I can easily use the push truck to convey loads in bulk. It may not be possible to headload all produce from many locations within a limited time period" (Adabra, beneficiary, female, interview April 2002).* Some control group members also attributed the increase in number of cultivated plots in part to IMT availability. One farmer said "*I always make one bigger maize farm at the forest and rely on head porters to transport the produce home. This year I made two separate maize farms, one at the forest and the other by the roadside. The aim was partly to hire IMT to transport harvested produce from the farm located by the roadside and hire porters to transport produce from the farm at the forest. This was to reduce the transport burden at the major harvest" (Lome, control, male, interview February 2002).*

There were instances where farmers reduced the number of cultivated plots and also made contiguous farms along an IMT-accessible route in order to be able to use the push truck to transport loads from farm to village. A female beneficiary said "*This year I cultivated fewer plots (only two contiguous farms). This is our only family land located by road and I decided to farm at this location in order to be able to use the push truck to transport produce at the major harvest. I will keep all my farms at this location so long as the push truck exists and land is available at this location. This is the only way by which I can use the push truck to transport all produce from farm to village." (Lome, beneficiary, female, interview June 2002).* In this situation the decision to farm at an IMT-accessible location was dependent upon the availability of free family land. This farmer added that she would have had second thoughts if no free family land were located by an IMT-accessible location.

Other farmers attributed the increased number of cultivated plots over the study period to factors other than IMTs but admitted that the IMTs eased their transport burden. A female push truck owner from Lome said "*I had land at a location different from where I farm always and so I made more farms this year. My push truck was not the reason for making this farm, however, it helped me a lot in carting load from this farm which is located by the Oguan road"*

(Lome, beneficiary, female, interview, May 2002). Another woman stated, "*Fortunately for me all the farms I made this year are accessible by push truck and so my grandchildren used the push truck to transport all the produce for me. I sometimes return from the farm only with my cutlass in hand. The main headache is whether the push truck can go to the farm but not how much load I have to transport" (Lome, beneficiary, female, interview, June 2002).* Other farmers, including males, made similar statements.

Other reasons given by farmers for the increase in number of cultivated plots include availability of land, labour and funds, improved produce prices and increase crop diversity. In Lome, the clan elders decided not to increase land rent in years 2001/2002 while other clans opened up new locations for farming. According to some farmers this motivated them to increase the scale of their production which in some instances involved acquiring land at different locations. One farmer said, "*I had an additional plot of land from my clan, my husband also bought a new land which is very good for the production of vegetables and so I made additional farms at these new locations. Lands at different locations are sometimes good for different crops and cultivating plots at different locations serves as a security" (Lome, beneficiary, female, interview May 2002).* Owing to the general scarcity of land in Adabra some people did not obtain a sizeable piece of land at one location and so made separate smaller farms at various locations. One farmer said, "*Things are difficult for us this year. Some landlords have leased their lands to the commercial pineapple farmer. All of us turned to the remaining landlords some of whom have resorted to dividing their land into fragments to make sure each farmer receives a portion to farm. We (the farmers) have also resorted to taking such smaller plots from as many landlords as possible in order to increase our acreage." (Adabra, control, male, interview March 2002).*

Farmers like other economic agents also respond to prices changes. In year 2001, prices of maize and vegetables increased significantly and farmers responded by cultivating more maize and vegetables. This may imply the cultivation of additional plots. A farmer said "*Because the price of maize was very good in the previous year a friend of mine in Accra brought huge money for us to make joint farm. I therefore made two big farms by using the plot behind my house which I planned to use next year" (Adabra, beneficiary, male, interview April 2002).* The poor produce prices preceding the base year contributed to the cultivation of fewer plots in the base year, since there was relatively little incentive to produce

5.2.3 Changes in farm size

There was an observed decrease in the sizes of cultivated plots over the study period. The average cultivated plot size across all the villages in the end year was 0.2 poles smaller than that of the base year. Figure 5.11 to 5.15 show changes in proportion of separate cultivated plots fallen within the relevant category over the study period. Appendix III Table A9 and A10 also show the sizes of cultivated plots in the base year and end year respectively. The changes in the sizes of cultivated plots did not follow any clear pattern. However, there was a larger increase in proportion of farms below 0.6 poles than any other size category. In addition, the sizes of plots cultivated by the beneficiaries increased more than those of the control group across all the study villages: the average size of beneficiary plots increased by 0.1 poles while control plots decreased by 0.2 poles.

Fig 5.11. ALL VILLAGES: Graph showing changes in size of plots cultivated by all respondents across all study villages between base year and end year (percent end year plots minus percent base year plots)

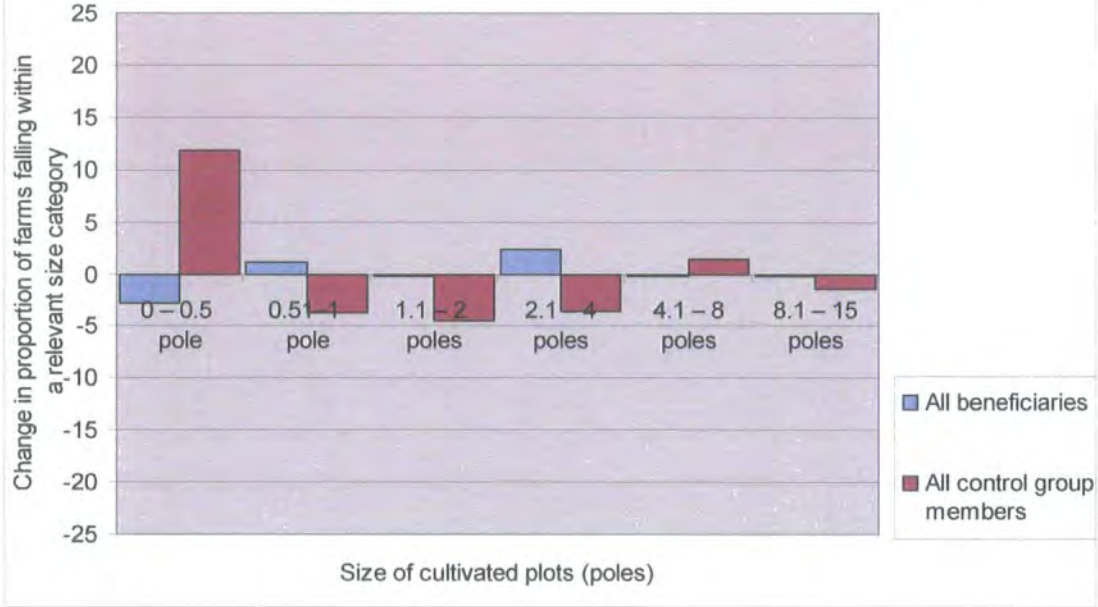


Fig 5.12. LOME: Graph showing changes in size of cultivated plots among all respondents in Lome between base year and end year (percent end year plots minus percent base year plots)

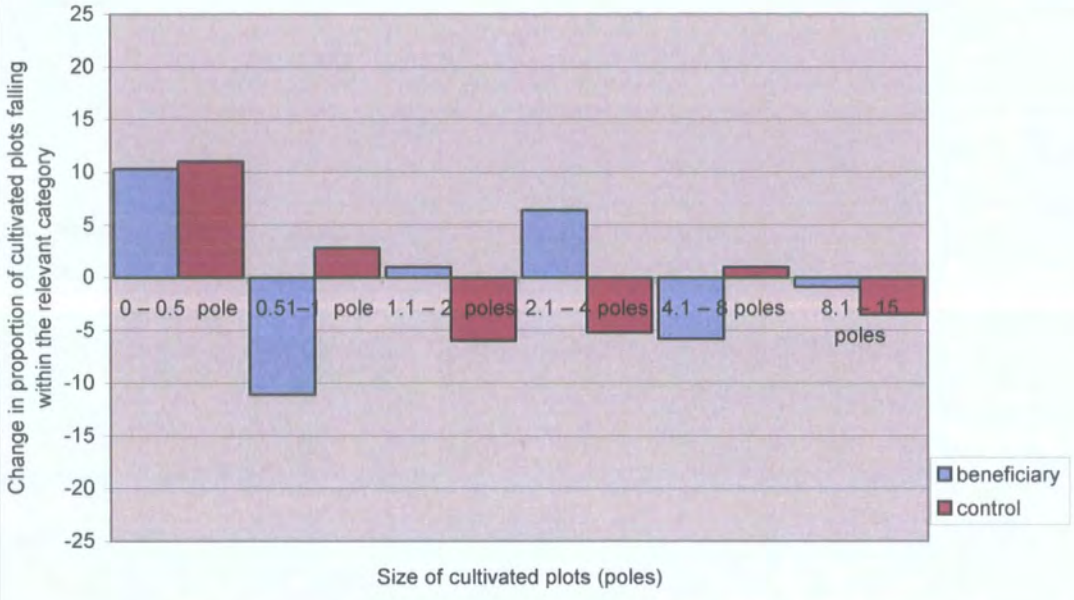


Fig 5.13 ABORA: Graph showing changes in size of cultivated plots among all respondents in Abora between base year and end year (percent end year plots minus percent base year plots)

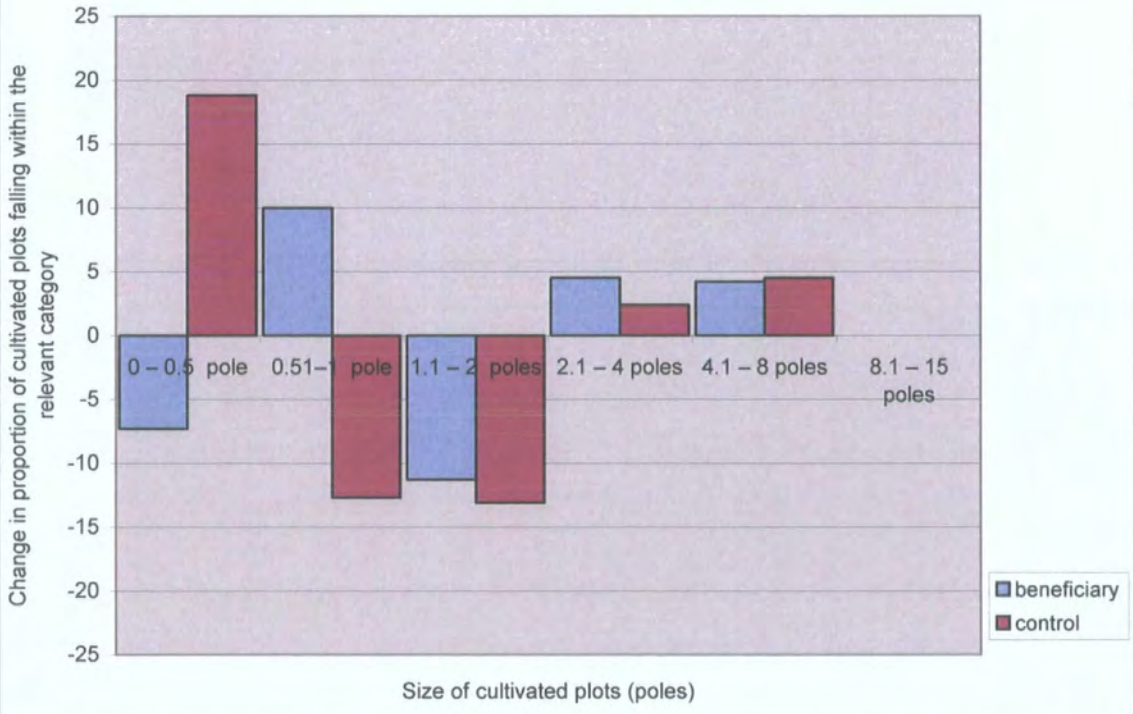


Fig 5.14. SAMPA: Graph showing changes in size of cultivated plots among all respondents in Sampa between base year and end year (percent end year plots minus percent base year plots)

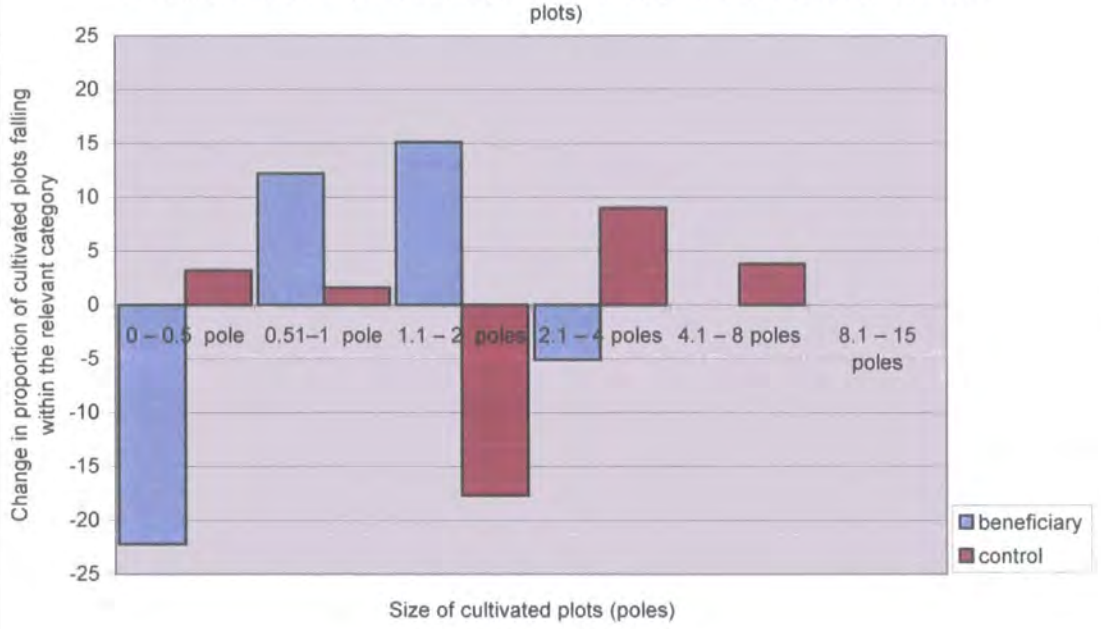
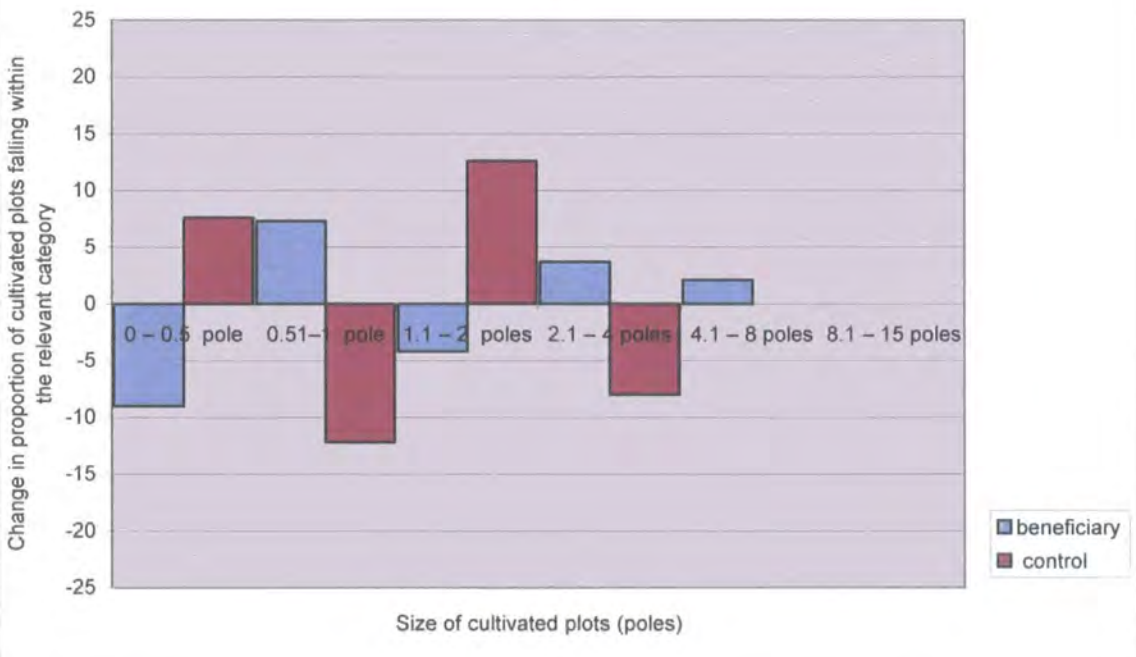


Fig 5.15. ADABRA: Graph showing changes in size of cultivated plots among all respondents in Adabra between base year and end year (percent end year plots minus percent base year plots)



The pattern of change in farm sizes differs among the villages. Lome recorded a decrease in the average plot size while the remaining three villages recorded marginal increases in average plot sizes. The large increase in proportion of smaller plots in Adabra is mainly due to land

availability, though the IMT availability also has some influence on the perceived change. The change in size of cultivated plots between beneficiaries and control in each village also do not show any clear pattern. The beneficiaries in Abora and Adabra recorded larger increases in average plots sizes than their respective control counterparts, the control in Sampa recorded a larger increase than the beneficiaries while both the beneficiary and control group in Lome recorded decreases in average plot sizes. The total cultivated area may give a better indication of the nature of transport burden than the individual plots and this is considered below.

There was an observed increase in total land area cultivated by farmers over the study period. The average cultivated landholding per farmer increased by 0.8 poles across all study villages over the study period. Fig 5.16 to 5.20 show changes in proportion of respondents who cultivated a given land area. Appendix III Table A13 and A14 give the number of farmers who cultivate a given total land area. The proportion of respondents who cultivated a total land area exceeding 4 poles increased from 38% at the baseline survey to 54% at the end survey, while those who cultivated 4 poles or less decreased from 62% to 45% over same period.

Unlike the separate plot sizes, the average land holding per farmer increased by 0.8 poles over the study period. However, there was a larger increase in the total area cultivated by beneficiaries than the control. The average landholding of beneficiaries increased by 1.1 poles while that of the control increased by 0.7 poles over the period.

Fig 5.16. ALL VILLAGES: Graph showing change in total area cultivated by all respondents across all study villages between base year and end year (percent end year plots minus percent base year plots)

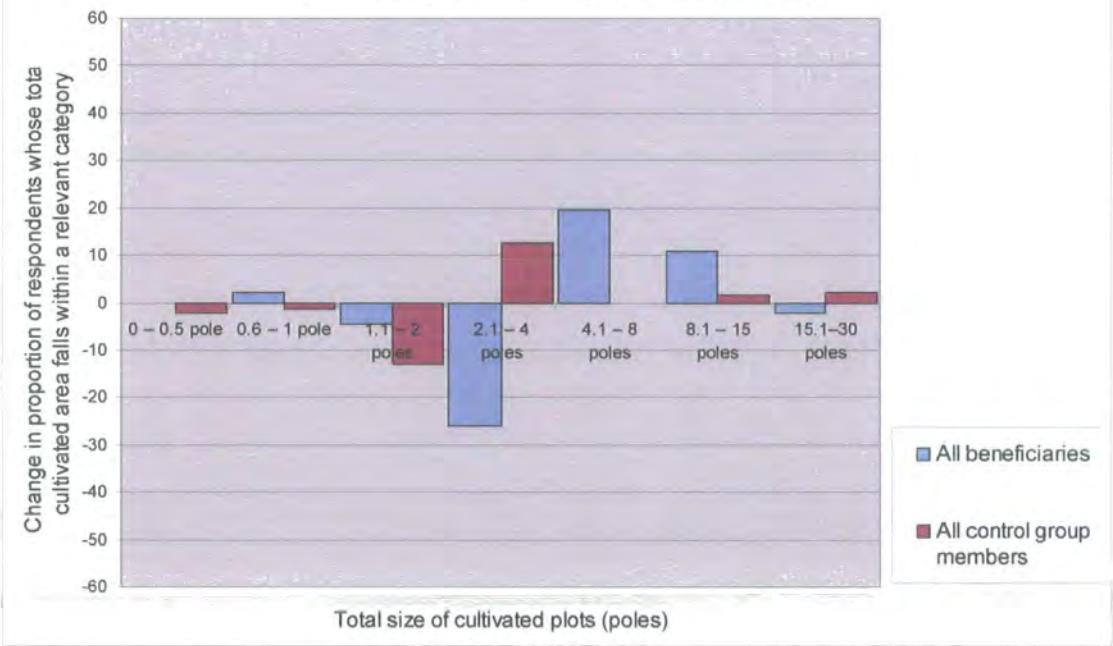


Fig 5.17. LOME: Graph showing changes in total area cultivated among all respondents in Lome between base year and end year (percent end year plots minus percent base year plots)

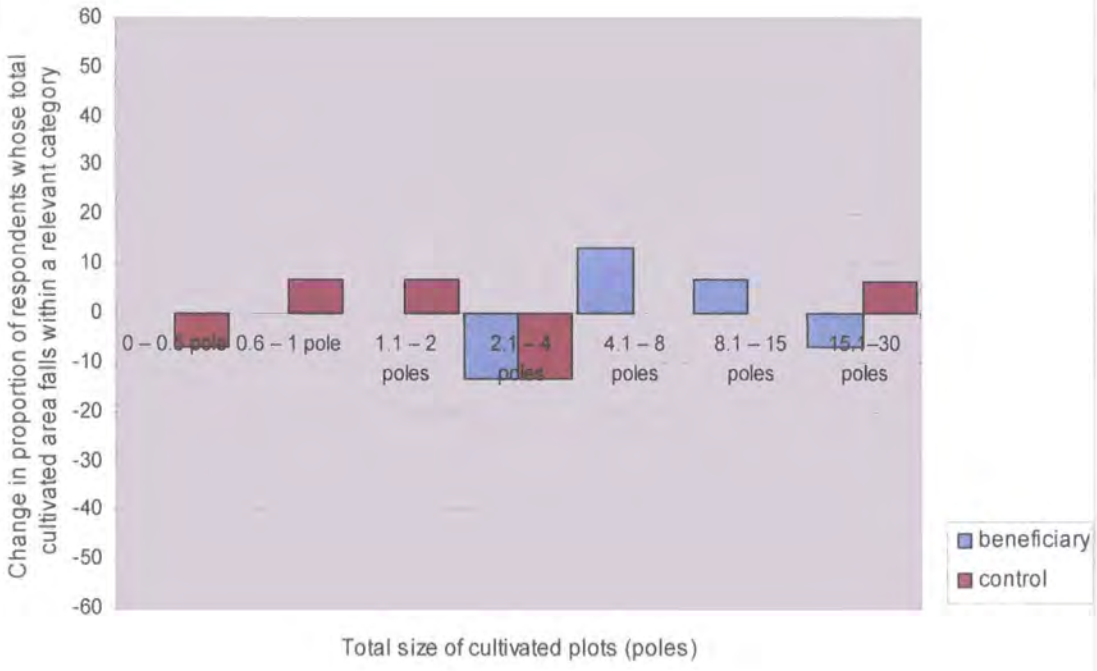


Fig 5.18 ABORA: Graph showing changes in total land area cultivated among all respondents in Abora between base year and end year (percent end year plots minus percent base year plots)

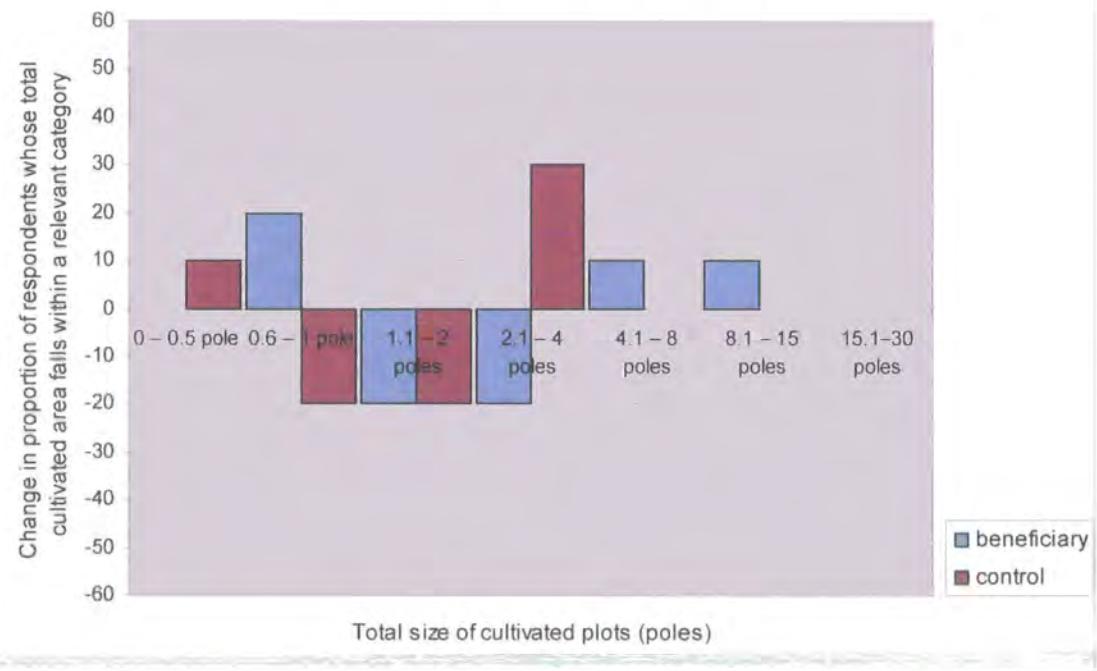


Fig 5.19. SAMPA: Graph showing changes in total land area cultivated among all respondents in Sampa between base year and end year (percent end year plots minus percent base year plots)

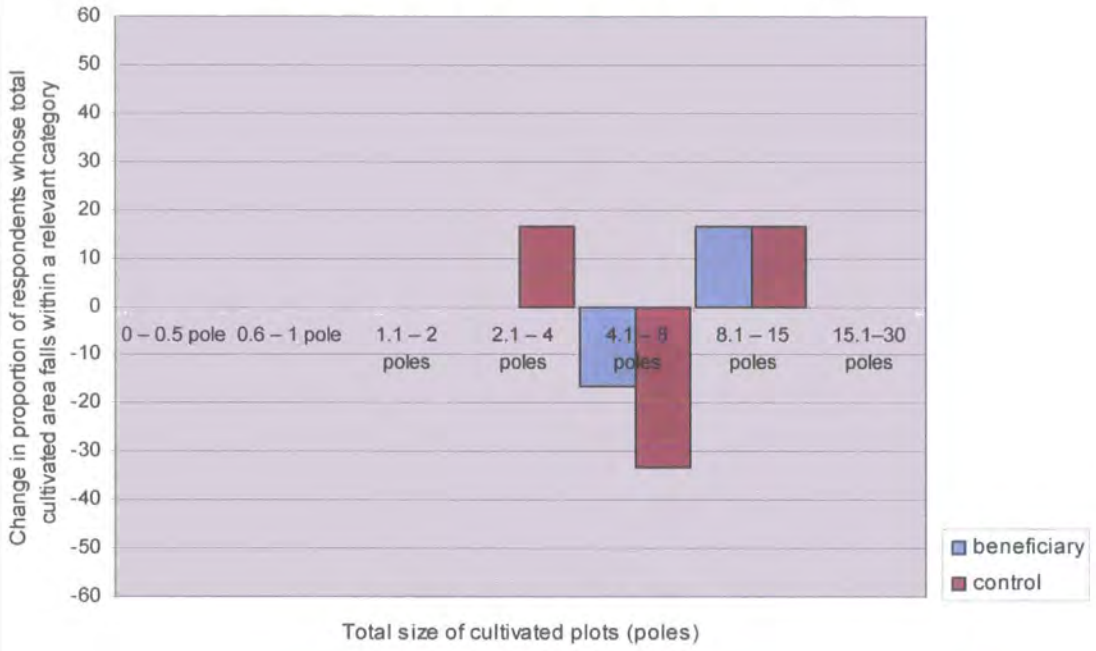
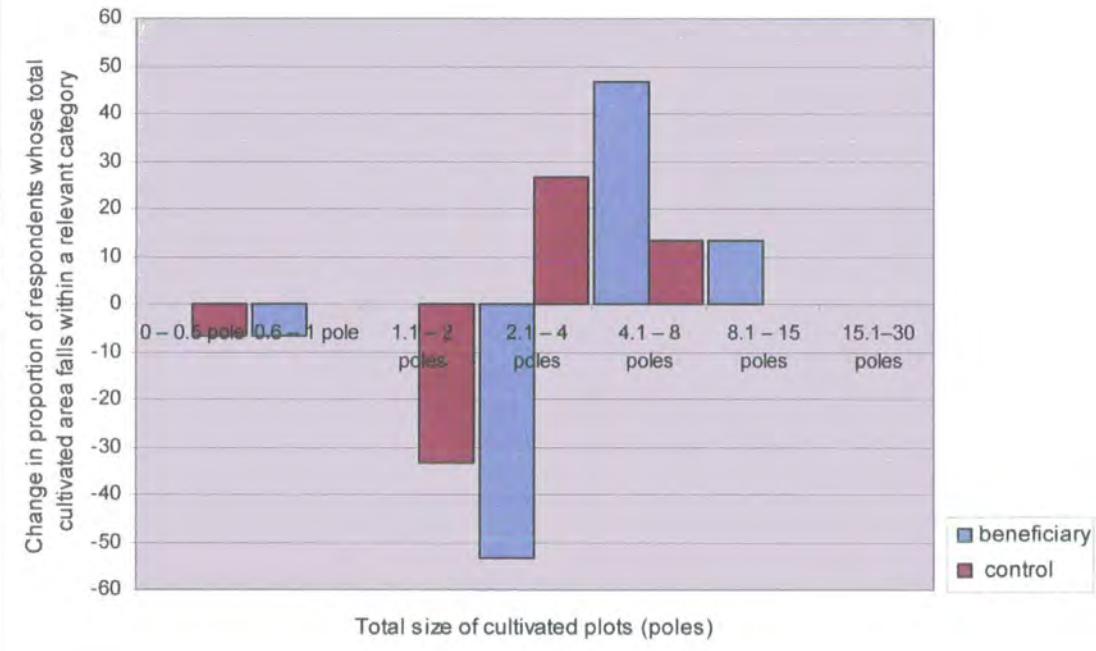


Fig 5.20. ADABRA: Graph showing changes in total land area cultivated among all respondents in Adabra between base year and end year (percent end year plots minus percent base year plots)



In each village there was an increase in number of people who cultivated more than four poles total and a decrease in those who cultivated four poles or less. The largest increase in total cultivated land per farmer occurred in Adabra and the lowest occurred in Abora. Adabra and Lome are the villages where the IMTs were mostly used, particularly for the transport of produce from farm to village. Hence this influenced the greater increase in farm sizes. The qualitative data supports this observation. The majority of people who attributed increases in the total cultivated land to IMT availability were from these two villages. There was also a larger increase in the average landholding of beneficiaries than the control in each village except Abora. The control group in Abora recorded a larger increase in total farm size than the beneficiaries. The IMTs were least used in Abora and so the observed changes cannot be attribute to the IMT availability.

The qualitative data reveals that 62% of respondents made bigger farms in the end year than the base year, 30% made smaller farms and 8% cultivated same land size in both periods. In whole 11 respondents including 9 beneficiaries and 2 control members attributed the increases in their cultivated land to the availability of IMTs. They pointed to the fact that IMT allows for bulk transport, makes load transport faster and less strenuous. One farmer stated, "W*ith the push truck I could convey a lot of produce and inputs at a time. This allowed me to harvest and transport all my produce within a shorter period and also saved some time to do more work at farm" (Lome, beneficiary, male, interview April 2002).* Another farmer said "*My farm is very far from the village and porters charge very high whenever they carry produce from my farm. With the use of the push truck the cost of transport will reduce and so I can transport more load at a relatively lower cost" (Lome, beneficiary, male, interview February 2002).*

The IMTs also proved beneficial to farmers who increased their cultivated area for reasons other than IMT availability. A farmer said "*I did not buy a push truck and so did not consider it when deciding on how much land to cultivate. However, the push truck assisted me greatly during the major harvest seasons. It made the transport of produce relatively easier than last year when I made smaller farm and headloaded all crops. I have decided to increase my farm in the next year to take advantage of these push trucks" (Lome, control, male, interview, July 2002).* Another farmer said "*I always headload produce from my farm to the village. I therefore increased the size of my farm according to how much my family and I can carry this year. However, during the major harvests I saw some people who used the push truck to transport their produce and they completed over a short period. I also decided to use it and it made the transport of produce from farm easier and faster. I am now confident that load transport problem at the major harvest is a thing of the past irrespective of my farm size and load volume" (Adabra, control, female, interview, May 2002*). This gives an indication that the

uses and influence of IMTs on farming in the study villages will be more evident and larger with time. With time farmers may learn from their colleagues who are already using the IMTs. The non-user may become more confident about the use of the IMTs and adopt it on their farms. A similar observation was made by Rogers (1995).

Farmers listed several other factors that contributed to increased or decreased cultivate land over the study period. Chief among these factors are availability of money, land and labour, ill-health, time availability and food security. Availability of money to purchase farm inputs is a factor commonly cited by farmers across all four villages. A female farmer said "*I made bigger farm this year because I had financial support from my brother in London for my farm. Therefore I was able to hire labour this year" (Abora, beneficiary, female, interview February 2002).* Farmers in the area usually obtain money from the sale of some produce, remittances and credits from fellow farmers or *susu* groups.

One major input which farmers in all villages complained of as being scarce, expensive and major constraint to agricultural production is labour, particularly for initial land preparation and produce transport at major harvest. To many farmers, especially the women, once the initial clearance is done it is easier to take care of the remaining activities. Lack of money places a major limitation on how much labour farmers can hire. As a farmer put it "*I made a small farm this year because I had some small income from my trading and so could pay for (more) labour last year than this year. Also my husband and children cleared part of the field for me last year but I had no such help from them this year" (Abora, beneficiary, female, interview May 2002).* The majority of farmers who pointed to labour availability are from Abora where labour shortage has been a problem over several years. See section 5.5 for more on labour and IMT.

Other factors cited in line with labour availability are ill-health and time availability, either of the farmer or a close relative. One female farmer said "*I rely on my own strength and limited money to make farms. I was very strong this year and so could work enough. I was pregnant last year and used to get sick frequently. As a result I could spend only a limited time for the initial clearing and harvesting" (Adabra, beneficiary, female, interview, February 2002*).

Some farmers also increased their cultivated area in order to ensure food security. One farmer said, "*The previous year's farm did not do well and so there was shortage of food in my home. My children, including those in the cities, contributed labour this year and so I could clear larger plot" (Lome, beneficiary, female, interview, May 2002).* Many farmers increased their farm sizes in order to meet expanded family needs.

In some instances more than one factor contributed to the increase in farm size over the study period. For instance one farmer said, "*I made bigger farm this year because my family is expanding and so I have to increase production every year to meet our needs. Also I had no problem this year but in the previous year my child was sick and so had limited time and money to farm" (Abora, control, male, interview February 2002).* A woman also said *"The land I had last year was too small but I had a bigger land this year and so I was able to expand my farm. I also heard on radio that we were going to have good rainfall this year and so I decided to make bigger farm to take advantage of it" (Adabra, beneficiary, female, interview March 2002).*

Many of the factors stated above have long-term influence on cultivated size in the study area. These factors include not just transport conditions but also rainfall, availability of labour, land and money, and produce prices and concerns around food security. Lack of money is by far the most limiting factor and it affects the size of production of virtually all farmers in all the villages. A farmer said, "*Some of the lands at the village contain dangerous weeds which easily damage crops. However, I do not have money to hire labour and so I cannot manage a bigger farm" (Lome, control, male, interview May 2002).* To other farmers, particular those in Abora, the lack of money affects both farm production and house keeping and this compels them to devote sufficient part of their time for non-farm work thereby reducing the time available for farm work. For instance a farmer said, "*I do not have money to pay for farm inputs and other items for my household. I spend a lot of time hewing and selling fuelwood. This takes a lot of time such that by the time I realise the period for cultivation had passed" (Abora, control, female, interview April 2002).* Some farmers provide paid farm labour to other people in order to raise money for their farms and household. This limits the time these labourer farmers can spend on their own farms and in some instances they can only start their own farms late. Some farmers also loss time through ill-health. One farmer said, "*One of my children is a sickler and in some years I spend the entire planting season at hospital. I do not have enough money which I can use to hire labour while at the hospital. In such year I start my farm very late and also have to use own labour because I have spent my limited money on hospital bills" (Abora, control, male, interview February 2002).*

What compounds the financial problem is the fact that some major farm inputs in the villages, particularly land and labour, are scarce and expensive (*see 4.2 and 4.6*) and limit the quantity farmers can purchase. The land situation is worse in Adabra. A woman recounts an ordeal which has dampened her enthusiasm for agricultural production for years. She narrated, "*I had always wanted to increase my production and become one of the successful farmers in the*

village but lack of money has always been a barrier. To overcome this I collected a loan of ¢150,000 from the susu group in the village. Owing to the scarcity of land at the village, I could not obtain a plot to buy on time. When I obtained one at a nearby village the cultivation period was nearly over. To compound the problem I could not obtain labour on time to clear the land for me even though I had money in hand. When I finally obtained labour, most people had completed cultivation. Because I planted late it could not receive the right amount of water though there was good rainfall that year. Consequently, I had poor yield. It was time to repay the loan but I had neither money nor enough produce to settle my debt. The interest on the loan was very high, over 100% per annum and the longer I waited the higher the debt rose. I therefore could not store the little maize I had but to sell it immediately after harvest at a cheap price. I even had to sell part of my previous year's cassava farm before I could pay off the loan. For this reason I will never go for loan again and that mean I can never expand my production" (Adabra, control, female, interview May 2002). Loans, especially from established financial institutions, are very scarce in the villages. The groups and/or individuals within the villages who provide limited loans to farmers charge exorbitant interest rates which make them unattractive. This has further entrenched farmers' poor financial situation.

The non-availability of money does not allow farmers to store produce to attract good prices in the future. One farmer said, "*Produce price is a major problem but that is something we can do little about. I think I have not produced enough for sale because there is no money to do so. If there is money I can produce enough, store it and wait for better price" (Lome, control, male, interview April 2002).* The effects of these factors were largely the same between beneficiaries and control but differed among the villages. Hence the larger perceived changes between villages than between beneficiary and control group.

5.2.4 Changes in cropping pattern

Over the study period there was a marked shift in the overall cropping pattern among the study villages. There was an increase in monoculture plots and a decrease in intercropped plots across the study villages. While plots under monoculture increased by 80% (50 plots) those under intercropping increased by 11% (17 plots). Nonetheless, intercropping was the dominant practice in both periods. It is a common practice in subsistence systems such as this area where farmers have to produce all their household food consumption needs on a limited plot. Fig 5.21 to 5.25 show changes in the cropping pattern over the study period. Appendix III Table A17 and A18 show the cropping pattern in the base year and end year respectively.

There was an increase in monoculture plots for both beneficiaries and control, though the increase was higher among the control than the beneficiaries. For instance control monoculture

plots increased by 30% over the study period while beneficiary monoculture plots increased by 17% over the same period. Intercropped plots for both the beneficiary and control increased by equal amount (7% for each group) over the study period. There was an increase in monoculture plots for beneficiaries and control in each village except the beneficiaries in Abora who recorded a decrease in monoculture plots. Similarly, the proportion of intercropped plots decreased for both beneficiaries and control in all villages except the Abora beneficiaries.

Fig 5.21. ALL VILLAGES: Graph showing changes in crop types cultivated by all respondents across all villages between base year and end year (percent end year plots minus percent base year plots)

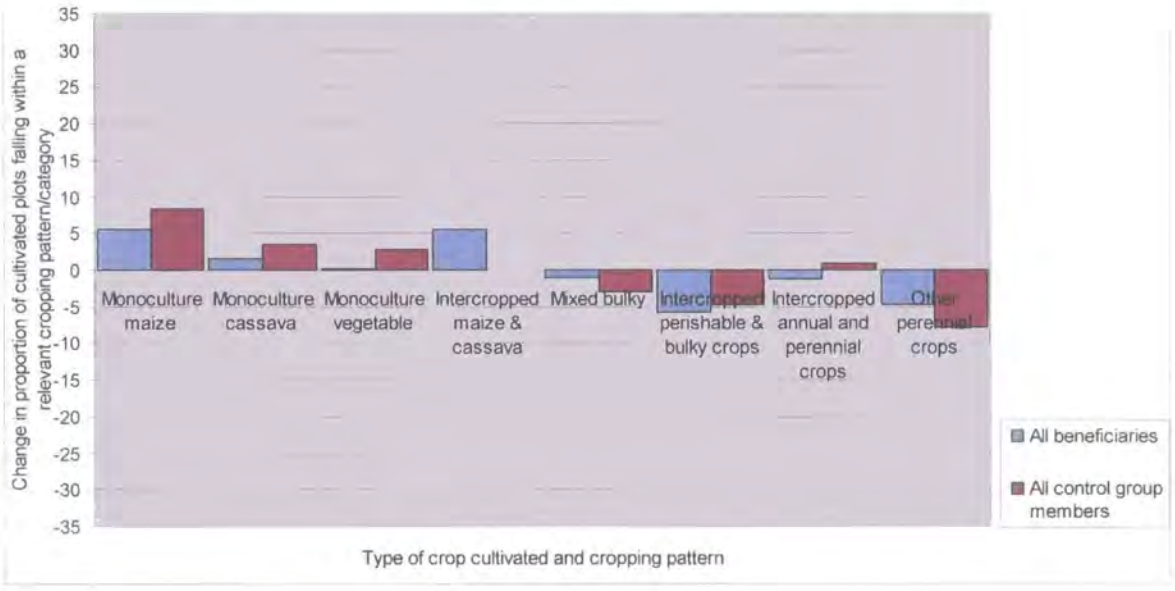


Fig 5.22. LOME:. Graph showing change in cropping pattern among all respondents in Lome between base year and end year (percent end year plots minus percent base year plots)

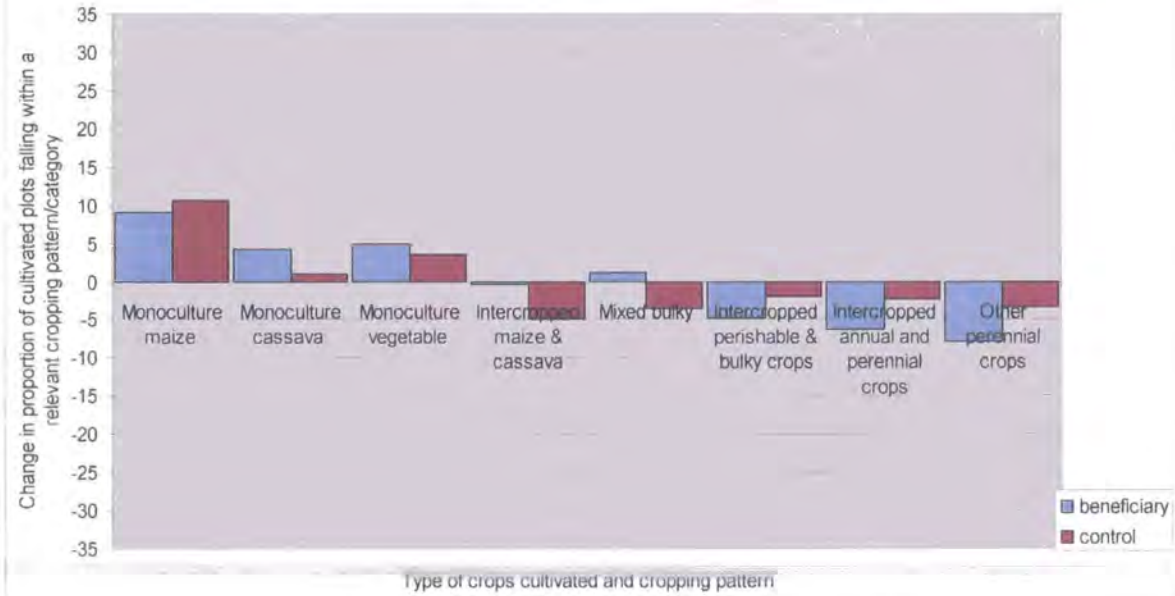


Fig 5.23. ABORA: Graph showing changes in crop types cultivated among all respondents in Abora between base year and end year (percent end year plots minus percent base year plots)

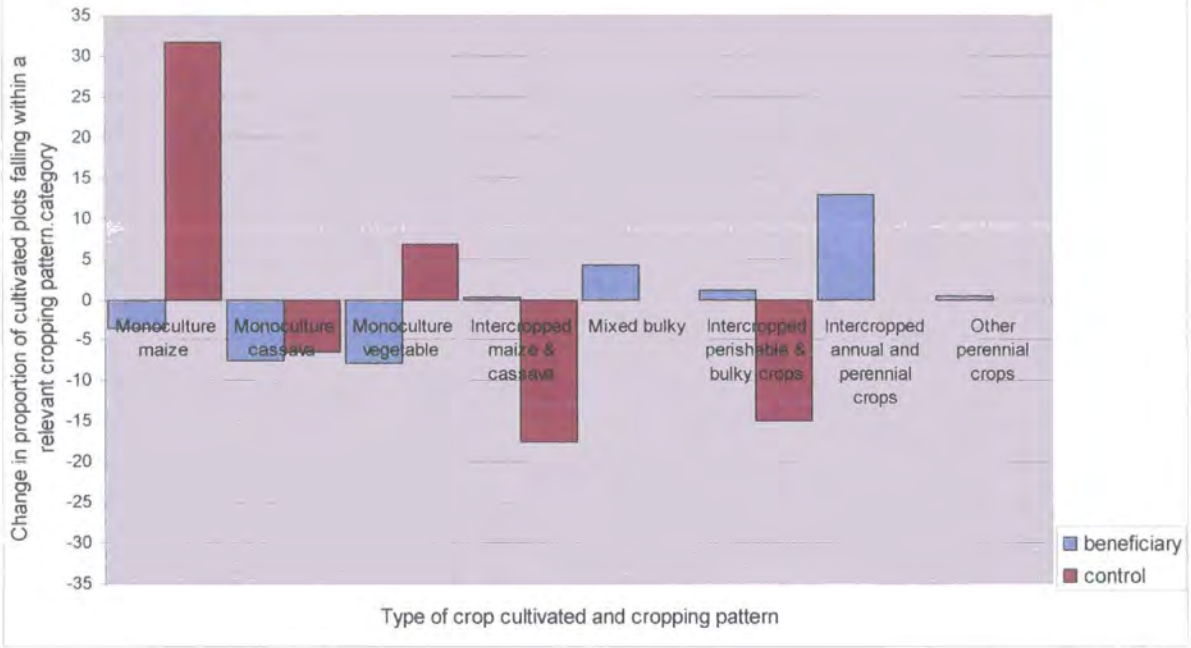


Fig 5.24. SAMPA: Graph showing change in cropping pattern among all respondents in Sampa between base year and end year (percent end year plots minus percent base year plots)

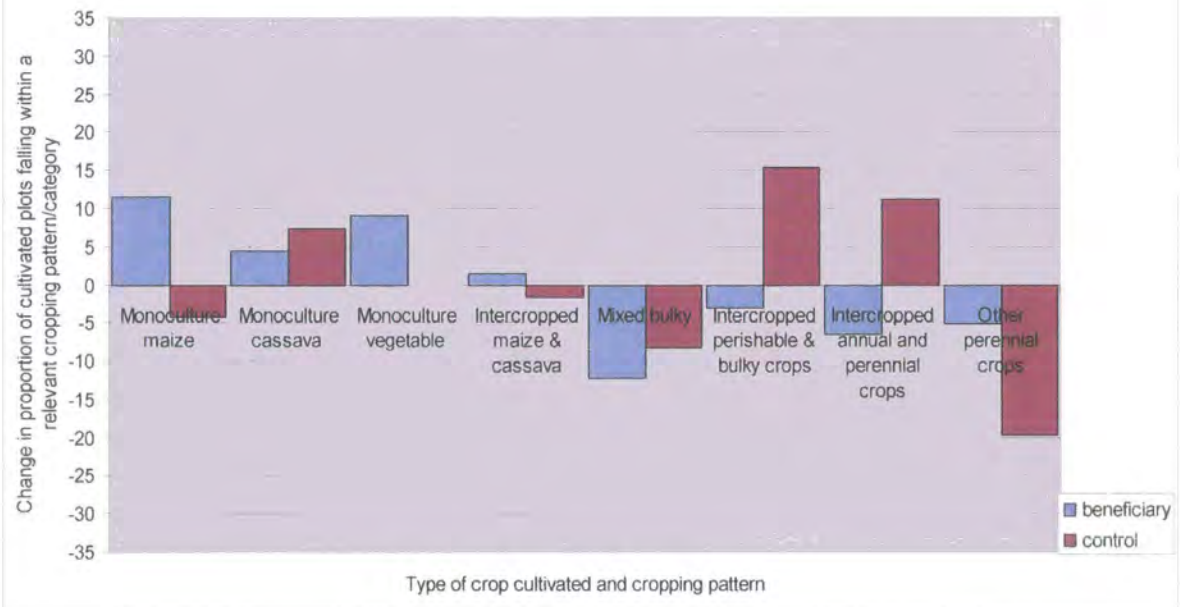
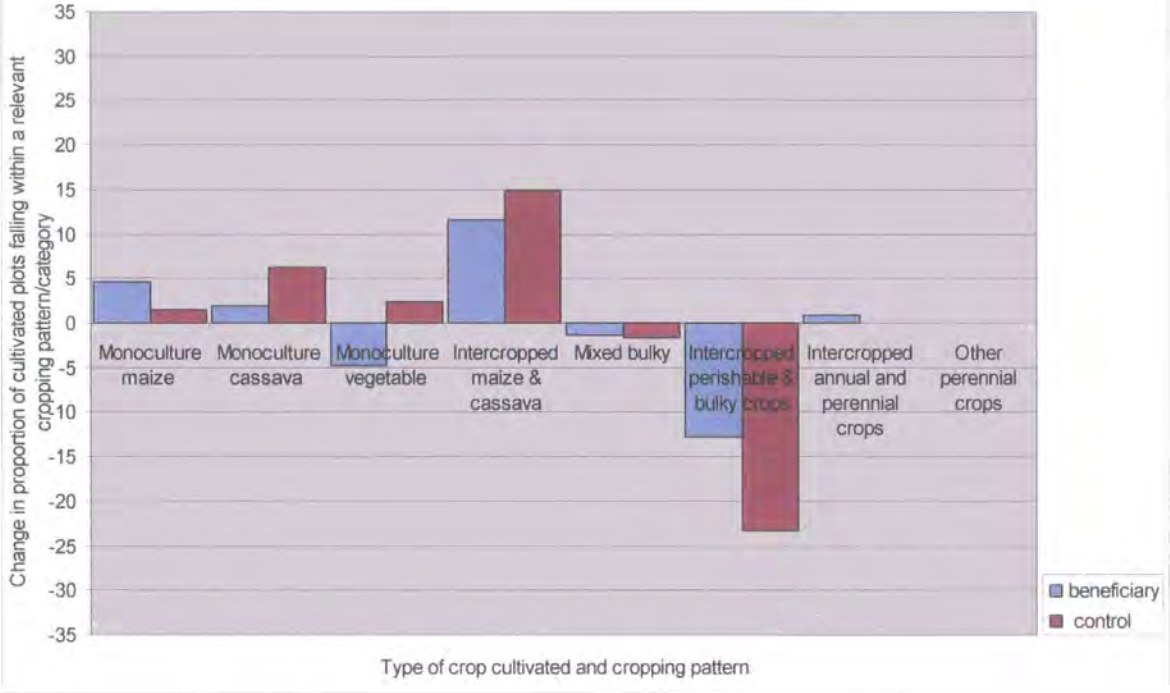


Fig 5.25. ADABRA: Graph showing change in cropping pattern among all respondents in Adabra between base year and end year (percent end year plots minus percent base year plots)



Over the study period there were no changes in the dominant crops cultivated in the area. Maize, cassava and vegetables (particularly pepper, tomato and garden eggs) remained the dominant annual crops cultivated while cashew, citrus and oil palm were the dominant perennial crops. However, there was a larger increase in plots cultivated with maize and cassava than any other crops. The number of plots under maize and cassava (monoculture and intercropped) increased by 63% over the study period while plots under vegetables and perennial crops increased by 14% and 8% respectively. There was a larger increase in control plots cultivated with maize and cassava than that of beneficiaries. Adabra recorded the highest increase in number of plots under cassava cultivation and only Abora recorded a decrease in plots under cassava production. The processing of cassava into *gari* (cassava flake) and cassava dough for sale at the Kasoa market is the dominant activity of women in Adabra. Adabra and Lome recorded the largest increase in plots planted with maize.

The increase in number of plots containing maize and cassava and the bulky nature of these two crops undoubtedly increased farmers' transport burden. Five farmers (four beneficiaries and one control) increased the production of cassava because of the available push trucks. A woman in Adabra said "*I cultivated a larger acreage of cassava this year because I now have a push truck which can enable me transport produce easily and faster. Owing to the heavy nature of cassava headloading always causes undue delay in the harvesting and transport of*

the produce from farm to village. Hence this limited the size I cultivated in the previous year" (Adabra, beneficiary, female, interview May 2002). A man from Lome also stated "*My wives and I cultivated our largest ever maize and cassava plots this year. We did this partly because of the availability of the push truck. My children used the push truck to transport all produce and cassava sticks. We had more time to do more farm work" (Lome, beneficiary, male, interview April 2002*).

The control group recorded a larger increase in vegetable plots (5 plots) than the beneficiaries (2 plots). Lome and Sampa recorded higher increases than Adabra and Abora. Some farmers increased the cultivation of vegetables (perishable crops) owing to the availability of IMTs. A farmer in Lome said "*I made a larger tomato and pepper farm this year. With my bike I was able to make quick trips to the farm each day to water the crops before I go to school or visit my wives farms at different locations" (Lome, beneficiary, male, interview April 2002).* Fast moving IMTs could thus encourage the cultivation of vegetable crops by facilitating frequent trips to farm while larger capacity IMT has the potential to increase the cultivation of bulky crops.

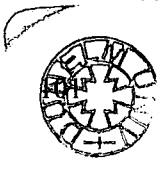
Three farmers (two beneficiaries and one control) from Abora cited the availability of power tiller as the reason for cultivating long maturing tree crops. They stated that they cultivated large plots of cassia tree because of the availability of the power tiller. They hope to cut these trees for fuelwood and use the power tiller to transport it to the Apam and Mumford markets (both fishing towns about 5 – 8 km away) for sale. In Lome some farmers who have long maturing tree crop farms stated that the push trucks assisted them greatly in the transport of such produce over the study period. A female farmer said, "*My oil palm farm is about 1.5 km from my house and it is accessible by the push truck. My grandchild and his friends used the push truck to transport all the palm fruits for me. I harvested a lot of palm fruits this year and without the push truck it would have been difficult to headload all the fruits" (Lome, beneficiary, female, interview May 2002*). There is much evidence of the use of large capacity IMTs for the transport of produce in areas of higher long maturing tree cash crop production in Ghana (Adarkwa et al., 2000; Anchirinah and Yoder, 2000). With time the IMTs are likely to make a larger impact on the production of long maturing tree crops in the study area.

A few new crops, namely water melon, green pepper, carrot and cabbage were introduced into the area, mainly in Lome, during the study period. The introduction was not the result of IMT availability. Three teachers who used to produce these crops elsewhere in Ghana were transferred to Lome and started their cultivation in Lome. However, they suggested that the IMT availability in the village enabled them to increase the production of these crops – it

facilitated bulk carting and reduced losses. One of them acquired a push truck through the project with the view to use it to transport produce from farm to the village. He explained, "*I did not make bigger farm when I did not have an IMT because I could not transport enough produce to the village on time. It was difficult to get produce home in bulk as I do not have people to convey the produce for me. However, with the push truck I can easily bring produce home and even if I do not get lorry I can use the push truck to convey the load to Dawurampong market (about 5 km away). Because it is easy for me to convey produce in bulk and within a relatively shorter period of time I made bigger farm this year. I now farm at a distant location because the push truck can convey a lot over the distance in a short time. I also made farms by the roadside so that the push truck can easily go there" (Lome, beneficiary, male, interview March 2002).*

A total of eight farmers (five beneficiaries and three controls) said they increased the diversity of crops cultivated owing to the availability of IMTs. A farmer in Abora said "*I cultivated cassia tree in addition to the crops I cultivated over the year. This is because the power tiller will enable me to transport the fuelwood obtained from these trees to the village and market (Abora, beneficiary, female, interview February 2002).* An elderly farmer said "*I produced tomato, pepper and garden eggs this year. These products rot easily and I did not produce them in the previous years because I am old and could not carry them to the market to sell. I cultivated them this year because the power tiller can always take them to the Apam market for sale" (Abora, beneficiary, female, interview April 2002).* Some people increased the crop diversity by adding more saleable crops. Other factors that influenced the increased production of particular crops were high produce prices, the need to raise food security within the farm family, anticipated good rainfall, availability of land, availability of funds and farmers' decision to diversify crops to act as a buffer against weather and price variability.

Further insight into the changed transport needs brought about over the study period by the changes in cropping pattern is obtained by examining crop distribution by distance from village. The data indicate that there was a greater tendency for expansion of cassava and vegetables on plots closer to the village, and a decline, with replacement by maize, in more distant plots. As discussed in section 5.2.1 this is related to better IMT access to fields closer to the village. A comparison of the three major crops, cassava, maize and vegetable (classification based on perishability, storability under existing structures and bulkiness) reveals that more maize is cultivated in distant plots than cassava and vegetables. Maize is the least perishable, less heavy (in terms of their most frequently transported forms in the area) and most storable of the three groups. At the end survey there were larger proportions of cassava and vegetable plots located within 2 km radius from the villages than in the baseline



survey. Owing to the bulky nature of cassava and the perishable nature of vegetable some farmers relocated their plots closer to the village to enable them to use IMTs to transport these crops. Long maturing cash crops such as citrus and sugar cane are also very bulky and the results show that they are largely located closer to the village. Thus highly bulky crops and highly perishable crops tend to be cultivated on plots closer to the villages while relatively lighter and less perishable crops tend to be farther away.

5.3 Changes in the farming system between males and females

Farm innovations could influences the faming systems of males and females in different ways owing to the differences in male and female roles in agriculture in the study area. Any differential influence resulting from the use of on-farm innovations such as IMTs could be shaped by the differences in socio-economic characteristics of males and females. This section examines the between gender, the farming system and the availability and uses of IMTs.

5.3.1 Gender and changes in farm location

Over the study period the proportion of farms within 1 km radius from the villages increased for both males and females. While the proportion of male-cultivated plots within 1 km radius from village increased by 22%, those of females within the same distance category increased by 19%. On the other hand the proportions of both male and female-cultivated plots beyond 1 km radius from the villages decreased. Figure 5.26 below shows changes in proportion of farms falling within the relevant distance category (see Appendix III Table A3 and A4).

Fig 5.26: ALL VILLAGES: Graph showing changes in distance to cultivated plot between all male and female respondents across all study villages between base year and end year (percent end year plots minus percent base year plots)

The qualitative data show that 55% and 68% of male and female respondents respectively did not change the location of their farms while 31% of males and 14% of females changed the location of their farms. The remaining 14% males and 18% females made some farms at their previous farm locations and made other farms at entirely new locations. Four males (all push truck owners) and six females (four push truck owners and two control members) attributed the change in location of their farm wholly or partly to the IMT availability.

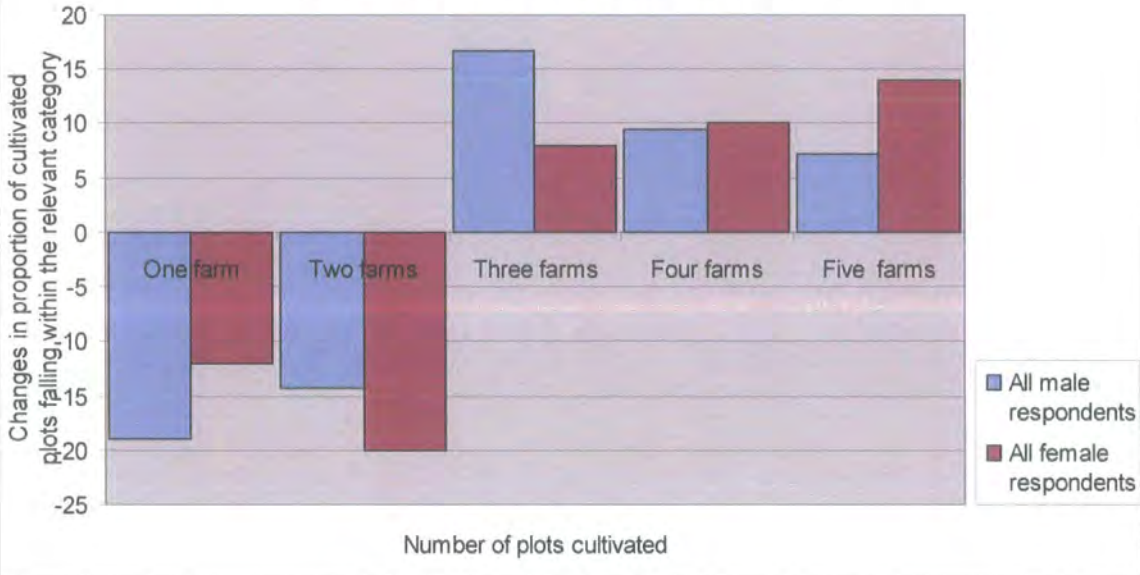
The changes in number of plots for the various villages do not show any clear gendered pattern. However, in each village there was an increase in proportion of farms within 1 km radius from the village and a decrease in proportion of farms beyond 1 km radius for both men and women. As explained in section 5.2.1 some farmers cultivated more plots closer to the village in order to be able to use the IMTs to transport their produce. Some people particularly women could not change the location of their farms because they do not have money to acquire land at a new location. One female said, "*I always farm at one location. This plot belongs to my family and I pay nothing for it. I would have liked to relocate my farms to be able to use the IMTs but I do not have money to do so" (Lome, control, female March 2002).* This implies women are more limited than men in terms of availability of funds to make changes on their farms in order to take advantage of IMT availability and other farm innovations.

5.3.2 Gender and changes in number of farms

There was a larger increase in the number of female-cultivated plots than male-cultivated plots. The average number of plots cultivated by men increased from 2.6 to 3.3 plots while that of females increased from 2.2 to 3 plots over the study period. The total number of plots cultivated by men increased by 27% while those cultivated by women increased by 35%. This implies increase in number of trips for female farmers than male farmers, all other things remaining the same. Figure 5.27 below shows the changes in proportion of males and females who cultivated particular number of plots (see also Appendix III Table A7 and A8).

The primary aim of female farm production is to provide food directly for home consumption. They therefore cultivate all sorts of crops needed for household consumption. This sometimes requires the cultivation of land at different locations depending on crop types and soil requirements. One woman stated, "*The yield was poor last year because of the poor weather. I therefore cultivated many plots and many crops in order to reduce risk and possibility of crop loss in case of poor weather. I also planned to use the push truck to transport the load" (Lome, beneficiaries, female, interview April 2002).*

Fig. 5.27: ALL VILLAGES: Graph showing change in number of plots cultivated by all male and female respondents across all study villages between base year and end year (percent end year plots minus percent base year plots)



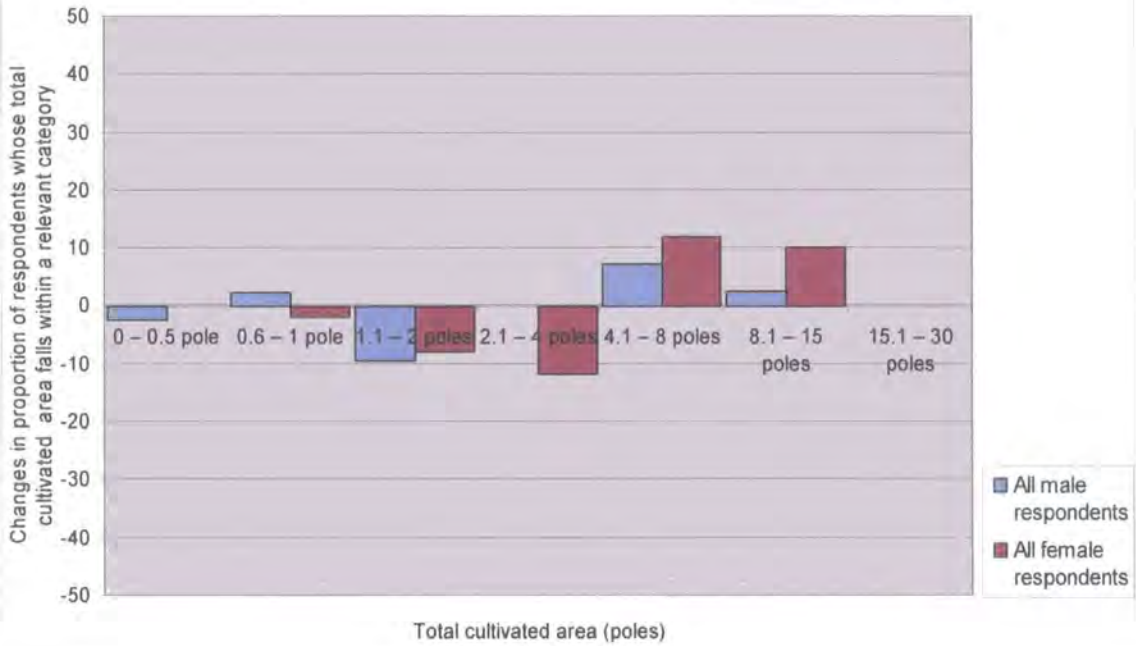
There was an increase in average number of cultivated plots per person for both males and females in each village except for males in Abora and females in Sampa. Men and women in Adabra recorded the highest increase in number of farms than their counterparts in the other villages. Both men and women in Adabra recorded higher on-farm use of IMTs than their counterparts in the other villages. Anticipation of such on-farm use of the IMTs (particularly the push truck) motivated some farmers in the village to increase their level of production. However, the scarcity of land in the village compelled some farmers to cultivate plots in nearby villages in addition to their plot in Adabra.

5.3.3 Gender and changes in farm size

The study observed that IMT availability had more influence on the size of female cultivated plots than males. The average size of female cultivated plots increased slightly (0.06 poles) while male cultivated plots decreased (0.4 poles) over the study period. Male and female cultivated plot sizes increased partly because of the availability of push trucks to transport loads from farm. This may be partly due to the fact that women gained more time when the farm family substituted IMTs for head porterage. The time gained possibly enabled them to increase their cultivated area. Thus IMTs do not only reduce the drudgery associated with headloading by women but also has the potential to increase the scale of farm production by women.

The change in total cultivated area also differs between male and female farmers. The average cultivated area per male farmer increased by 0.3 poles while the average area cultivated by women increased by 1.1 poles over the study period. Figure 5.28 shows the changes in land area cultivated by men and women over the study period (see also Appendix III Tables A11, A12, A15 and A16). The increase in the average cultivated land area per female farmer in each village was greater than that of the male farmers except in Abora.

Fig 5.28: **ALL VILLAGES**: Graph showing changes in total cultivated area by all respondents across study villages between base year and end year (percent end year respondents minus percent base year respondents)



In Abora IMTs were least used for farm transport and so the changes in farm size in the village can be attributed to other factors rather than IMT availability. In this case availability of funds particularly for the hiring of labour and availability of free family labour were the main reason male-cultivated land areas increased more than female's. Men's physical strength enables them to clear larger plots of land than women. One woman stated, "*Many of us had no money to hire labour for the initial land preparation this year and so there was only a little piece of land we could clear. However, the men are stronger and they always manage to clear bigger plots than women" (Abora, control, female, February 2002).* Many men and women at the village share similar views. One male farmer said, "*In this village the physical strength of each farmer gives an indication of his or her farm size. Hired labour is scarce and expensive and majority of us do not have money to hire one. The men have to clear their plots earlier in order to have a little time to spare on our wives' plots. Women without partners are worse off since women*

naturally do not have the physical strength for initial land clearing" (Abora, control, male, interview March 2002).

Lome is a major agricultural production area with a lot of farm loads to be transported, especially in the major harvest. These loads are largely transport by women. With the IMTs women's transport burden was reduced and so they saved some time, which was partly used to increase production. As a women stated "*My husband and I make separate farms each year but I always have to transport all the produce from his farm. This year my husband and our children use the push truck to transport most loads from his farm as well as mine. My transport responsibilities were reduced and I had more time and energy to cultivate larger acreage of land" (Lome, beneficiary, female, interview May 2002).* Some other women as well as some men said they increased their cultivated area because they could use the IMTs to transport their produce.

The IMT availability enabled farmers in Adabra to cultivate larger but distant plots. There was a larger increase in female-cultivated plots than male plots. Just like Lome, female farmers in Adabra saved some time through the use of IMTs to transport loads. The time saved enabled farmers to expand their cultivated area. A female farmer stated "*I cultivated larger land area this year than last year because I aimed at using the push truck to transport produce at major harvests. My husband acquired larger plot of land in a nearby village, which though is farther from my home, he gave me a larger portion to cultivate" (Adabra, beneficiary, female, interview June 2002).* Thus female farmers were able to increase their cultivated area through the use of IMTs. The change was also made possible because her husband had money to obtain a larger plot of hire land. Other farmers, particularly men, cited availability of cash to hire land in nearby villages and the possibility of using push trucks to transport loads from these plots as the reasons for increasing their total cultivated area.

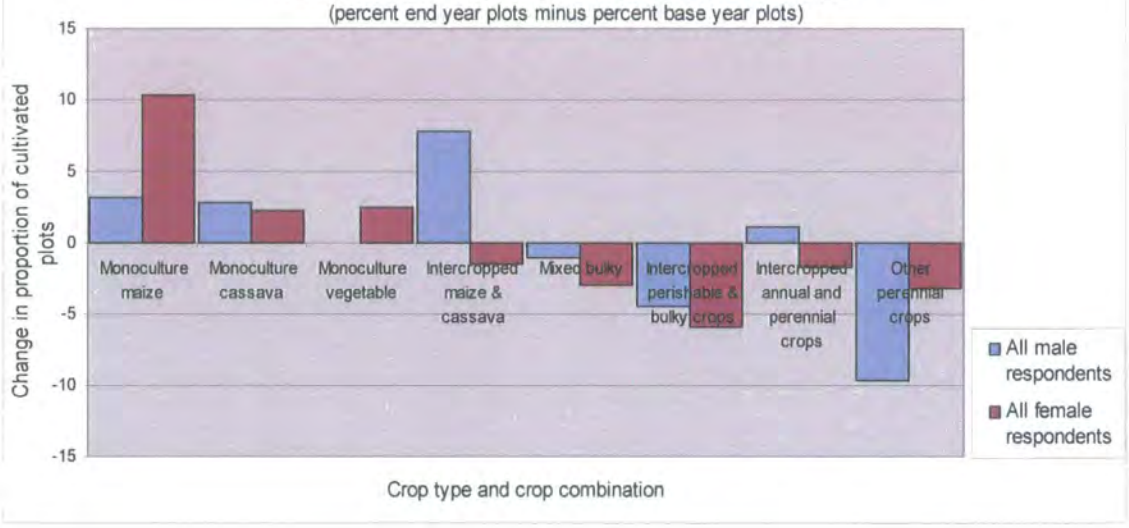
In Sampa the change has limited gender implications since the majority of respondents make a joint farm with their spouses. In addition, the IMTs were hardly used for farm related transport activities in this village. The only influence that IMTs could have on farm sizes in this village is through the generation of income from hiring services in other towns or markets. There was some evidence of this among some beneficiaries. One man stated that income from the hiring of his push truck enabled him to hire more labour in the end year.

5.3.4 Gender and changes in cropping pattern

Over the study period there was a larger increase in female-monoculture plots than males'. There was also a corresponding decrease in intercropped combinations for both men and women. There was a larger increase in female maize and vegetable monoculture crops than in the same crop combinations for males. On the other hand there was an increase in male maize-cassava intercropped plots whereas there was a decrease in the same crop combination for females. Fig 5.29 shows the changes in cropping pattern over the study period.

Generally, the cultivation of monoculture plots implies specialisation and crops on such plots are often meant for sale (see section 4.5.5). The large increase in female monoculture plots could mean increase in the production of saleable crops by women. One woman said "*This year I made a separate farm at the distant maize farmstead. Maize prices were higher last year and so I cultivated a lot of maize this year to sell and generate income" (Lome, beneficiary, female, March 2002).*

Fig 5.29. ALL VILLAGES: Graph showing changes in cropping pattern between all male and female respondents across study villages between base year and end year (percent end year plots minus percent base year plots)



There was an increase in all types of female monoculture plots in each village over the study period except Abora where female monoculture cassava plots decreased. Male monoculture plots on the other hand increased in Lome and Sampa but decreased in Abora and Adabra. Some farmers stated that they earned a lot of money by the hiring out of their push trucks and this enabled them to improve their farms. One of them said, "*The push truck is useful in many ways. It has made the transport of load from my farm easier. I also earned a lot of money by hiring it out to other farmers. I used some of the money to buy farm inputs including labour, cowpea seeds and pepper seedlings" (Adabra, beneficiary, female, interview May 2002).*

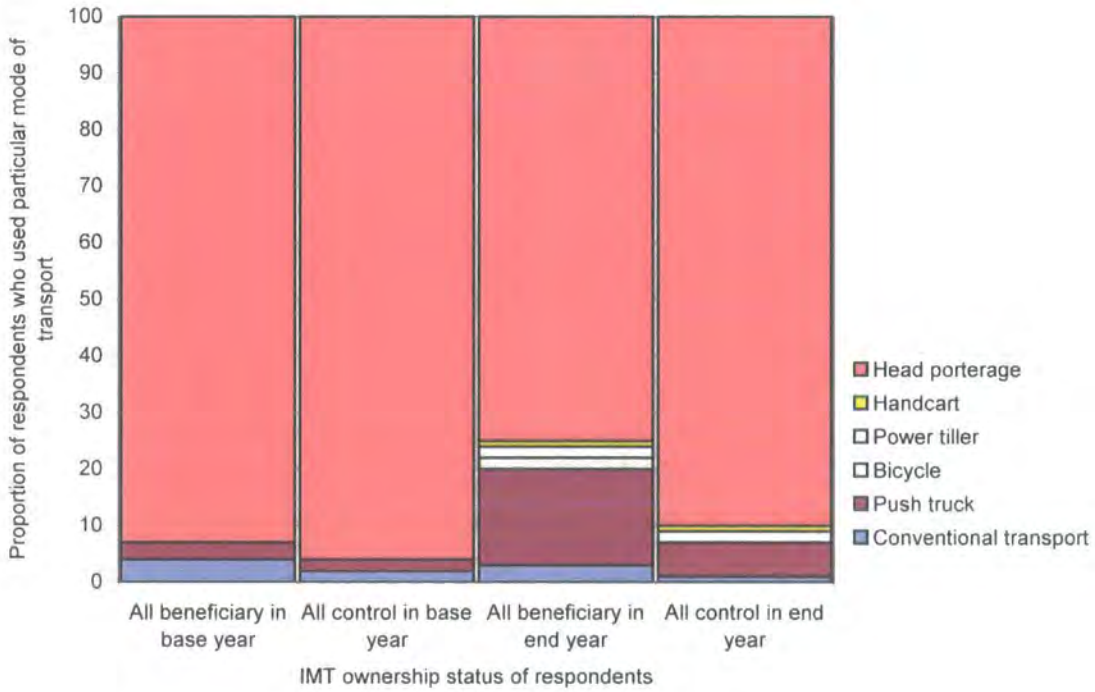
5.4 Farm labour

The study observed that the availability of IMTs in the village saved some farmers time and energy (reduced labour demand for produce evacuation) particularly in major harvest periods. The IMTs also improved the timeliness of crop evacuation for some farmers and hence reduced the tendency of produce deteriorating under the influence of the weather or getting destroyed by rodents. IMTs availability also influenced the hiring of porters. However, the availability of free extended family and communal labour has the tendency to reduce the utility of IMTs for farm transport.

5.4.1 IMT as labour saving technology

There was substantial evidence that IMTs helped to reduce the amount of labour involved in transporting loads from farm to village. In general head porterage continued to be the dominant mode for transport of loads between farm and village while conventional transport remained the major mode for transporting load between village and market. However, the availability of the IMTs appeared to reduce the proportion of loads transported by head porterage and conventional transport in the end year. Fig 5.30 below shows the transport modes used by respondents to move loads from farm to village for the base year and end year.

Fig 5.30: ALL VILLAGES: Graph showing the major modes of transports used to move loads in base year and end year (The blocks do not represent intensity of use. They only represent the proportion of respondents who used a particular mode)



The push truck was the IMT commonly used to transport loads from farm to village. The bicycle and handcart were used occasionally to transport produce from farm but the power tiller was never used for this purpose. There was a higher use of the IMTs among the beneficiaries than the control. The relatively lesser use of IMTs was partly due to the fact that many farms are not accessible by four-wheeled IMTs and that some control group members did not have money to hire these IMTs. Also the availability of free communal labour for moving produce at peak harvesting seasons in the Fanti dominated villages (Lome, Abora and Sampa) limited the use of IMTs in these villages. The free labour enabled many farmers in these villages to transport produce within a few days after harvest and this reduced the possibility of crops deteriorating under the influence of adverse weather conditions.

There was an observed reduction in the proportion of farmers who used hired head porters. The proportion of farmers who hired porters decreased from 21% (10 beneficiaries and 9 controls) in the base year to 14% (4 beneficiaries and 9 controls) in the end year. The fact that there was an increase in the use of IMTs for transporting produce from farm and a reduction in hiring of porters, particularly among the beneficiaries, could imply that some beneficiaries substituted IMTs for the use of porters. The qualitative data supports this. One farmer said "*I used to hire porters to transport my maize in the past and they charged very high. I decided to use the push truck this year instead of porters to transport loads from my farm located by the Ohua road. The push truck is cheaper to use and also makes load transport faster. I only hired porters to transport maize from my other farm which is not accessible by the push truck" (Lome, beneficiary, male, interview June 2002*). The general labour shortage in the area during peak harvest season makes it difficult to obtain porters. As a result farmers whose farms are located by IMT accessible routes see the IMTs as a suitable and probably a preferred alternative. The cheaper cost for using IMTs is one factor that could makes it a preferred choice to head porterage[6]. This study estimated the use of push truck to be about three to five times cheaper than the use of hired porters depending of the form of payment. Head porterage is more expensive when payment is made in kind.

The highest on-farm use of IMTs for both beneficiaries and control was observed in Adabra, followed by Lome, Abora and Sampa in decreasing order. The highest use of the IMTs in

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[6] The cost of transporting a unit load = $\frac{\text{total transport charge (¢)}}{\text{total weight of load (kg) x distance travelled (km)}}$

Unit cost of using hired porters (for payment made in cash) = 7000/50x4.5 = ¢31/kgkm
Unit cost of using hired porters (for payment made in kind) = 7000/35x4.5 = ¢44.4/kgkm
Unit cost of using push truck = 11000/250x4.5 = ¢9.8/kgkm
NB: total charge of push truck is for one day whereas total charge of hired porter is for a single journey. Thus farmers can make many trips at the same cost with push truck if they have plenty of loads.

Adabra is partly due to the fact that the free communal labour, which exists in the other villages, is not present in Adabra.

Farmers who used IMTs to transport loads from farm to village indicated that is saved them a lot of time compared to when they headloaded in the previous year. A female farmer said "*I used the push truck to transport all my maize, cassava and palm fruits this year. The truck made it faster and easier to get all the produce home. While my husband and I were harvesting, the children were transporting the crop home with the push truck. We made bigger farm this year but it took us fewer days to harvest and transport all produce home than the previous year when we made smaller farm.*" *(Lome, beneficiary, female, interview April 2002).* The use of the push truck also saved some farmers the time and energy to construct cribs at farm for storing maize. One farmer said "*I did not need to build a crib at my farm this year. With the push truck I was able to transport all my maize in a day. It had taken me a week or more to construct a crib in the past. The construction of crib was necessary to ensure that maize was not exposed longer to the adverse weather and rodents since it took us longer time to transport all maize home with headloading*" *(Adabra, beneficiary, male, interview March 2002*).

Farmers also recounted other advantages associated with the use of IMTs in addition to the time saving and the reduction in drudgery. A female farmer said "*The place I farm is farther from the village and it takes a couple of weeks to transport all maize to the village during the peak harvest in September. In the past I have had some maize destroyed by rodents or rainfall or stolen by thieves. However, with the push truck I was able to transport all maize to the village within two day. This saved me some time and energy and reduced the chance of maize deteriorating under the influence of rainfall or being destroyed by rodents*" *(Adabra, beneficiary, female, interview March 2002).* Farmers in Lome and Adabra gave similar reasons.

The IMTs did not only improve the timeliness of load transport but also improved the timeliness of planting among some users. One farmer said "*I cultivated a large plot of oil palm, cashew and citrus this year. The seedlings were heavy and could have taken my wife and me many weeks to transport to the farm and this could have delayed the planting. The children and I used the push truck to transport all the seedlings while my wife and my sister were doing the planting. Within a week after the planting the rain stopped. Without the push truck the planting would delay, I would have then missed the rain and many seedlings would die*" *(Lome, beneficiary, male, interview March 2002).* A Few other farmers also cited instance where push truck enabled them to transport bulky planting materials from village to farm.

Labour continues to walk to farm, probably because the IMTs provided were mostly more suitable for the evacuation loads rather than humans. Only the few people who purchased bicycles indicated that it assisted them in trips to farm. It enabled them make two or more trips on a given day to two or more cultivated plots at entirely different locations (See cited cases in section 5.2.2 and 5.2.4). The bicycle thus improved the mobility of labour and in instances where farmers had to keep plots at different locations for reasons such as non-availability of enough land at one location, IMTs could make working on these plots easier. Improved mobility through the use of IMTs could also influence the cultivation of vegetables, which require frequent farm visits. The study did not observe a lot of the effect of fast moving IMTs such as bicycle because the numbers requested and supplied were fewer. However, the available few gave some indications that IMTs have the potential to improve labour mobility and hence improve labour productivity.

5.4.2 Labour availability in the study period

Overall, labour was scarcer in the end year than the base year: 22% of respondents (11 control and 9 beneficiaries) indicated that it was easier for them to obtain labour in the end year than base year, while 33% (12 control and 18 beneficiaries) said it was more difficult to obtain labour in end year than base year. The remaining 43% believed labour availability remained the same in both the base year and end year. No respondent made direct reference to IMT availability as a major factor that influenced general labour availability in the villages. Probably the observed improvements in the farming systems over the study period generated a higher labour demand which masked the limited labour made available through the use of IMTs. Those who found labour to be relatively scarce in the end year attributed this to:

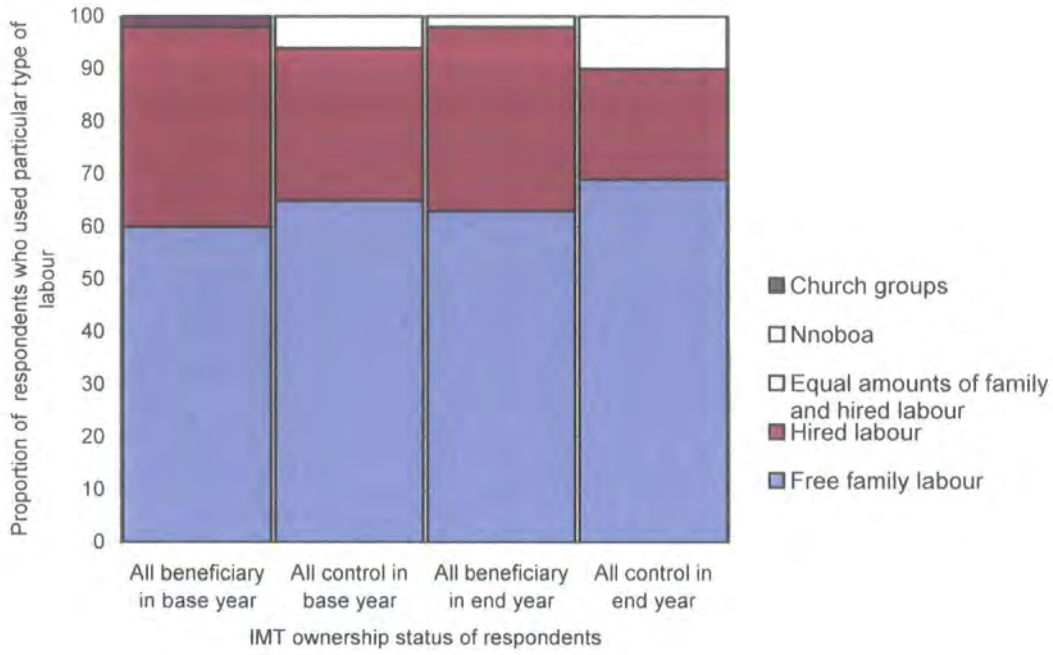
- Increased farm cultivation across the villages owing to poor yield in the previous year, improved crop prices in the previous year and the need to improve food security within the farm family.
- Perceived increase in out-migration of labour in the end year than base year.
- The fixing of farm labour wage in Lome which did not allow labourers to charge their own (higher) prices.

Those who suggested labour was more available in the end year than the base year cited reasons such as:

- Availability of *nnoboa* groups in Adabra and church groups in Lome to provide paid labour.
- Financial hardship in end year and the need to generate income to support family.
- Relatively lower out-migration of labour in the end year than base year.

There was an increase in the proportion of respondents who used free family labour as the major source and a decrease in those who used hired labour as the major source. Fig 5.31 shows the major sources of labour used by respondents in the base year and end year.

Fig 5.31 ALL VILLAGES: Major sources of labour used by all respondents across all villages in the base year and end year



Over the study period there were increases in the proportion of respondents who used family labour and nnoboa and a reduction in those who used hired labour and church groups as major sources of labour. The increase in proportion of respondents who used family labour is partly attributed to the relative scarcity of hired labour and availability of IMTs in the end year. One farmer said "*I used to hire labour to reweed my farm in August-October when my family and I are engaged in harvest and transport of maize. With the push truck we complete the transport of maize on time and did the reweeding ourselves" (Lome, beneficiary, male, interview, April 2002).*

Poverty, particularly in Abora, restrained some farmers from hiring labour. A female farmer in Abora said, "*Labour and money are the main problems in the village. I did not have enough money to travel outside the village to bring labour to work for me as other farmers did. I could not even raise enough money to hire labour within this village and so had to use own strength" (Abora, control, female, interview March 2002).* In Abora the labour non-availability limits the

uses of IMTs. This is the case of the Abora women's push truck. The women themselves could not operate it neither could they find a man to operate it for a fee. This shows that IMTs themselves, depending on the type, require some amount of labour before they can make the needed impact.

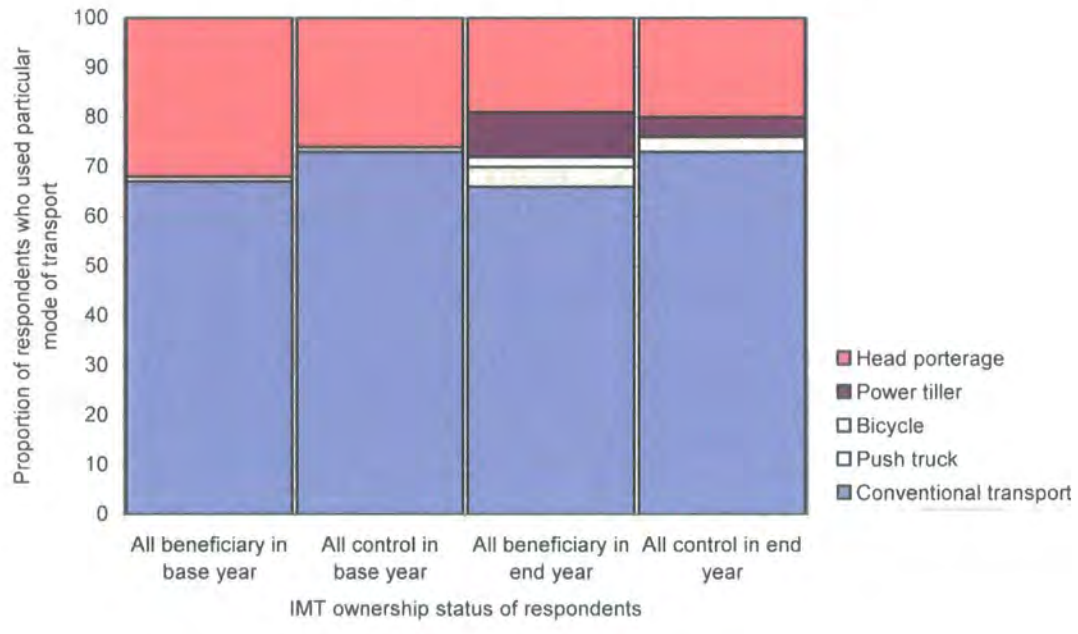
5.5 Market access and patterns of trade

The IMTs influenced crop marketing in the study villages in a number of ways. The IMTs influenced access and trips to market, marketed output, introduction of new cash crops and the location of sale of crops. However, the effect of IMTs on marketing is determined by many factors including the conventional transport situation, road conditions, distance to markets, the degree to which walking and headloading dominates market trips, volume of marketed items and availability of crop traders at the village. Other observations made included the synergy/complementary effect between IMTs and conventional transport and the amalgamation of loads among farmers to make trips less costly.

5.5.1 Changes in transport modes used for trips to market

There was limited use of IMTs for direct trips to markets in both the base and end survey. Fig 5.32 shows the transport modes used by respondents for direct trips to market. IMTs were mostly used for trips to market or to aid trips to market in Abora followed by Adabra and least in Lome. It was never used in Sampa for such purposes.

Fig 5.32: ALL VILLAGES: Graph showing the transport modes used by all respondents across all villages for trips to market in base year and end year



The only village where IMTs were directly used to transport loads from village to market was Abora. The power tiller, a relatively fast moving and larger capacity IMT was used a lot in Abora and nearby villages for trips to markets. The push truck was also used to a lesser extent for direct trips to market by some people in Abora. Many people in Abora stated that the substitution of power tiller and push truck for headloading reduced drudgery and number of weekly trips to market (see Appendix II Box 1). The use of IMTs for travel and transport to markets was higher in Abora principally because:

- Regular conventional transport services are not available in the village
- The route to market is poor.
- The distance to market is short (see table 4.7).
- People frequently transport large volumes of loads to market (see section 4.8.2), and
- There is limited availability of crop traders at the village.

Farmers in Abora amalgamated fuelwood, charcoal, fish smoking sticks and maize, on several occasions and used the power tiller to transport to market in Apam or Ankamu.

People in Lome, Adabra and Sampa did not use IMTs for direct trips to markets probably because:

- Distances between these villages, particularly Adabra, and markets are relatively long (see table 4.7).
- The IMTs selected by beneficiaries in these villages are largely slow moving.
- Direct routes to markets are relatively better than that of Abora (see section 4.8).
- Conventional passenger transport services are relatively more available in these villages (see table 4.7).
- More crop traders are resident at these villages than Abora.

Conventional transport remained the major option for trips to market in Lome, Sampa and Adabra. However in Adabra the push truck was used a lot within and around the village to transport loads from satellite villages and homes to the roadside or village centre to board conventional transport to market. Both beneficiaries and control used the push truck for this purpose. The Adabra satellite villages were the major beneficiaries in this regard owing to the fact that they are away from the main roads used by conventional transport in the area. A woman from one satellite village said "*It is not easy to transport produce from our satellite village to the roadside to board vehicle to market. We used to headload it and we got tired even before we board vehicle to the market. I harvested a lot of produce this year and fortunately for me I could use the push truck to transport my loads to the roadside to board vehicle to market. This has made trips to market easier for me" (Adabra, beneficiary, female,*

interview September 2002). Other farmers and traders in Adabra expressed similar appreciation.

There were some instances in Adabra where bicycles were seen carrying humans and loads to and from the main road junction for onward journey to the market to sell produce or during the return journey from the market. A male bicycle owner also recounted several benefits he derived from the use of a bicycle (see Appendix II Box 3). Thus IMTs in Adabra were largely used to complement conventional transport services for trips to market. In Lome bicycles were also seen carrying humans but not loads to and from the market while there were several cases involving the use of push trucks to move produce from homes to the village centre to board *trotros* or taxi to market. The use of IMTs to aid market trips in Adabra and Lome but not in Sampa is also due to the fact that people in Lome and Adabra transport larger volumes of loads to external markets than Sampa.

5.5.2 Changes in access to markets and transport charges

Only Abora recorded a major change in the condition of the main road linking the village to a major road junction over the study period. The Abora – Ankamu road was paved immediately after the base line survey in 2000 (an "election" road). However, this did not lead to a major increase in the number of vehicles visiting the village (see Appendix II Box 1). The main roads in Lome, Adabra and Sampa were also graded once each over the study period. There was a slight improvement in the number of vehicles visiting Lome and Adabra and people attributed this to the grading of the roads and increased vehicle ownership in the villages. The road

Table 5.1 Changes in transport and marketing features over study period.

Criteria	Lome	Abora	Sampa	Adabra
Number of vehicle visits	Increased	Unchanged	Unchanged	Increased
Changes in main access road	Graded	Paved	No activity	Gravelled
Effect of change in road condition	Increased number of taxis and trotro	No change	No change	Increased number of taxis
Change in transport fares	Increased	Increased	Increased	Increased
Change in mode of transport from village to markets	No change	From headloading only to power tiller, push truck & headloading	No change	No change
Change in mode of transport from house to village centre/roadside	From headloading only to largely headloading and some push truck	Not applicable	No change: headloading in both years	From headloading only to push truck and headloading

Sources: author's survey data

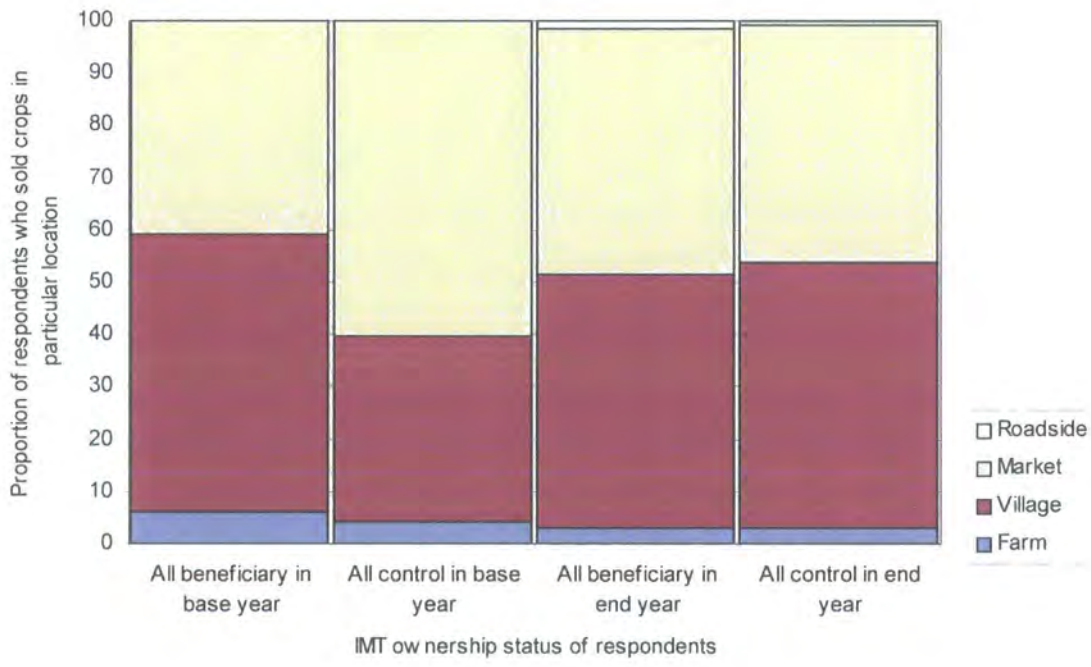
Improvements increased drivers' willingness to visit the villages. Also vehicle ownership in Lome increased from one to three *trotros* and one taxi. These run from the village to the Dawurampong and Swedru markets. Four people in Adabra also acquired taxis during the study period and two of these run from the Akoti Junction to Kwanyako through the Adabra village. The traffic count exercise associated with the larger project supports this observation.

Transport charges to markets increased slightly over the study period. This change was largely the results of nationwide fuel price increases rather than changes in physical accesses, slightly improved conventional transport or IMT availability in the villages.

5.5.3 Changes in the location of sale of crops

The location of sale of crops did not change over the study period. Fig 5.33 shows the locations where crops were sold in the base year and end year. There was a reduction in the proportion of beneficiaries who sold their crop at farm and village and an increase in those who sold crops at external markets. By contrast, there was an increase in the proportion of control members who sold crops at village and a decrease in those who sold at markets and farm.

Fig. 5.33 ALL VILLAGES: Graph showing the proportion of all respondents across all study villages who sold crops in particular locations in the base year and end year (Figures represent percentage of respondents)



The use of IMTs enabled some farmers to move crops to locations where buyers were available and prices were better. Five people from Abora and Adabra (4 beneficiaries and one control) observed that the availability of IMTs enabled them change the location of sale of their produce. These included a woman and a man in Adabra who used the push truck and bicycle respectively to hawk gari and other goods round nearby villages (see also Appendix II Boxes 2 and 3). Some of the villages visited were very far away and they could not visit these in the past by walking and headloading. An elderly farmer said, "*The major crop I cultivate is cassava. It is very heavy and I cannot headload it in larger quantities from farm to village. I therefore sold it at farm to the gari processors at the village in the previous year. This year I harvested the cassava in larger quantities and hired a push truck to transport it to the village and process the gari myself and I had better price than last year" (Adabra, control, female, interview April 2002).* In this instance the push truck not only assisted the farmer to change the location of sale of crops but also enabled her to add value to the crop. The value addition can enable farmers to store crop over time and/or improve the price.

5.5.4 Changes in marketed output.

The study observed that the quantity of crops sold increased over the study period among a large cross-section of the respondents: 70% control and 72% beneficiary said they marketed more produce in the end year than the base year. On the other hand 20% control and 26% beneficiaries said they marketed less produce in end year while it remained the same for 10% control and 2% beneficiaries. Major reasons given for the increase in marketed output were good yield due to good weather and other factors, increased cultivated area, reduced crop losses, increased crop diversity, improved crop prices, increased family and hired labour, the availability of IMTs and improved conventional transport services. The fact that some farmers whose marketed output increased over the study period attributed this to increases in their farm production, which was also partly attributed to IMT availability, implies that the IMTs influenced marketed output.

At Abora, one of the women beneficiaries observed that the availability of the power tiller to take harvested produce to market when no conventional vehicle was available also encouraged her to make a larger farm. IMTs also led to increased production of particular crops for sale. This is particularly the case of Abora (see Appendix II Box 1) and Adabra (see Appendix II box 2). In Abora there were instances of increased marketed output and increased diversity of marketed crops owing to the availability of IMTs. Two women beneficiaries observed that the availability of the power tiller to take produce to market encouraged them to make larger farms and hence sold larger volumes of crops than the year before. An elderly farmer also said "*I produced tomato, pepper and garden eggs this year. These crops rot easily and I did not*

produce them in the past because I am old and cannot headload them to the market to sell. I cultivated them this year because the power tiller can always take it to the Apam market for sale" (Abora, beneficiary, female, 70 years old, interview April 2002).

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of findings

6.1.1 Influence of IMTs on farm production

The study observed that IMT availability has had some influence on the location, distribution, size and cropping pattern of cultivated plots in farming systems in the four Gomoa villages studied. The availability and uses of IMTs influenced farmers' decision to move farms to IMT-accessible locations. This involved the cultivation of plots closest to the villages since routes to farms are wider at the immediate outskirts of the villages.

IMTs were associated with an increase in the number of cultivated plots and improvement in the mobility of farmers and farm labour. Bicycles were particularly important in this respect as they facilitated frequent and regular trips to farms at different locations. However, this change appears to have been constrained to an extent by the inability of some farmers to obtain land at one location and the need to cultivate plots at different locations owing to certain comparative advantages of those locations.

IMTs also influenced labour productivity. The availability and uses of IMTs contributed toward an increase in total cultivated area per farmer. Separate farm sizes did not increase but total cultivated area per farmer increased.

Both the cropping practice and the quantity of particular crops cultivated were also influenced by IMT availability and use. There was an increase in monoculture plots and a decrease in intercropped plots. Although, the dominant crops cultivated in the area did not change, there was an increased diversification of crops among farmers, with isolated cases of newly introduced crops into the area. Bicycles had some influence on the cultivation of perishable and labour intensive crops, particularly through improvements in labour mobility, while large capacity IMTs had some influence on the cultivation of bulky crops.

IMTs influenced the farm production of the beneficiaries more than the control group. The relocation of farms to IMT-accessible locations and increases in cultivated area were higher among the beneficiaries than the control group. This was due in part to the fact that many members who did own IMTs had to pay for the services of IMTs.

IMT availability and use influenced farm production of both men and women. However, the mechanism by which it impacted on males' farm production differs from that of females'. Men benefited through their physical ability to clear a larger land area and their relatively sound

financial position which enabled them to acquire the needed inputs including land in order to be able to use the IMTs. Men acquired more land at new locations more than women. Women on the other hand saved time through the substitution of IMTs for headloading and this enabled them to expand their cultivated plot/area. IMTs influenced the cultivated area and cropping pattern of women more than men. On the other hand IMTs influenced relocation of farms among males more than females.

The particular significance of IMTs in influencing farming in the study area depends upon social relationships, physical characteristics of the villages and the economic and financial conditions of farmers. The use of IMTs by non-owners was limited by their inability to pay for the equipment. Poverty affects farmers' ability to acquire IMTs and hence can impede the scope of adoption in the area. This is reflected in the poor repayment achieved for the project IMTs as indicated by reported of R7575.

The existence of strong extended family and communal relationships (social ties) in the area has a mixed effect on the uses of IMTs. On one hand the stronger social ties gives people some free right to the use of their neighbours' facilities including IMTs. This encouraged increased use of IMTs among non-owners and hence increases the overall effect of IMTs in such settlements. On the other hand, the free family and communal labour available for load transport and related tasks discourages people from purchasing or hiring IMTs.

Land availability and cost limits the size and the distribution of farms and the cropping pattern (suitability of soil/land for particular crops). Land has the potential to limit the influence of an innovation on farm production in the area, though this differs from one village to another.

Labour non-availability is a major limitation to farming in the area and had a major influence on the observed changes in farming. By partially replacing headloading and reducing the time and energy used to transport loads between farms and villages, IMT led to some improvements in the labour situation in the area. This was a major advantage since labour is particularly scarce and expensive in the peak harvest season. However, there was evidence that most farmers preferred to headload in off-peak period when loads are smaller.

Other factors that influenced the observed changes in the farming system over the study period were improved crop prices, availability of time, the need to improve food security, anticipated good rainfall, land rotation, change in soil fertility pattern, presence of pests, type of tenancy agreement and physical access conditions.

6.1.2 Influence of IMTs on marketing

IMTs influenced the number of trips to markets, marketed output, introduction of new crops and change in location of crop sale. The effect of IMTs on marketing is determined by the conventional transport situation, road conditions, distance to markets, the degree to which walking and headloading dominates market trips, volume of marketed items and availability of traders. The influence of IMTs on crop marketing was larger in areas where access routes to markets are poor, distance shorter, conventional transport service poorer and crop traders are not common at the village. In such areas IMTs partially replaced headloading. On the other hand, IMTs played a complementary role in areas where conventional transport is the major mode for trips to markets but people had to headload crops to a more accessible location in order to catch such conventional transport.

IMTs were also associated with an increase in marketed output through their effect on farm production. The increased output was largely limited to the dominant crops in the area. Crops were mostly sold in the village and nearest markets. There was an increase in the number of beneficiaries and a decrease in the control members who sold their crops at external markets. The on-farm use of IMTs also contributed partly to a reduction in the sale of crops at field.

6.2 Constraints to the uses of IMTs

Certain physical and socio-economic constraints limited the uses of IMTs in the study area. Paramount among these factors were non-availability of funds, land and labour, communal labour obligations, lack of IMT-accessible routes and other physical barriers on farm routes and lack of substantial load at many times of the year. The physical barriers include unbridged streams, hilly spots, muddy and flooded spots, fallen trees and tree stumps across farm routes.

6.3 Limitations of the study

There were some limitations associated with the study. In the first place it was difficult to isolate the specific influence of IMTs on farm productivity from those caused by other factors such as land, labour, availability of funds etc.

Secondly, the limited time over which the uses of the IMTs were monitored did not allow farmers sufficient time to adjust and to reallocate their resources in order to reap the full potential of the IMTs.

Furthermore, the sample size was relatively small and in a way limited the degree to which the results could be generalised.

Finally, differences in characteristics among the villages led to variations in the observed changes among the villages. However, this meant it was difficult to generalise results.

6.4 Conclusion

The study concluded that IMTs can make some positive impacts on farming and marketing in off-road areas. There was an increase in farm size, farm productivity and marketed output associated with the use of IMTs in the four study villages. IMTs also influenced changes in farm location and distribution, location of sale of crops and labour mobility and availability.

There were observed changes in the use of space and travel pattern, particularly for farming and marketing activities, in the study area. IMTs enabled some people to move to distant plots to cultivate plots. Others also moved to more accessible locations in order to be able to undertake bulk transport with the IMTs. The improved mobility enabled people to expand production, largely by cultivating more plots than before. In many instances individuals cultivated separate plots that were farther apart.

The IMTs really led to increased participation in external markets. This was observed in the form of increased marketed output. This led to the inclusion of men in the external marketing processes – transport of crop to market with IMTs and the actual sale of crops at the market – activities that were solely performed by women in the past.

The influence of IMTs is determined by other factors such as availability of funds, land and labour, produce prices, rainfall pattern and the consumption needs of the farm family. Poverty and scarcity of land and labour in the area place a major limitation on the scale of farm production and hence do not allow farmers to take advantage of opportunities provided by the improved transport services. Physical features and the availability of free family and communal labour influence the direct use of IMTs. Stream crossing points, hilly terrain, narrow paths and muddy spots place a major limitation on locations where IMTs could be taken. Hence farmers still could not cultivate lands at inaccessible locations that have high agricultural potential. The degree to which IMTs influence farming differs between IMTs owners and non-owners and between males and females.

The impact of IMTs could be higher if the physical and socio-economic constraints to their uses are minimized and if other non-transport constraints limiting farm production are alleviated. Future studies on IMT adoption and uses should consider the constraints to IMT use and the limitations of the present study.

There is the need to scale up the research to achieve a larger sample size and to conduct monitoring over a longer period of time before any firm policy recommendations can be made. A larger sample size will also provide greater confidence in the results and allow for broader generalisation of results.

Finally, this research has made a major contribution to knowledge by providing such detailed observations, case studies and analyses on the impact of IMTs on Agricultural production and marketing in rural areas in developing countries which may not be found in many such studies. These days not many researchers go to the field to undertake such detailed and long period of survey owing to time and other resources constraints. As a result many studies of this kind do not provide in-depth understanding of the transport situation in rural areas as this study has done.

It is my contention that empirical work of the nature undertaken in this thesis can, although obviously specific to a certain extent to the field area, add to the overall sum of knowledge about the importance of IMTs in African development. In addition we can now say more about the relationship between IMTs and the various constraints to farming that make villagers lives difficult.

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APPENDICES

Appendix I

Maps showing the locations of respondents' farms in the end year and the trafficability of major access routes linking the study villages to the farms in wet and dry season
(maps are located at pages 137 – 140)

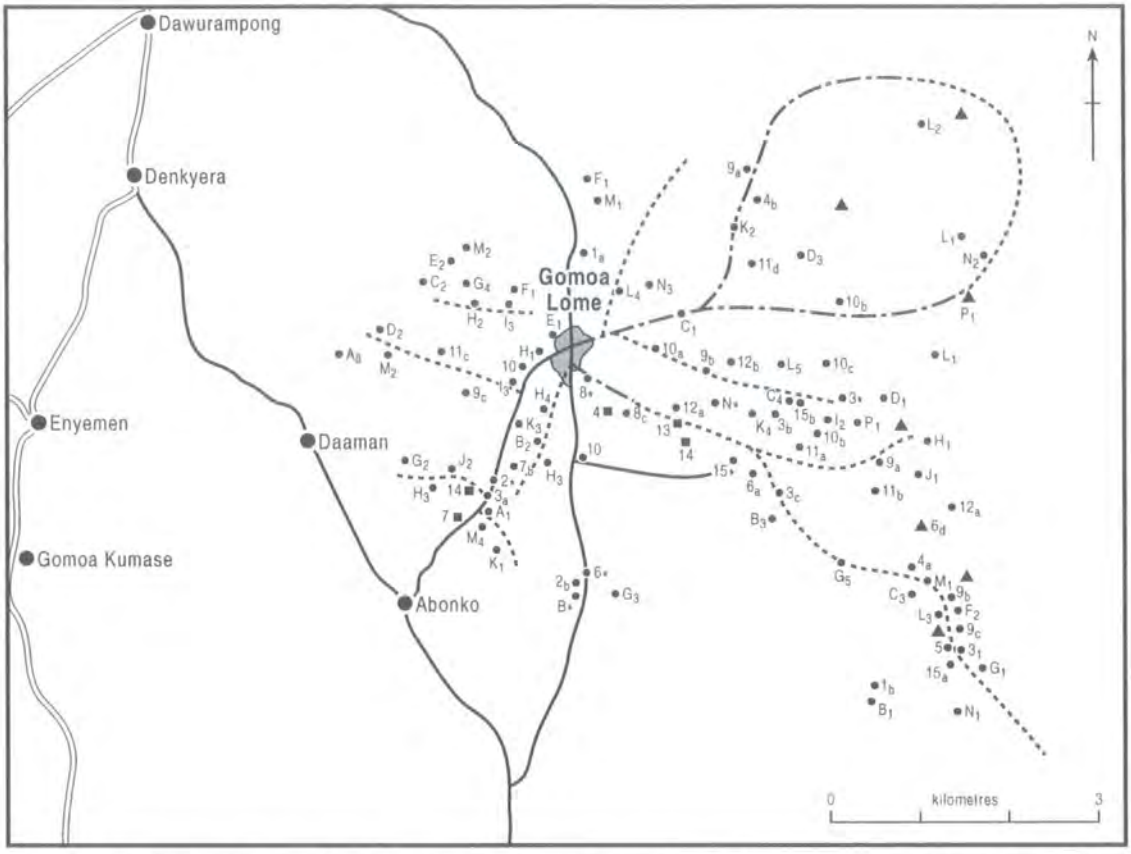

Figure A1: Gomoa Lome farm locations and road / path trafficability in wet season, 2002

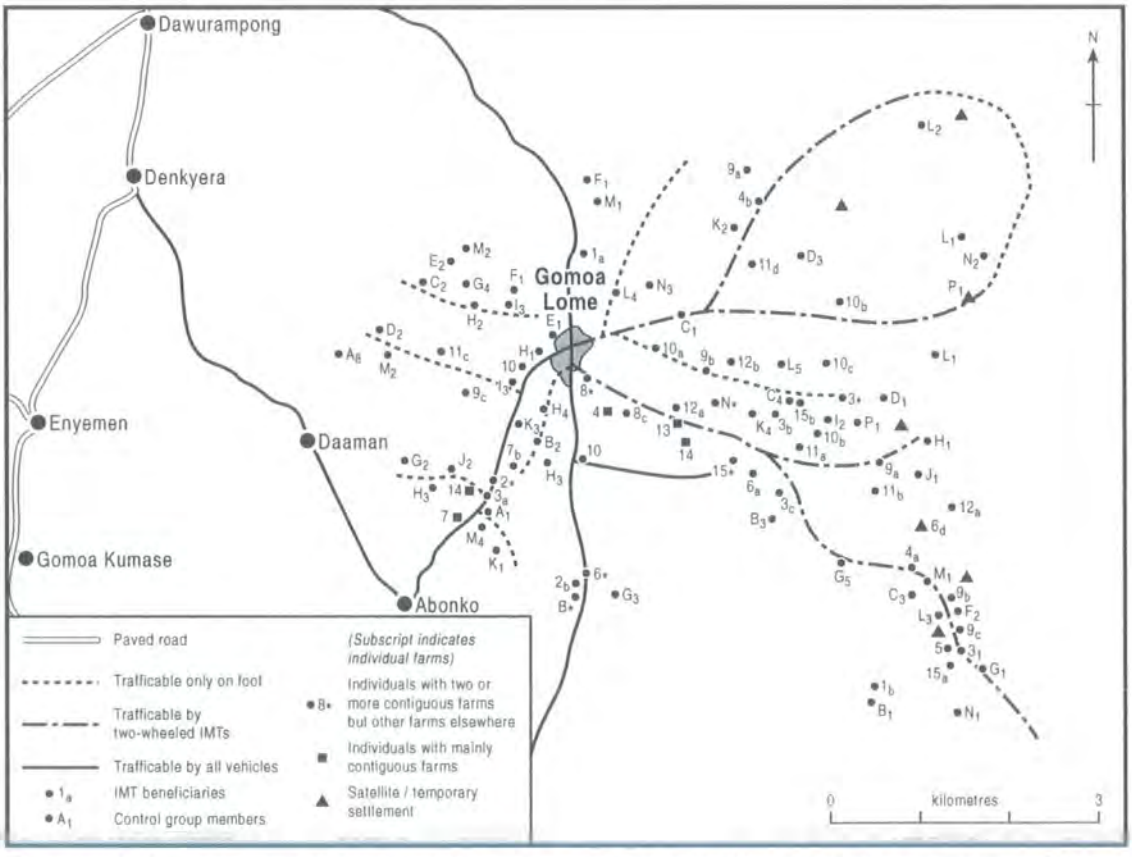

Figure A2: Gomoa Lome farm locations and road / path trafficability in dry season, 2002

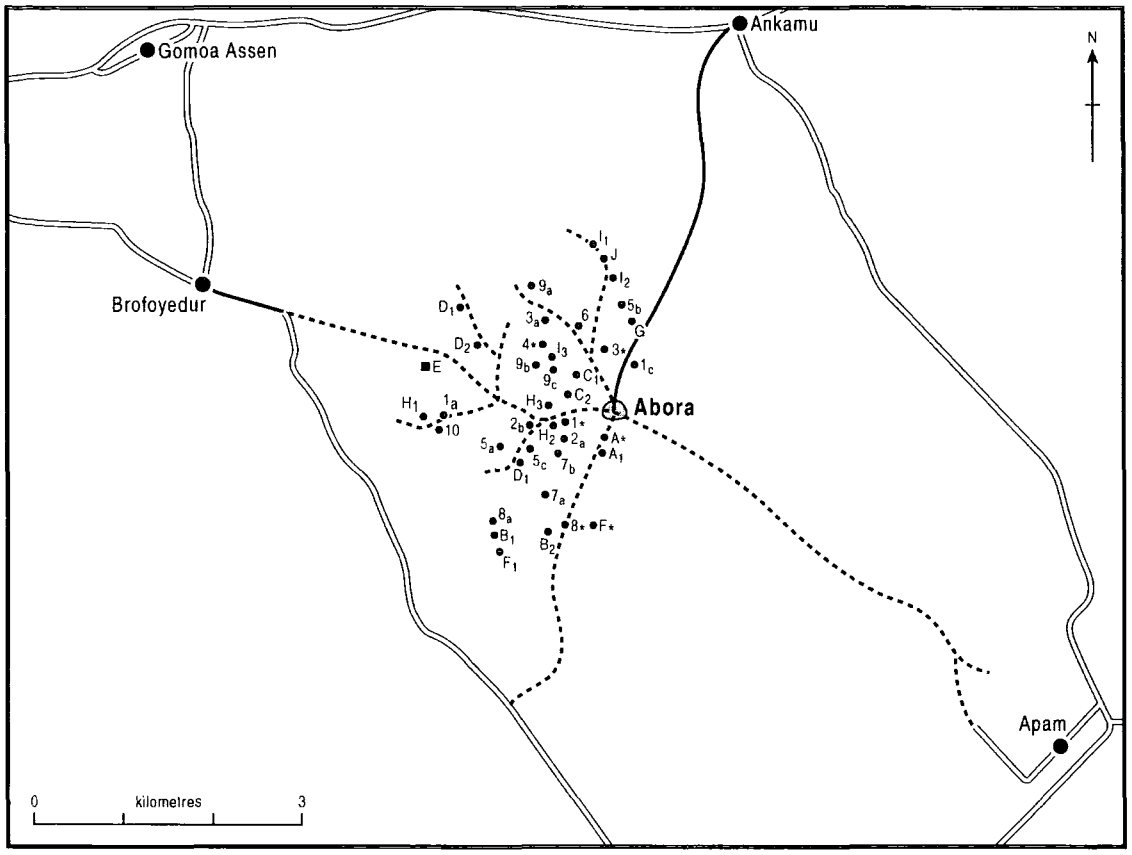

Figure A3: Gomoa Abora farm locations and road / path trafficability in wet season, 2002

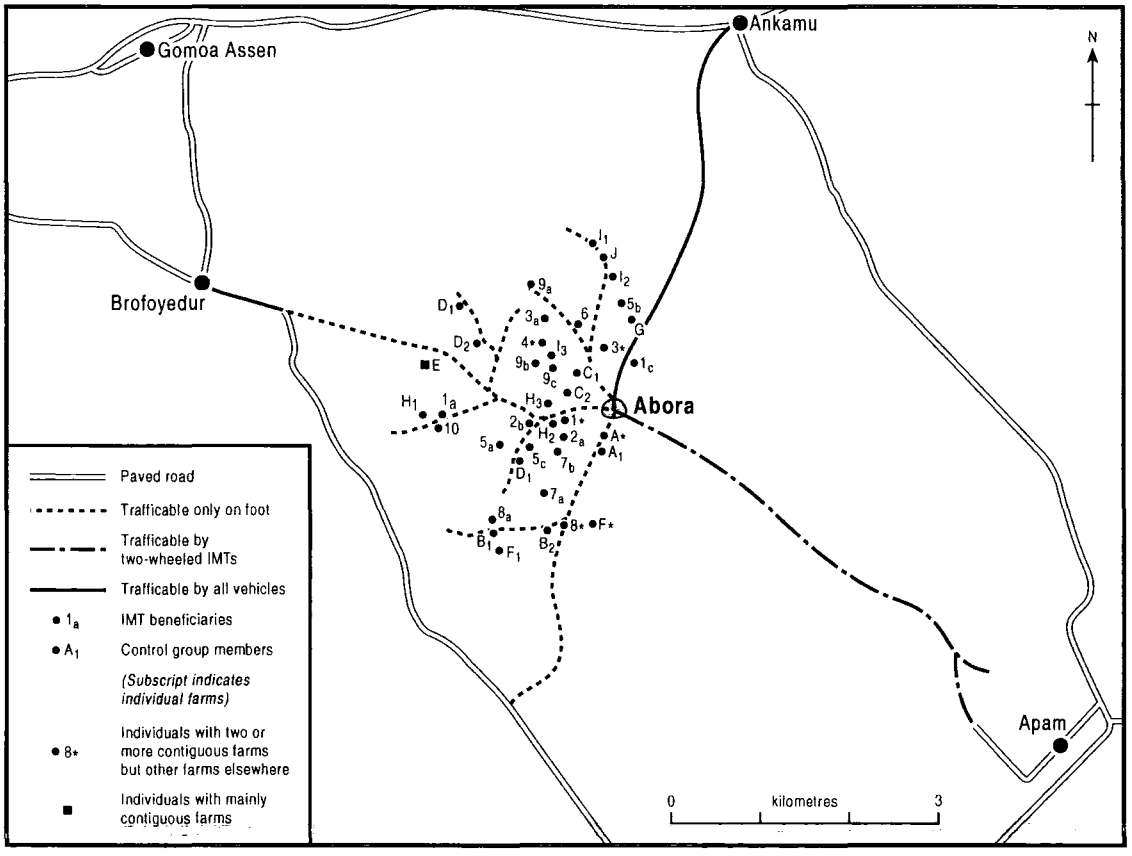

Figure A4: Gomoa Abora farm locations and road / path trafficability in dry season, 2002

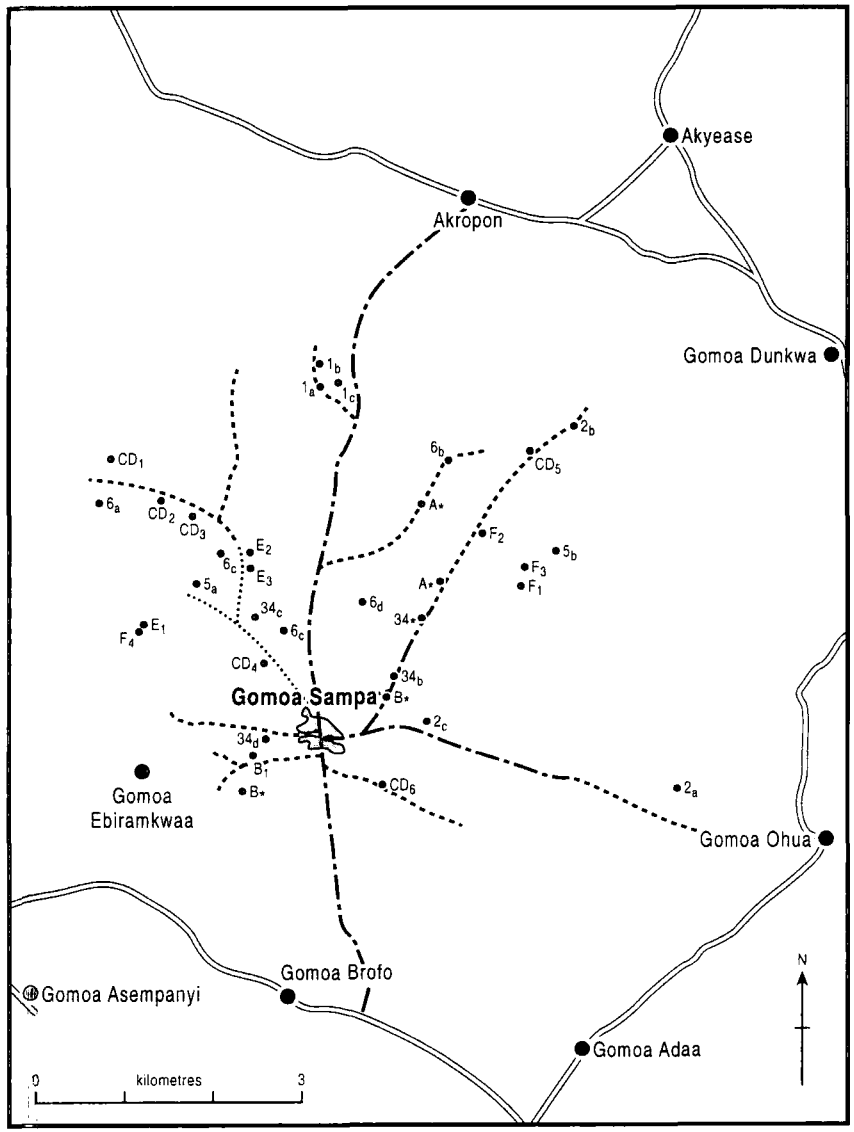

Figure A5: Gomoa Sampa farm locations and road / path trafficability in wet season, 2002

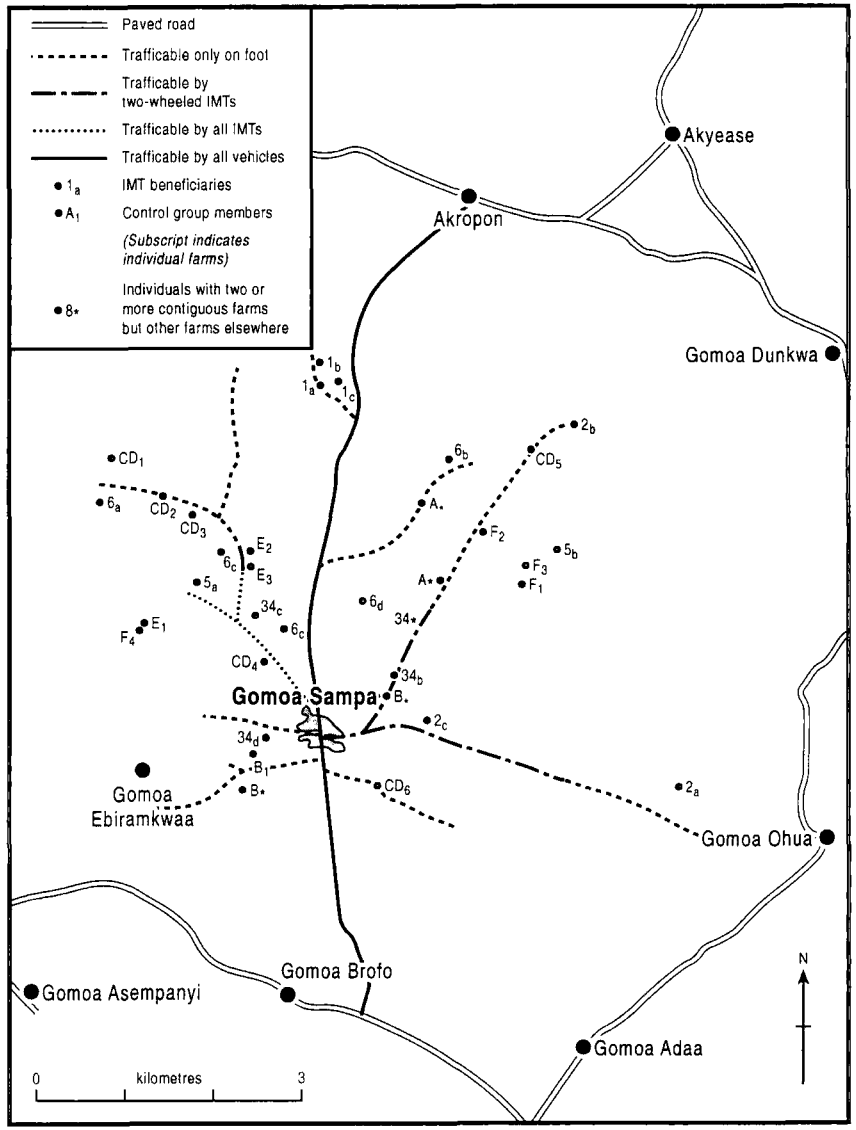

Figure A6: Gomoa Sampa farm locations and road / path trafficability in dry season, 2002

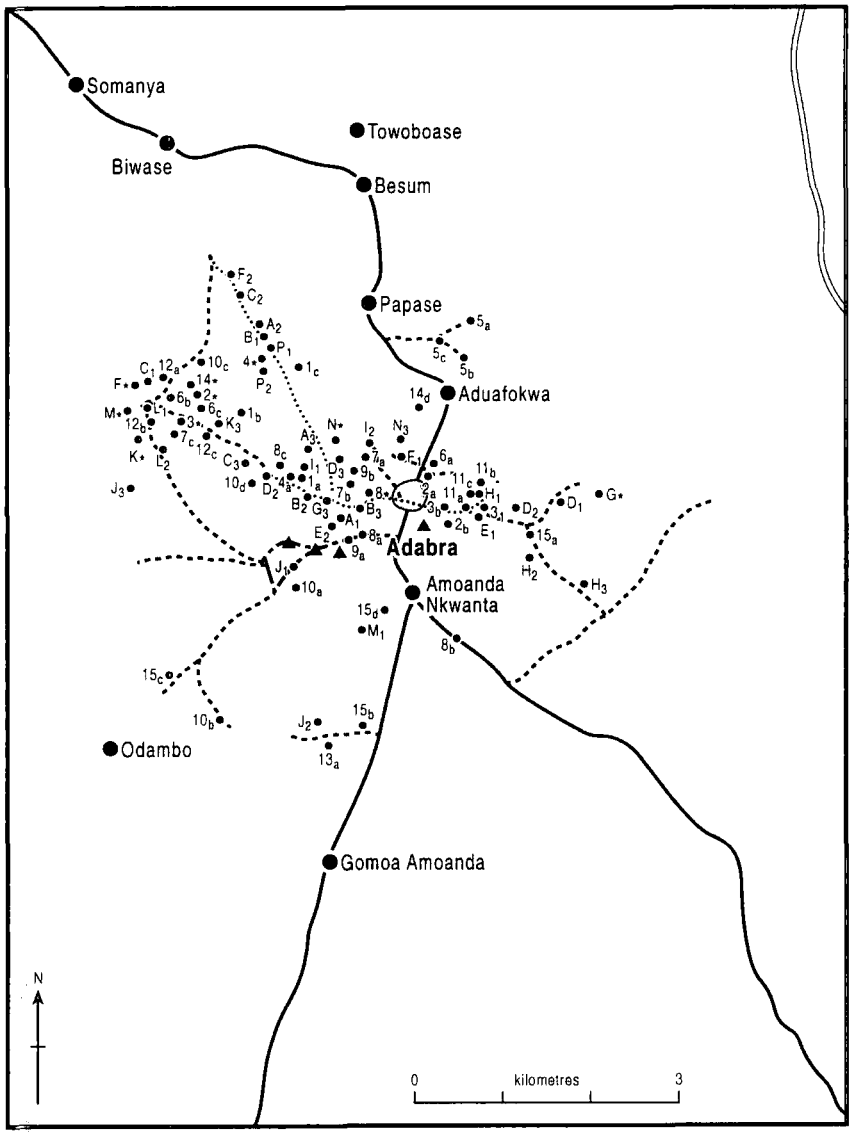

Figure A7: Gomoa Adabra farm locations and road / path trafficability in wet season, 2002

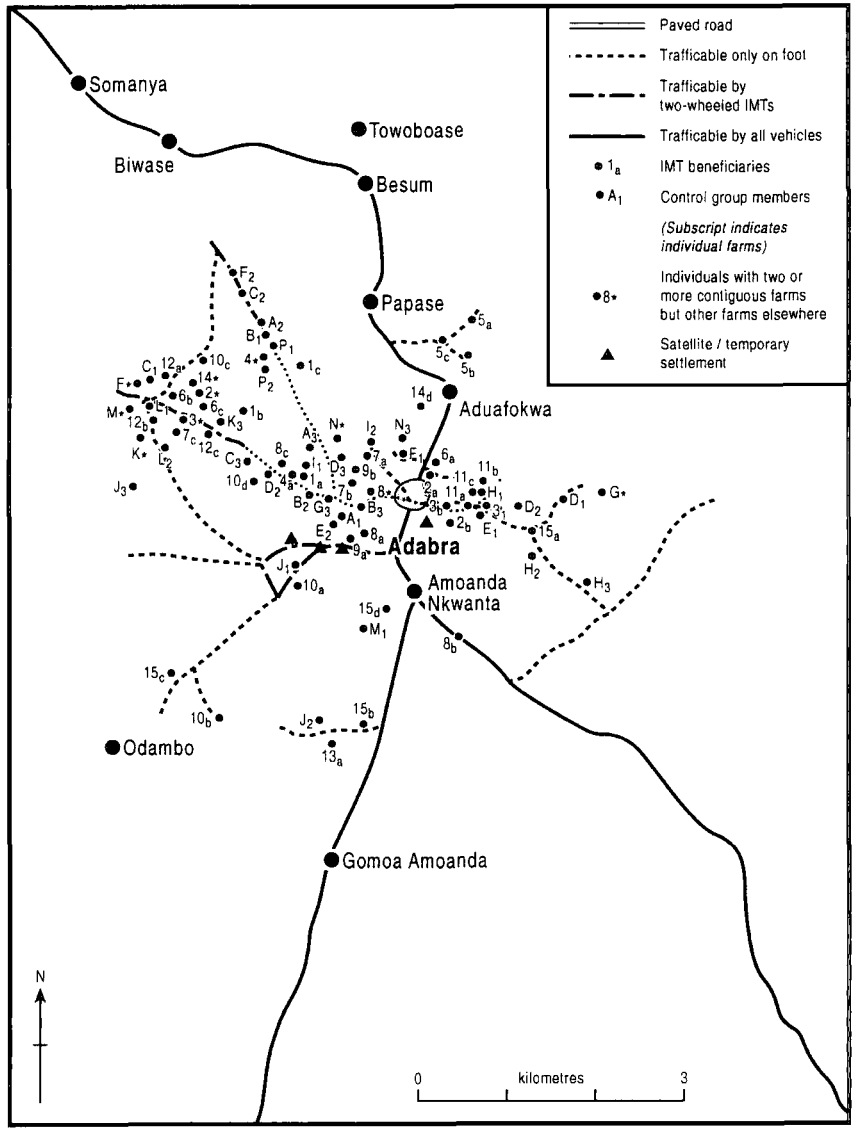

Figure A8: Gomoa Adabra farm locations and road / path trafficability in dry season, 2002

Appendix II

Selected case studies

Box 1: Changes in accessibility in Abora and their impact

The sale of fuelwood:
In the base year people in Abora used to make an average of 3 – 5 market trips in a week mainly by walking and headloading. However, with the availability of the power tiller and push trucks in the village most people no longer headloaded loads to market. They relied on these IMTs for a larger proportion of trips to Apam market. The major commodities taken to market for sale by people in Abora are fuelwood and charcoal. With the availability of IMTs the marketing technique changed. People now assemble fuelwood over several days and use the power tiller to transport all in a single trip. The average weekly trip had therefore reduced to once or twice a week or fortnight in the end year survey. The use of the power tiller and push truck also led to an increase in the quantity of fuelwood, charcoal, pestles and fish smoking sticks sold in the end year compared to the base year and this increased their income. Some farmers started the planting of trees on their cultivated plots. The aim of this, according to the farmers, was to replace the trees they cut for fuelwood, charcoal, pestles and fish smoking sticks and also to provide a future source of fuelwood particular for sale. It is hoped this mechanism will be adopted by a larger cross-section of the people in the village to help mitigate environmental problems that could result from the cutting of trees in the village.

Resident specialised traders:
The IMTs also provided options for specialised traders at the village who purchase produce in large quantities from external markets. Unlike the base year when the specialized traders in the village relied mainly on hired taxi to transport goods from the main road junction (Ankamu) to the village, in the end year they had the option to use the handcart, push trucks, power tiller or hired taxi. The traders preferred the handcart in situations where they had to operate it themselves, usually with the help of their children. However, these traders preferred the push truck when an elderly male was available to operate it. The IMTs were preferred because traders tend to pay less for IMT services than hired taxis.

Improvement in main access route:
The 3.3 km road linking Abora to Ankamu was paved in late 2000 (just prior to national election). However, this failed to improve vehicular flow between the village and Ankamu since it is not a through route and ends at the village. No regular commercial passenger services commenced on this road and hired taxis still remained the only option by which people travelling from the junction (Ankamu) could reach the village. The fares paid for hired taxis also did not decrease following the paving of the road. Nonetheless, taxi operators were more willing to use their vehicles on the paved road than when it was not paved. The people at the village would have preferred the grading of the footpath to the market to the paving of this road.

Box 2: Cassava processing business in Adabra

In Adabra some people increased the cultivation of cassava in the end year which they processed into Gari and cassava dough for sale. The IMTs in Adabra enabled farmers to transport produce from farm to the village. It also enabled farmers to transport peeled cassava in larger quantities to milling points within the village to process, and to the roadside to await *trotros* or mammy wagons to the market. Two mill operators at the village acknowledged increases in their milling operations and cash proceeds. One of the mill operators devised a business strategy with the push truck he purchased through his wife. He usually sent his children to visit farmers' homes and occasionally farms (including farmers in nearby villages) with the push truck to transport their peeled cassava to the mill for free. In this case the operator was able to increase his milling activities and hence his income. Many farmers were happy with this arrangement since they did not have to headload, neither did they have to pay to obtain a push truck (hire) from the owners to transport their cassava to the mill. The ripple effect was that IMT availability led to increased cultivation of cassava which generated more loads. Some people hired IMTs to transport the increased load, though many enjoyed free transport services with the mill operator's push truck, and this generated income to IMT beneficiaries. The processing of the additional cassava also generated income for the mill operator. The farmer also generated more income through the sale of the additional crop.

There was a recorded incidence where a woman and her two children (a boy and a girl) used their push truck to hawk gari in the nearby village. In the base year they performed this hawking activity by walking and headloading. With the push truck they could transport large quantities of gari to distant villages. According to the woman she was able to supply larger quantities of the gari to her clients in these distant villages.

Box 3: IMT and male participation in trading in Adabra

Bicycle and market trips:
People in Adabra have to wake up early in the morning in order to catch one of the few *trotro*/mammy wagons which visit the village on market days. Some people manage to wake up early but could still miss the vehicles owing to the limited space availability. One bicycle owner in Adabra recounted how useful his bicycle helped him to visit the market without the need to rush for the *trotros* in the early morning. He rides his bicycle, sometimes with crops tied to the carrier, to the Akoti junction (a distance of 7.2 km to the nearest paved road) where it is easier to obtain vehicle to the market. He leaves his bike with friends who live a t the junction and board a vehicle to the market. When returning from the market, he buys soap, sugar, biscuits, toffees and drinks for resale at the village. He then joins a *trotro* travelling on the Accra–Cape Coast road and alight at the Akoti Junction. He then ties his purchased goods to the bicycle and ride back to Adabra. The bicycle thus saves him the trouble of waking up early on market days or returning early from the market for the fear of missing the few *trotro* which visit the village.

Bicycle and male trading:
Though very few men undertake trading in the study villages, they are hardly seen hawking goods in or around the villages. The sales of certain goods are traditionally done by women. However, the bicycle motivated a male trader to hawk goods round the villages. This man uses his bicycle to carry soap, sugar, biscuits, toffees and drinks and hawk them round the nearby villages. He admitted that the bicycle enbled him to carry more good at a time, travel longer distance and cover more villages than when he had no bicycle and his children used to do the hawking. This has led to an increase in sales and has enabled him to expand his business.

Appendix III

Tables showing major features of respondents' farms in base year and end year

i. Distance to plots cultivated by farmers

Table A1: Categorisation of plots cultivated by the beneficiary and the control group in the base year by distance from the village (Percentages in parentheses)

Distance from village to farm (km)	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
Plot A (0 – 0.5)	4 (9.3)	0 (0.0)	6 (24.0)	2 (13.3)	1 (5.6)	2 (8.3)	3 (10.3)	2 (8.0)	14 (12.2)	6 (5.7)
Plot B (0.51–1.0)	8 (18.6)	4 (9.8)	10 (40.0)	4 (26.7)	1 (5.6)	4 (16.7)	3 (10.3)	11 (44.0)	22 (19.1)	23 (21.9)
Plot C (1.1 – 2.0)	19 (44.2)	21 (51.2)	8 (32.0)	6 (40.0)	5 (27.8)	6 (25.0)	15 (51.7)	7 (28.0)	47 (40.9)	40 (38.1)
Plot D (2.1 – 4.0)	9 (20.9)	11 (26.8)	1 (4.0)	3 (20.0)	10 (55.6)	10 (41.7)	7 (24.1)	5 (20.0)	27 (23.5)	29 (27.6)
Plot E (4.1- 8.0)	3 (7.0)	5 (12.2)	0 (0.0)	0 (0.0)	1 (5.6)	2 (8.3)	1 (3.4)	0 (0.0)	5 (4.3)	7 (6.7)
Total	43 (100.0)	41 (100.0)	25 (100.0)	15 (100.0)	18 (100.0)	24 (100.0)	29 (100.0)	25 (100.0)	115 (100.0)	105 (100.0)

Source: Author's survey data

Table A2: Categorisation of plots cultivated by the beneficiary and the control group in the end year by distance from the village (Percentages in parentheses)

Distance from village to farm (km)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Benef-iciary	Control	Benefi-ciary	Control	Benef-iciary	Control	Benef-iciary	Contro l	Benef-iciary	Control
Plot A (0 – 0.5)	10 (19.2)	11 (20.8)	11 (45.8)	8 (36.4)	5 (22.7)	2 (7.7)	14 (29.8)	10 (23.8)	40 (27.6)	31 (21.7)
Plot B (0.51 – 1)	18 (34.6)	8 (15.1)	8 (33.3)	6 (27.3)	8 (36.4)	5 (19.2)	7 (14.9)	13 (31.0)	41 (28.3)	32 (22.4)
Plot C (1.1 – 2)	13 (25.0)	18 (34.0)	3 (12.5)	5 (22.7)	1 (4.5)	13 (50.0)	8 (17.0)	12 (28.6)	25 (17.2)	48 (33.6)
Plot D (2.1 – 4)	8 (15.4)	11 (20.8)	2 (8.3)	3 (13.6)	7 (31.8)	4 (15.4)	18 (38.3)	7 (16.7)	35 (24.1)	25 (17.5)
Plot E (4.1 – 8)	3 (5.8)	5 (9.4)	0 (0.0)	0 (0.0)	1 (4.5)	2 (7.7)	0 (0.0)	0 0.0)	4 (2.8)	7 (4.9)
Total	52 (100.0)	53 (100.0)	24 (100.0)	22 (100.0)	22 (100.0)	26 (100.0)	47 (100.0)	42 (100.0)	145 (100.0)	143 (100.0)

Source: Author's survey data

Table A3: Categorisation of pots cultivated by male and female respondents in the base year by distance from the village (Percentages in parentheses)

Distance from village to farm (km)	Settlement and gender of respondent									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	female	Male	female	Male	female
Plot A (0 – 0.5)	4 (8.2)	0 (0.0)	3 (37.5)	5 (15.6)	2 (7.1)	1 (7.1)	3 (13.0)	2 (6.5)	12 (11.1)	8 (7.1)
Plot B (0.51 – 1)	7 (14.3)	5 (14.3)	1 (12.5)	13 (40.6)	3 (10.7)	2 (14.3)	4 (17.4)	10 (32.3)	15 (13.9)	30 (26.8)
Plot C (1.1 – 2)	23 (46.9)	17 (48.6)	2 (25.0)	12 (37.5)	6 (21.4)	5 (35.7)	9 (39.1)	13 (41.9)	40 (37.0)	47 (42.0)
Plot D (2.1 – 4)	9 (18.4)	11 (31.4)	2 (25.0)	2 (6.3)	15 (53.6)	5 (35.7)	6 (26.1)	6 (19.4)	32 (29.6)	24 (21.4)
Plot E (4.1 – 8)	6 (12.2)	2 (5.7)	0 (0.0)	0 (0.0)	2 (7.1)	1 (7.1)	1 (4.3)	0 (0.0)	9 (8.3)	3 (2.7)
Total	49 (100.0)	35 (100.0)	8 (100.0)	32 (100.0)	28 (100.0)	14 (100.0)	23 (100.0)	31 (100.0)	108 (100.0)	112 (100.0)

Source: Author's survey data

Table A4: Categorisation of pots cultivated by male and female respondents in the end year by distance from the village (Percentages in parentheses)

Distance from village to plot (km)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Plot A (0 – 0.5)	14 (23.0)	7 (15.9)	1 (25.0)	18 (47.4)	3 (10.0)	4 (22.2)	11 (28.9)	13 (25.5)	29 (21.2)	42 (27.8)
Plot B (0.51 – 1)	17 (27.9)	9 (20.5)	4 (37.5)	10 (26.3)	5 (16.7)	8 (44.4)	9 (23.7)	11 (21.6)	35 (25.5)	38 (25.2)
Plot C (1.1 – 2)	13 (21.3)	18 (40.9)	2 (25.0)	6 (15.8)	12 (40.0)	2 (11.1)	5 (13.2)	15 (29.4)	32 (23.4)	41 (27.2)
Plot D (2.1 – 4)	12 (19.7)	7 (15.9)	1 (12.5)	4 (10.5)	8 (26.7)	3 (16.7)	13 (34.2)	12 (23.5)	34 (24.8)	26 (17.2)
Plot E (4.1 – 8)	5 (8.2)	3 (6.8)	0 (0.0)	0 (0.0)	2 (6.7)	1 (5.6)	0 (0.0)	0 (0.0)	7 (5.1)	4 (2.6)
Total	61 (100.0)	44 (100.0)	8 (100.0)	38 (100.0)	30 (100.0)	18 (100.0)	38 (100.0)	51 (100.0)	137 (100.0)	151 (100.0)

Source: Author's survey data

ii. Number of plots cultivated by farmers

Table A5: Number of separate plots cultivated by the beneficiary and the control group in the base year (Percentages in parentheses)

Number of farms	Settlement of respondent and IMT status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi -ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
1	2 (13.3)	2 (13.3)	2 (20.0)	5 (50.0)	0 (0.0)	0 (0.0)	4 (26.7)	5 (33.3)	7 (15.2)	11 (23.9)
2	4 (26.7)	4 (26.7)	3 (30.0)	5 (50.0)	2 (33.3)	0 (0.0)	8 (53.3)	10 (66.7)	18 (39.1)	20 (43.5)
3	5 (33.3)	6 (40.0)	3 (30.0)	0 (0.0)	3 (50.0)	2 (33.3)	3 (20.0)	0 (0.0)	12 (26.1)	8 (17.4)
4	3 (20.0)	2 (13.3)	2 (20.0)	0 (0.0)	0 (0.0)	2 (33.3)	0 (0.0)	0 (0.0)	6 (13.0)	3 (6.5)
5	1 (6.7)	1 (6.7)	0 (0.0)	0 (0.0)	1 (16.6)	2 (33.3)	0 (0.0)	0 (0.0)	3 (6.5)	4 (8.7)
Total	15	15	10	10	6	6	15	15	46	46

Source: Author's survey data

Table A6: Number of separate plots cultivated by the beneficiary and the control group in the end year (Percentages in parentheses)

Number of farms	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
1	1 (6.7)	1 (6.7)	2 (20.0)	2 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (6.5)	3 (6.5)
2	2 (13.3)	1 (6.7)	3 (30.0)	4 (40.0)	1 (16.7)	0 (0.0)	4 (26.7	6 (40.0)	10 (21.7)	11 (23.9)
3	2 (13.3)	5 (33.3)	4 (40.0)	4 (40.0)	2 (33.3)	1 (16.7)	7 (46.7)	7 (46.7)	15 (32.6)	17 (37.0)
4	6 (40.0)	5 (33.3)	1 (10.0)	0 (0.0)	1 (16.7)	2 (33.3)	2 (13.3)	2 (13.3)	9 (19.6)	9 (19.6)
5	4 (26.7)	3 (20.0)	0 (0.0)	0 (0.0)	2 (33.3)	3 (50.0)	2 (13.3)	0 (0.0)	9 (19.6)	6 (13.0)
Total	15	15	10	10	6	6	15	15	46	46

Source: Author's survey data

Table A7: Number of separate plots cultivated by male and female respondents in the base year (Percentages in parentheses)

Number of farms	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	2 (12.5)	2 (14.3)	2 (50.0)	5 (31.3)	0 (0.0)	0 (0.0)	6 (42.9)	3 (18.8)	10 (23.8)	10 (20.0)
2	4 (25.0)	4 (28.6)	1 (25.0)	7 (43.8)	2 (25.0)	1 (25.0)	7 (50.0)	11 (68.8)	14 (33.3)	23 (46.0)
3	4 (25.0)	7 (50.0)	0 (0.0)	3 (18.8)	3 (37.5)	1 (25.0)	1 (7.1)	2 (12.5)	8 (19.0)	13 (26.0)
4	4 (25.0)	1 (7.1)	1 (25.0)	1 (6.3)	1 (12.5)	1 (25.0)	0 (0.0)	0 (0.0)	6 (14.3)	3 (6.0)
5	2 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	2 (25.0)	1 (25.0)	0 (0.0)	0 (0.0)	4 (9.5)	1 (2.0)
Total	16 (100.0)	14 (100.0)	4 (100.0)	16 (100.0)	8 (100.00	4 (100.0)	14 (100.0)	16 (100.0)	42 (100.0)	50 (100.0)

Source: Author's survey data

Table A8: Number of separate plots cultivated by male and female respondents in the end year (Percentages in parentheses)

Number of farms	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	0 (0.0)	2 (14.3)	2 (50.0)	2 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.8)	4 (8.0)
2	1 (6.3)	2 (14.3)	0 (0.0)	7 (43.8)	1 (12.5)	0 (0.0)	6 (42.9)	4 (25.0)	8 (19.0)	13 (26.0)
3	4 (25.0)	3 (21.4)	2 (50.0)	6 (37.5)	2 (25.0)	1 (25.0)	7 (50.0)	7 (43.8)	15 (35.7)	17 (34.0)
4	8 (50.0)	3 (21.4)	0 (0.0)	1 (6.3)	2 (25.0)	0 (0.0)	0 (0.0)	4 (25.0)	10 (23.8)	8 (16.0)
5	3 (18.8)	4 (28.6)	0 (0.0)	0 (0.0)	3 (37.5)	3 (75.0)	1 (7.1)	1 (6.3)	7 (16.7)	8 (16.0)
Total	16 (100.0)	14 (100.0)	4 (100.0)	16 (100.0)	8 (100.0)	4 (100.0)	14 (100.0)	16 100.0)	42 (100)	50 (100.0)

Source: Author's survey data

iii Size of separate plots cultivated by respondents

Table A9: Size categorization of separate plots cultivated by beneficiary and control group in the base year (Percentages in parentheses)

Plot sizes (poles)	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
U (0 – 0.5)	3 (7.0)	4 (9.8)	6 (24.0)	4 (26.7)	4 (22.2)	2 (8.3)	10 (34.5)	10 (40.0)	23 (20.0)	20 (19.0)
V (0.51– 1)	18 (41.9)	12 (29.3)	10 (40.0)	6 (40.0)	6 (33.3)	7 (29.2)	9 (31.0)	9 (36.0)	43 (37.4)	34 (32.4)
W (1.1 – 2)	7 (16.3)	11 (26.8)	7 (28.0)	4 (26.7)	3 (16.7)	7 (29.2)	8 (27.6)	4 (16.0)	25 (21.7)	26 (24.8)
X (2.1 – 4)	8 (18.6)	6 (14.6)	2 (8.0)	1 (6.7)	5 (27.8)	8 (33.3)	2 (6.9)	2 8.0)	17 (14.8)	17 (16.2)
Y (4.1- 8)	5 (11.6)	5 (12.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (4.3)	5 (4.8)
Z (8.1– 15)	2 (4.7)	3 (7.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.7)	3 (2.9)
Total	43 (100.0)	41 (100.0)	25 (100.0)	15 (100.0)	18 (100.0	24 (100.0)	29 (100.0	25 (100.0)	115 (100.0)	105 (100.0)

Source: Author's survey data

Table A10: Size categorization of separate plots cultivated by beneficiary and control group in the end year (Percentages in parentheses)

Plot sizes (poles)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
U (0 – 0.5)	9 (17.3)	11 (20.8)	4 (16.7)	10 (45.5)	0 (0.0)	3 (11.5)	12 (25.5)	20 (47.6)	25 (17.2)	44 (30.8)
V (0.51–1.0)	16 (30.8)	17 (32.1)	12 (50.0)	6 (27.3)	10 (45.5)	8 (30.8)	18 (38.3)	10 (23.8)	56 (38.6)	41 (28.7)
W (1.1 – 2.0)	9 (17.3)	11 (20.8)	4 (16.7)	3 (13.6)	7 (31.8)	3 (11.5)	11 (23.4)	12 (28.6)	31 (21.4)	29 (20.3)
X (2.1 – 4.0)	13 (25.0)	5 (9.4)	3 (12.5)	2 (9.1)	5 (22.7)	11 (42.3)	5 (10.6)	0 (0.0)	25 (17.2)	18 (12.6)
Y (4.1 – 8.0)	3 (5.8)	7 (13.2)	1 (4.2)	1 (4.5)	0 (0.0)	1 (3.8)	1 (2.1)	0 (0.0)	6 (4.1)	9 (6.3)
Z (8.1– 15.0)	2 (3.8)	2 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.4)	2 (1.4)
Total	52 (100.0)	53 (100.0)	24 (100.0)	22 (100.0)	22 (100.0)	26 (100.0)	47 (100.0)	42 (100.0)	145 (100.0	143 (100.0)

Source: Author's survey data

Table A11: Size categorization of separate plots cultivated by male and female respondents in the base year (Percentages in parentheses)

Plot size (poles)	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	female	Male	female	Male	female
U (0 – 0.5)	2 (4.1)	5 (14.3)	1 (12.5)	9 (28.1)	4 (14.3)	2 (14.3)	6 (26.1)	14 (45.2)	13 (12.0)	30 (26.8)
V (0.51–1.0)	17 (34.7)	13 (37.1)	3 (37.5)	13 (40.6)	7 (25.0)	6 (42.9)	9 (39.1)	9 (29.0)	36 (33.3)	41 (36.6)
W (1.1 – 2.0)	10 (20.4)	8 (22.9)	2 (25.0)	9 (28.1)	9 (32.1)	1 (7.1)	6 (26.1)	6 (19.4)	27 (25.0)	24 (21.4)
X (2.0 – 4.0)	7 (14.3)	7 (20.0)	2 (25.0)	1 (3.1)	8 (28.6)	5 (35.7)	2 (8.7)	2 (6.5)	19 (17.6)	15 (13.4)
Y (4.1 – 8.0)	8 (16.3)	2 (5.7)	0 (0.0)	0 (0.0)	0 (09.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (7.4)	2 (1.8)
Z (8.1–15.0)	5 (10.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (4.6)	0 (0.0)
Total	49 (100.0)	35 (100.0)	8 (100.0)	32 (100.0)	28 (100.0)	14 (100.0)	23 (100.0)	31 (100.0)	108 (100.0)	112 (100.0)

Source: Author's survey data

Table A12: Size categorization of separate plots cultivated by male and female respondents in the end year (Percentages in parentheses)

Farm sizes (poles)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
U (0 – 0.5)	9 (14.8)	11 (25.0)	0 (0.0)	14 (36.8)	1 (3.3)	2 (11.1)	14 (36.8)	18 (35.3)	24 (17.5)	45 (29.8)
V (0.6–1.0)	22 (36.1)	11 (25.0)	4 (50.0)	14 (36.8)	12 (40.0)	6 (33.3)	9 (23.7)	19 (37.3)	47 (34.3)	50 (33.1)
W (1.1 – 2.0)	9 (14.8)	11 (25.0)	0 (0.0)	7 (18.4)	7 (23.3)	3 (16.7)	13 (34.2)	10 (19.6)	29 (21.2)	31 (20.5)
X (2.0 – 4.0)	11 (18.0)	7 (15.9)	2 (25.0)	3 (7.9)	9 (30.0)	7 (38.9)	2 (5.3)	3 (5.9)	23 (16.8)	20 (13.2)
Y (4.1 – 8.0)	6 (9.8)	4 (9.1)	2 (25.0)	0 (0.0)	1 (3.3	0 (0.0)	0 (0.0)	1 (2.0)	9 (6.6)	5 (3.3)
Z (8.1–15.0)	4 (6.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (2.9)	0 (0.0)
Total	61 (100.0)	44 (100.0)	8 (100.0)	38 (100.0)	30 (100.0)	18 (100.0)	38 (100.0)	51 (100.0)	137 (100.0)	151 (100.0)

Source: Author's survey data

iv. Total land area (landholding) cultivated by respondents

Table A13: Total land area cultivated by the beneficiary and the control group in the base year (Percentages in parentheses)

Total land area cultivated (poles)	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control
U (0 – 0.5)	0 (0.0)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	2 (4.3)
V (0.51 – 1)	1 (6.7)	0 (0.0)	0 (0.0)	3 (30.0)	0 (0.0)	0 (0.0)	2 (13.3)	2 (13.3)	3 (6.5)	5 (10.)
W (1.1 – 2)	0 (0.0)	0 (0.0)	4 (40.0)	5 (50.0)	0 (0.0)	0 (0.0)	4 (26.7)	9 (60.0)	8 (17.4)	14 (30.4)
X (2.1 – 4)	3 (20.0)	3 (20.0)	5 (50.0)	1 (10.0)	1 (16.7)	0 (0.0)	9 (60.0)	3 (20.0)	18 (39.1)	7 (15.2)
Y (4.1 – 8)	5 (33.3)	6 (40.0)	1 (10.0)	1 (10.0)	4 (66.7)	3 (50.0)	0 (0.0)	0 (0.0)	10 (21.7)	10 (21.7)
Z (8.1 – 15)	5 (33.3)	4 (26.7)	0 (0.0)	0 (0.0)	1 (16.7)	3 (50.0)	0 (0.0)	0 (0.0)	6 (13.0)	7 (15.2)
β (15.1–30)	1 (6.7)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.2)	1 (2.2)
Total	15 (100.0)	15 (100.0)	10 (100.0)	10 (100.0)	6 (100.0)	6 (100.0)	15 (100.0)	15 (100.0)	46 (100.0)	46 (100.0)

Source: Author's survey data

Table A14: Total land area cultivated by the beneficiary and the control group in the end year (Percentages in parentheses)

Total land area cultivated (poles)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control
U (0 – 0.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.2)
V (0.51 – 1)	1 (6.7)	1 (6.7)	2 (20.0)	1 (10.0)	0 (0.0)	0 (0.0)	1 (6.7)	2 (13.3)	4 (8.7)	4 (8.7)
W (1.1 – 2)	0 (0.0)	1 (6.7)	2 (20.0)	3 (30.0)	0 (0.0)	0 (0.0)	4 (26.7)	4 (26.7)	6 (13.0)	8 (17.4)
X (2.1 – 4)	1 (6.7)	1 (6.7)	3 (30.0)	4 (40.0)	1 (16.7)	1 (16.7)	1 (6.7)	7 (46.7)	6 (13.0)	13 (28.3)
Y (4.1 – 8)	7 (46.7)	6 (40.0)	2 (20.0)	1 (10.0)	3 (50.0)	1 (16.7)	7 (46.7)	2 (13.3)	19 (41.3)	10 (21.7)
Z (8.1 – 15)	6 (40.0)	4 (26.0)	1 (10.0)	0 (0.0)	2 (33.3)	4 (66.7)	2 (13.3)	0 (0.0)	11 (23.9)	8 (17.4)
β (15.1–30)	0 (0.0)	2 (13.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.3)
Total	15 (100.0)	15 (100.0)	10 (100.0)	10 (100.0)	6 (100.0)	6 (100.0)	15 (100.0	15 (100.0)	46 (100.0)	46 (100.0)

Source: Author's survey data

Table A15: Total land area cultivated by male and female respondents in the base year
(Percentages in parentheses)

Total farm size (poles)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
U (0 – 0.5)	0 (0.0)	1 (7.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.1)	0 (0.0)	1 (2.4)	1 (2.0)
V (0.51 – 1)	0 (0.0)	1 (7.1)	0 (0.0)	3 (18.8)	0 (0.0)	0 (0.0)	2 (14.3)	2 (12.5)	2 (4.8)	6 (12.0)
W (1.1 – 2)	0 (0.0)	0 (0.0)	2 (50.0)	7 (43.8)	0 (0.0)	0 (0.0)	5 (35.7)	8 (50.0)	7 (16.7)	15 (30.0)
X (2.1 – 4)	0 (0.0)	6 (42.9)	0 (0.0)	6 (37.5)	1 (12.5)	0 (0.0)	6 (42.9)	6 37.5)	7 (16.7)	18 (36.0)
Y (4.1 – 8)	6 (37.5)	5 (35.7)	2 (50.0)	0 (0.0)	4 (50.0)	3 (75.0)	0 (0.0)	0 (0.0)	12 (28.6)	8 (16.0)
Z (8.1 – 15)	8 (50.0)	1 (7.1)	0 (0.0)	0 (0.0)	3 (37.5)	1 (25.0)	0 (0.0)	0 (0.0)	11 (26.2)	2 (4.0)
β (15.1–30)	2 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.8)	0 (0.0)
Total	16 (100.0)	14 (100.0)	4 (100.0)	16 (100.0)	8 (100.0)	4 (100.0)	14 (100.0	16 (100.0)	42 (100.0	50 (100.0)

Source: Author's survey data

Table A16: Total land area cultivated by male and female respondents in the end year
(Percentages in parentheses)

Total land area cultivated (poles)	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
U (0 – 0.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.0)
V (0.51 – 1)	0 (0.0)	2 (14.3)	1 (25.0)	2 (12.5)	0 (0.0)	0 (0.0)	2 (14.3)	1 (6.3)	3 (7.1)	5 (10.0)
W (1.1 – 2)	0 (0.0)	1 (7.1)	0 (0.0)	5 (31.3)	0 (0.0)	0 (0.0)	3 (21.4)	5 (31.3)	3 (7.1)	11 (22.0)
X (2.1 – 4)	0 (0.0)	2 (14.3)	1 (25.0)	6 (37.5)	2 (25.0)	0 (0.0)	4 (28.6)	4 (25.0)	7 (16.7)	12 (24.0)
Y (4.1 – 8)	7 (43.8)	6 (42.9)	1 (25.0)	2 (12.5)	2 (25.0)	2 (50.0)	5 (35.7)	4 (25.0)	15 (35.7)	14 (28.0)
Z (8.1 – 15)	7 (43.8)	3 (21.4)	1 (25.0)	0 (0.0)	4 (50.0)	2 (50.0)	0 (0.0)	2 (12.5)	12 (28.6)	7 (14.0)
β (15.1 – 30)	2 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.8)	0 (0.0)
Total	16 (100.0)	14 (100.0)	4 (100.0)	16 (100.0)	8 (100.0)	4 (100.0)	14 (100.0)	16 (100.0)	42 (100.0)	50 (100.0)

Source: Author's survey data

v. Cropping pattern

Table A17: Major crop combinations cultivated by the beneficiary and control group in the base year
(The figures indicate number of plots under a given crop combination: percentages in parentheses)

Type of crops grown	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
Sole maize	6 (14.0)	8 (19.5)	4 (16.0)	0 (0.0)	2 (11.1)	1 (4.2)	3 (10.3)	2 (8.0)	15 (13.0)	11 (10.5)
Sole cassava	4 (9.3)	5 (12.2)	5 (20.0)	3 (20.0)	0 (0.0)	1 (4.2)	5 (17.2)	5 (20.0)	14 (12.2)	14 (13.3)
Sole vegetable	2 (4.7)	2 (4.9)	3 (12.0)	1 (6.7)	0 (0.0)	0 (0.0)	2 (6.9)	0 (0.0)	7 (6.0)	3 (2.9)
Maize & cassava	6 (14.0)	9 (22.0)	1 (4.0)	4 (26.7)	3 (16.7)	5 (20.8)	9 (31.0)	7 (28.0)	19 (16.5)	25 (23.8)
Mixed bulky crops	2 (4.7)	3 (7.3)	0 (0.0)	0 (0.0)	3 (16.7)	2 (8.3)	1 (3.4)	1 (4.0)	6 (5.2)	6 (5.7)
Perishable & bulky crops	7 (16.3)	7 (17.1)	7 (28.0)	7 (46.7)	3 (16.7)	0 (0.0)	8 (27.6)	10 (40.0)	25 (21.7)	24 (22.9)
Food & cashcrops	6 (14.0)	1 (2.4)	2 (8.0)	0 (0.0)	2 (11.1)	1 (4.2)	1 (3.4)	0 (0.0)	11 (9.6)	2 (1.9)
Other cashcrops	10 (23.3)	6 (14.6)	3 (12.0)	0 (0.0)	5 (27.8)	14 (58.3	0 (0.0)	0 (0.0)	18 (15.7)	20 (19.0)
Total	43 (100.0)	41 (100.0)	25 (100.0)	15 (100.0)	18 (100.0)	24 (100.0)	29 (100.0)	25 100.0)	115 (100.0)	105 (100.0)

Source: Author's survey data

Table A18: Major crop combinations cultivated by the beneficiary and the control group in the end year
(The figures indicate number of plots under a given crop combination: percentages in parentheses)

Type of crop cultivated	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
Sole maize	12 (23.1)	16 (30.2)	3 (12.5)	7 (31.8)	5 (22.7)	0 (0.0)	7 (14.9)	4 (9.5	27 (18.6)	27 (18.9)
Sole cassava	7 (13.5)	7 (13.2)	3 (12.5)	3 (13.6)	1 (4.5)	3 (11.5)	9 (19.1)	11 (26.2)	20 (13.8)	24 (16.8)
Vegetables	5 (9.6)	4 (7.5)	1 (4.2)	3 (13.6)	2 (9.1)	0 (0.0)	1 (2.1)	1 (2.4)	9 (6.2)	8 (5.6)
Maize and cassava	7 (13.5)	9 (17.0)	1 (4.2)	2 (9.1)	4 (18.2)	5 (19.2)	20 (42.6)	18 (42.9)	32 (22.1)	34 (23.8)
Mixed bulky crops	3 (5.8)	3 (5.7)	1 (4.2)	0 (0.0)	1 (4.5)	0 (0.0)	1 (2.1)	1 (2.4)	6 (4.2)	4 (2.8)
Mixed perishable and bulky	6 (11.5)	8 (15.1)	7 (29.2)	7 (31.8)	3 (13.6)	4 (15.4)	7 (14.9)	7 (16.7)	23 (15.9)	26 (18.2)
Mixed food and cash crops	4 (7.7)	0 (0.0)	5 (20.8)	0 (0.0)	1 (4.5)	4 (15.4)	2 (4.3)	0 (0.0)	12 (8.3)	4 (2.8)
Other cash crops	8 (15.4)	6 (11.3)	3 (12.5)	0 (0.0)	5 (22.7)	10 (38.5	0 (0.0)	0 (0.0)	16 (11.0)	16 (11.2)
Total	52 (100.0)	53 (100.0)	24 (100.0)	22 (100.0)	22 (100.0)	26 (100.0	47 (100.0)	42 (100.0)	145 (100.0)	143 (100.0)

Source: Author's survey data

Table A19: Major crop combinations cultivated by male and female respondents in the base year
(The figures indicate number of plots under a given crop combination: percentages in parentheses)

Type of crops grown	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Maize	9 (18.4)	5 (14.3)	2 (25.0)	2 6.3)	3 (10.7)	0 (0.0)	5 (21.7)	0 (0.0)	19 (17.6)	7 (6.3)
Cassava	5 (10.2)	4 (11.4)	2 (25.0)	6 (18.8)	1 (3.6)	0 (0.0)	4 (17.4)	6 (19.4)	12 (11.1)	16 (14.3)
Vegetable	2 (4.1)	2 (5.7)	1 (12.5)	3 (9.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.8)	5 (4.5)
Pulses	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.3)	1 (3.2)	1 (0.9)	1 (0.9)
Maize & cassava	9 (18.4)	6 (17.1)	1 (12.5)	4 (12.5)	5 (17.9)	3 (21.4)	5 (21.7)	11 (35.5)	20 (18.5)	24 (21.4)
Mixed bulk	3 (6.1)	2 (5.7)	0 (0.0)	0 (0.0)	2 (7.1)	3 (21.4)	0 (0.0)	2 (6.5)	5 (4.6)	7 (6.3)
Perishable & bulky crops	4 (8.2)	10 (28.6)	1 (12.5)	13 (40.6)	2 (7.1)	1 (7.1)	8 (34.8)	10 (32.3)	15 (13.9)	34 (30.4))
Food & cash crop	4 (8.2)	3 (8.6)	0 (0.0)	2 (6.3)	2 (7.1)	1 (7.1)	0 (0.0)	1 (3.2)	6 (5.6)	7 (6.3)
Other cash crops	13 (26.5)	3 (8.6)	1 (12.5)	2 (6.3)	13 (46.4)	6 (42.9)	0 (0.0)	0 (0.0)	27 (25.0)	11 (9.8)
Total	49 (100.0)	35 (100.0)	8 (100.0)	32 (100.0)	28 (100.0)	14 (100.0)	23 (100.0)	31 (100.0)	108 (100.0)	112 (100.0)

Source: Author's survey data

Table A20: Major crop combinations cultivated by male and female respondents in the end year
(The figures indicate number of plots under a given crop combination: percentages in parentheses)

Type of crop cultivated	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Sole maize	16 (26.2)	12 (27.3)	3 (37.5)	7 (18.4)	4 (13.3	1 (5.6)	6 (15.8)	5 (9.8)	29 (21.2)	25 (16.6)
Sole cassava	8 (13.1)	6 (13.6)	0 (0.0)	6 (15.8)	3 (10.0)	1 (5.6)	8 (21.1)	12 (23.5)	19 (13.9)	25 (16.6)
Vegetables	4 (6.6)	5 (11.4)	0 (0.0)	4 (10.5)	1 (3.3)	1 (5.6)	0 (0.0)	2 (3.9)	5 (3.6)	12 (7.9)
Maize and cassava	9 (14.8)	7 (15.9)	1 (12.5)	2 (5.3)	6 (20.0)	3 (16.7)	20 (52.6)	18 (35.3)	36 (26.3)	30 (19.9)
Mixed bulky	3 (4.9)	3 (6.8)	0 (0.0)	1 (2.6)	1 (3.3)	0 (0.0)	1 (2.6)	1 (2.0)	5 (3.6)	5 (3.3)
Mixed perishable and bulky	7 (11.5)	7 (15.9)	1 (12.5)	13 (34.2)	2 (6.7)	5 (27.8)	3 (7.9)	11 (21.6)	13 (9.5)	37 (24.5)
Mixed food and cash crops	4 (6.6)	0 (0.0)	1 (12.5)	4 (10.5)	4 (13.3)	1 (5.6)	0 (0.0)	2 3.9)	9 (6.6)	7 (4.6)
Other cash crops	10 (16.4)	4 (8.7)	2 (25.0)	1 (2.6)	9 (30.0)	6 (33.3)	0 (0.0)	0 (0.0)	21 (15.3)	10 (6.6)
Total	61 (100.0)	44 (100.0)	8 (100.0)	38 (100.0)	30 (100.0)	18 (100.0)	38 (100.0)	51 (100.0)	137 (100.0)	151 (100.0)

Source: Author's survey data

vi. Land ownership

Table A 21: Ownership of plots cultivated by beneficiary and control group in the base year (Percentages in parentheses)

Type of land ownership	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
Own land	0 (0.0)	9 (22.2)	2 (8.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.7)	9 (8.6)
Family land	26 (60.5)	10 (24.4)	19 (76.0)	11 (73.3)	7 (38.9)	10 (41.7)	3 (10.3)	3 (12.0)	55 (47.8)	34 (32.4)
Hired land	16 (37.2)	22 (53.7)	0 (0.0)	0 (0.0)	8 (44.4)	7 (29.2)	19 (65.5)	11 (44.0)	43 (37.4)	40 (38.1)
Share-cropping	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (11.1)	7 (29.2)	6 (20.7)	11 (44.0)	8 (7.0)	18 (17.1)
Mixed	1 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.6)	0 (0.0)	1 (3.4)	0 (0.0)	3 (2.6)	0 (0.0)
Other form of ownership	0 (0.0)	0 (0.0)	4 (16.0)	4 (26.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (3.5)	4 (3.8)
Total	43 (100.0)	41 (100.0)	25 (100.0)	15 (100.0)	18 (100.0)	24 (100.0)	29 (100.0)	25 (100.0)	115 (100.0)	105 (100.0)

Source: Author's survey data

Table A22: Ownership of plots cultivated by beneficiary and control group in the end year (Percentages in parentheses)

Type of land ownership	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control	Benefi-ciary	Control
Own land	1 (1.9)	5 (9.4)	3 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (2.8)	5 (3.5)
Family land	19 (36.5)	18 (34.0)	21 (87.5)	22 (100)	5 (22.7)	9 (34.6)	6 (12.8)	5 (11.9)	50 (34.5)	54 (37.8)
Hired land	20 (38.5)	29 (54.7)	0 (0.0)	0 (0.0)	6 (27.3)	2 (7.7)	20 (42.6)	21 (50.0)	47 (32.4)	52 (36.4)
Sharecro-pping	7 (13.5)	0 (0.0)	0 (0.0)	0 (0.0)	10 (45.5)	15 (57.7)	13 (27.7)	16 (38.1)	30 (20.7)	31 (21.7)
Mixed	4 (7.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)	8 (17.0)	0 (0.0)	13 (9.0)	0 (0.0)
Other forms of ownership	1 (1.9)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.7)	1 (0.7)
Total	52 (100.0)	53 (100.0)	24 (100.0)	22 (100.0)	22 (100.0)	26 (100.0)	47 (100.0)	42 (100.0)	145 (100.0)	143 (100.0)

Source: Author's survey data

Table A23: Ownership of plots cultivated by male and female respondents in the base year
(Percentages in parentheses)

Type of land ownership	Settlement and gender of respondent									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Own land	9 (18.4)	0 (0.0)	0 (0.0)	2 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	9 (8.3)	2 (1.8)
Family land	15 (30.6)	21 (60.0)	8 (100.0)	22 (68.8)	12 (42.9)	5 (35.7)	6 (26.1)	0 (0.0)	41 (38.0)	48 (42.9)
Hired land	24 (49.0)	14 (40.0)	0 (0.0)	0 (0.0)	10 (35.7)	5 (35.7)	13 (56.5)	17 (54.8)	47 (43.5)	36 (32.1)
Share-cropping	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (21.4)	3 (21.4)	4 (17.4)	13 (41.9)	10 (9.3)	16 (14.3)
Mixed	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.1)	0 (0.0)	1 (3.2)	1 (0.9)	2 (1.8)
Other forms	0 (0.0)	0 (0.0)	0 (0.0)	8 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (7.1)
Total	49 (100.0)	35 (100.0)	8 (100.0)	32 (100.0)	28 (100.0)	14 (100.0)	23 (100.0)	31 (100.0)	108 (100.0)	112 (100.0)

Source: Author's survey data

Table A24: Ownership of plots cultivated by male and female respondents in the end year
(Percentages in parentheses)

Type of land ownership	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Own land	6 (9.8)	0 (0.0)	0 (0.0)	3 (7.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (4.4)	3 (2.0)
Family land	11 (18.0)	24 (54.5)	8 (100.0)	34 (92.1)	8 (26.7)	6 (33.3)	14 (29.2)	11 (28.9)	41 (29.9)	75 (49.7)
Hired land	31 (50.8)	18 (40.9)	0 (0.0)	0 (0.0)	5 (16.7)	3 (16.7)	8 (16.7)	15 (39.5)	44 (32.1)	37 (24.5)
Share-cropping	5 (8.2)	2 (4.5)	0 (0.0)	0 (0.0)	16 (53.3)	9 (50.0)	25 (52.1)	9 (23.7)	46 (33.6)	20 (13.2)
Mixed	6 (9.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.3)	0 (0.0)	1 (2.1)	3 (7.9)	8 (5.8)	3 (2.0)
Other forms of ownership	2 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.5)	0 (0.0)
Total	61 (100.0)	44 (100.0)	8 (100.)	38 (100.0)	30 (100.0)	18 (100.0)	38 (100.0)	51 (100.0)	137 (100.0)	151 (100.0)

Source: Author's survey data

vii. Land tenure arrangements

Table A25: Land tenure arrangements of plots cultivated by beneficiary and control group in base year (Percentages in parentheses)

Type of tenure arrangement	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control
Free	20 (46.5)	19 (46.3)	22 (88.8)	15 (100.0)	7 (38.9)	7 (29.2	3 (10.3)	3 (12.0)	52 (45.2)	44 (41.9)
Cash	13 (30.2)	22 (53.7)	0 (0.0)	0 (0.0)	9 (50.0)	5 (20.8)	18 (62.1)	11 (44.4)	40 (34.8)	38 (36.2)
Abunu	1 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (33.3)	0 (0.0)	0 90.0)	1 (0.9)	8 (7.6)
Abusa	2 (4.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.6)	3 (12.5)	6 (20.7)	11 (44.4)	9 (7.8)	14 (13.3)
Credit	2 (4.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.4)	0 (0.0)	3 (2.6)	0 (0.0)
Mixed	5 (11.6)	0 (0.0)	3 (12.0)	0 (0.0)	1 (5.6)	1 (4.2)	1 (3.4)	0 (0.0)	10 (8.7)	1 (1.0)
Total	43 (100.0)	41 (100.0)	25 (100.0)	15 (100.0)	18 (100.0)	24 (100.0)	29 (100.0)	25 (100.0)	115 (100.0)	105 (100.0)

Source: Author's survey data

Table A26: Land tenure arrangements of plots cultivated by beneficiary and control group in end year (Percentages in parentheses)

Type of tenure arrangement	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control	Beneficiary	Control
Free	19 (36.5)	25 (47.2)	24 (100.0)	22 (100.0)	5 (22.7)	6 (23.1)	6 (12.8)	5 (11.9)	54 (37.2)	58 (40.6)
Cash	18 (34.6)	27 (50.9)	0 (0.0)	0 (0.0)	6 (27.3)	5 (19.2)	20 (42.6)	21 (50.0)	44 (30.3)	53 (37.1)
Abunu	5 (9.6)	0 (0.0)	0 (0.0)	0 (0.0)	3 (13.6)	7 (26.9)	0 (0.0)	0 (0.0)	8 (5.5)	7 (4.9)
Abusa	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (31.8)	5 (19.2)	13 (27.7)	16 (38.1)	20 (13.8)	21 (14.7)
Mixed	10 (19.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	3 (11.5)	8 (17.0)	0 (0.0)	19 (13.1)	3 (2.1)
Other forms of tenure	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.7)
Total	52 (100.0)	53 (100.0)	24 (100.0)	22 (100.0)	22 (100.0)	26 (100.0)	47 (100.0)	42 (100.0)	145 (100.0)	143 (100.0)

Source: Author's survey data

Table A27: Land tenure arrangements of plots cultivated by male and female respondents in base year (Percentages in parentheses)

Type of land tenure arrangement	Settlement of respondent and IMT ownership status in the project									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Free	18 (36.7)	21 (60.0)	8 (100.0)	29 (90.6)	9 (32.1)	5 (35.7)	6 (26.1)	0 (0.0)	41 (38.0)	55 (49.1)
Cash	23 (46.9)	12 (34.3)	0 (0.0)	0 (0.0)	11 (39.3)	3 (21.4)	13 (56.5)	16 (51.6)	47 (43.5)	31 (27.7)
Abunu	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (14.3)	4 (28.6)	0 (0.0)	0 (0.0)	5 (4.6)	4 (3.6)
Abusa	0 (0.0)	2 (5.7)	0 (0.0)	0 (0.0)	4 (14.3)	0 (0.0)	4 (17.4)	13 (41.9)	8 (7.4)	15 (13.4)
Credit	2 (4.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.2)	2 (1.9)	1 (0.9)
Mixed	5 (10.2)	0 (0.0)	0 (0.0)	3 (9.4)	0 (0.0)	2 (14.3)	0 (0.0)	1 (3.2)	5 94.6)	6 (5.4)
Total	49 (100.0)	35 (100.0)	8 (100.0)	32 (100.0)	28 (100.0)	14 (100./0)	23 (100.0)	31 (100.0)	108 (100.0)	112 (100.0)

Source: Author's survey data

Table A28: Land tenure arrangements of plots cultivated by male and female respondents in end year (Percentages in parentheses)

Type of tenure arrangement	Settlement and project status of respondents									
	Lome		Abora		Sampa		Adabra		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Free	18 (29.5)	25 (56.8)	8 (100)	38 (100.0)	5 (16.7)	6 (33.3)	11 (28.9)	0 (0.0)	42 (30.7)	69 (45.7)
Cash	28 (45.9)	17 (38.6)	0 (0.0)	0 (0.0)	8 (26.7)	3 (16.7)	15 (39.5)	26 (51.0)	51 (37.2)	46 (30.5)
Abunu	3 (4.9)	2 (4.5)	0 (0.0)	0 (0.0)	6 (20.0)	4 (22.2)	0 (0.)	0 (0.0)	9 (6.6)	6 (4.0)
Abusa	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (26.7)	4 (22.2)	9 (23.7)	20 (39.2)	17 (12.4)	24 (15.9)
Mixed	11 (18.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (10.0)	1 (5.6)	3 (7.9)	5 (9.8)	17 (12.4)	6 (4.0)
Other forms of tenure	1 (1.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.7)	0 (0.0)
Total	61 (100.0)	44 (100.0)	8 (100.0)	38 (100.0)	30 (100.0)	18 (100.0)	38 (100.0)	51 (100.0)	137 (100.0)	151 (100.0)

Source: Author's survey data

VIII. Average number of cultivated plots and land area

Key for table A29 – A32: B = Beneficiaries, C = Control, M = Males, F = Females

Table A29: Average number of farms and land area cultivated by beneficiaries and control group in base year

Farm features	Settlement and IMT ownership status of respondents										
	Settlement of respondents								IMT status of respondents		
	Lome		Abora		Sampa		Adabra		All beneficiaries	All Control	All respondents
	B	C	B	C	B	C	B	C			
Average number of plots per person	2.9	2.7	2.5	1.5	3	4.0	1.9	1.7	2.5	2.3	2.4
Average plot size (poles)	2.7	2.9	1.2	1.2	1.7	1.8	1.1	1.0	1.8	1.9	1.9
Average land holding per person (poles)	7.7	7.8	3.0	1.8	5.2	7.2	2.2	1.7	4.4	4.5	4.5

Source: Author's survey data

Table A30: Average number of farms and land area cultivated by beneficiaries and control group in end year

Farm features	Settlement and IMT ownership status of respondents										
	Settlement of respondents								IMT status of respondents		
	Lome		Abora		Sampa		Adabra		All benef-iciaries	All Control	All respondents
	B	C	B	C	B	C	B	C			
Average number of plots per person	3.5	3.5	2.4	2.2	3.7	4.3	3.1	2.8	3.2	3.1	3.1
Average plot size (poles)	2.2	2.3	1.4	1.2	1.8	2.0	1.3	1.0	1.7	1.7	1.7
Average land holding per person (poles)	7.6	8.1	3.4	2.6	6.6	8.7	4.1	2.8	5.5	5.2	5.3

Source: Author's survey data

Table A31: Average number of farms and land area cultivated by male and female respondents in base year

Plot sizes (poles)	Settlement and IMT ownership status of respondents										
	Settlement of respondents								Sex of respondents		
	Lome		Abora		Sampa		Adabra		All male	All female	All respondents
	M	F	M	F	M	F	M	F			
Average number of plots per person	3.1	2.5	2.	2.0	3.5	3.5	1.6	1.9	2.6	2.2	2.4
Average Plot size (poles)	3.5	1.8	1.7	1.1	1.8	1.7	1.2	1.0	2.4	1.4	1.9
Average land holding per person (poles)	10.7	4.5	3.5	2.1	6.3	6.0	2.0	1.9	6.2	3.1	4.5

Source: Author's survey data

Table A32: Average number of farms and land area cultivated by male and female respondents in end year

Plot sizes (poles)	Settlement and IMT ownership status of respondents										
	Settlement of respondents								Sex of respondents		
	Lome		Abora		Sampa		Adabra		All male	All female	All respondents
	M	F	M	F	M	F	M	F			
Average number of plots per person	3.8	3.1	2.0	2.4	5	3	2.7	3.2	3.3	3.0	3.1
Average Plot size (poles)	2.5	1.9	2.5	1.1	1.9	1.9	1.2	1.1	2.0	1.4	1.7
Average land holding per person (poles)	9.5	5.9	5.1	2.5	7.2	8.6	3.2	3.5	6.5	4.2	5.3

Source: Author's survey data

Appendix IV

Survey questionnaires

Questionnaire IVA. Semi-structure questionnaire for baseline survey

Personal and general household features

1. Name of farmer:..... 2. Date interviewed:.....

3. Village..... .. 4. District:.....

5. Sex: male ( ) female ( ) 6. Age:.....

7. Place of birth with region:..... 8. Ethnicity:.....

9. Religion: Christianity ( ) Islam ( ) traditionalist ( ) Other (specify).....

10. Marital status: married ( ) single ( ) divorce ( ) widow(er) ( ) separated ( )

11. Spouse's residence:..... 12. Household status:.....

13. Number of children:..... 14. Number of children in school:.....

15. Highest educational level of respondent with years:.....

16. House ownership:.....

17. House type:.....

18. Do you own any means of transport? Yes ( ) No ( )

19. If yes state:

	type(s)	number owned	where based
i:			
ii:			
iii:			

20. Do you own any type of livestock? Yes ( ) No ( )

Detail (type & herd size).....

.....

21. Which of these items do you have: radio ( ) television ( )

non-working radio ( ) non-working television ( )

Farm features:

22. Features of current farms

Farm number	Land ownership	Land tenure arrangements	Farm size (poles)	Crop types cultivated	Distance to farm (km)	Type of route to farm
Farm I						
Farm II						
Farm III						
Farm IV						
Farm V						
Farm VI						

23. No of family members working fully on the farm:.....

24. Major source of farm labour? Family ( ) Hired ( ) Other (specify):.....

25. What is the major source(s) of labour you used for each of the following activities?

a. Land clearing:.....

b. Plandting:.....

c. Reweeding I:.....

d. Reweeding II:.....

e. Reweeding III:.....

f. Harvesting: .....

g. Crop transport:.....

h. Other (please specify):.....

26. Do you employ porters? Yes ( ) No ( )

27. If yes

a. For what crops/loads:?.....

b. When (month and season).....

c. From where?.....

d. To where?.....

e. Number of porters hired per seaon: women: .....

Men: .....

Children:.....

g. Porter charge per trip:.....

28 other farm inputs used:.....

Transport means for moving inputs.....

Marketing activities

29. Quantity of maize harvest:.....

30. Quantity of cassava harvested:.....

31. Quantity of other crops harvested:.....

32. Crop sale

Feature	Crop I	Crop II	Crop III	Crop IV	Crop V
Crop types sold					
Locations of sale					
When crops sold					
Crop price					
Who sold crops					
Transport type used to move crops to point of sale					

33: Do you have any non-farm occupation? Yes ( ) No ( )

34. If yes:

a. State type(s).....

b. How much do you earn from the non-farm activities per annum:.....

35. Do you receive any remittances? Yes ( ) No ( )

36. If yes: a. from whom?.....

b. How much remittance do you receive in a year?.....

37. Do you have a bank account? Yes ( ) No ( )

38. Where is the bank located?.....

39. Wealth ranking of farmer:

a) Farmer: how will you rank yourself? Rich ( ) Average ( ) Poor ( )

b) Interviewer's view: Rich ( ) Average ( ) Poor ( )

40. Do you have a bank account? Yes ( ) No ( )

If yes, where based?.....

41. Do you participate in susu? Yes ( ) No ( )

42. If yes: a. How much contributed in a: day ( ) week ( ) month ( ) year ( )

b. What benefits do you get from susu?.....

43. Do you always live in this village or migrate regularly to farm or do other job elsewhere?

Migrate ( ) Do not migrate ( )

44. If you migrate, give:

i. Where you migrate to:.....

ii. Job type(s) you do over there:.....

45. Do you receive remittance(s) Yes ( ) No ( )

Specify relations with remitter(s):.....

Amount per annum:.....

46. Do you receive any form of loan? Yes ( ) No ( )

If yes state source and amount per annum.....

Questionnaire IVB. Semi-structured questionnaire for end survey

Personal/General household information

Name:..... 2. Date:.....

3. Settlement:..... 4. District:.....

5. Sex: Male ( ) Female ( ) 6. Age:.....

7. Birth place with region:.....

8. Ethnic group:..... 9. Religion:.....

10. Marital status: married ( ) single ( ) divorce ( ) widow(er) ( )

11. Spouse's residence: inside village ( ) outside village ( ) migrates ( )

12.Position of respondent in household:.....

13. No. of adults in household:.....

14. No. of children in household with ages:.....

.....

15. No. of children currently in school;.....

16. No of family members working fully on the farm:.....

17. What is your major source of farm labour? Family ( ) Hired ( )

18. Highest educational level of respondent with years:.....

19. House ownership:.....

20. House type :.....

21. Do you own any means of transport? Yes ( ) No ( )

22. Do you own the IMT as an individual or with a group of people?

a) individual b) group c) both individual and group IMTs

a) IMT type owned

i:.....

ii:.....

iii:.....

b) Where is (are) the IMT(s)

based.....

.....

c): Motorised vehicle type owned

i:.....

ii:.....

d) Where is the vehiclebased?.....

22. Do you own any type of livestock? Yes ( ) No ( )

Detail(type & herd size).....

23. Which of these items do you have: radio ( ) television ( )

non-working radio ( ) non-working television ( )

24. Table showing features of land currently under production.

Farm number	Farm Size (acres)	Major Crops	Distance to Farm (Km)	type of route	Land Ownership	Tenure Arrangement
Farm I						
Farm II						
Farm III						
Farm IV						
Farm V						
Farm VI						

25. Have you made bigger or smaller farms this year than last year?

Bigger ( ) No change ( ) Smaller ( )

Why.....

.....

26. Give the major reason why you do not make bigger farm farm than you cultivate over the years.....

26. How do you rank these factors on how they influence the size of your farm over the years

a) poorer physical access to market ( ) b) poor price

c) no money for inputs ( ) d) cannot get more land ( )

e) bad weather ( ) f) not enough labour ( )

f) other

factors(specify).....

27. Is it easier to obtain labour now than it was last year at this time? Yes ( ) No ( )

Why:.....

28. Have you taken more or less produce to market this year than last year?

More ( ) No change ( ) Less ( )

Why?.....

.....

29. Table regarding transport needs and means used

Major transport needs	Means used	Any problems faced in meeting these transport needs

30. Are there any physical barrier(s) that limit your use of IMT (purchased/loaned/borrowed) to some specified places? Yes ( ) No ( )

If yes, specify place and respective barriers involved:.....

.....

.....

Qu.30b. Were any of these barriers crucial enough to stop you from purchasing an IMT?

Yes ( ) No ( )

If yes, state which one(s)

31. If you do not own an IMT, rank how these factors stopped you purchasing one.

a. cost ( ) b. complexity of IMT operations ( )

c. Lack of credit ( ) d. limited load carting capacity ( )

e. lack of subsidy ( )

32. Rank how these physical factors stopped you purchasing an IMT.

a. unsuitable path ( ) b. bad road/path ( )

c. unbridged stream crossing point ( ) d. hilly terrain ( )

33. How does transport non-availability influence your farm production activities?

.....

.....

34. How does transport availability influence your marketing activities?

.....

.....

35. Do you ever amalgamate your load with another farmer's load to take advantage of transport opportunities? Yes ( ) No ( )

Details: a) Pre-IMT period:.....

.....

b) Now (IMT period):.....

.....

36. Have you made any changes to your farm owing to

a. your possession of an IMT? Yes ( ) No ( )

b. your ability to hire IMT ? Yes ( ) No ( )

Why?.....

.....

37. If yes, how has the use of IMT impacted on the following?

Criteria	Direction of change	Reasons for change
Farm size		
Crop diversity		
Farm location		
Yield		
Location of sale		
Other items		

38. Wealth ranking of farmer:

a) Farmer: how will you rank yourself? Rich ( ) Average ( ) Poor ( )

b) Interviewer's view: Rich ( ) Average ( ) Poor ( )

39. Do you have a bank account? Yes ( ) No ( )

If yes, where based?.....

40. Do you participate in susu? Yes ( ) No ( )

Where susu based:.....

How often contributions made:.....

How much contributed at a time:.....

What benefits do you get from susu?.....

.....

41. Give your other sources of income beside farming and the annual estimated earnings from each source?.....

.....

42. Do you always live in this village or migrate regularly to farm or do other job elsewhere?

Migrate ( ) Do not migrate ( )

43. If you migrate, give:

i. Where you migrate to:.....

ii. Job type(s) you do over there:.....

iii. Duration of stay at this place:.....

iv. Earnings from each job done during stay:.....

.....

44. Do you earn more usually where you migrate or here?.....

Why:.....

.....

45. Do you receive remittance(s) Yes ( ) No ( )

Specify relations with remitter(s):.....

Amount per annum:.....

46. If you need a loan where would you go first to get one?.....

Why?.....

Questinnaire IVC: Semi-structured questionnaire for quarterly survey

Quarterly data (For the last three months)

1. Farmer's name:..... Interview date:.....

2. Village:..... 3. Quarter (specify months):.....

5. Settlement's accessibility ranking (main route):.....

4. Have you used any IMT over the past 3 months? Yes ( ) No ( )

If yes, what IMT used over the past 3 months

	Bicycle	Push truck	Power tiller	Hand cart	Wheel barrow	Other IMTs
What used for						
Sources and destinations						
Who operated it						
Payment form & level						
Quantity of goods conveyed						
Max & min Distance covered						
Other comments						

5. Did you have any problem using any of the IMTs? Yes ( ) No ( )

Details:.....

.....

6. Table showing the various means by which produce from farm or granary had been conveyed to the house in last 3 months?

		Means for carting				Quantity carted				transport cost				destination			
crop type	source	family labour	hired labour	IMT	vehicle	family labour	hired labour	IMT	vehicle	family labour	hired labour	IMT	vehicle	family labour	hired labour	IMT	vehicle

Why did you choose that transport mode?.....

7. Table showing how farmer had used produce at farm/granary/home and means for carting saleable produce to market in the last 3 months.

		Quantity taken out					Points of sale		Per unit price		Means of transport to		transport cost of produce to;	
crop type	source	sold	consu-mption	gift	loan out	loan repay	Point I	Point II	Average price I	Average price II	Point of sale I	Point of sale II	Point of sale I	Point of sale II

Why did you choose to sell at that location?.....

8. Water collection over the past 3 months for household use:

i. Source(s).....

ii. How far from home:.....

iii. Nature of route:.....

iv. Means of collection:.....

v. How much paid per trip for collection:.....

vi. Who collected it:.....

vii. Quantity transported per trip:.....

viii. Time for return trip:.....

ix. How much water used per day?.....

x. How many trips made to collect water each day?.....

9. Fuelwood collection over the past 3 months for household use:

i. source(s).....

ii. How far from home:.....

iii. Nature of route:.....

iv. Means of collection:.....

v. How much paid per trip for collection:.....

vi. Who collected it:.....

vii. Quantity transported per trip:.....

viii.Time for return trip:.....

ix. How much fuelwood used per week:.....

10. Have you sold any fuelwood or charcoal for the past 3 months? Yes ( ) No ( )

i. If yes, state: Where sold:.....

ii. Number of headloads or mini bag sold over last 3 months:.....

iii. Price per headload or mini bag:.....

iv. Means of transport used:.....

v. Transport charge:.....

11. Have you collected pestle/fish smoking sticks/game over the last 3 months?

Yes ( ) No ( )

i. If yes, state: where sold:.....

ii. Quantity sold over last 3 months:.....

iii. Per unit price:.....

iv. Means of transport used:.....

v. Transport charge:.....

12. collection of other goods (eg. building materials) over the past 3 months:

i. Type of material:.....

ii. source(s).....

iii. Destination(s):.....

iv. How far from home:.....

v. Nature of route:.....

vi. Means of collection:.....

vii. How much paid per trip for collection:.....

viii. Who collected it:.....

ix. Quantity transported per trip:.....

x. Time for return trip:.....

xi. Total quantity collected over last 3 months:.....

13. Have you met the extension agent over the last 3 months? Yes ( ) No ( )

If yes, how many times?.....

What help did (s)he give you?.....

14. Have you received any form of loan since the past 3 months? Yes ( ) No ( )

i. If yes, state: source(s) of loan:.....

ii. Form of loan:.....

iii. How much loan collected:.....

iv. At what interest rate:.....

v. Duration:.....

vi. What the loan was used for:.....

.....

15. Have you loan money to other farmers/family members since last 3 months? Yes ( ) No ( )

i. To whom:.....

ii. How much loan given:.....

iii. At what interest rate:.....

iv. Duration:.....

v. What was the loan used for:.....

.....

16. Have you conveyed any input over the last 3 months? Yes ( ) No ( )

If yes, how was this activity accomplished?

Input type	Source(s)	Unit of sale	Unit price	Quantity per trip	Total quantity in the period	Destina-tion(s)	Distance (Km)	Type of route	Means of transport	Transport charge	Who collected it	Time used per trip

17. Which of the farm activities below did you undertake over the last 3 months?

Type of farm activity	Response (yes/no)	Quantity of labour used		Labour charge		frequency/work size	
		Family	Hired	Family	Hired	Family	Hired
Clearing							
Planting							
First Reweeding							
Second Reweeding							
Third Reweeding							
Harvesting							
Transport of produce							
Other Activities (specify)							

Did you have problem getting labour over the last 3 months? Yes ( ) No ( )
Detail:.....
.....

Appendix V

Comparison of IMT beneficiaries with their control counterparts

KEY

Symbol	Meaning	Symbol	Meaning
GCB	Ghana Commercial Bank	m	Maize
F	Female	c	Cassava
M	Male	pp	Pepper
Chd	Children	t	Tomato
Chd at sch	Children in school	g	Garden eggs
S	Self (farmer him/herself)	y	Yam
F	Family labour	cy	Cocoyam
H	Hired labour	gn	groundnut
H	Hired land	cp	cowpea
sc	Sharecropping	l	Water melon
		bb	Cabbage
		tt	Carrot
		cw	cashew

Continue on next page

Lome

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Akua Aframah	Akua Gyeiba	Sex: F/F, Age: 46/43, Ethnicity: fanti/fanti, Chd: 8/4, Chd at sch: 3/3, Both married, Other occupation: trading/trading, Food crop farm size: 8/2, Crops: m, c, pp, k/m, c, pp, Cash crop: 15 acre cocoa & 10 acre oil palm/none Livestock: 16 goats & 21 sheep/5 goats, Labour: h, s, f/h, s, f, Land ownership: father's/Hired, Land tenure: free/cash, Housing: own/family & hired, Bank account: none/none, Remittances: none/none
Adwoa Maning (Abiba)	Barikisu Idriss	Sex: F/F, Age: 36/34, Ethnicity: fanti/fanti, Chd: 6/4, Chd at sch: 6/4, Both married, Other occupation: trading/trading, Food crop farm size: 3/2, Crops: m, c, p, cw/m, c, t, pp, Cash crop: none/none, Livestock: 3 goats/4 goats, Labour: h, s, f/h, s, f; Land ownership: husband/Hired, Land tenure: free/cash, Housing: husband/father, Bank account: none/none, Remittances: none/brother
Efua Terbah	Adwoa Mansah	Sex: F/F, Age: 37/31, Ethnicity: fanti/fanti, Chd: 5/3, Chd at sch: 5/2, Both married, Other occupation: trading/trading, Food crop farm size: 3.25/1.25, Crops: m, c, pp, g/m,c, Cash crop: none/none, Livestock: none/none, Labour: h, s, f/h, s, f, Landownership: Hired/family, Land tenure: cash/free, Housing: husband's/grandmother's, Bank account: none/none, Remittances: none/none
Abena Donkor	Adwoa Sakyiwa	Sex: F/F, Age: 62/52, Ethnicity: fanti/fanti, Chd: 5/5, Chd at sch: 2/0, Marital status: married/widow, Other occupation: none/none, Food crop farm size: 4/6, Crops: m, c, o p ,g, pp, t/m, c, y, Cash crop: 4 acre cw, 6 acre oil palm & 9 acre cocoa/30 cocoa Livestock: 4 goats/none, Labour: h, s, f/h, s, Land ownership: family/Hired, Land tenure: free/cash, Housing: own/own, Bank: Akyempim/Swedru GCB, Remittances: sons/none
Sarah Kontoh	Esi Akyere	Sex: F/F, Age:30/32, Ethnicity: fanti/fanti, Chd: 1/3, Chd at sch:1/2, Marital status: divorced/divorced, Other occupation: trading/trading, Food farm size:1/1.25, Crops: m/m, c, k, pp, t, Cash crop: none/none, Livestock: none/none, Labour :h, s, f/h, s, Land ownership: Hired/Hired, Land tenure: cash/cash, Housing: grandfather's/grandmother's, Bank account: none/none, Remittances: brother/none

Lome (cont.)

IMT OWNER CONTROL	COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Amina-tu Ali	Adjala Esi Kotua	Sex: F/F, Age: 37/31, Ethnicity: fanti/fanti, Chd: 5/3, Chd at sch : 4/1, Both married, Other occupation: trading/trading, Food farm size: 6.75/1, Crops: c, m, g, t, /m, c, k, pp, t, Cash crop: none/none, Livestock: 6 goats/none, Labour: h, s, f /h, s, Land ownership: family & hired /Hired, Land tenure: free & cash /cash, Housing: family/grandfather's Bank account: none/none, Remittances: none/none
Mariama Mbroma	Abena Yaba	Sex: F/F, Age:31/34, Ethnicity: fanti/fanti, Chd:7/5, Chd at sch:7/4, Both married, Other occupation: trading/trading, Food farm size:1/3, Crops: m, c, p, pp, g, t/m, c, pp, g, t, Cash crop: cashew/none, Livestock: 3 goats/none, Labour: h, s, f/h, s, f, Land ownership: family/hired, Tenure: free/cash, Housing: husband/mother-in-law, Bank: none/none, Remittances: none/none
Paul Simpson	Charles Turkson	Sex: M/M, Age: 49/54, Ethnicity: fanti/fanti, Chd: 4/5 Chd at sch: 3/3, Both married, Other occupation: masonry/painting, Food crop farm size: 4/7, Crops: m, c/m, p, Cash crop: 3 acre cw/4 acre cw & 2 acre oil palm Livestock: 21 goats/7 goats, Labour: h, s/h, s, f, Landownership: family/Hired, Land renure: free & sc/cash, Housing: own/hired, Bank account: Akyempim/SwedruGCB Remittances: none/none
Kwame Abubu	Kofi Atta	Sex: M/M, Age: 50/32, Ethnicity: fanti/fanti, Chd: 10/4, Chd at sch: 1/2, Both married, Other occupation: hunting/hunting & carpentry, Food crop farm size: 12/10, Crops: m/m, Cash crop: 3 acre cocoa/3 acre cocoa, Livestock: 12 goat/none, labour: h, s, f/s, Land ownership: Hired/Hired & caretaker, Land tenure: cash/cash, sc & free, Housing: father/own, Bank account: none/none, Remittances: brother/none
Nana Yaw Acquah Ababio II	Opanin Kofi Gyasi	Sex: M/M, Ages:68/63, Ethnicity: fanti/fanti, Status: chief/village elders, Chd:12/6, Chd at sch:2/2, Both married, Other occupation: none/carpentry, Food farm sizes:17/15, crops: m, c, pp, p/m, c, p, Cash crop:6 acre cocoa/2 acre cw & 1 acre Oil palm, Livestock:22 sheep, 4 goats/ 30 sheep & 8 goat, Labour: h, s, f/h, s, f, Land ownership: Hired /own, Land tenure: cash/free, Housing: community palace/uncle, Bank account: Swedru ADB/none, Remittances: none/none

Lome (cont.)

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Isaac Nyarko	Samuel Gyekye Asante	Sex:M/M, Age: 29/27, Ethnicity: fanti/Akim, Chd: 1/3, Chd at sch: 1/3, Both married, Other occupation: teaching/teaching, Food farm size: 12/7, Crops: m, c/m, c, t, pp, l, tt, bb, Cash crop: 3 acre cocoa/none, Livestock: none/none, Labour: h, s, f/ h, s, Land ownership: Hired/Hired, Land tenure: cash/cash, Housing: family/hired, Bank account: Akyempim/Akyempim, Remittances: none/none
Alex Yaw Sam	Paul Assan	Sex: M/M, Age: 41/45, Ethnicity: fanti/fanti, Chd: 5/5 Chd at sch: 5/2, Both married, Other occupation: mason/mason, Food crop farm size: 9/10, Crops: m/m, Cash crop: 1 acre cashew/none, Livestock: 1 goat & 3 sheep/none, Labour: h, s, f/h, s, Land ownership: family & Hired/Hired, Land tenure: free & cash/cash, Housing: own/co-owner Bank account: Swedru rural bank/none, Remittance:none/none
Emmanuel Arthur Simpson	Adam Kofi Sam	Sex: M/M, Age:65/55, Ethnicity: fanti/fanti, hd:12/13, Chd at sch:2/2, Both married, Other occupation: trading/none, Food farm size: 2/9, Crops: m, c/m, c, Cash crop: 1 acre cw/2 acre cw & 8 acre cocoa, Livestock: 8 goats/12 goats, Labour: h, s, f/h,s,f Land ownership: Hired/own & hired, Land tenure: cash/free and cash, Housing: own/mother, Bank account: Agona rural bank in Swedru/none, Other income: pension pay/none, Remittances: none/children
Bashiru Entsil	Benjamin Gurah	Sex: M/M, Age: 40/53, Ethnicity: fanti/fanti, Chd: 15/1 Chd at sch:12/1, Both married, Other occupation: teaching/none, Food crop farm size: 6/9.5, Crops: m, c/m, c, y, p, Cash crop: 6 acre cashew/1acre cashew, Livestock: 11 sheep & 14 goats/14 sheep, Labour: h, s, f/h, s, f, Land ownership: family & hired/family & hired, Land tenure: free & cash/free & cash, Housing: own/family, Remittances: none/none Bank account: akyempim/akyempim,
Justice Kontoh	Dominic Asambil	Sex: M/M, Age: 39/39, Ethnicity: fanti/fanti, Chd: 15/4 Chd at sch: 5/1, Both married, Other occupation: none/carpentry & lotto agent, Food crop farm size: 8.75/7, Crops: m, c/m. c, Cash crop: 1 acre cw/none, Livestock: 14 goats & 8 sheep/5 sheep, Labour: h, s, f/h, s, f, Land tenure: free & cash/cash, Land ownership: family & hired/Hired, Housing: family/family, Bank: Dawurampong/none Remittance: none/none

Abora

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Esi Kwagyirba	Adwoa Batewah	Sex: F/F, Age:50/48, Ethnicity: fanti/fanti, Chd: 1/5, Chd at sch: 4/3, Marital status: divorced/married, Other occupation: trading/trading, Food crop farm size: 2/1, Crops: m, c, pp/m, c, pp, t, Cash crop:1 cashew/none, Livestock: 3 goats/2 goats, Labour: h, s, f/h, s, f, Land ownership: family/husband, land tenure :free/free, Housing: father's/husband's, Bank accounts: Akyempim/none, Remittances: none/none
Amma Amoaba	Mary Nyarko (Abba Ackon snr)	Sex: F/F, Age: 65/63, Ethnicity: fanti/fanti, Chd: 7/3, Chd at sch:2/3 Both married, Other occupation: none/trading, Food crop farm size: 1/2, Crops: m, c, pp/m, c, pp, g, Cash crop: cashew/none, Livestock: 4 goats/none Labour: h, s, f/h, s, f, Land ownership: own/communal, Land Tenure: free/free, Housing: husband's/mother & father's Bank accounts: none/none, Remittances: none/none
Patience Sam	Yaa Yaa	Sex: F/F, Age: 41/41, Ethnicity: fanti/fanti, Chd:5/7 Chd at sch: 3/3, Both are married, Other occupation: trading/trading, Food farm size:2.75/1.5, Crops: m, c, pp/m, c, pp, g, Cash crop: none/none, Livestock: 2 goats/none, Land ownership: communal/family, Land tenure: free/free, Labour :h, s, f/s, f, Housing: mother's/sister's, Bank: Akyempim/none, Remittances: brothers/none
Nana Quansemah	Adwoa Yedua	Sex: F/F, Age: 56/80, Ethnicity: fanti/fanti,Chd:6/6, Chd at sch:0/1, Both widows, Other occupation: none/trading, Food crop farm size:1.3/1, Crops: m, c, pp/m, c, pp, g, Cash crop:1 cashew/none, Livestock: 4 goats/none, Labour: h,s,f/h,s,f, Land ownership: family/late husband Land tenure: free/free, Housing: own & father/brother Bank accounts: none/none, Remittances: 1 son/5 chd
Aba Ackon (Jr)	Aba Nsaba	Sex: F/F, Age: 45/48, Ethnicity: fanti/fanti, Chd: 8/6, Chd at sch: 5/2, Both married, Other occupation: trading/none Food crop farm size: 2.5/1, Crops: m, c/m, c, Cash crop: none/none, Livestock: none/none, Land ownership: family/communal, Land tenure: free/free, Labour: h, s, f/s, f, Housing: uncle's/mother's Bank accounts: none/none, Remittances: none/2 chd

Abora (cont.)

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Abena Amoah	Adwoa Kweiba	Sex: F/F, Age: 40/40, Ethnicity: fanti/fanti, Chd: 5/7, Chd at sch: 3/2, Both married, Other occupation: trading/trading, Food crop farm size:2/2, Crops: m, c, pp/m, c, pp, g, Cash crop: none/none, Livestock: none/none, Labour: h, s, f/h, s, f, Land ownership: husband's/uncle's, Land tenure: free/free, Housing: husband's/grandfather's, Bank accounts: none/none, Remittances: none/none
Adwoa Aprakuwa	Adwoa Nsowa	Sex: F/F, Age: 60/40, Ethnicity: fanti/fanti,Chd: 4/1, Chd at sch: 1/1, Marital status: married/single, Other occupation: trading/trading, Food crop farm size:0.5/0.5, Crops: m,c,pp/m,c, Cash crop: none/none Livestock: 3 goats/none Land ownership: family's/grandfather's Land tenure: free/free, Labour: s,f /s, Housing: grandpa/uncle Bank accounts: none/none, Remittances: none/none
Ekua Enyindah	Amma Amina	Sex: F/F, Age: 40/26, Ethnicity: fanti/fanti, Chd: 6/1, Chd at sch: 6/1, Both married, Other occupation: trading/trading, Food crop farm size: 3.5/1, Crops: m, c, pp/m, c, pp, t, Cash crop: none/none, Livestock: none/4 goats, Land ownership: husband/husband's, Land tenure: free/free, Labour: h, s, f/s, f, Housing: husband's/father-in-law's, Bank account: none/none, Remittances: none/none
Augustus Amoanyi	Kwabena Kyea	Sex: M/M, Age: 45/32, Ethnicity: fanti/fanti, Chd: 5/3, Chd at sch :3/3, Both married, Other occupation: hunting/hunting, Food crop farm size: 5/4, Crops: m, c, g/m, c, Cash crop: cashew/none, Livestock: 2 goats/1goat, Labour: h, s, f/s, f, Landownership: family/family, Land tenure: free/free, Housing: own & father/father, Bank accounts: Akyempim/none, Remittances: none/none
Kojo Ayitey	Kwaku Abam	Sex: M/M, Age: 27/27, Ethnicity: fanti/fanti, Chd: 0/0, Chd at sch: 0/0, Marital status: married/single, Other occupation: hunting/driving, Food crop farm size: 2/2, Crops: m/m, pp, potato, Cash crop: none/none, Livestock: none/none, Labour: s, f/s, f, Land ownership: family/family, Land tenure: free/free, Housing: father/father, Bank account: none/Akyempim, Remittances: none/none

Sampa

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Adjoa Krampah	Georgina Nyarko	Sex: F/F, Age: 30/45, Ethnicity: Fanti/fanti, Chd: 4/7, Chd at sch:4/4, Both married, Other occupation: trading/trading, Food farm size:2/0.5 Crops: m, c, pp/m, c, Cash crop: 2 acre cw & 0.25 oil palm/3 acre citrus, 1.5 acre oil palm, 1 acre sugar cane, Livestock: 5goats/none, Labour: h, s, f/h, s, f, Land ownership: father-in-law/hired, Land tenure: free/cash & sc, Housing: care taker/own, Bank account: none/none, Remittances: none/none
Mary Andam	Amma Oguamah	Sex:F/F, Age:32/45, Ethnicity: Fanti/fanti, Chd:3/8, Chd at sch: 2/5, Both married, Other occupation: trading/trading, Food farm size: 4/3.5, Crops: m, c, t/m, c, p, y, Cash crop: none/oil palm, citrus, sugar cane, Livestock: none/33 sheep, Labour: h, s, f/h, s, f, Land ownership: Hired/family, free Land tenure: Cash/free, sc, Housing: Mother/husband's family Bank account: none/none, Remittances: none/none
Isaac Andam	Joseph Kwaku Sam	Sex: M/M, Age: 36/49, Ethnicity: Fanti/fanti, Chd: 3/8, Chd at sch:2/5, Both married, Other occupation: none/none, Food farm size:4/3.5, Crops: m, c, t/m, c, p, y, Cash crop: none/oil palm, citrus, sugar cane, Livestock: none/33 sheep, Labour: h, s, f/s, f, h, Land ownership: Hired/family, share cropping Land tenure: cash/free, sc, Housing: Mother-in-law/own, Bank account: none/none, Remittances: none/none
Emmanuel Amponsah	Kwame Acquah	Sex: M/M, Age: 35/32, Ethnicity: Fanti/fanti, Chd: 0/0, Chd at sch: 0/0, Both are not married, Other occupation: radio repairer/masonry, Food crop farm size: 1/2.75, Crops: cassava/maize, Cash crop: 0.25 acre sugar cane, 2.5 acre pineapple, sugarcane and citrus/sugar cane, Livestock: none/none, Labour: s, h/s, f Land ownership: hired & family/family & hired, Land tenure: cash & sc/ free and cash, Housing: family/family, Bank: Gomoa Enyiresi/none, Remittance: none/none

Sampa (cont.)

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Solomon Djan	Kwasi Otu	Sex: M/M, Age: 37/38, Ethnicity: Fanti/fanti, Chd: 3/6, Chd at sch: 3/5, Both married, Other occupation: none/none, Food crop farm size: 5/4, Crops: m, c/m, c, Cash crop: 2 acres citrus/2 acres citrus & 1sugercane, Livestock: 1 sheep & 2goats/2 goats, Labour: h, s, f/h, s, f, Land ownership: Hired & family/Hired, Housing: family/family, Land tenure: sc & free/cash, Bank account: none/none, Remittances: none/none
Kofi Menko	Kwabena Anobil	Sex: M/M, Age: 30/29, Ethnicity: Fanti/fanti, Chd: 2/3, Chd at sch:2/5, Both married, Other occupation: masonry/blacksmith, Food farm size:2.5/4, Crops: m, c/m, c, Cash crop: 2 acre citrus/2 acre oil palm & 2.5 acre citrus, Livestock: 4 goats & 3 sheep/6goats, Labour: s, f/h, s, f, Land ownership: Hired/Hired & family, Land tenure: cash/free & cash, Housing: co-own/father, Bank account: none/none, Remittances: none/none

Adabra

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Adwoa Nyarkoa (Emmaa)	Amma Owu	Sex: F/F, Age: 25/30, Ethnicity: Fanti/fanti, Chd: 4/4, Chd at sch: 2/3, Both married, Other occupation: trading/trading, Food farm size: 2.5/0.5, Crops: m, c/m, c, pp, Cash crop: none/none, Livestock: none/none, Labour: s, f/h, s, f, Land ownership: Hired/Hired, Land tenure: cash & sc/sc Housing: husband/husband, Bank account: none/none Remittances: check/none
Grace Agbeshi	Akosua Victoria	Sex: F/F, Age:check/37, Ethnicity: Fanti/fanti, Chd:7/4, Chd at sch: 4/4, Both married, Other occupation: trading/trading, Food farm size: 2/1, Crops: m, pp, g, /m, c, pp, g, Cash crop: oil palm/none, Livestock: none/none, Labour: h, s, f/s, f, Land ownership: Hired/Hired, Land tenure: cash & sc/sc Housing: husband/husband, Bank account: none/none Remittances: none/none
Joyce Agbeshi	Faustina Afortorvor	Sex: F/F, Age: 25/29, Ethnicity: Ewe/Ewe, Chd: 0/1, Chd at sch:0/1, Marital status: single/married, Other occupation: dress making/trading, Food farm size: 2/2 Crops: m, c, pp, gn/m, c, pp, Cash crop: none/none, Livestock: 2 goats/none, Labour: h, s/s, h; Land ownership: Hired/Hired, Land tenure: credit/sc, Housing: own/husband, Bank account: none/none, Remittances: none/none
Victoria Tawiah	Mary Okyere	Sex: F/F, Age: 33/44, Ethnicity: Ewe/fanti, Chd: 6/6, Chd at sch: 3/2, Both are married Other occupation: gari processing & trading/gari processing, Food farm size: 0.5/3, Crops: m, c/m, c, Cash crop: none/none, Livestock: none/none, Labour: h, s/s, f, Land ownership: Hired/Hired, Land tenure: sc/cash, Housing: husband / husband, Bank account: none/none, Remittances: none/none.
Gladys Blewusi	Efua Atta	Sex: F/F, Age:28/40, Ethnicity: Ewe/fanti, Chd:3/5, Chd at sch: 2/3, Both married, Other occupation: Gari processing/gari processing, Food crop farm size: 0.87/0.5, Crops: m, c/m, c, pp, Cash crop: none/none, Livestock: 3 goats/none, Labour: s, f/s, f, Land ownership: Hired/Hired, Land tenure: cash & sc/cash, Housing: husband/husband Bank account :none/none, Remittances: none/none

Adabra (cont.)

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Hanah Aduafo	Davie Adjo	Sex: F/F, Age:49/56, Ethnicity: Fanti/Ewe, Chd: 5/11, Chd at sch:5/2, Both married, Other occupation: trading/trading, Food crop farm size: 3/1, Crops: m, c, pp, t/m, c, Cash crop: none/none, Livestock: 10 sheep/none, Labour: h, s, f/s, f; Land ownership: Hired/Hired, Land tenure: cash/sc, Housing: husband/husband, Bank account: none/none; Remittances: uncle/son,
Agbologba	Akua Ahun	Sex: F/F, Age: 24/28, Ethnicity: Ewe/Fanti, Chd: 2/4; Chd at sch: 0/2, Both married, Other occupation: trading/trading, Food farm size:0.5/0.75, Crops: m, c/m, c, pp, g, Cash crop: none/none, Livestock: none/none, Labour: h, s, f/h, s, f; Land ownership: H/H, Land tenure: cash/sc; Housing: husband/husband, Bank account: none/none; Remittances: none/none
E.K.V. Gbemu	Mama Dogbagi	Sex: F/F, Age: 23/25, Ethnicity: Ewe/Ewe, Chd: 3/2, Chd at sch: 2/1, Both married, Other occupation: trading/trading, Food crop farm size: 1/1; Crops:m,c, cp,gn/m, c, cp, gn Cash crop: none/none, Livestock: none/none, Labour: h, s, f/h, s; Land ownership: Hired/Hired, Land tenure: cash/cash; Housing: father-in-law/grandfather; Bank account: none/none Remittances: father & auntie/none
David Agbeshi	Samuel Ahiaveh	Sex: F/F, Age: 32/36, Ethnicity: Ewe/Ewe, Chd: 1/2, Chd at sch: 0/0, Both married, Other occupation: none/none, Food crop farm size: 2/3, crops: m/m, c, Cash crop: none/none; Livestock: none/4 goats, Labour: s, f/h, s, f; Land ownership: Hired/Hired, Land tenure: cash/cash, Housing: own/own, Bank account: none/Bereku GCB, Remittances: none/none.
Kwame Botwe	Joseph Asuman (Tonka)	Sex: M/M; Age: 22/21; Ethnicity: Fanti/fanti, Chd: 0/2; Chd at sch:0/0; Marrital status: single/married, Other occupation: none/none; Food farm size: 1.5/3; Crops: m, c/m, c; Cash crop: none/none; Livestock: 4 goats/1goat; Labour: s, f/h, s; Land ownership: Hired/Hired; Land tenure: sc/cash; Housing: own/own; Bank account: none/Awutu Bereku rural bank, Remittances: brother/brother

Adabra (cont.)

IMT OWNER	CONTROL COUNTERPART	BASIC CHARACTERISTICS AND COMMON FEATURES UNDERLYING THE PAIRINGS
Samuel Essah	Kwasi Odontoh (Sos man)	Sex: M/M, Age: 53/check, Ethnicity: Fanti/fanti, Chd: 12/7; Chd at sch: 4/2, Both married, Other occupation: none/none; Food crop farm size: 2.5/1; Crops: m, c, pp/m, c, Cash crop: none/none; Livestock: none/none Labour: h, s, f/s, f; Land ownership: Hired/Hired, Land tenure: cash/cash, Housing: own/own, Bank account: check/check, Remittances: check/check
J.A. Ayi (Ayitey Joseph)	Stephen Boye Asare	Sex: M/M, Age: 45/26, Ethnicity: Ga/Fanti, Chd: 1/2 , Chd at sch: 1 / 2, Marital status: married/single, Other occupation: teaching/teaching, Food farm size: 0.75/0.5, Crops: m, c, pp, g/c, m, Cash crop: none/none, Livestock: none/3 goats, Labour: hired/family, Land ownership: hired/hired, Land tenure: cash/sc, Housing: Rent/own, Bank: Accra/Cape Coast, Remittance: None/brother
Kwadwo Afortorvor	Abor Dzreke	Sex: M/M, Age:55/36, Ethnicity: Ewe/Ewe, Chd:8/4, Chd at sch:5/3, Both married, Other occupation: none/none, Food farm size: 2.5/2, Crops: m/m, Cash crop: none/none, Livestock: none/none, Labour: s/s, f, Land ownership: Hired/Hired, Land tenure: cash/cash, Housing: own/own, Bank account: none/none, Remittances: none/none
Kobina Odoom	Kofi Ano (Original Ketato)	Sex: M/M, Age: 35/35, Ethnicity: Fanti/fanti, Chd: 6/3, Chd at sch: 4/1, Both married, Other occupation: trading/hunting, Food crop farm size: 2.3/2, Crops: m, c, cy, t, gn/m, c, pp, g, Cash crop: none/none, Livestock: none/none, Labour: h, s/h, s, f, Land ownership: family/family, Land tenure: free/free, Housing: own/own, Bank account: none/none, Remittances: none/none,,
Kweku Kakra	Kweku Panin	Sex: M/M, Age: 26/26, Ethnicity: Fanti/fanti, Chd: 2/1, Chd at sch:1/0, Both married, Other occupation: mason/hunting, Food crop farm size: 1.5/1, Crops: m, c, pp, g/m, Cash crop: none/none, Livestock: none/none, Labour: s, f/s, f, Land ownership: father/father, Land tenure: free/free Housing: own/father, Bank account: none/none, Remittances: none/none