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**COMMERCIAL COTTON GROWING IN THE SUDAN  
BETWEEN 1860 AND 1925**

**A STUDY IN HISTORICAL GEOGRAPHY**

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**Vol. II - Maps**

**THESIS FOR THE DEGREE OF Ph.D.**

**BY**

**HASSAN ABDEL AZIZ AHMED**

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**UNIVERSITY OF DURHAM, U.K.,**

**NOVEMBER, 1970.**

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PLEASE NOTE :

FIGURES 53, 54, 55, and 56 HAVE BEEN MISPLACED  
IN BINDING AS FOLLOWS : 54, 53. 56,55:

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NOTE:

FIGURES 46, 57, 59 and 60 HAVE BEEN ENLARGED AND  
INSERTED IN POCKETS.

FIG. 1

FIG. 1. A SKETCH MAP OF THE WORLD TO SHOW COTTON GROWING AREAS UP TO 1918

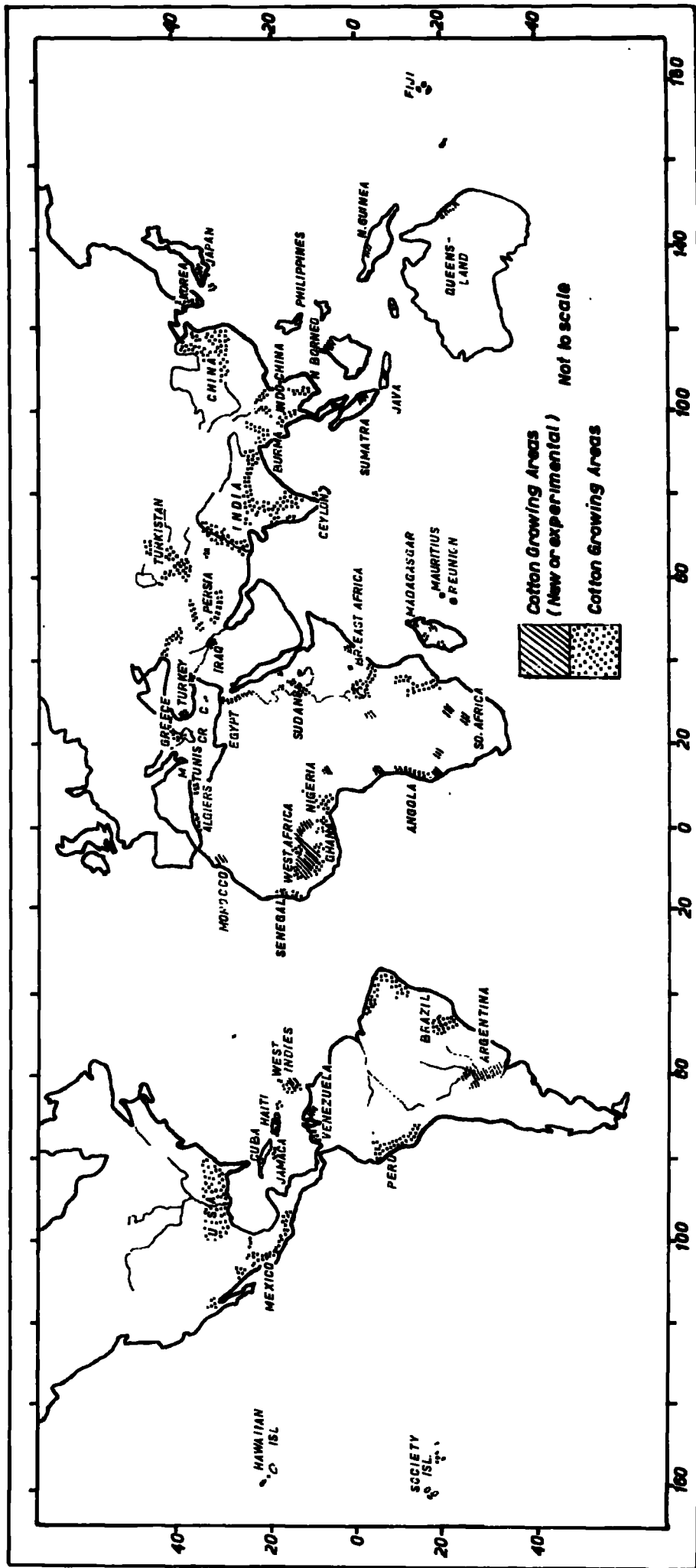




FIG. 2.

**FIG. 2. DISTRIBUTION OF COTTON SPECIES IN THE OLD AND NEW WORLDS**

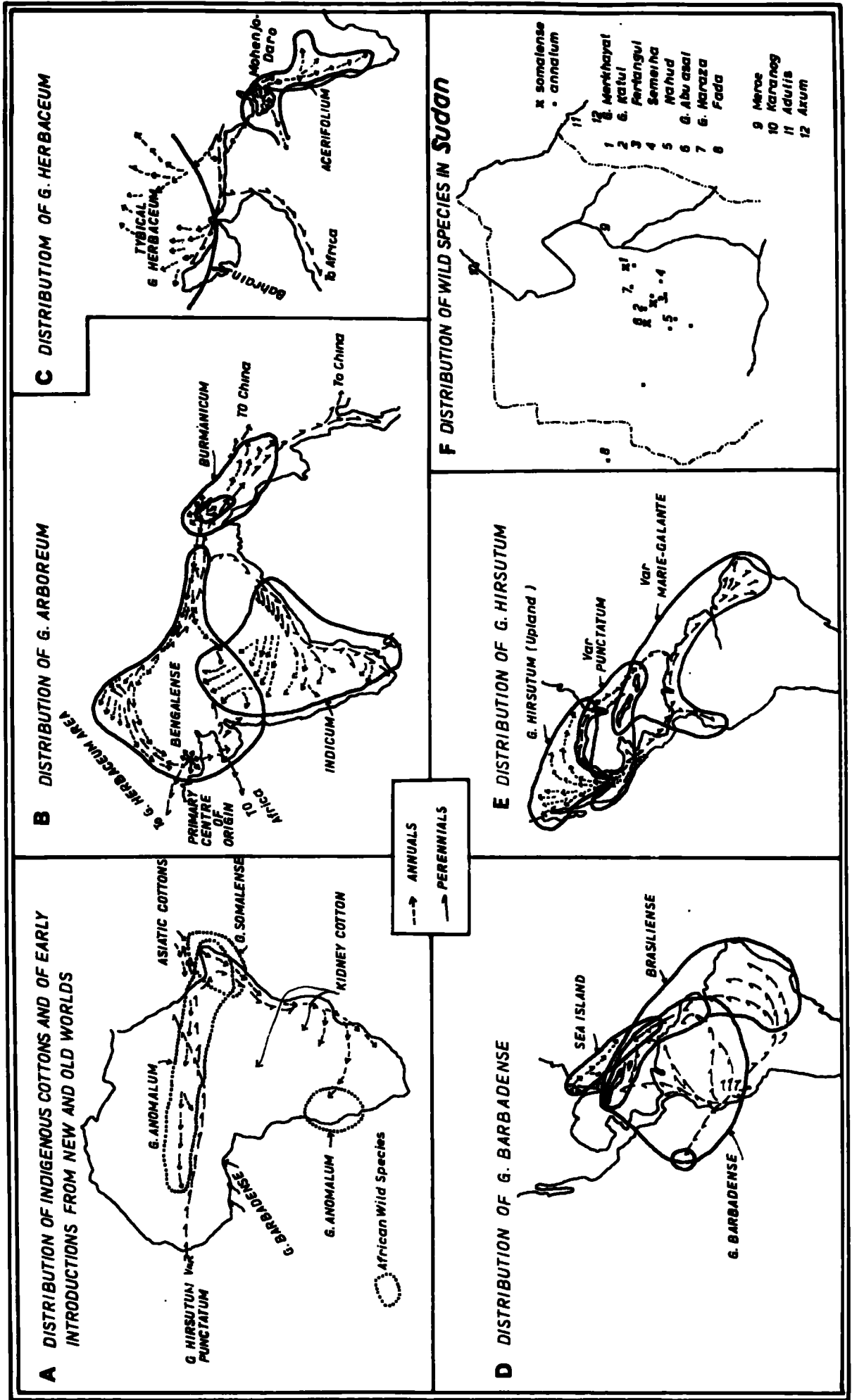
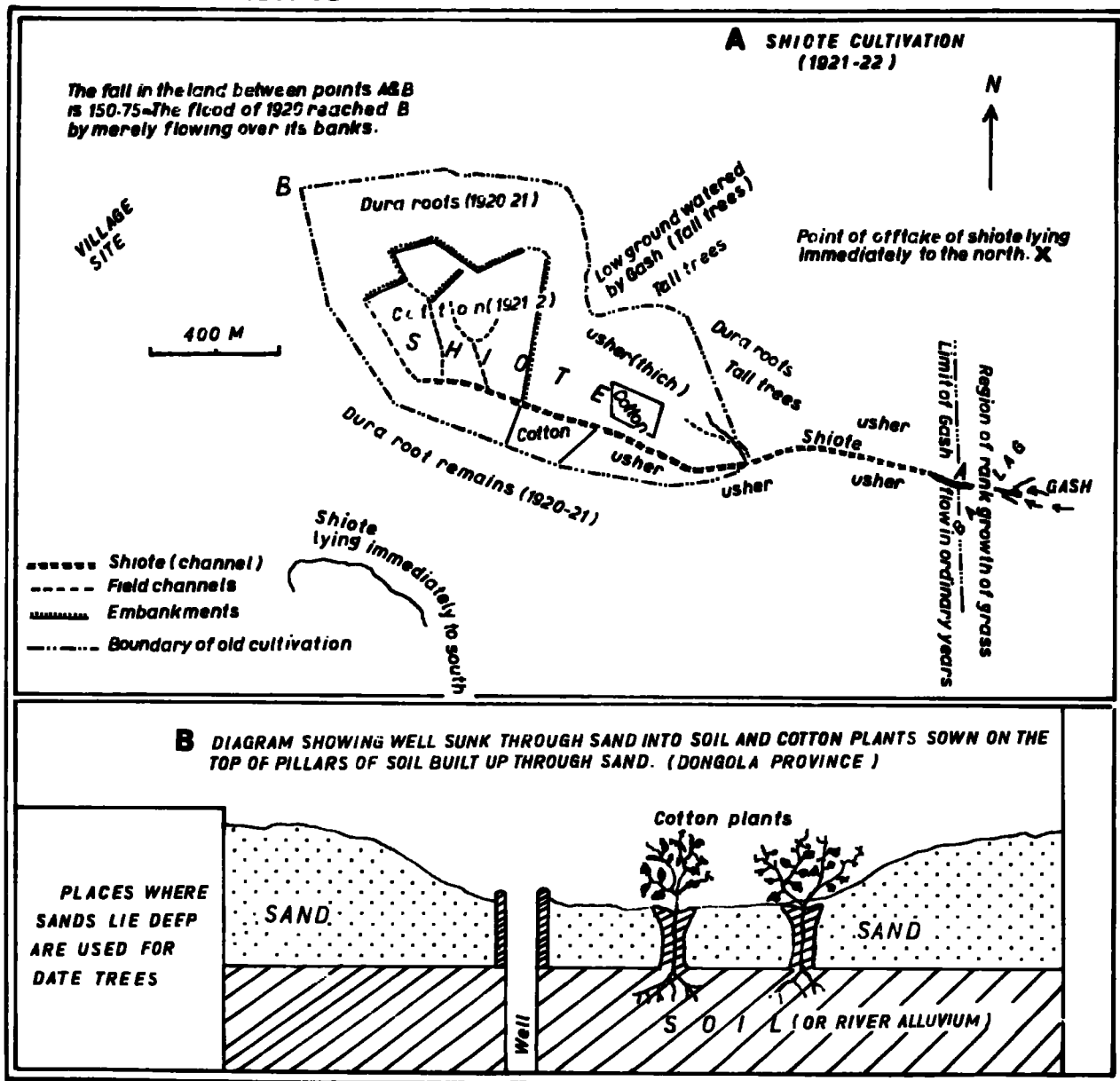


FIG 4-E (AFTER J. B. HUTCHINSON (1947) op. cit.)

FIG. 3.

**FIG. 3. METHODS OF CULTIVATION IN GASH DELTA & DONGOLA PROVINCE**



FROM S.N.R. vol. 5 no. 2 (1925)

FIG. 4.



FIG. 5.

FIG. 5. SOLID GEOLOGY AND SUPERFICIAL DEPOSITS IN THE SUDAN

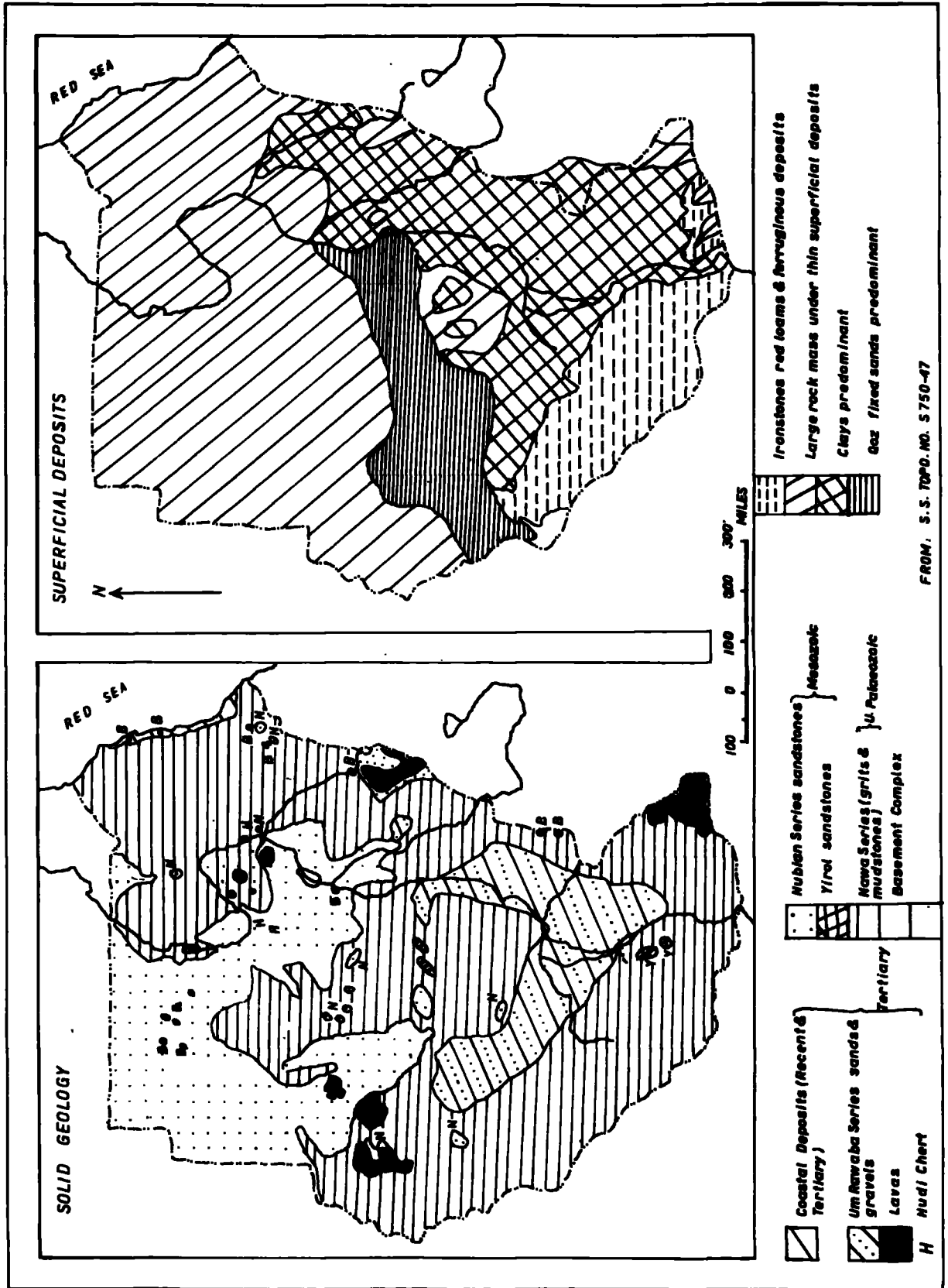
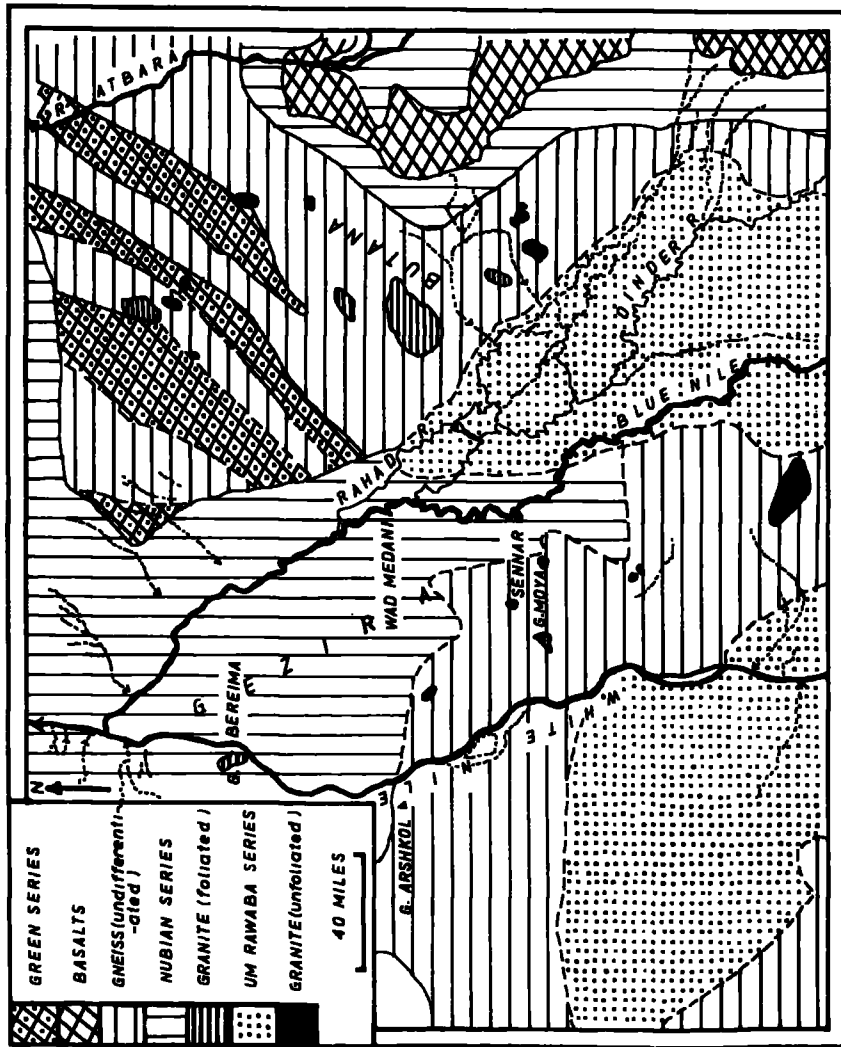




FIG. 6. and  
FIG. 7.

FIG. 6. GEOLOGY OF THE GEZIRA and PART OF BUTANA



FROM S.S. (TOPO. NO. 5867)

FIG. 7.

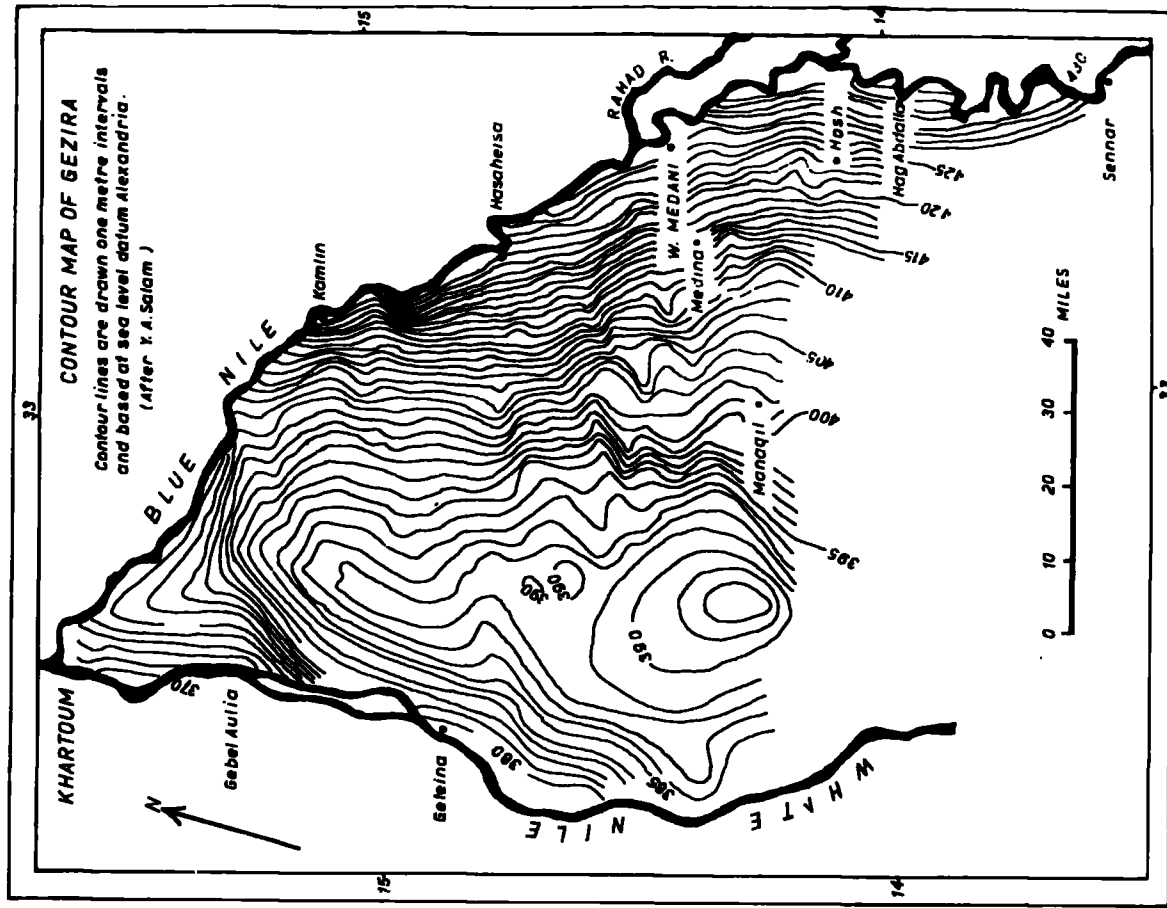


FIG. 8.

FIG. 6. THE GASH DELTA (after 1922 flood)

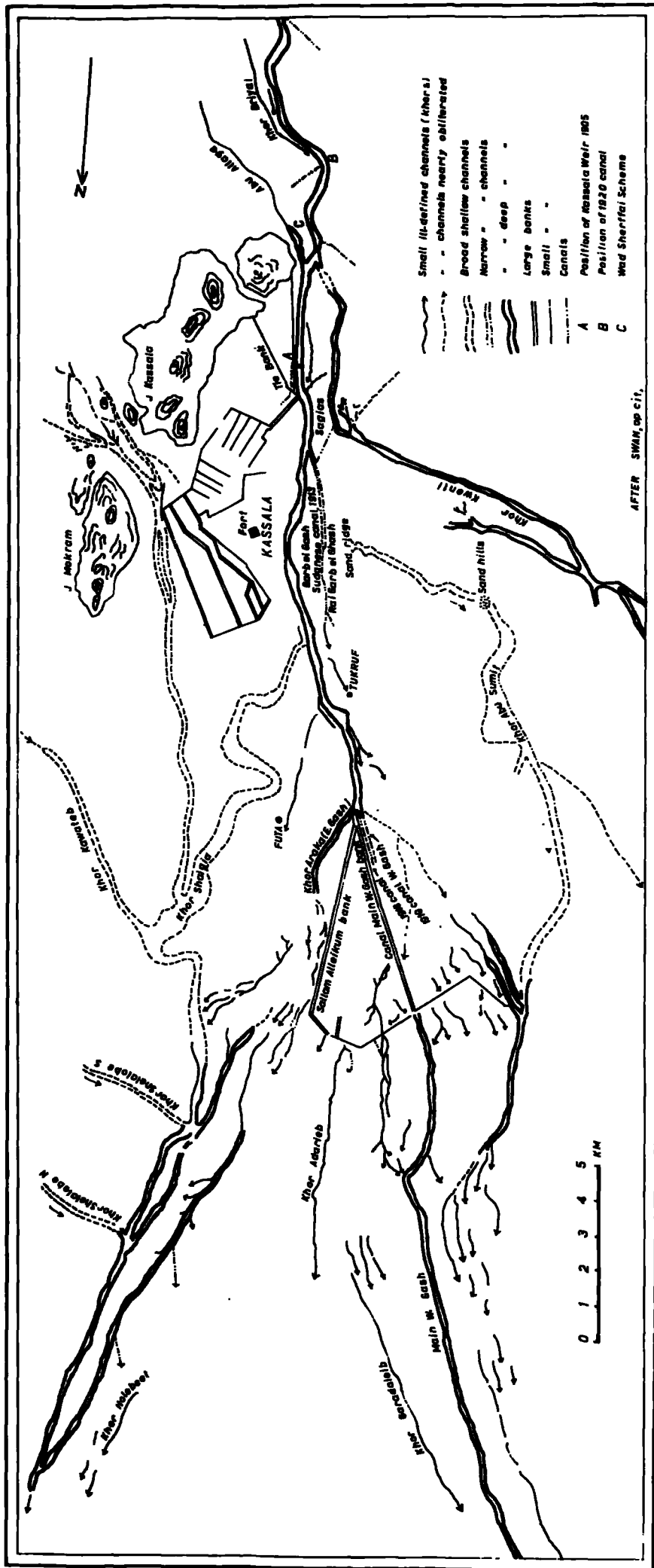
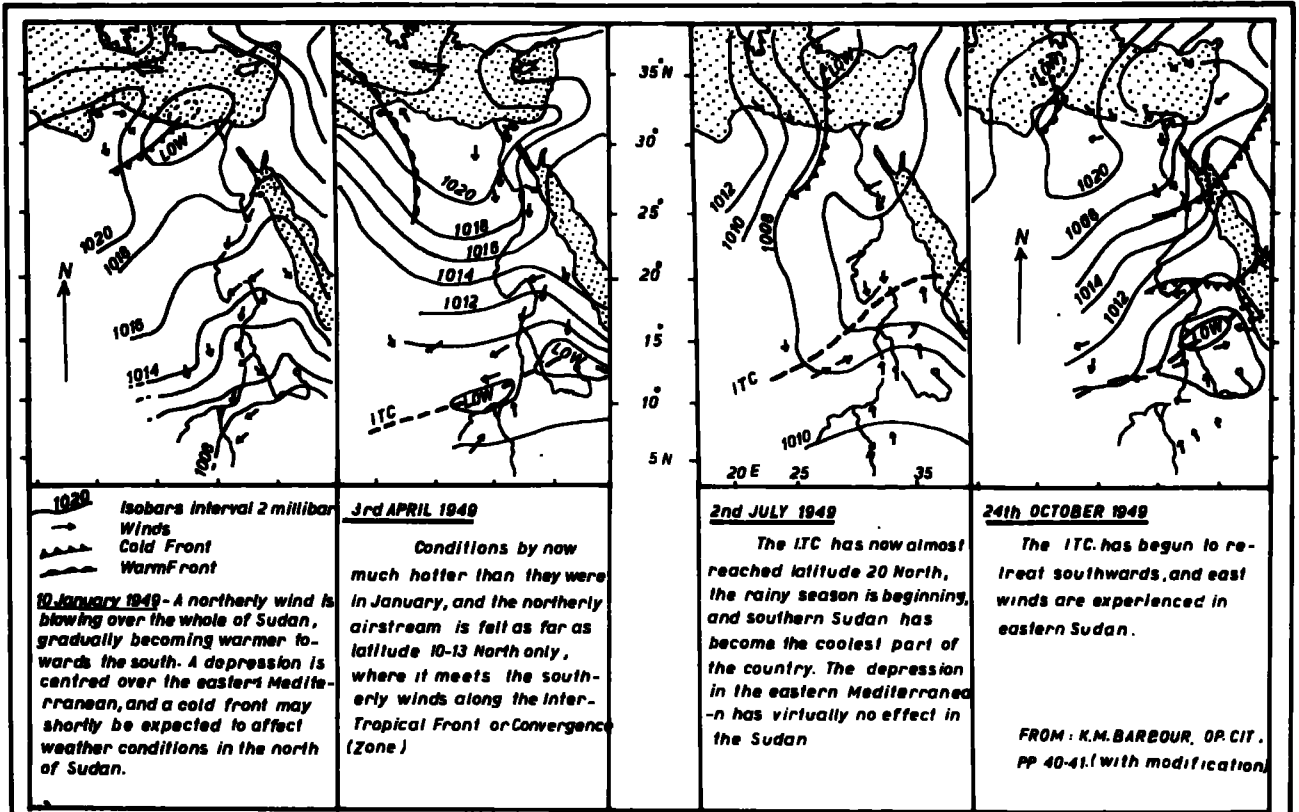


FIG. 9.

**FIG. 9.**

**A- DAILY WEATHER REPORTS ILLUSTRATING TYPICAL WEATHER CONDITIONS IN SUDAN**



**B RELIEF RAINFALL and TEMPERATURE CONDITIONS**

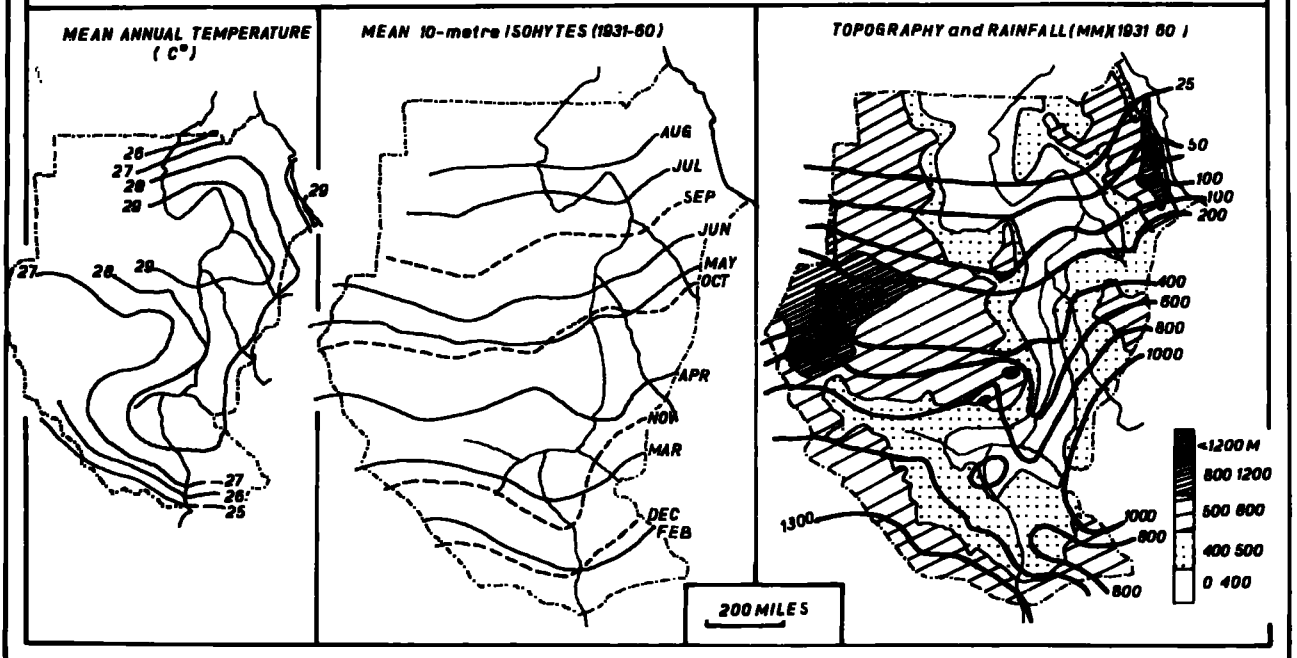


FIG. 10. and  
FIG. 11.

FIG. 11.

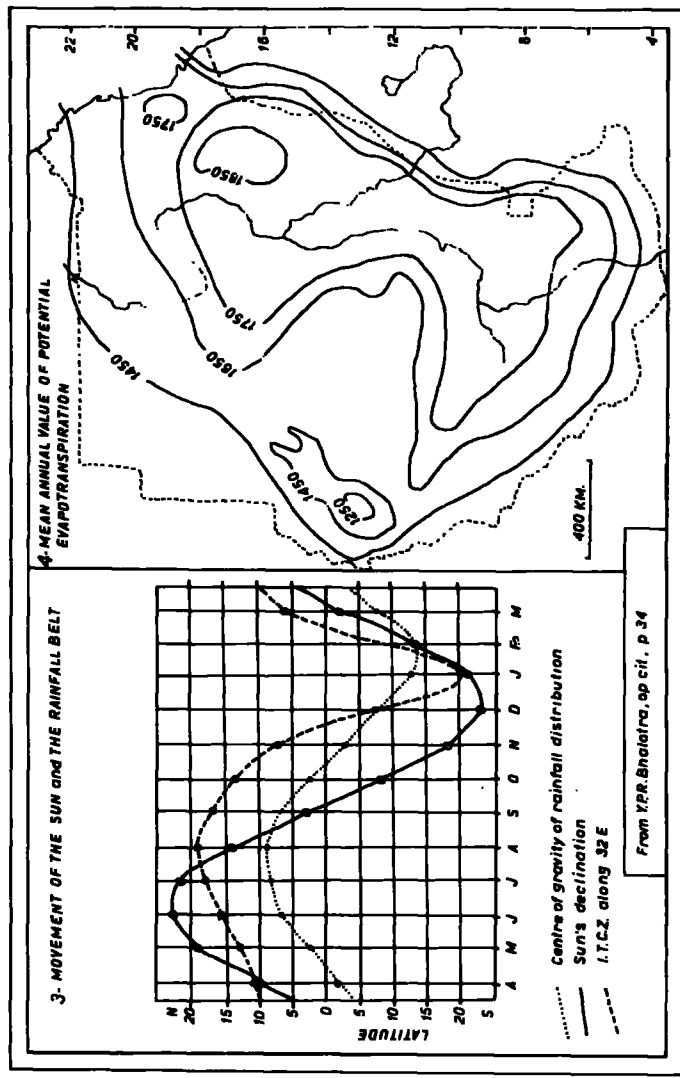


FIG. 10.

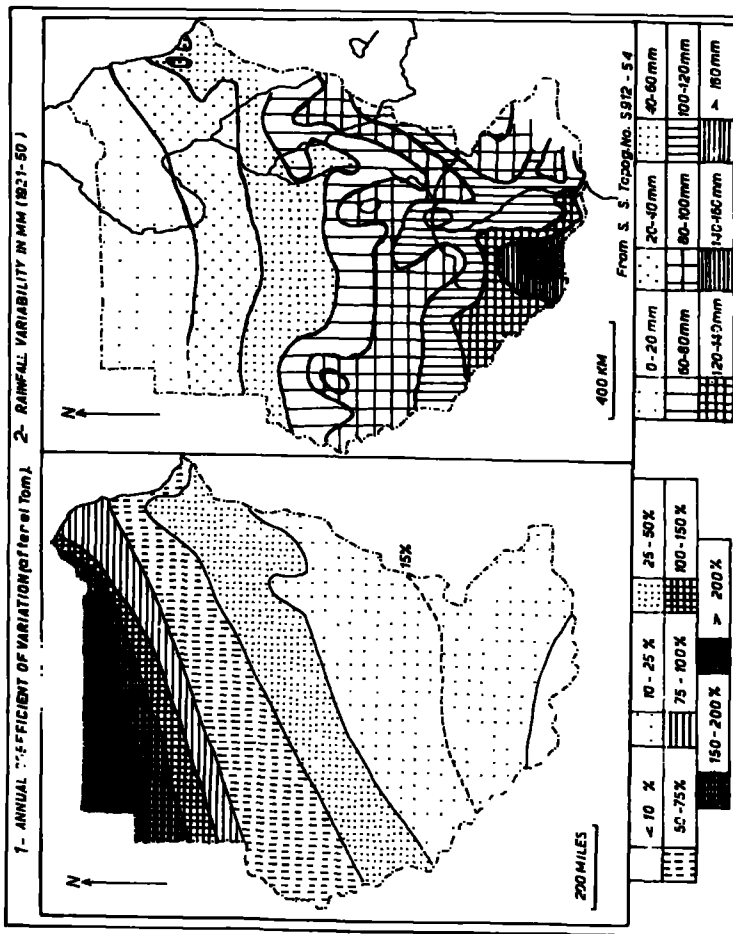
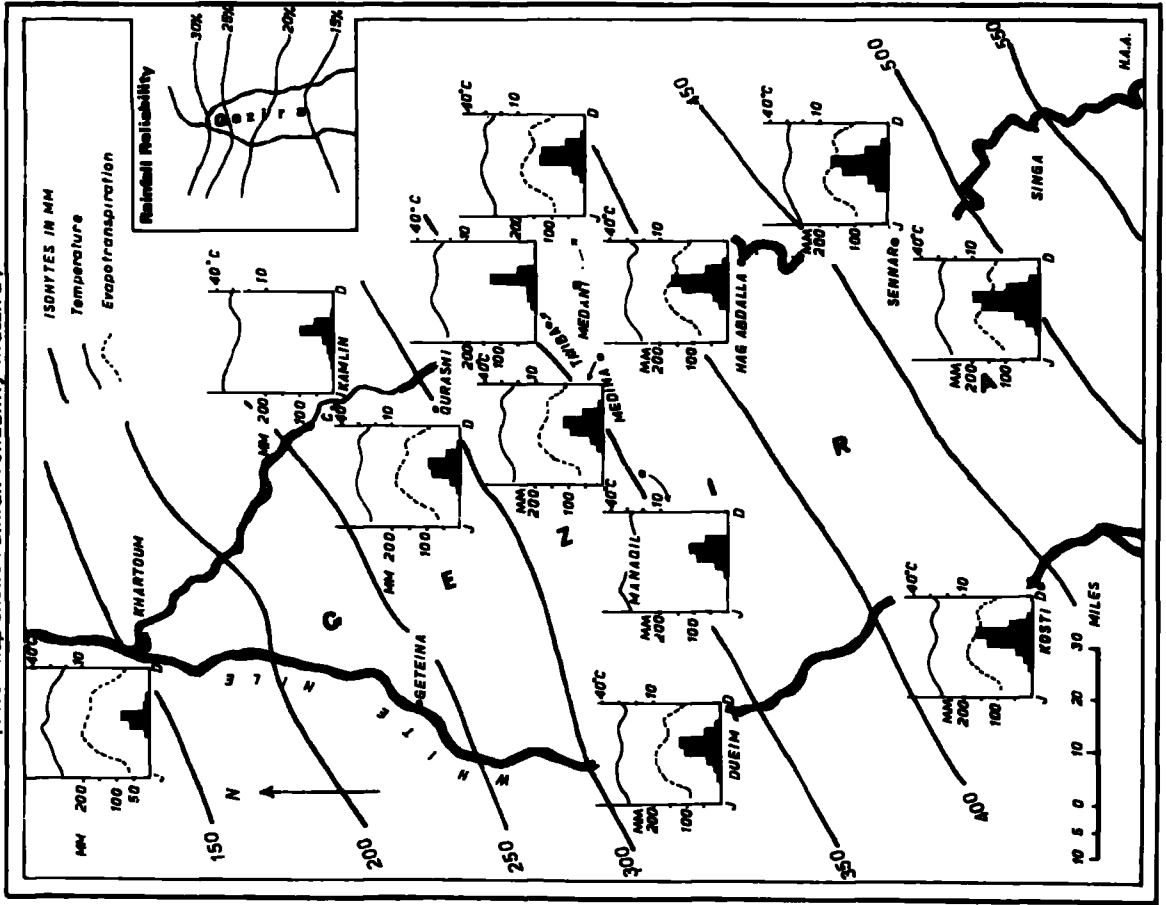




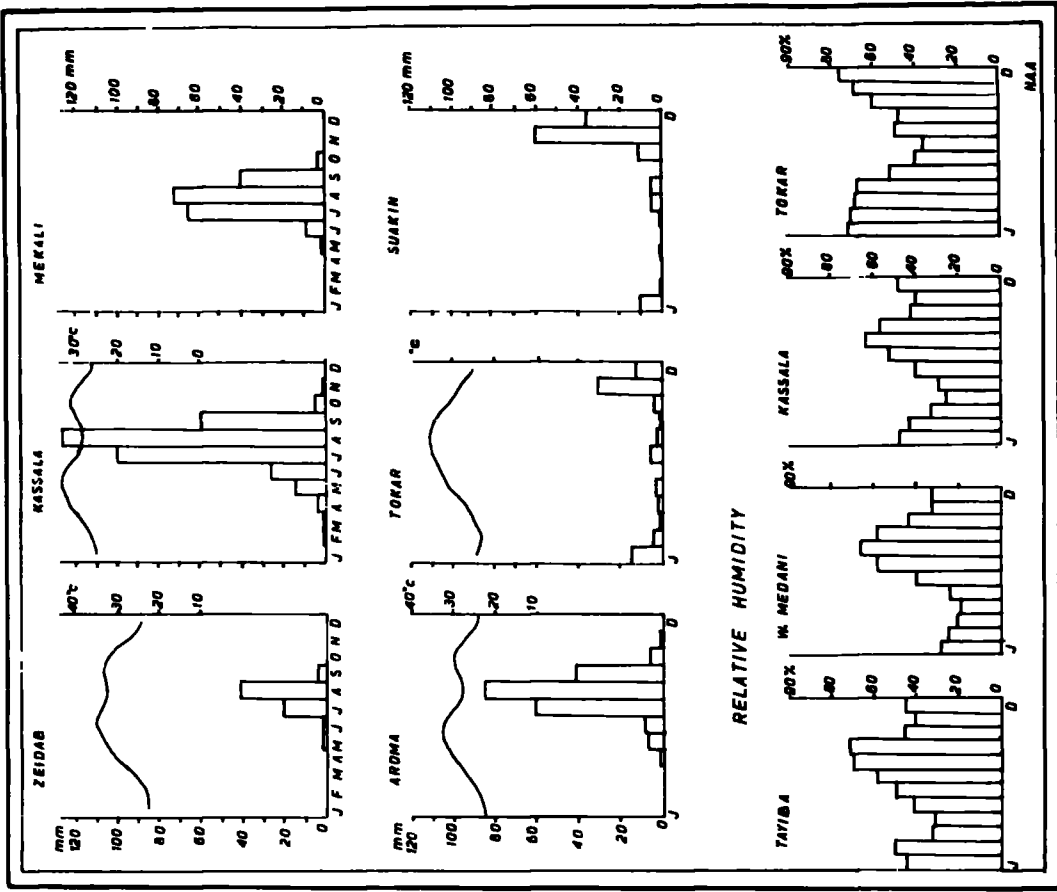
FIG. 12 and  
FIG. 13.

FIG. 12. MEAN MONTHLY RAINFALL, TEMPERATURE & EVAPOTRANSPIRATION (POTENTIAL).  
 GEZIRA. (Inset map shows rainfall reliability in Gezira)



SOURCE: S.M.D. MEMOIR NO 6 (1963)

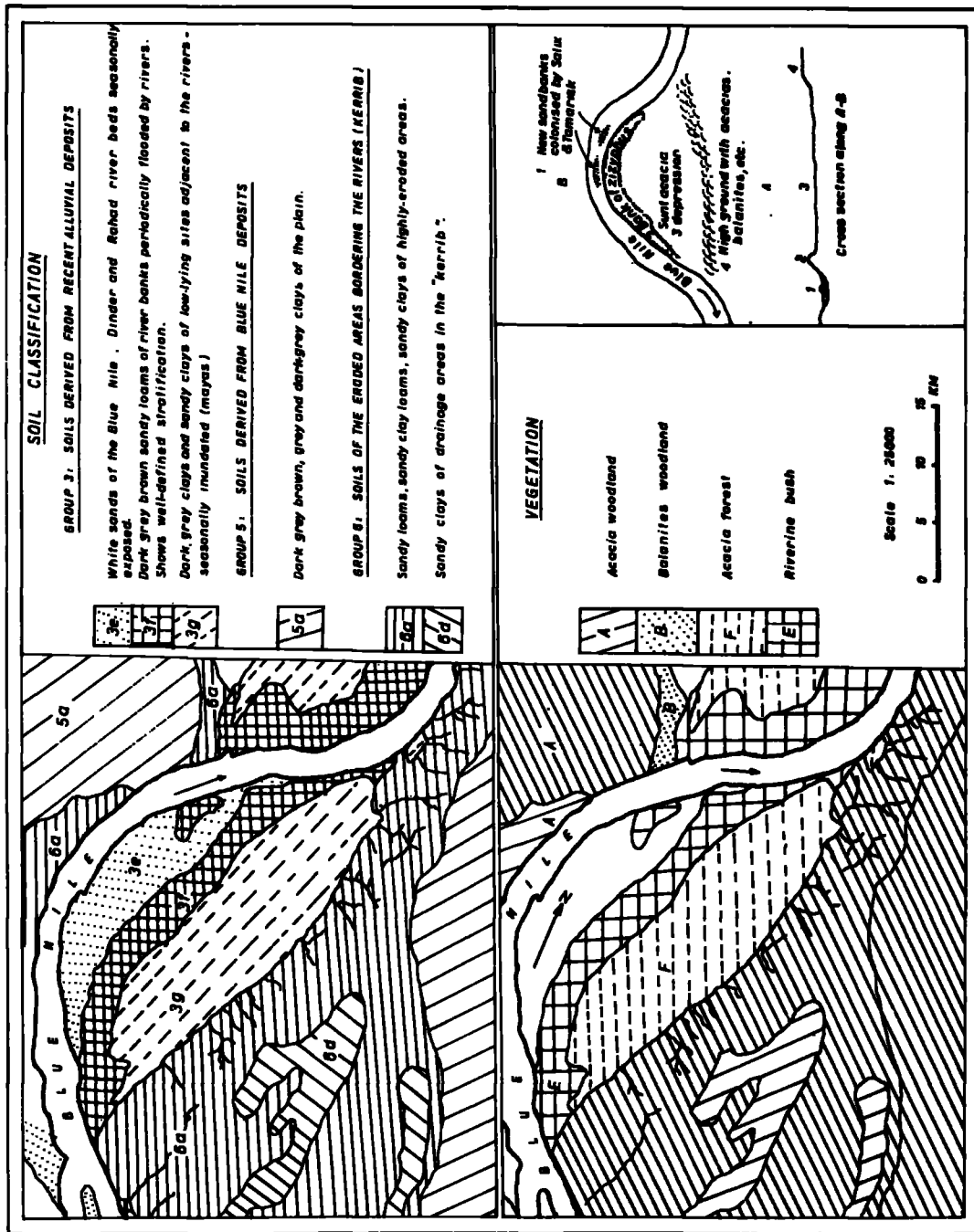
FIG. 13. MEAN MONTHLY RAINFALL, TEMPERATURE & RELATIVE HUMIDITY AT SELECTED PLACES



SOURCE: S.M.D. PUBLICATIONS NO. 2 (1957)

FIG. 14.and  
FIG.15.

FIG. 14. SOILS AND ASSOCIATED VEGETATION ALONG THE BLUE NILE (LAT. 12° 45')



FROM A. SIDES & PARTNERS, INC.

FIG. 15. VEGETATION IN THE BEZIRA, THE BUTANA AND N.E. SUDAN

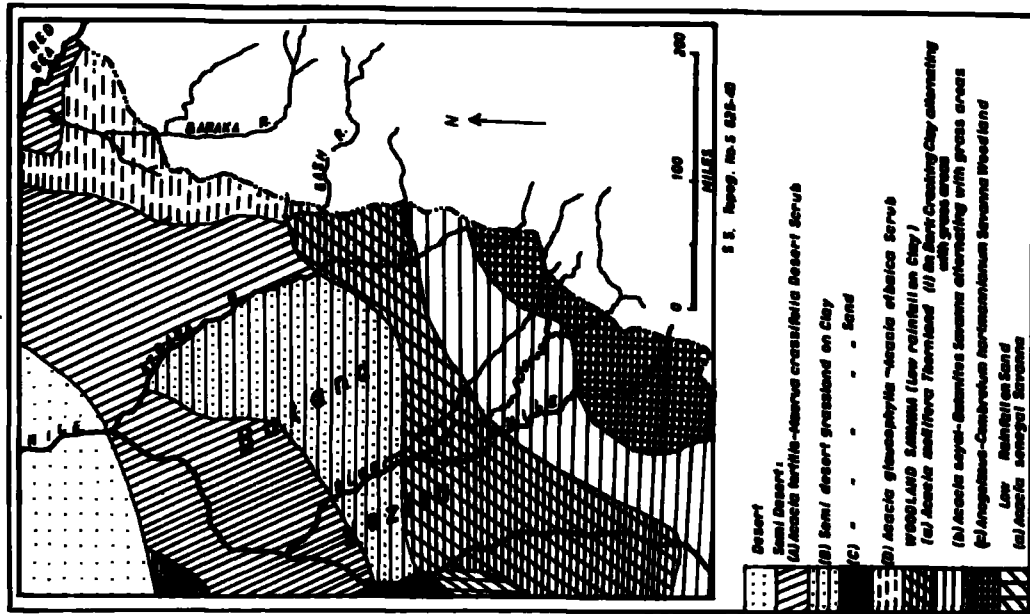


FIG. 16a and  
FIG. 17.

FIG. 16.

1 - PERCENTAGE PROBABILITY OF RECEIVING LESS THAN 100 MM      2 - PERCENTAGE PROBABILITY OF RECEIVING LESS THAN 500 MM OF ANNUAL R/T

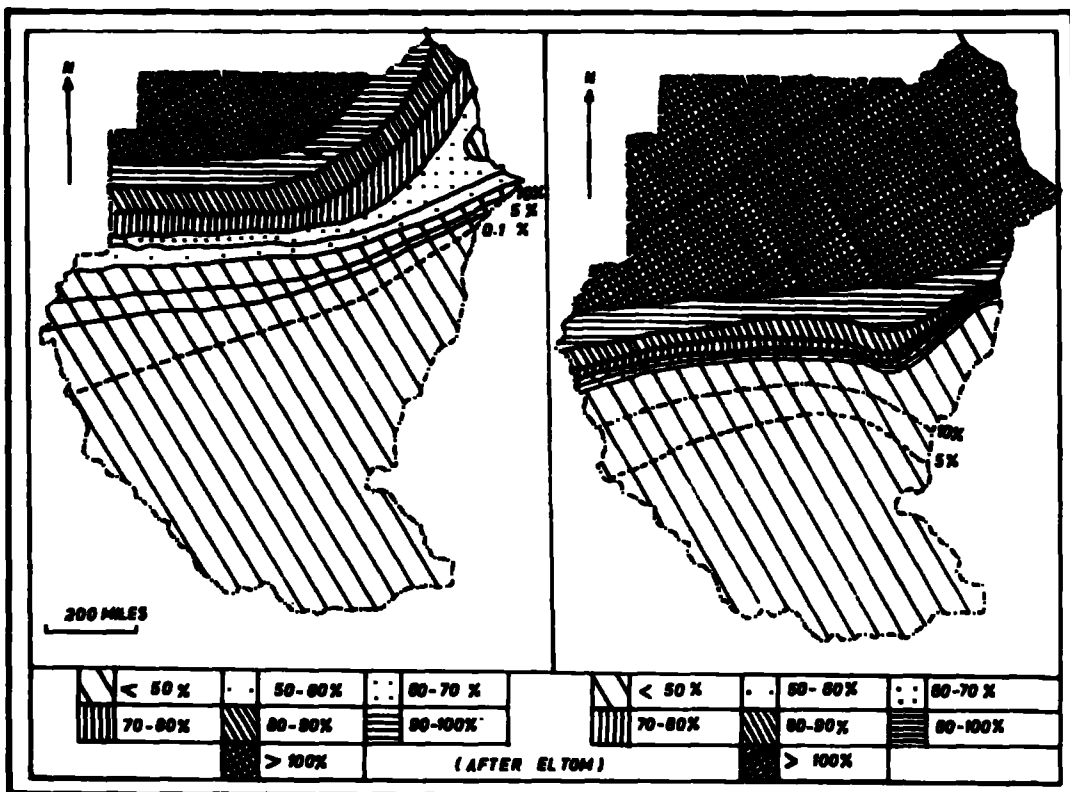


FIG. 17. - AVERAGE DISCHARGES OF THE NILE & TRIBUTARIES IN CUMECs

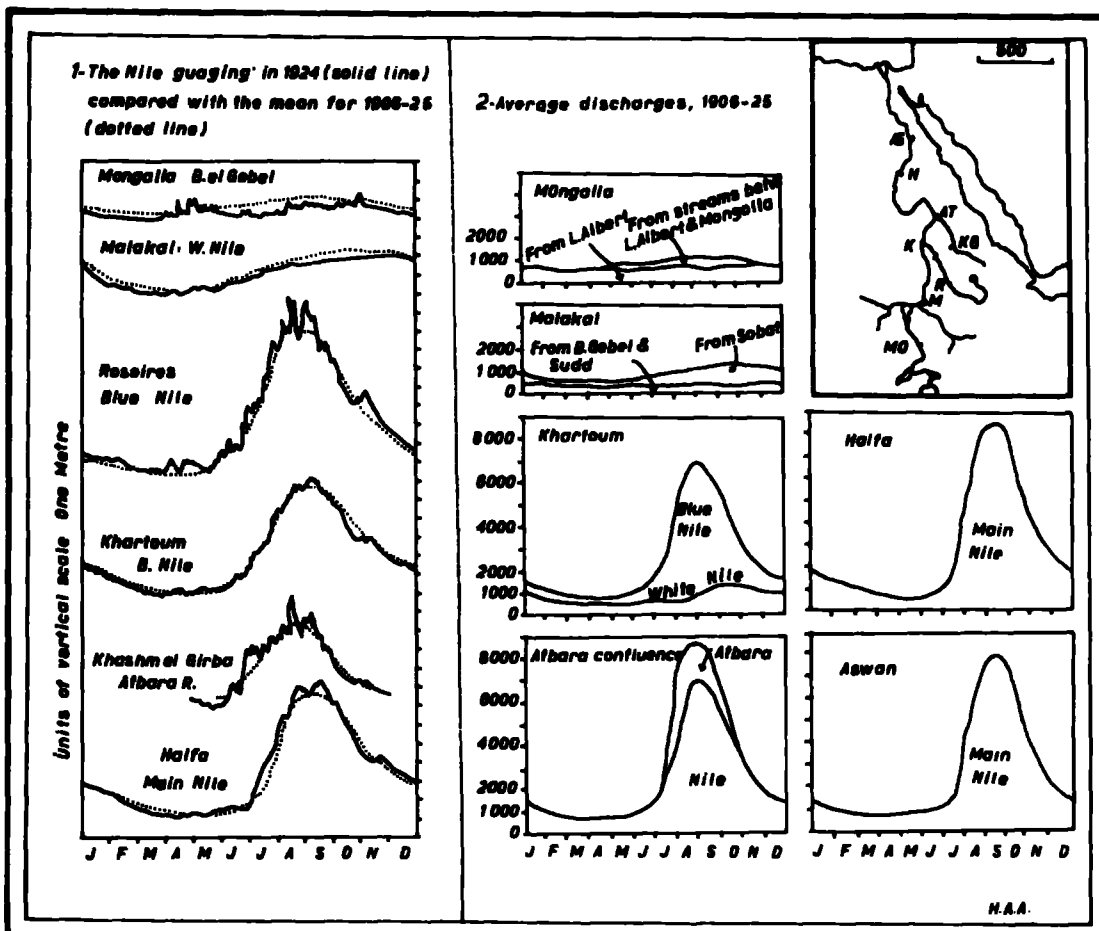


FIG. 18A & B.

FIG. 18 A.

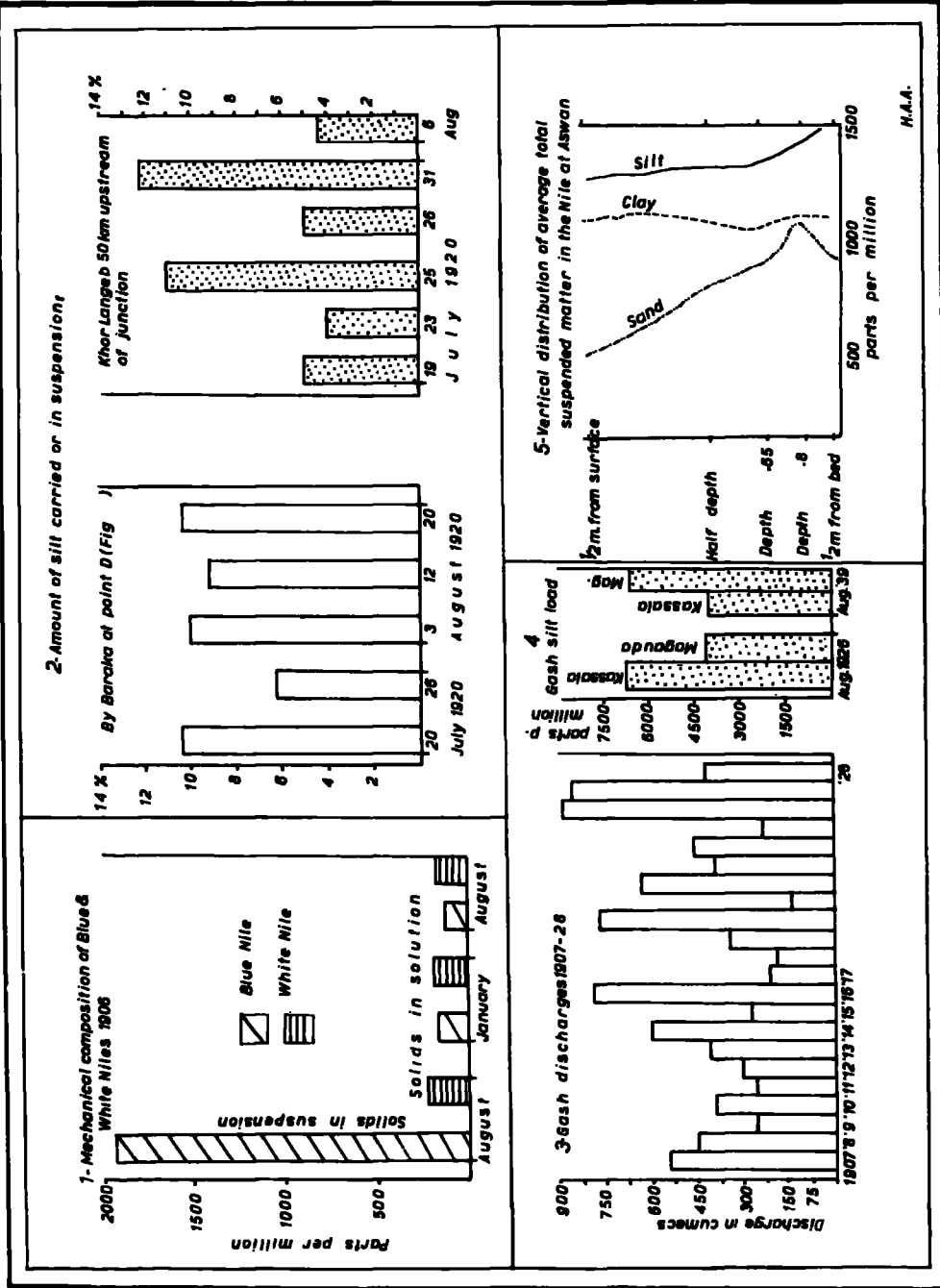
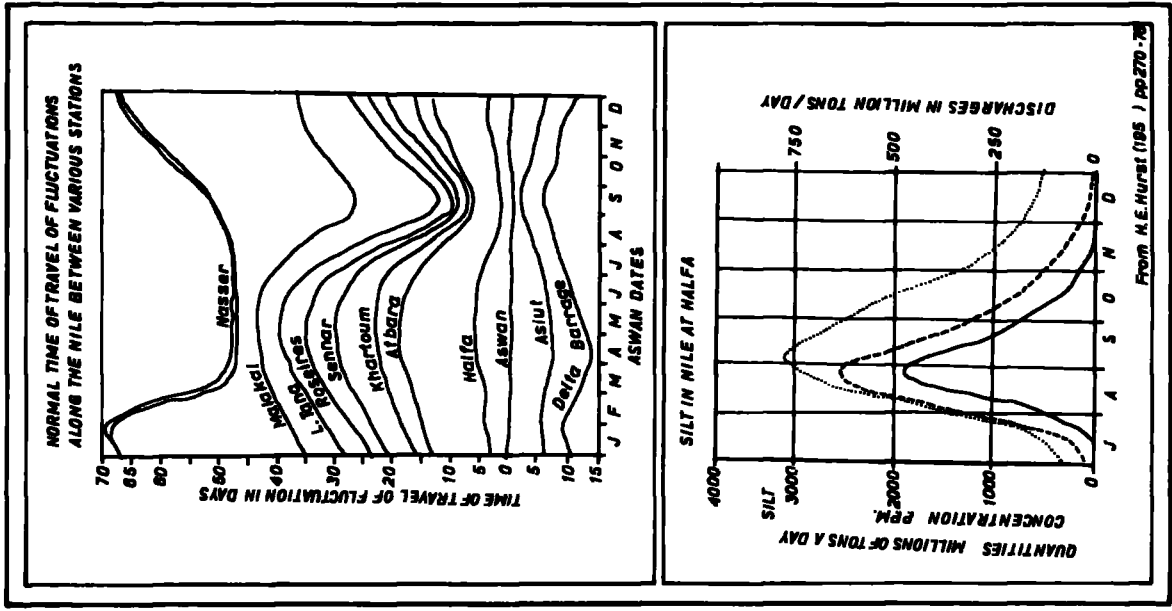


FIG. 18 B.

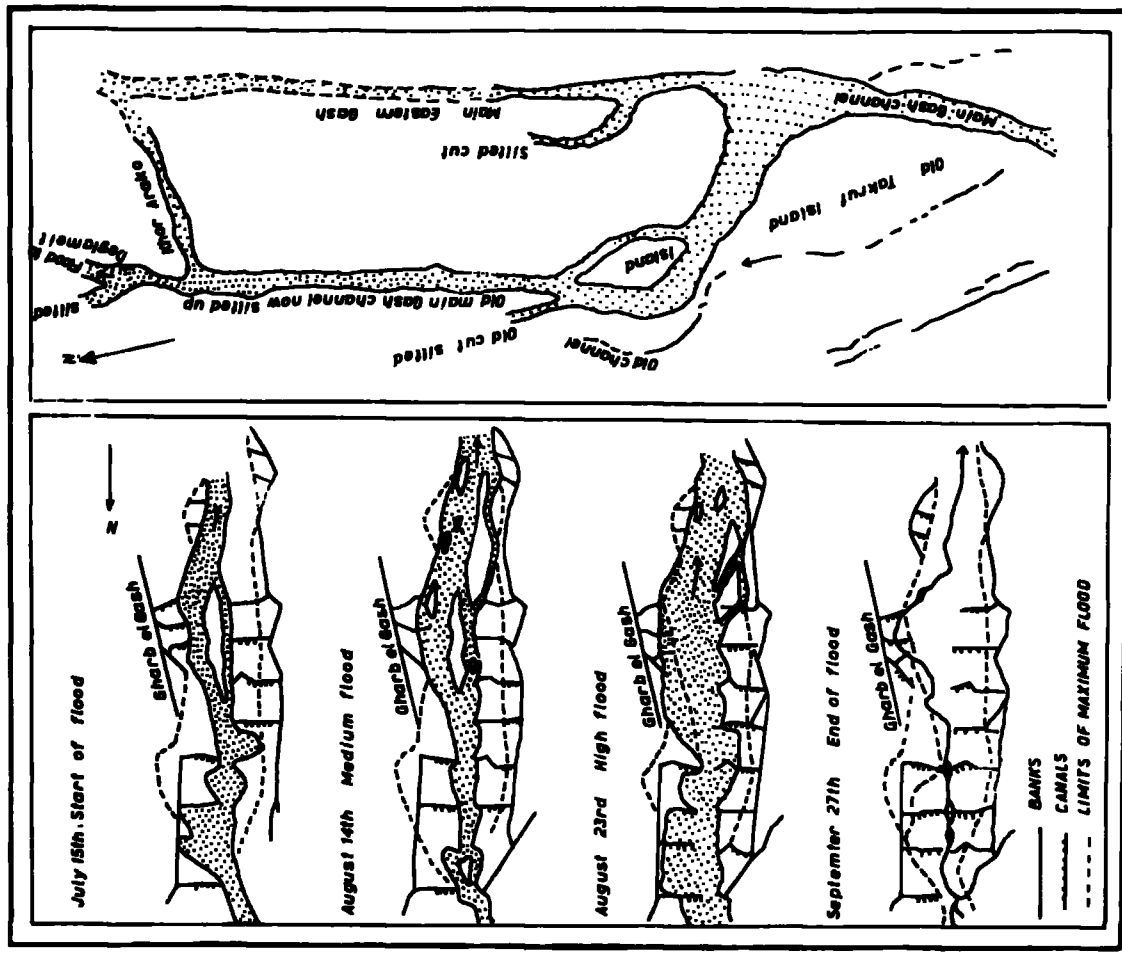


From M.E. HURST (1951) PP. 270-75



FIG. 19. and  
FIG. 20.

**FIG. 20. TYPICAL GASH BEHAVIOR IN FLOOD TIME (1934 flood)**  
(AFTER SWAN)



**FIG. 19. AREAS FLOODED BY THE BARAKA, 1914-1921**

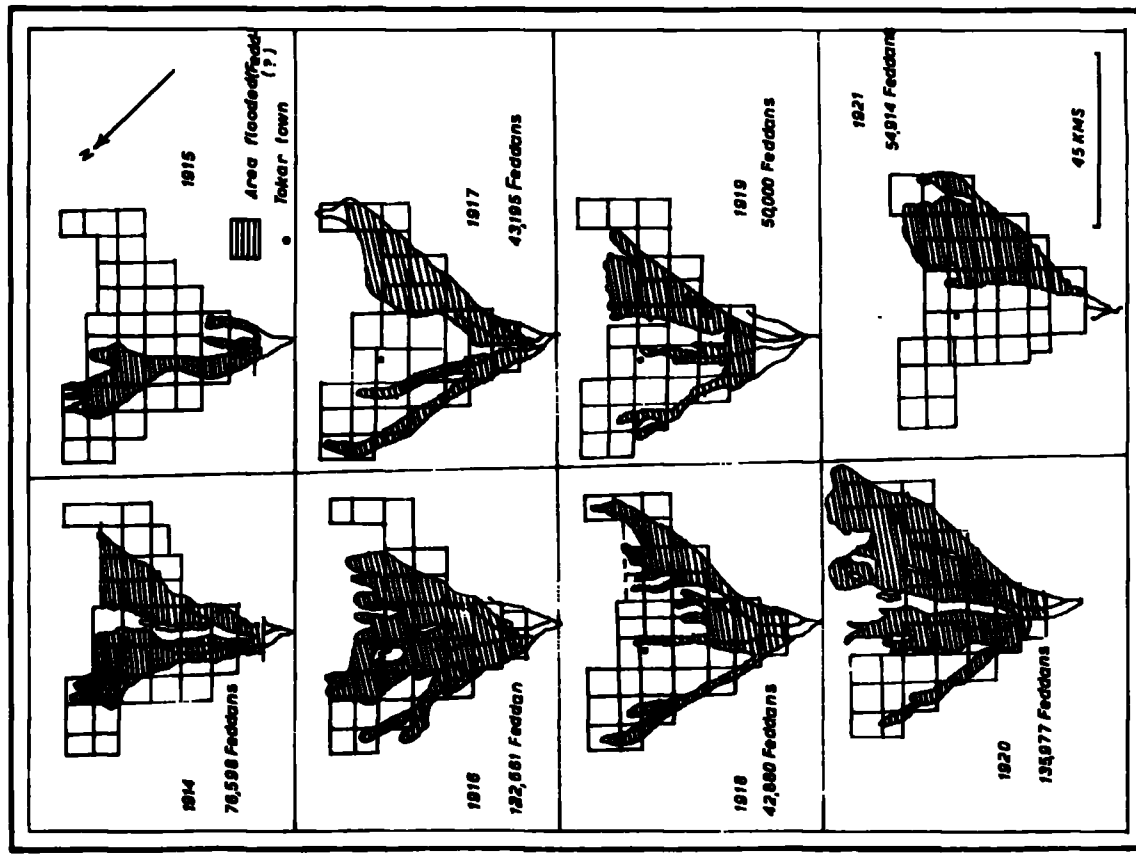
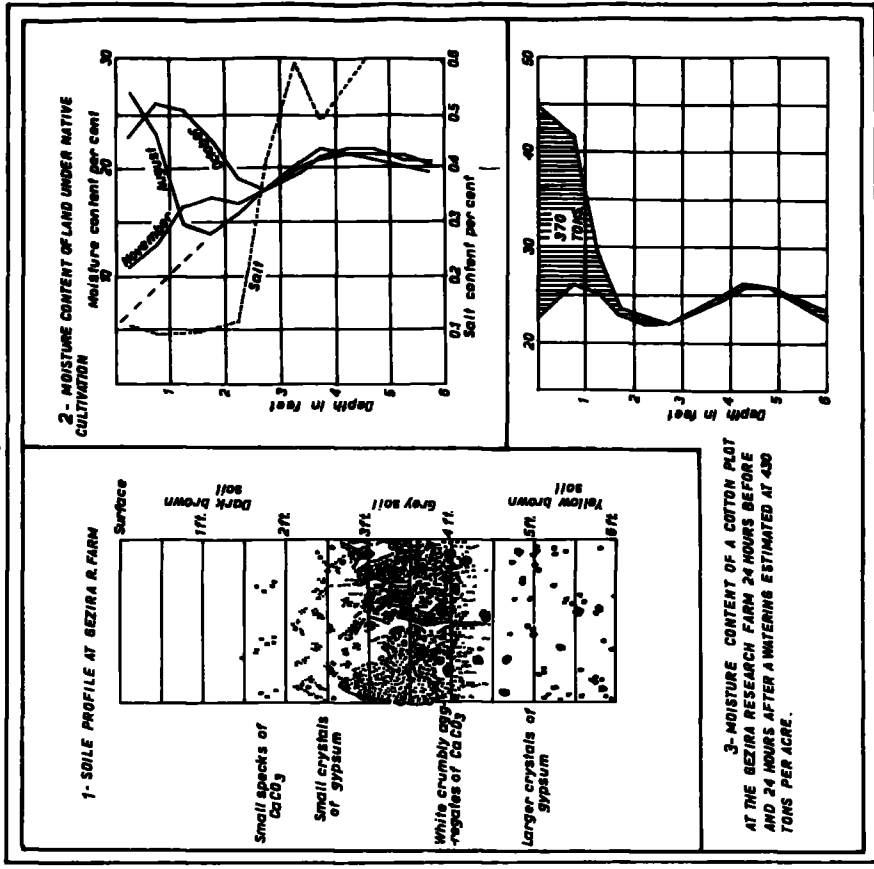


FIG. 21 and  
FIG. 22.

FIG. 22. SOIL PROFILE AND PERMEABILITY IN EASTERN GEZIRA



FROM: AGRIC. IN THE SUDAN, pp. 443, 445, 447.

FIG. 21. GEZIRA: FIELD NITRATES, SOIL PRODUCTIVITY & RELATION BETWEEN CLAY & YIELD

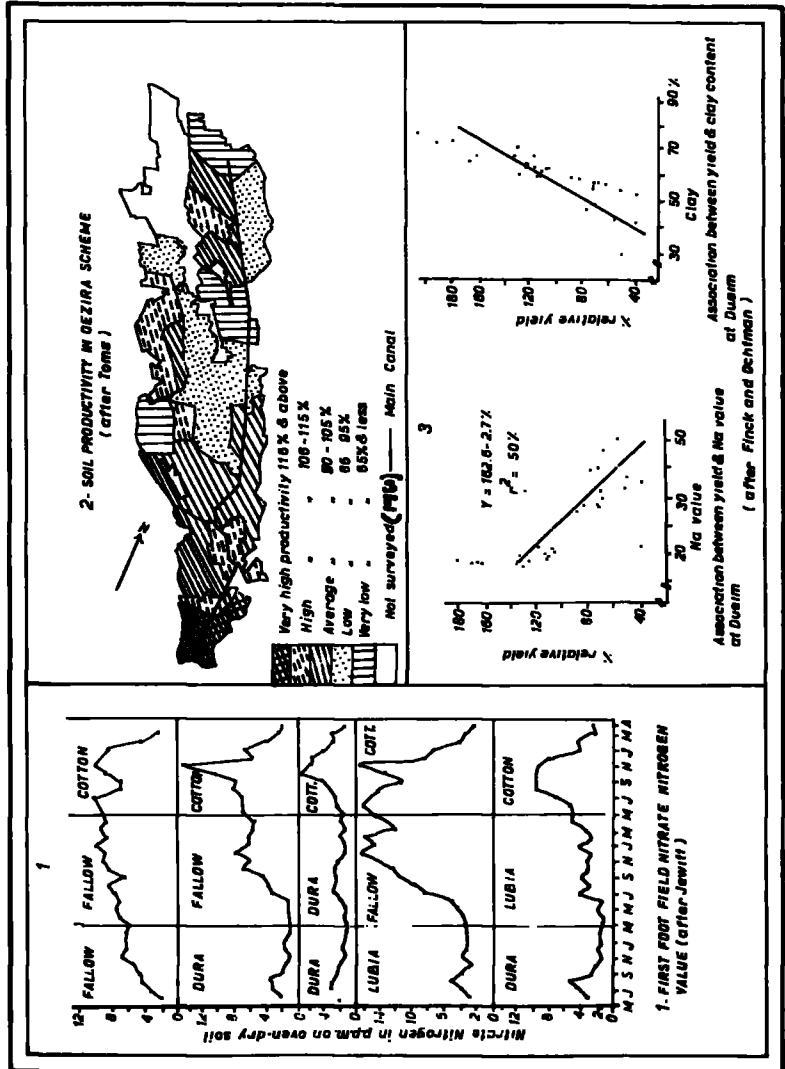
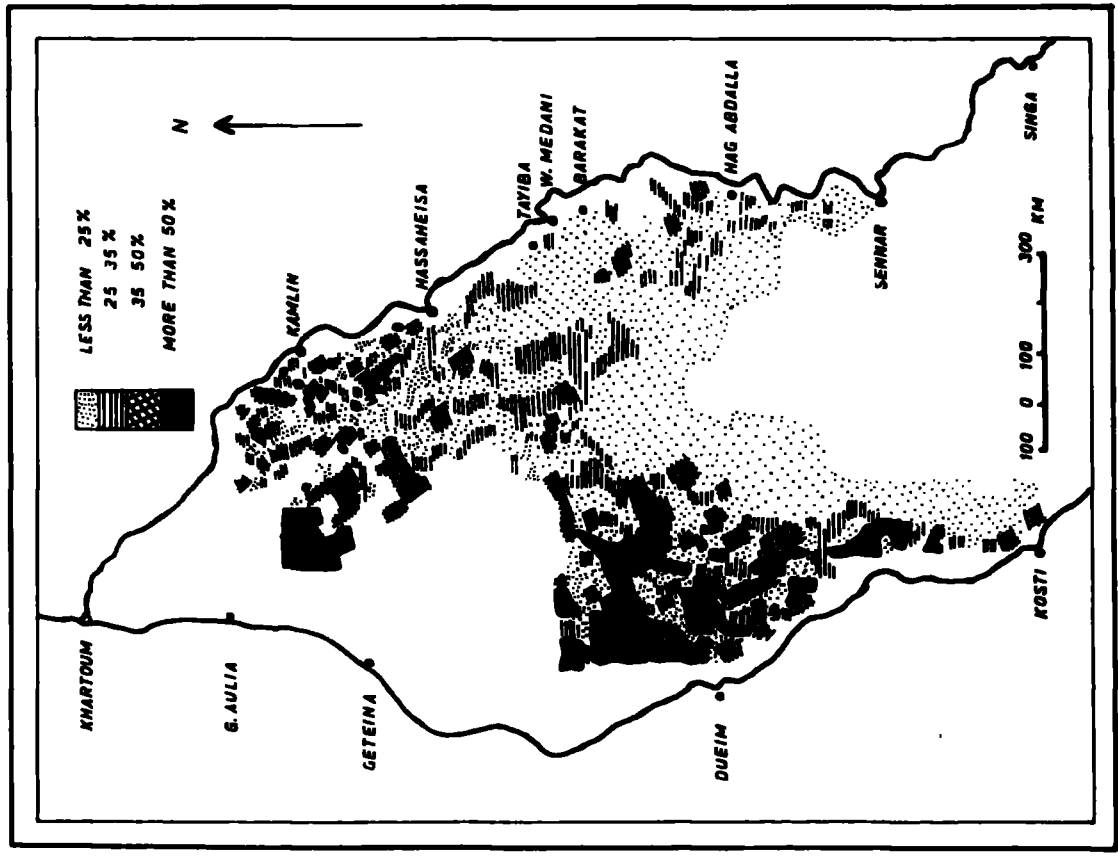


FIG. 23. and  
FIG. 24.

FIG. 23. GEZIRA: PERCENTAGE OF SOLUBLE SALTS IN TOP 4-FT OF SOIL



FROM: AGRIC. IN THE SUDAN P. 448

FIG. 24. MEAN MONTHLY TEMPERATURE AT SOME COTTON GROWING AREAS

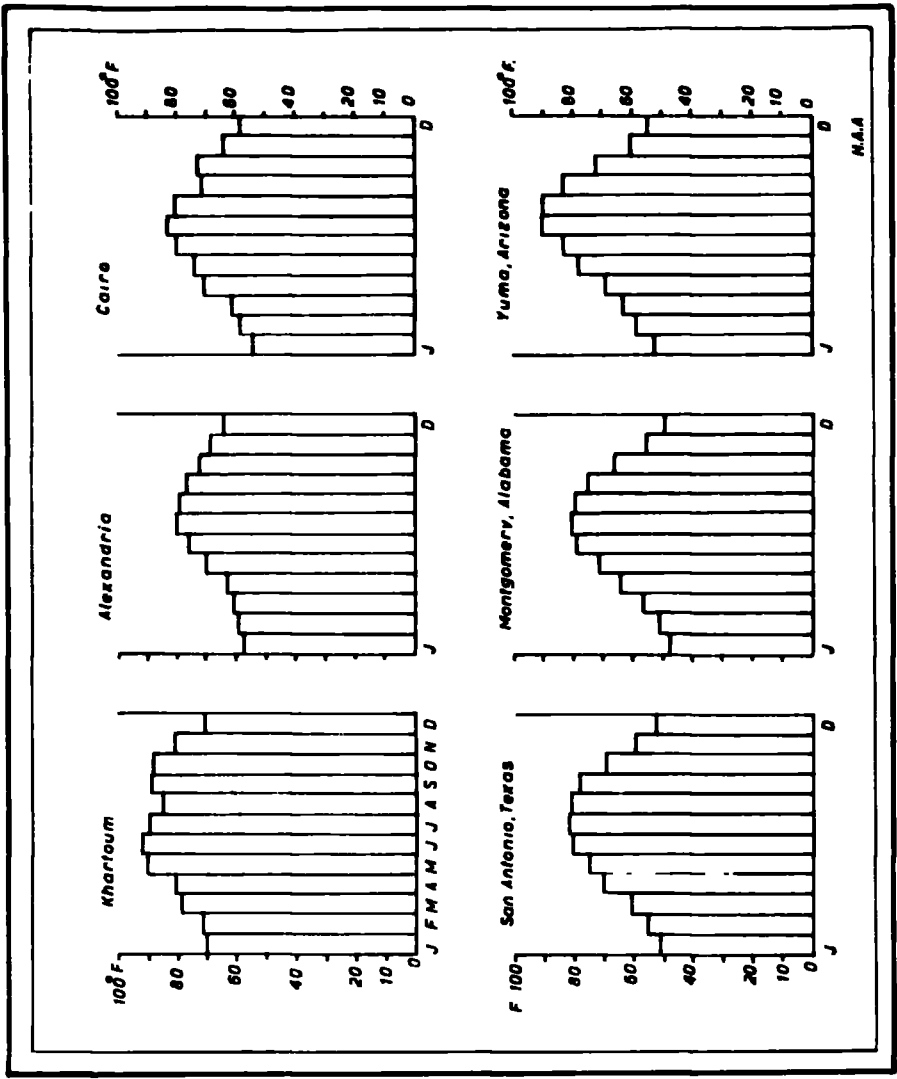


FIG. 25. and  
FIG. 26.

FIG. 25.

A. BRITAIN'S SHARE IN TOTAL COTTON EXPORT FROM AMERICA FROM 1836 - 1898 (No record during Civil War 1862-64)

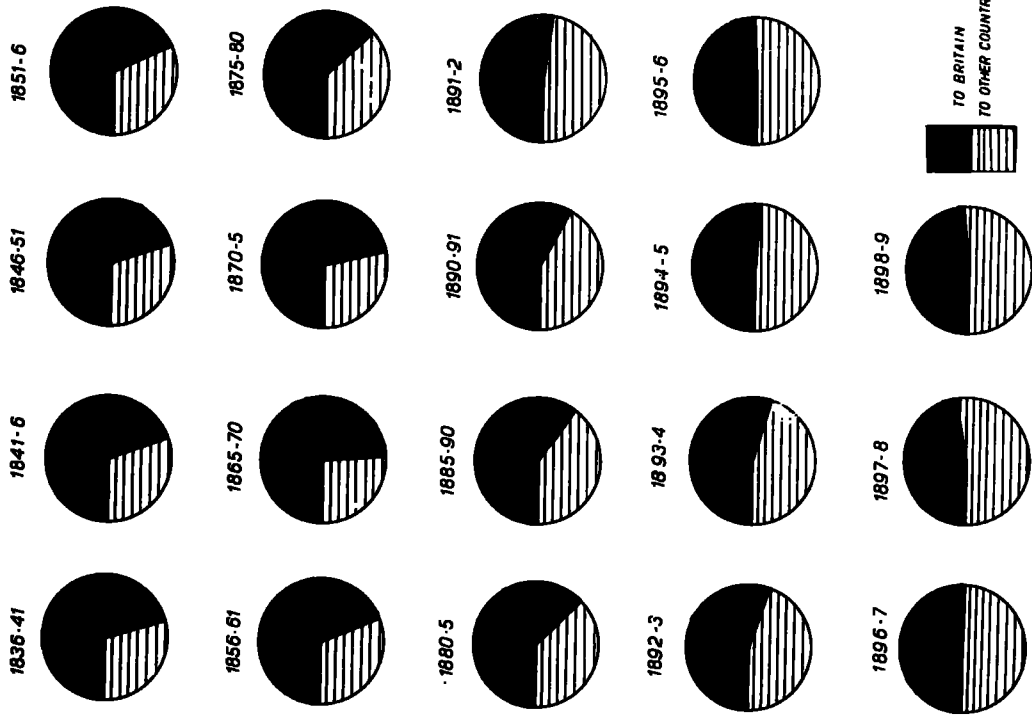


FIG. 26.

B. DISTRIBUTION OF AMERICAN COTTON CROP FROM 1836 TO 1898 (No record during Civil War 1862-64)

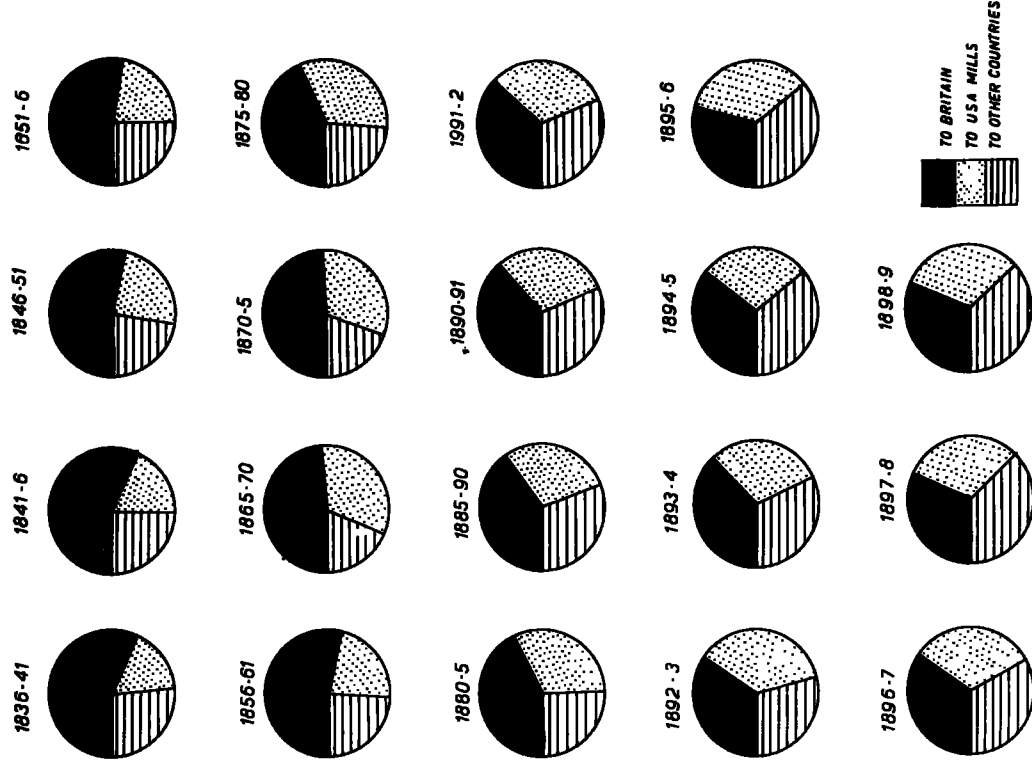
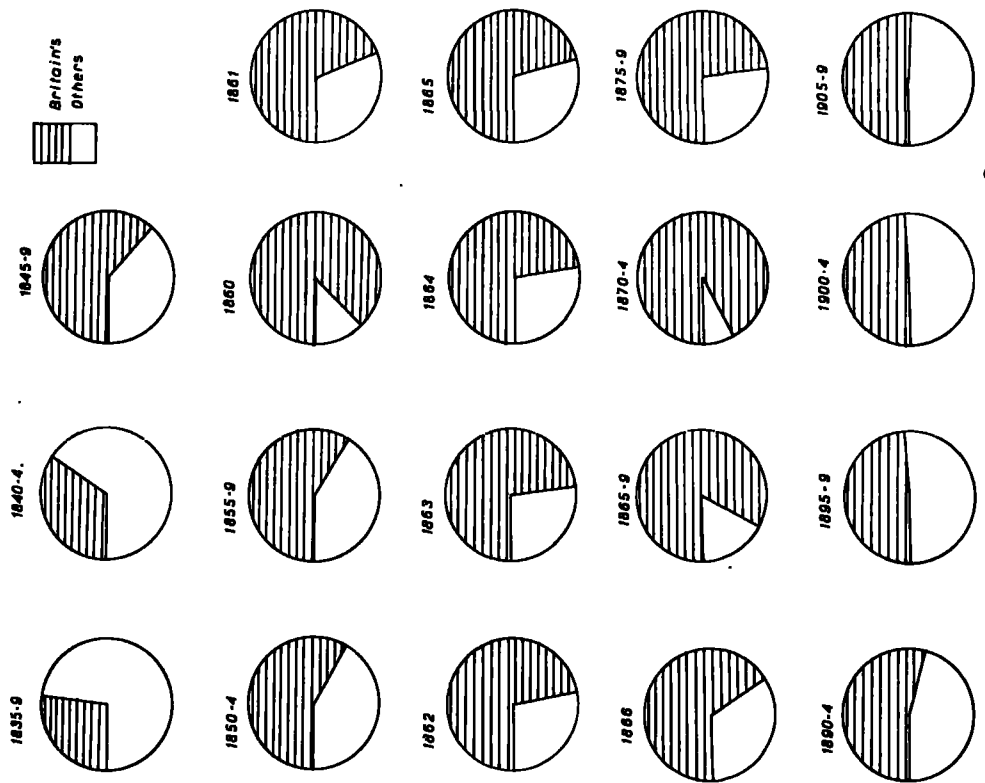




FIG. 27. and  
FIG. 28.

FIG. 27.

C- PROPORTION OF BRITISH IMPORTS OF EGYPTIAN COTTON (by weight) BEFORE and AFTER AMERICAN CIVIL WAR (in annual averages) and DURING THE WAR (1860-66)



SOURCE TABLE 20

H.A.A.

FIG. 28. MONTHLY COTTON PRICES AT ALEXANDRIA & LIVERPOOL (1861-66)

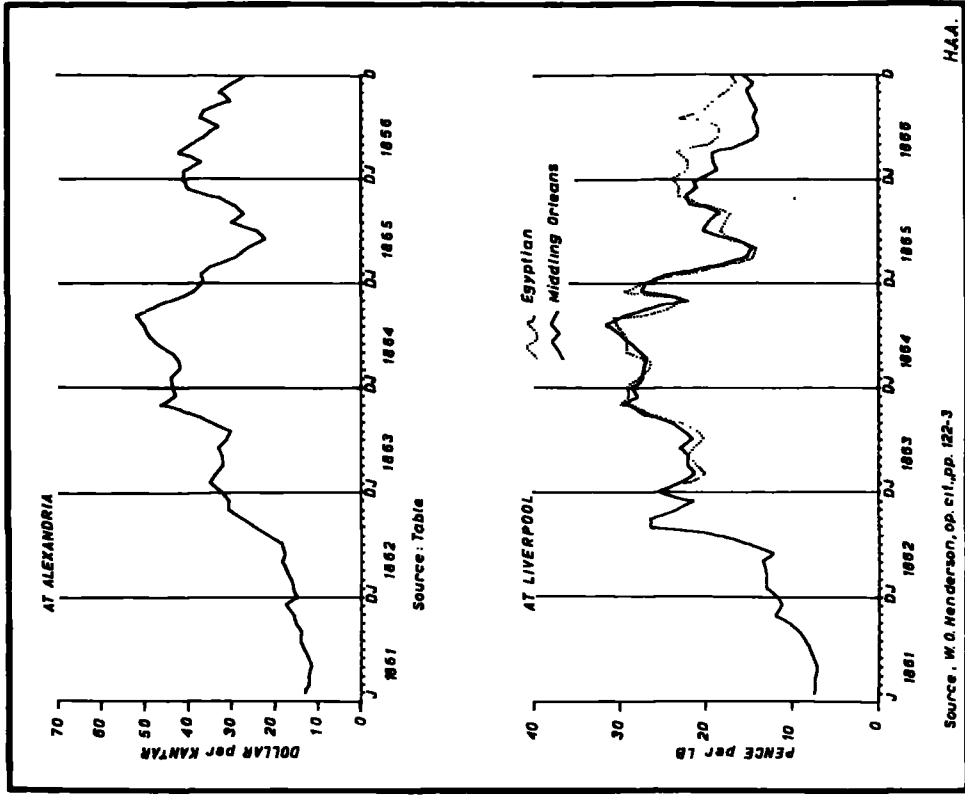
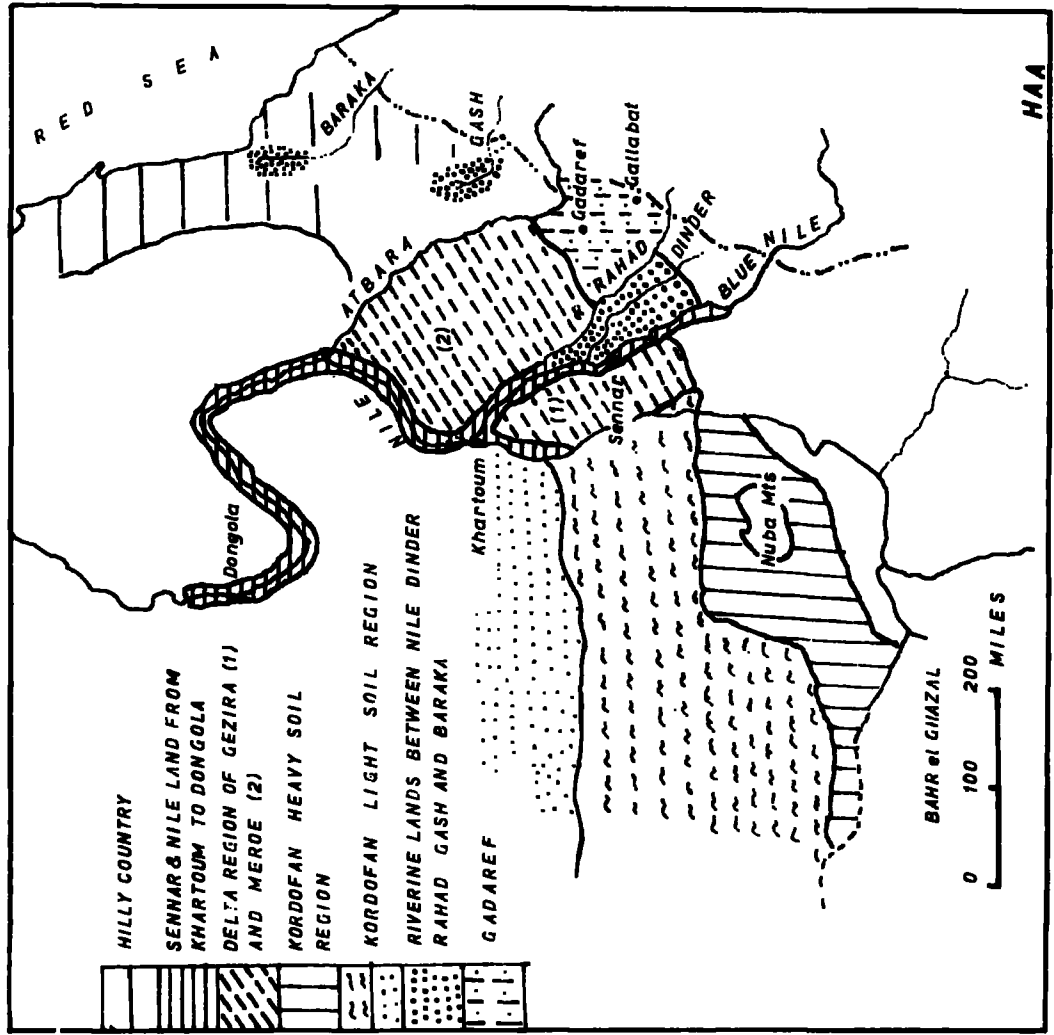


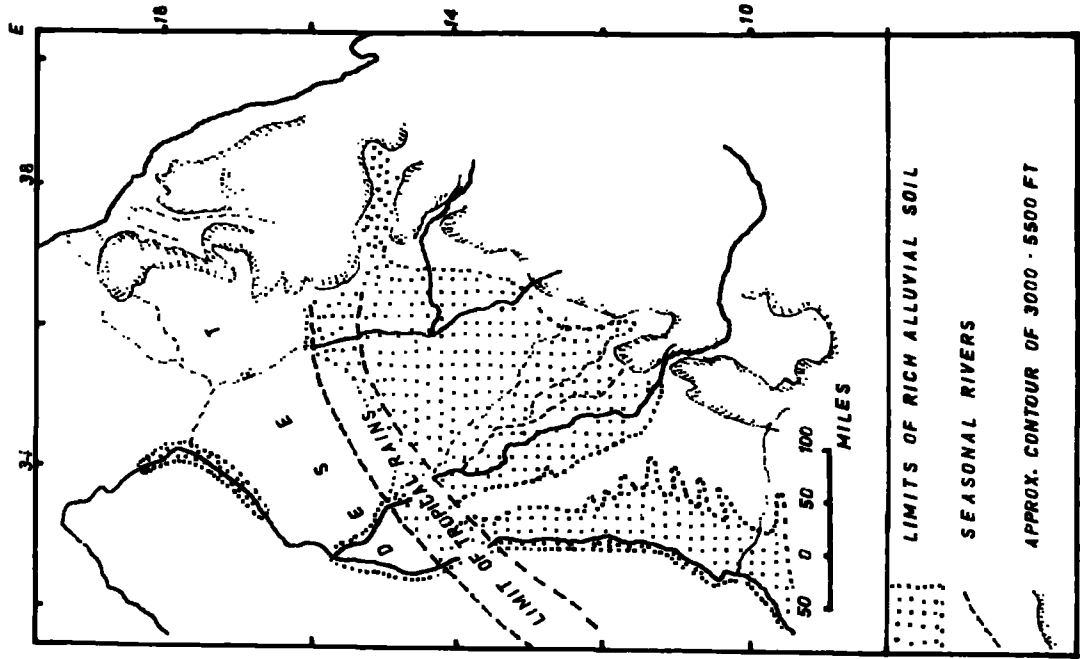
FIG. 29.

**FIG. 29.**

**1- MUNZINGER'S DIVISIONS OF THE SUDAN**



**2- CULTIVABLE AREAS (after Wills)**



FROM: THE SCOTTISH GEOGR. MAG. vol.11(1886), p.413

SOURCE OF INFORMATION: F. J. COX, op.cit., pp.198-7

FIG. 30A &B.

FIG. 30A. SUAKIN PROVINCE (1870s)

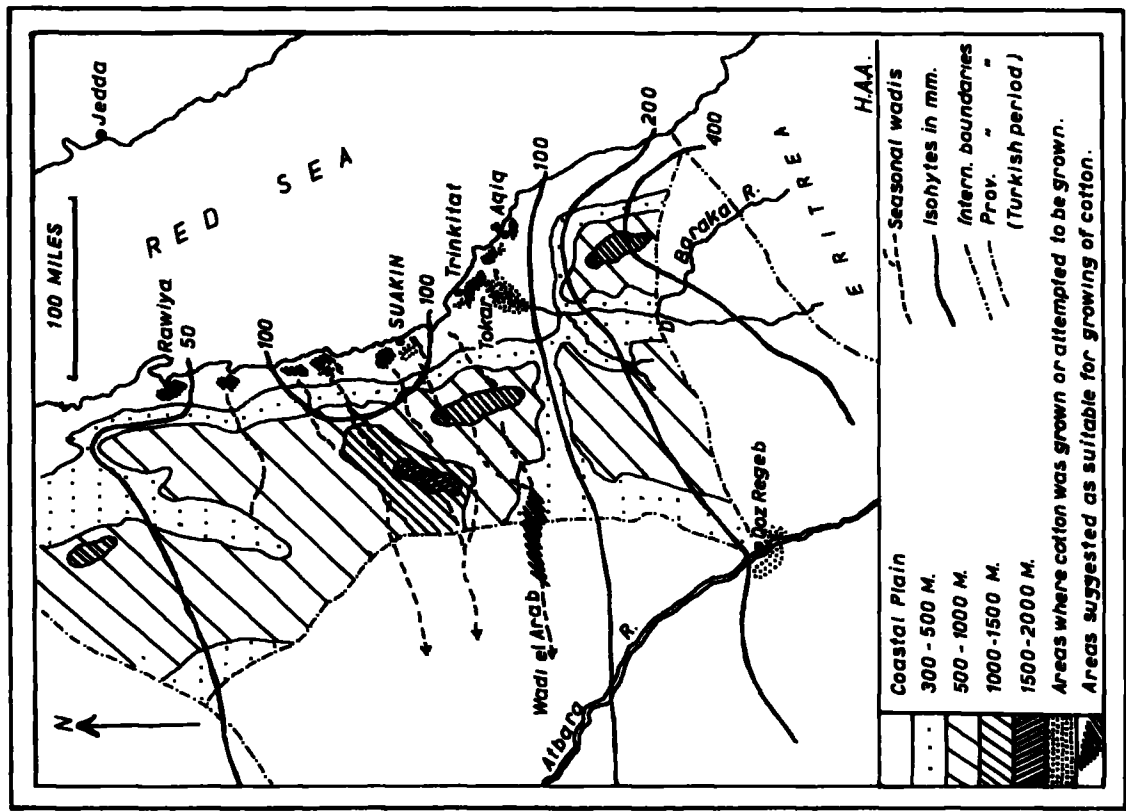


FIG. 30B. TAKA PROVINCE and GASH DELTA (1870s)

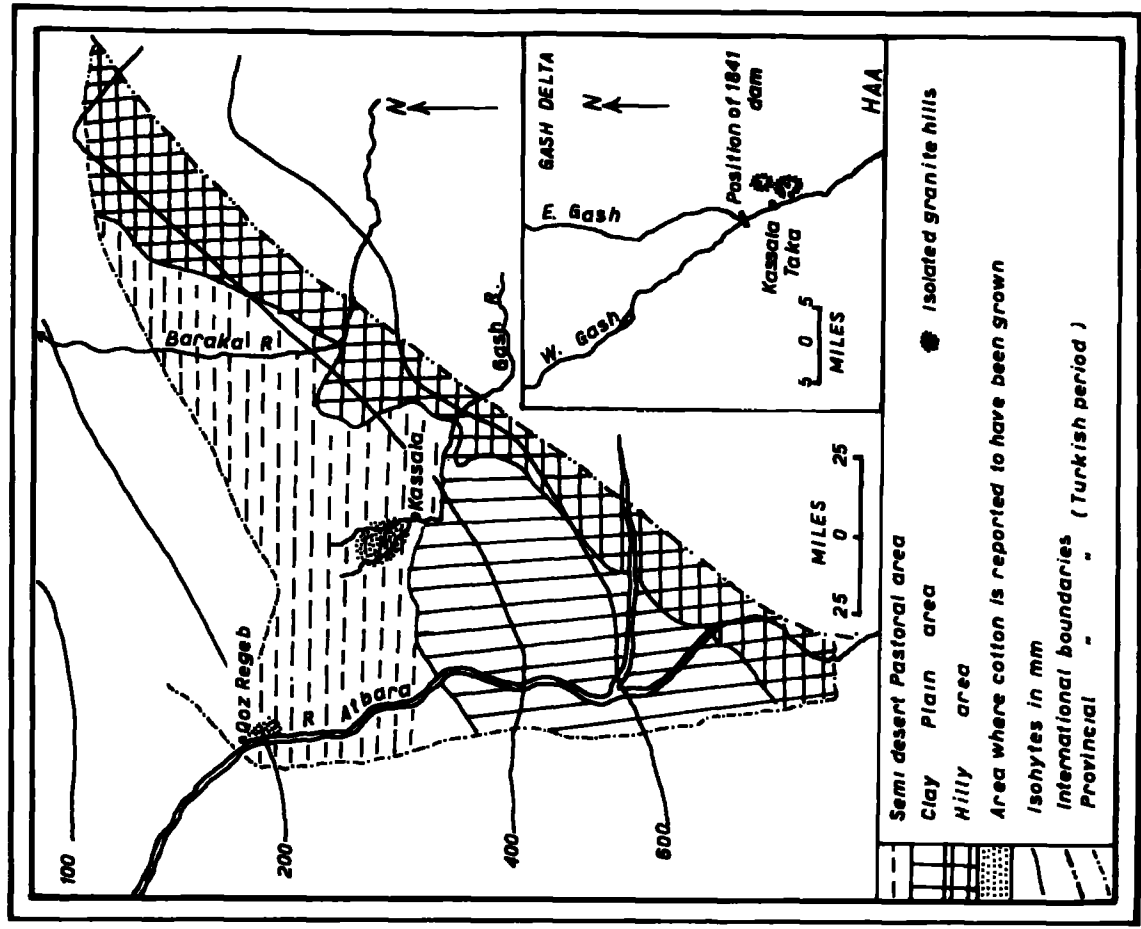


FIG. 31A & B.

FIG. 31B. KORDOFAN PROVINCE (1870s)

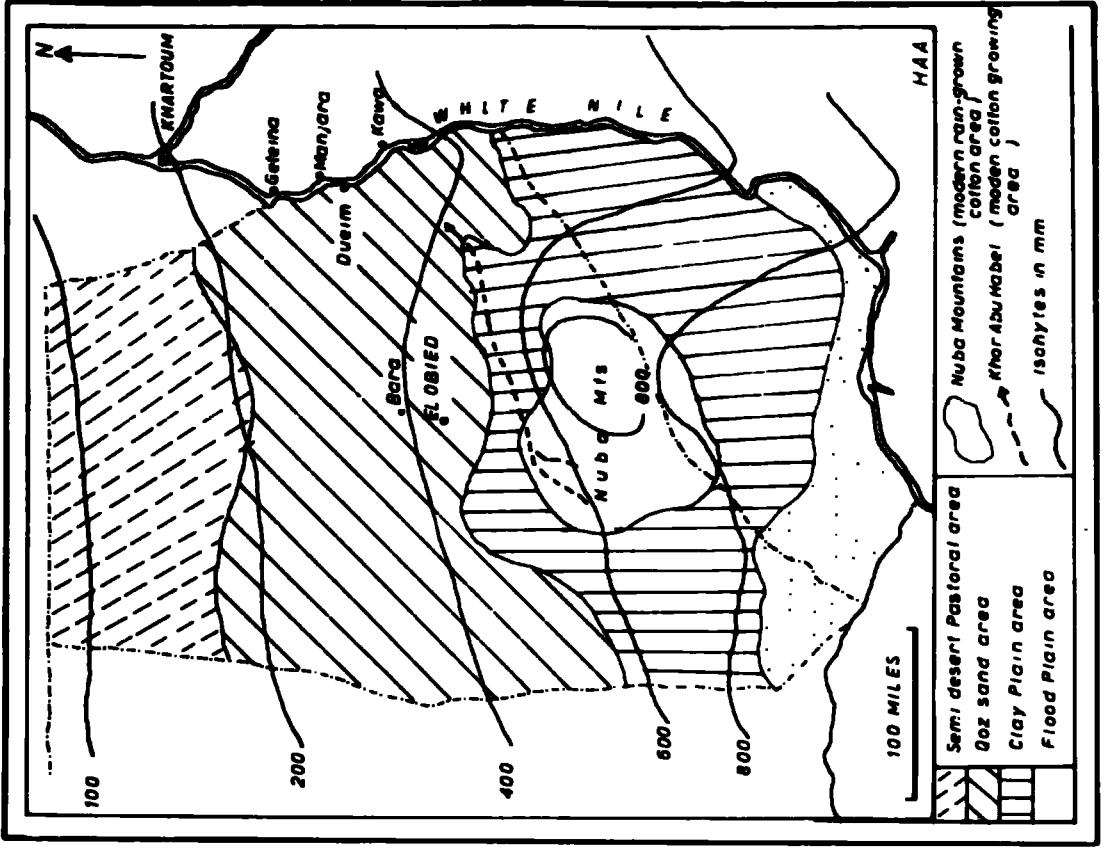


FIG. 31A. KHARTOUM and SENNAR PROVINCES (1870s)

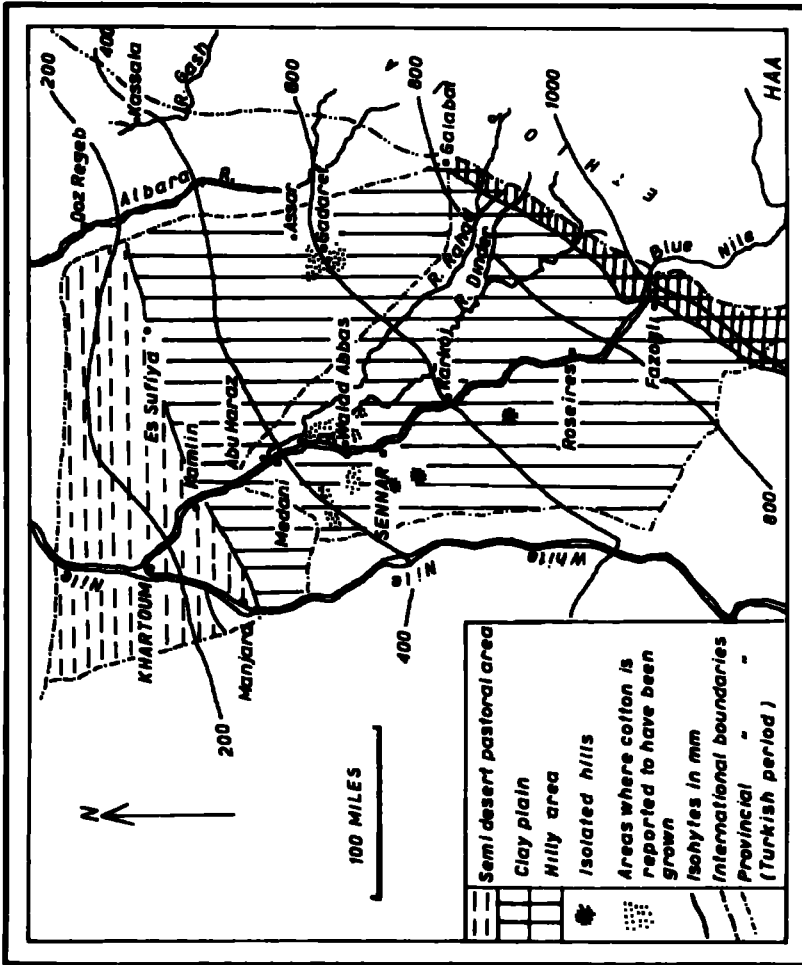




FIG. 32.

**FIG. 32. DONGOLA and BERBER PROVINCES (1870s)**

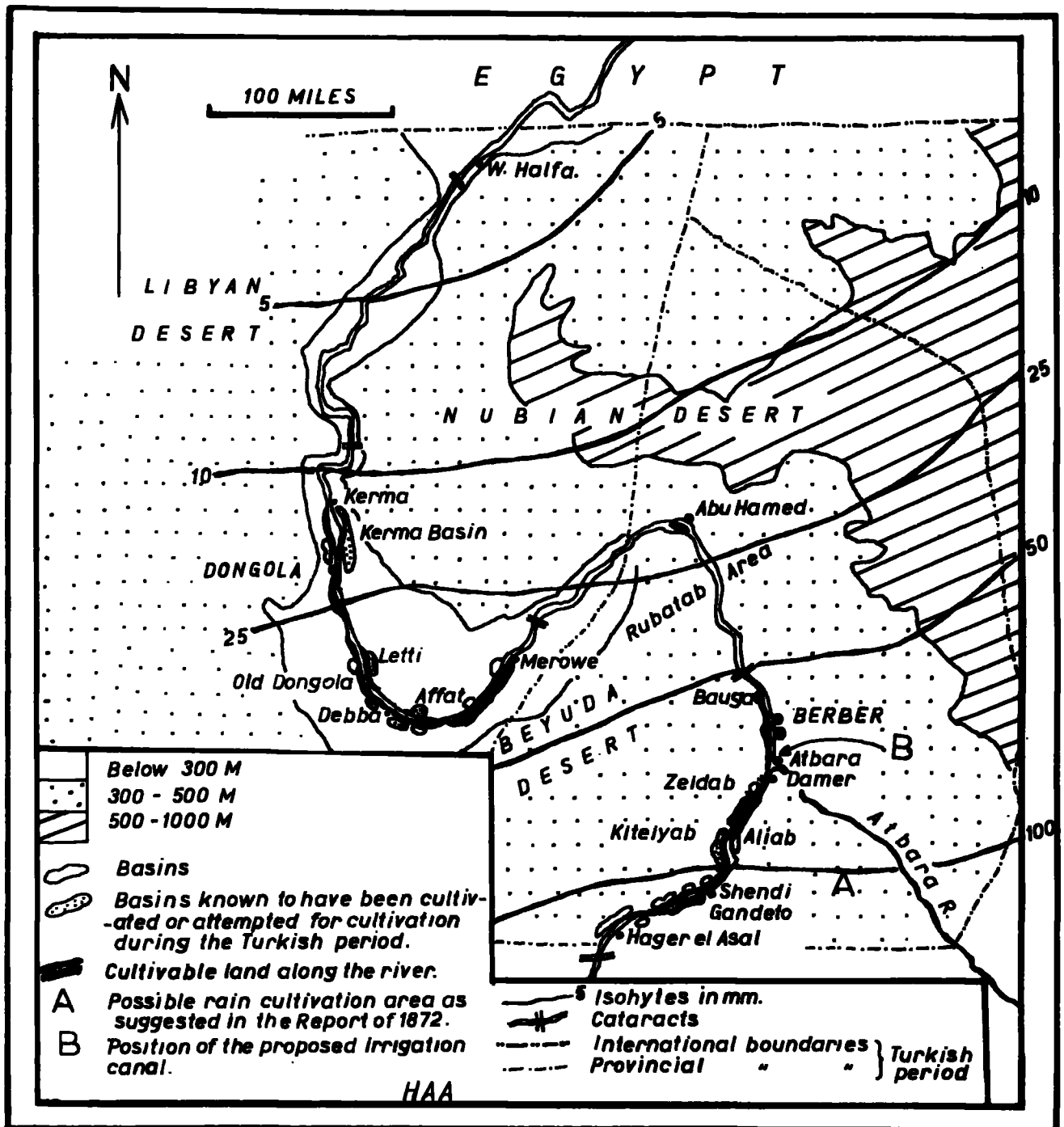
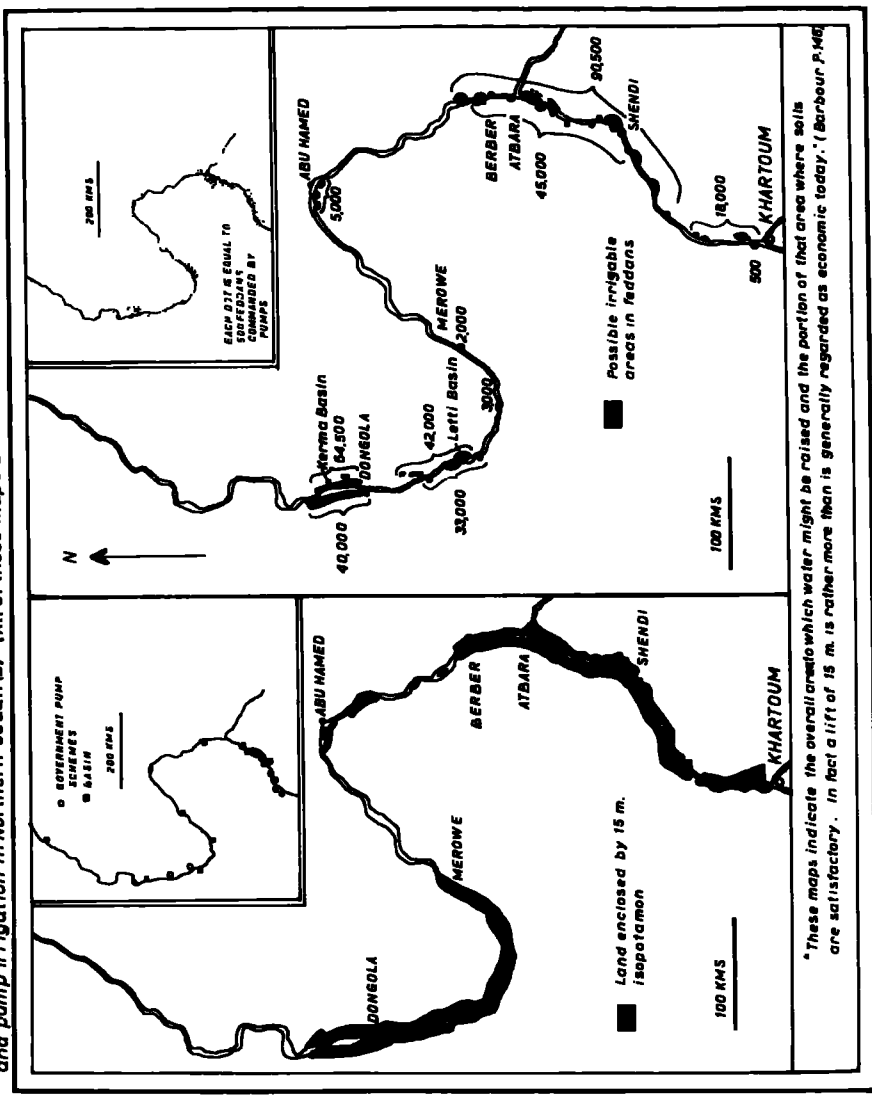


FIG. 33. and  
FIG. 34.

**FIG 34 LAND ENCLOSED BY 15m ISOPOTAMON IN NORTHERN SUDAN and AREAS RECOMMENDED FOR EXTENSION OF IRRIGATION (inset maps show government pump schemes and areas of basin irrigation (a), and pump irrigation in Northern Sudan (b). All of these maps are modern & after K.M. Barbour (1961) )**



**FIG. 33. LAND SUITABLE FOR COTTON BETWEEN BLUE NILE and DINDER RIVERS and ESTIMATED IRRIGABLE AREAS BETWEEN RAHAD and DINDER RIVERS ( inset map )**

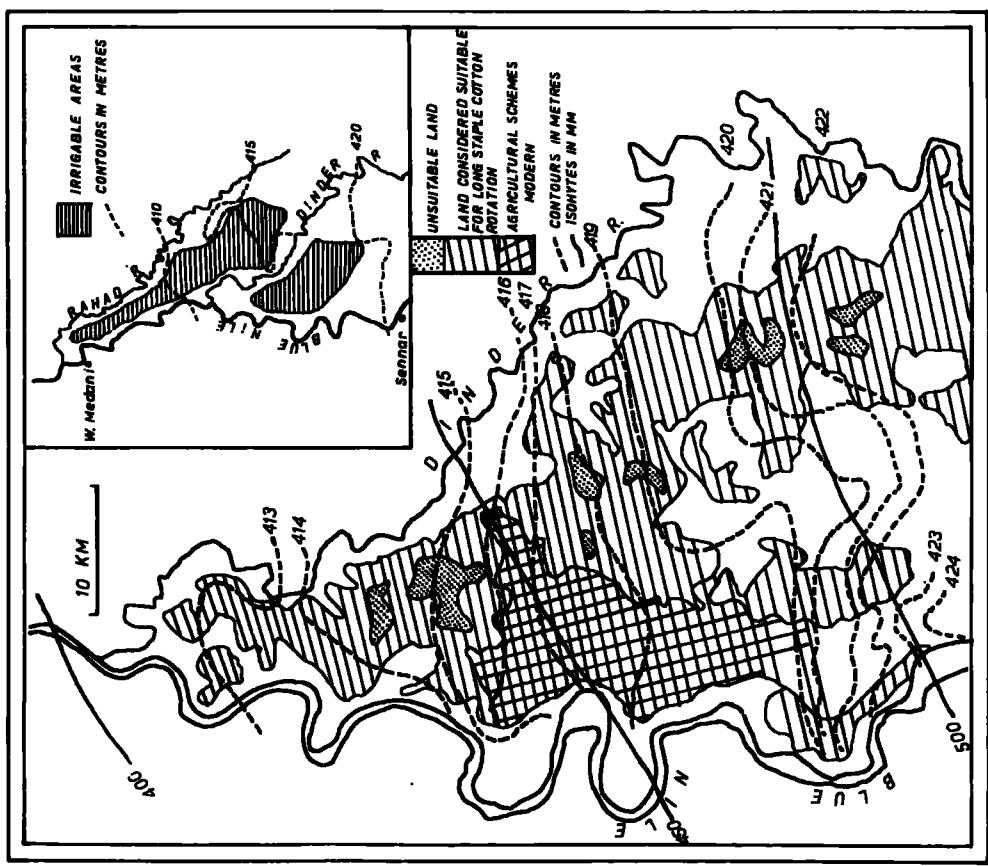


FIG. 35.

**FIG. 35. SUDAN'S COMMUNICATIONS & TRANSPORT FACILITIES WITH EGYPT & COTTON GROWING AREAS & RELATED INDUSTRIES DURING THE TURKISH PERIOD (1870s)**

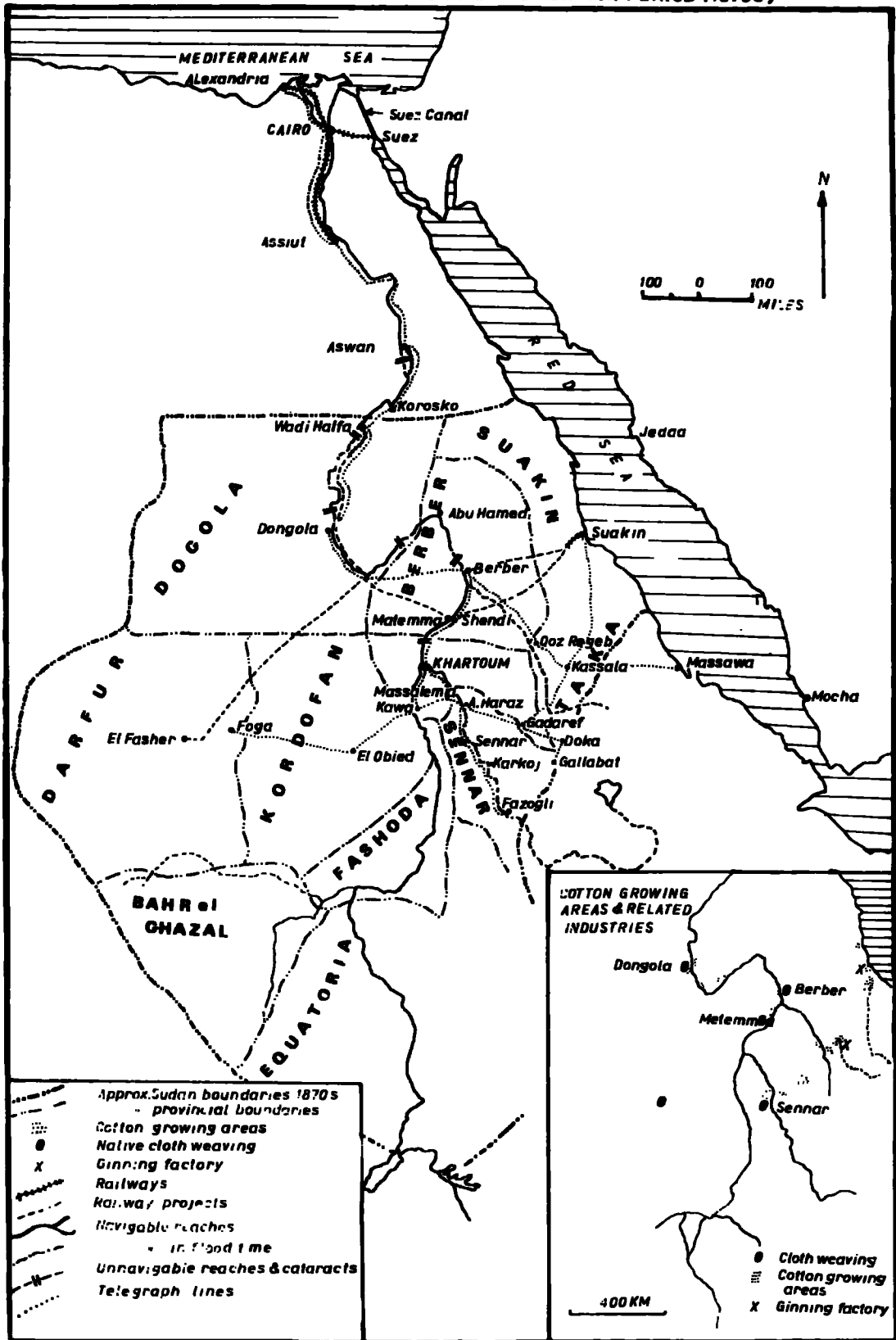
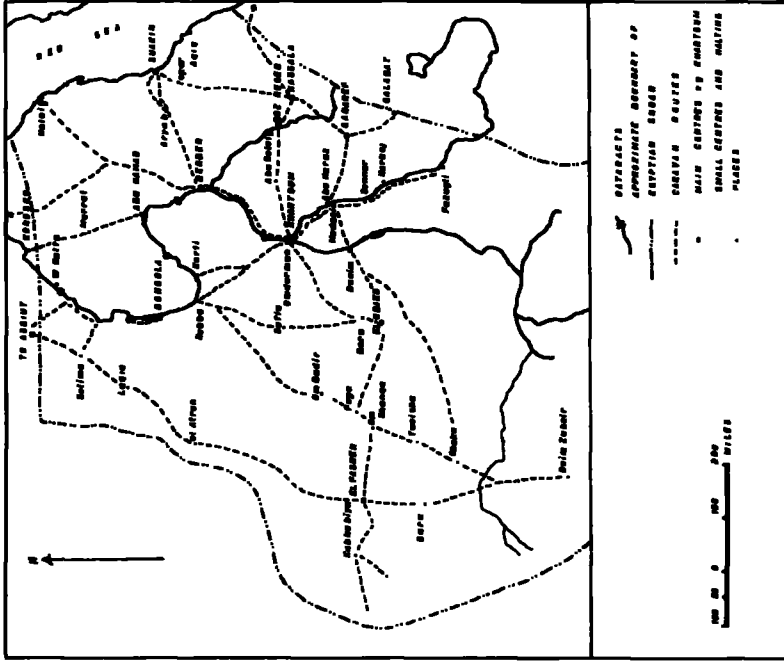
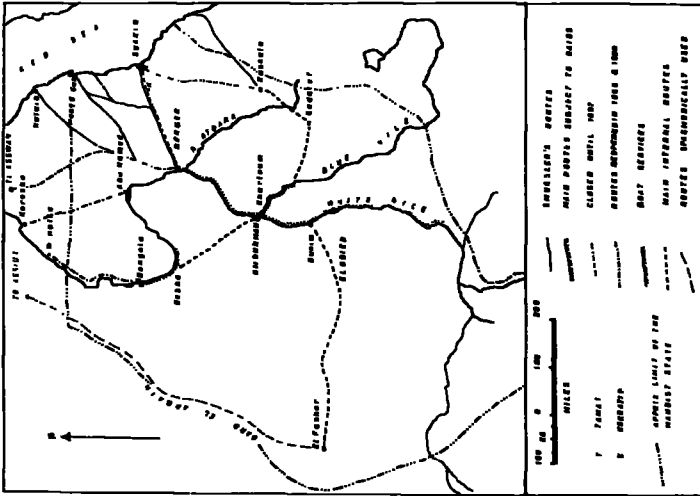
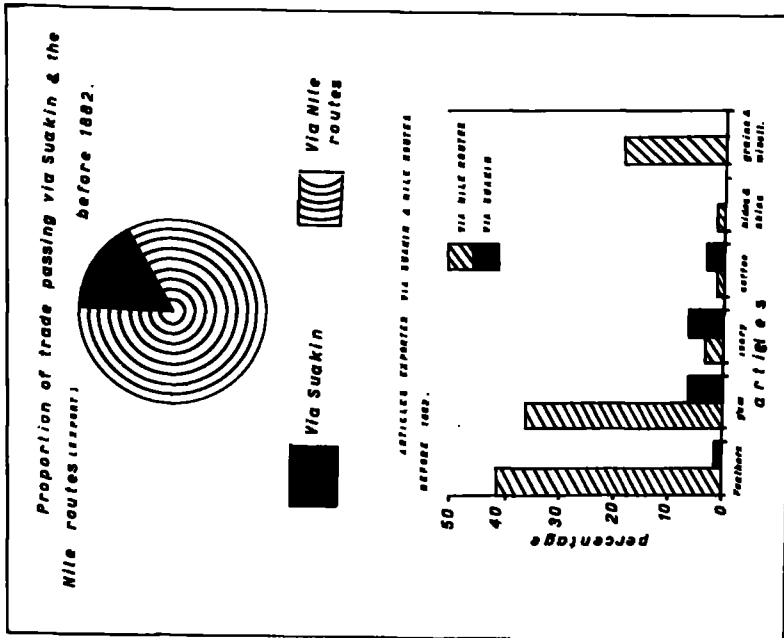


FIG. 36.

# FIG 36



BASED ON STEWART'S MAP AND REPORT (P. 6).



FIG. 37. and  
FIG. 38.

FIG. 37. Fate of the Population between 1883 and 1903.

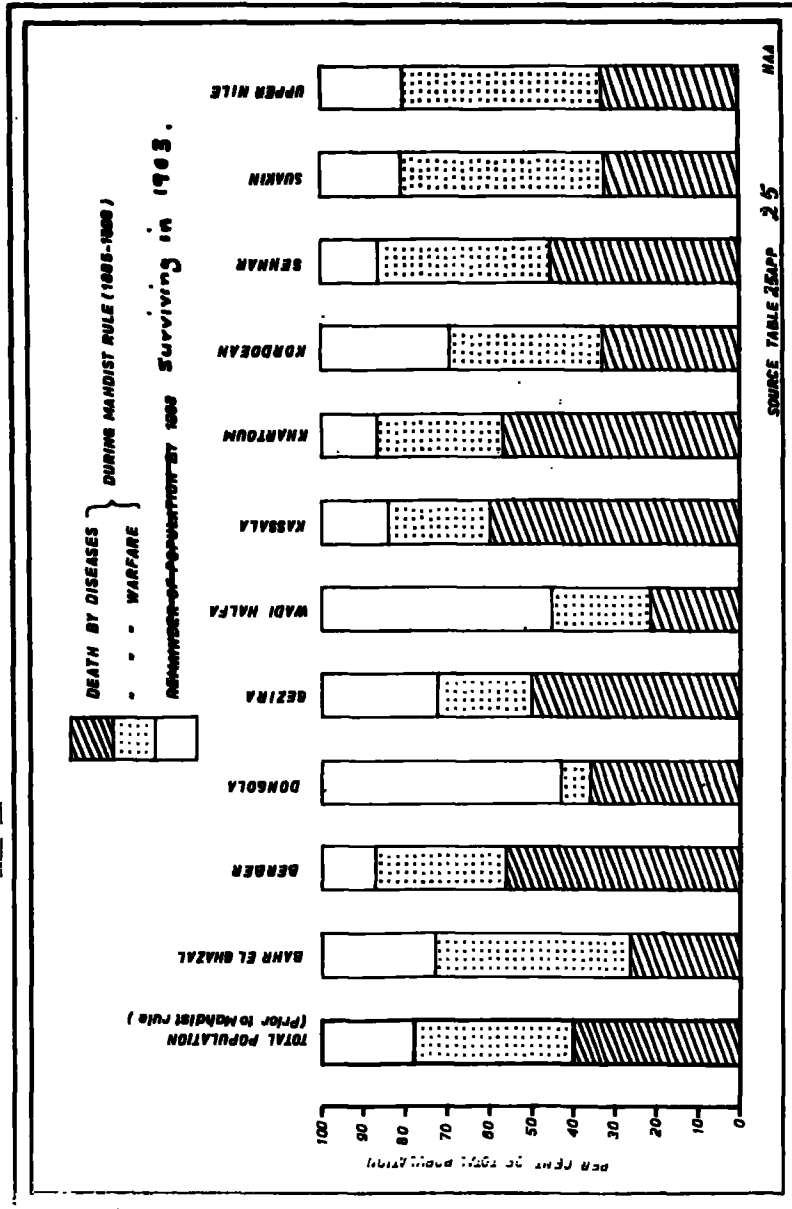


FIG. 38.

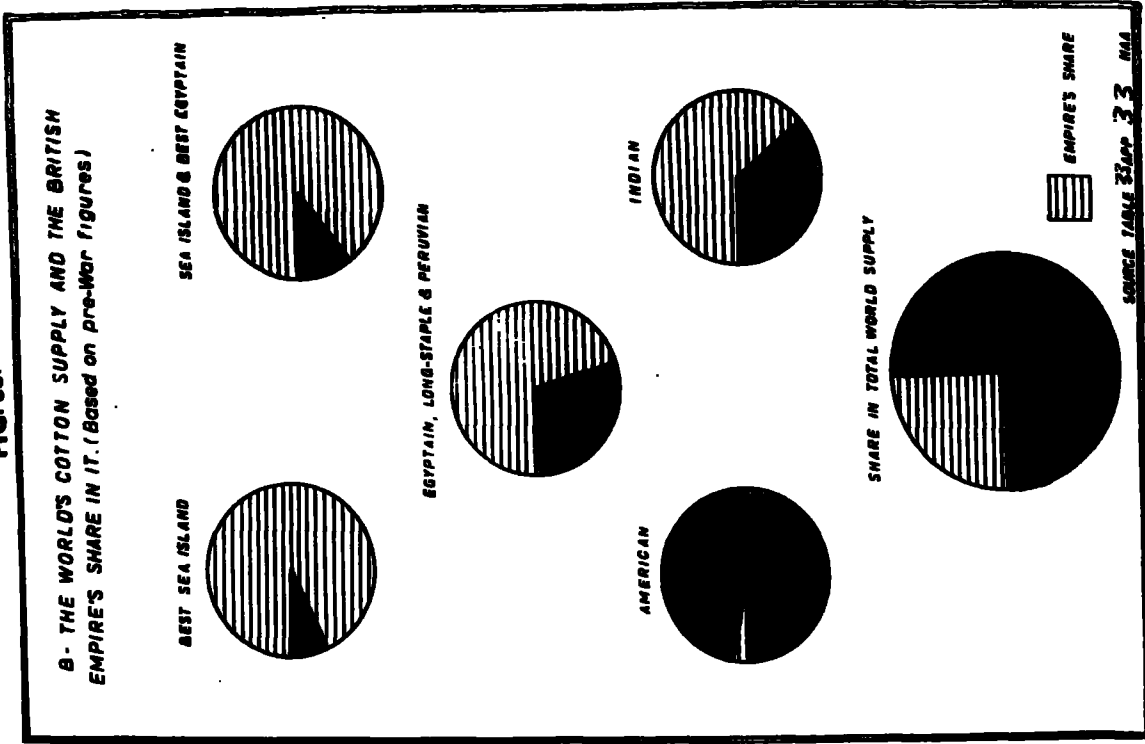
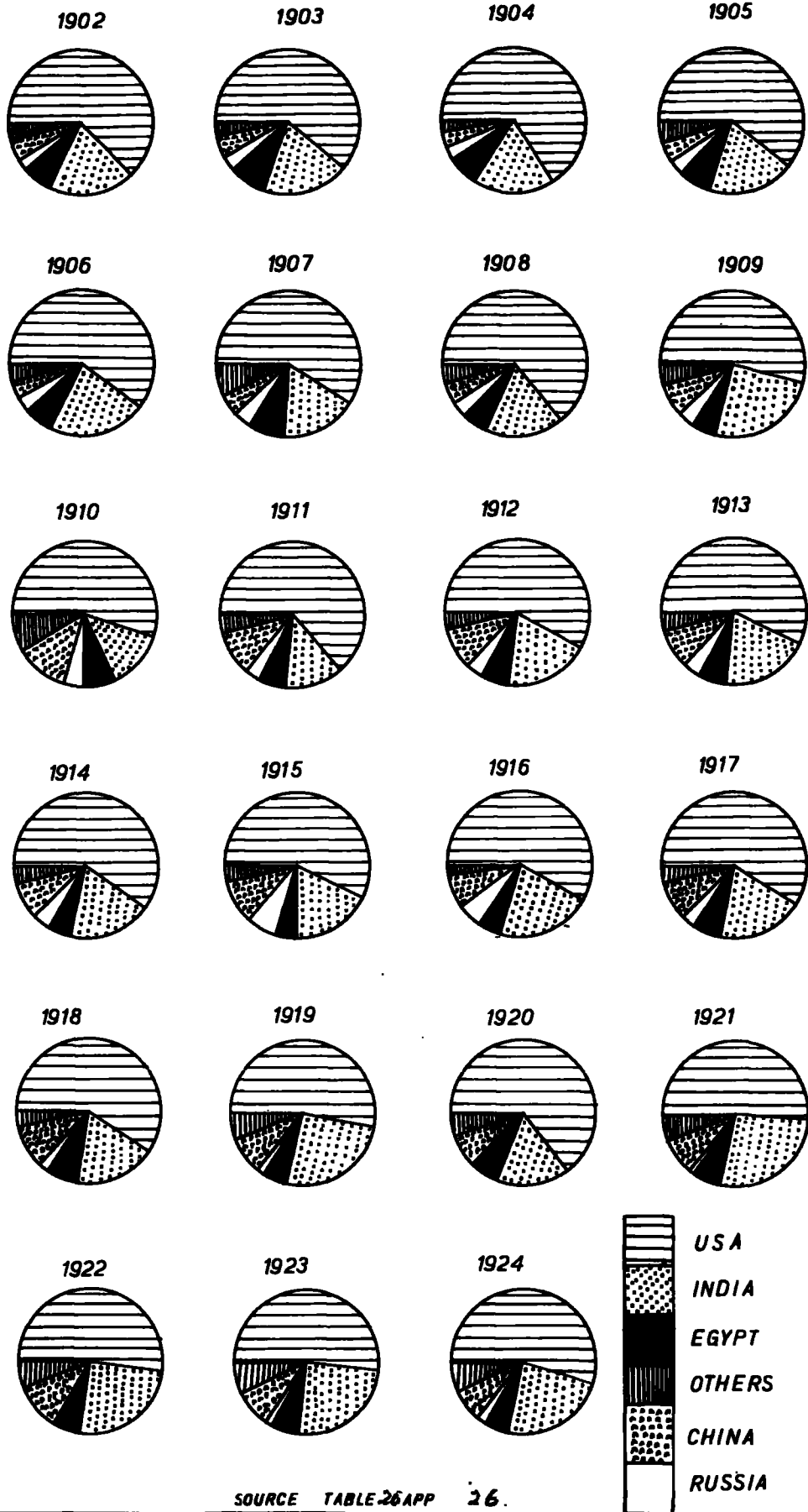


FIG. 39.

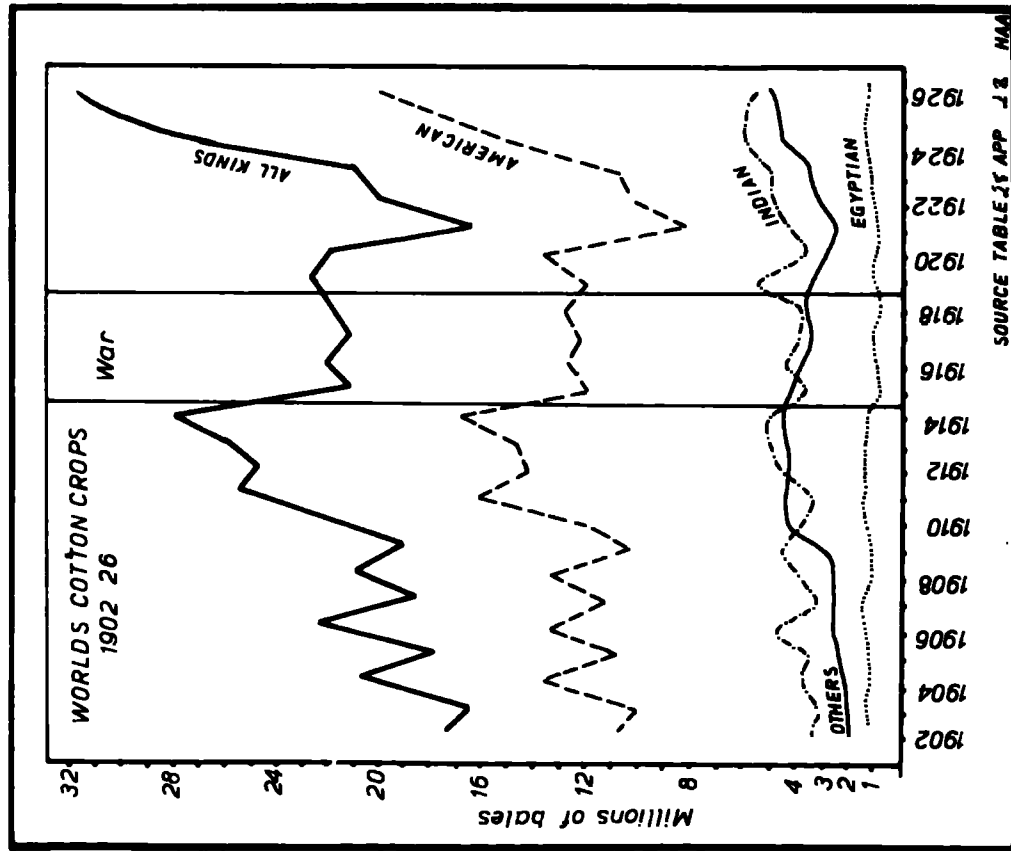
**FIG. 39.**

**THE WORLD'S COTTON CROPS, 1902-24**



FIG, 40A & B.

**FIG. 40 A. WORLD COTTON PRODUCTION. 1902-26**



SOURCE TABLE 38 APP 28 MAA

**FIG. 40 B. WORLD'S CONSUMPTION OF ALL KINDS OF COTTON (1911-24)**

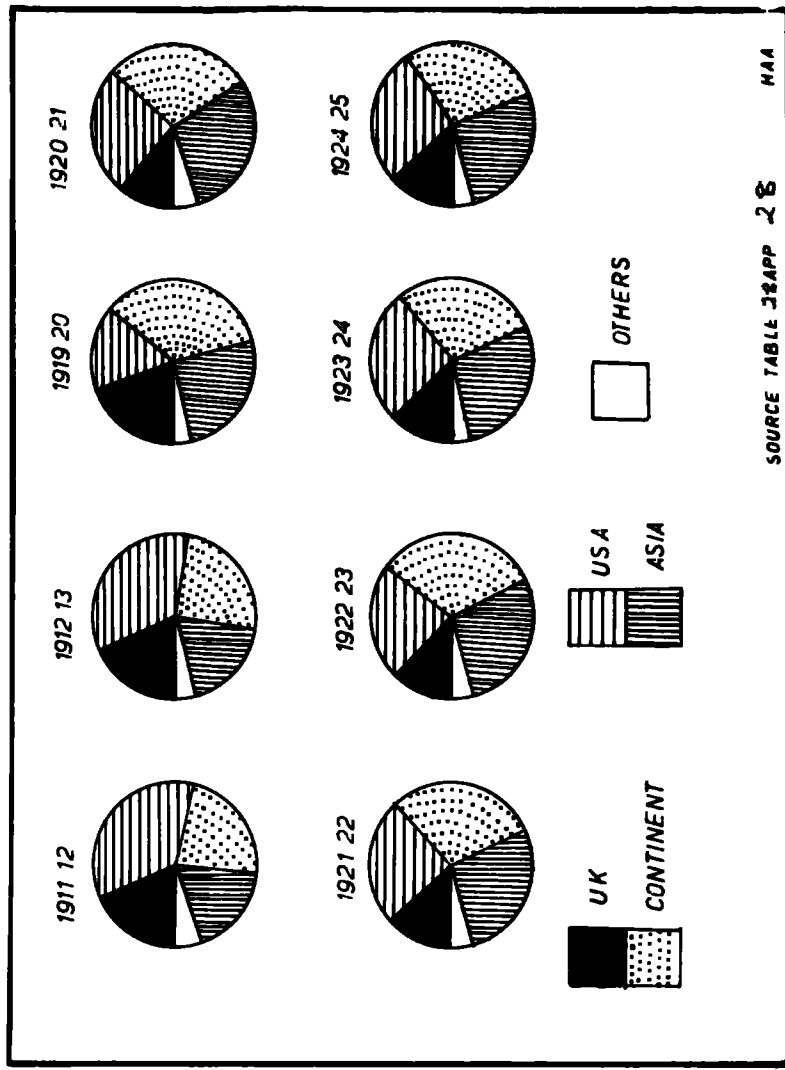


FIG. 41.

FIG. 41. PRICES OF COTTON, 1899-1923 (Season's averages)

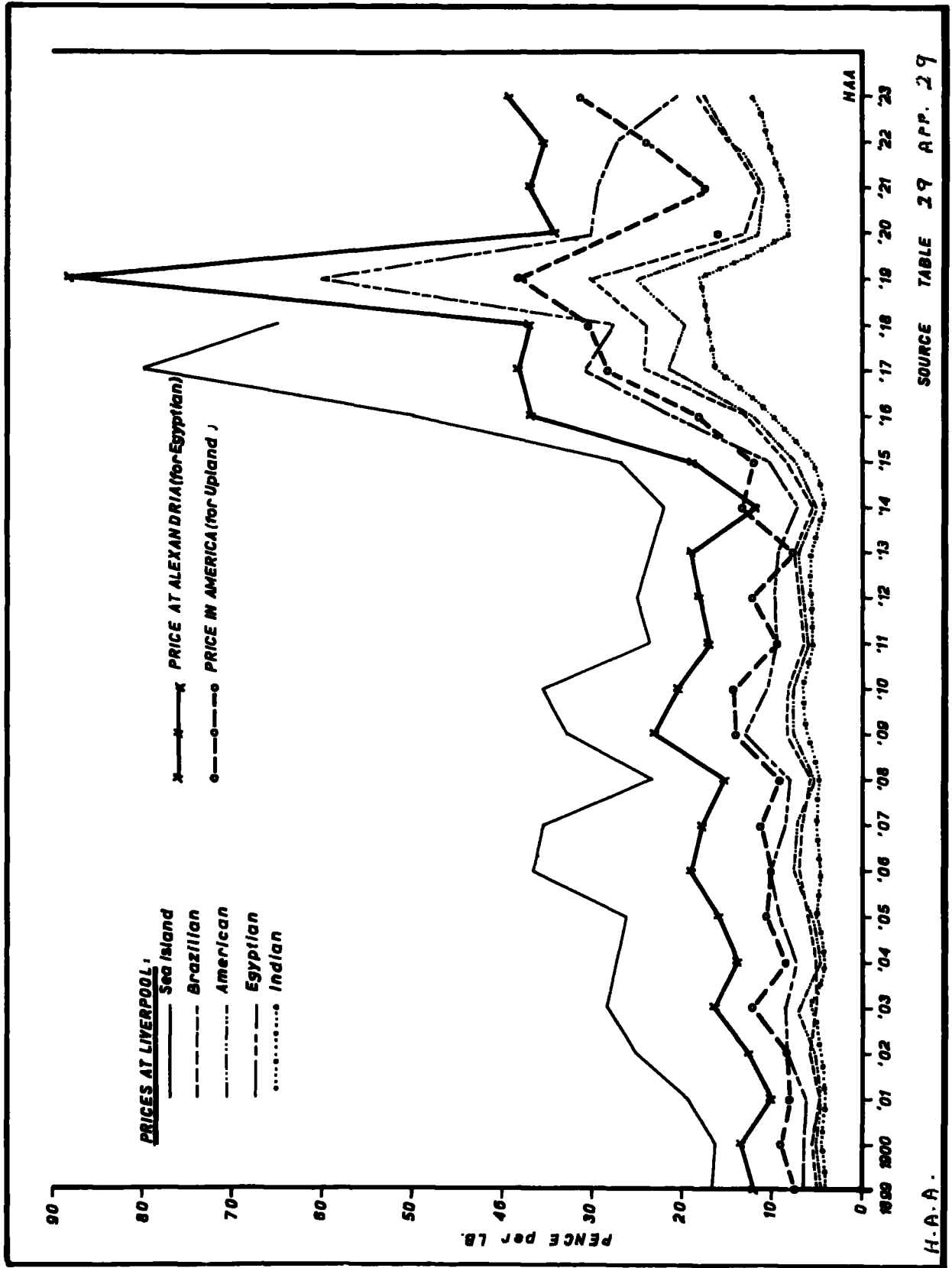




FIG. 42.

FIG. 42. BRITAIN'S CONSUMPTION OF ALL KINDS OF COTTON CROPS, 1919-24

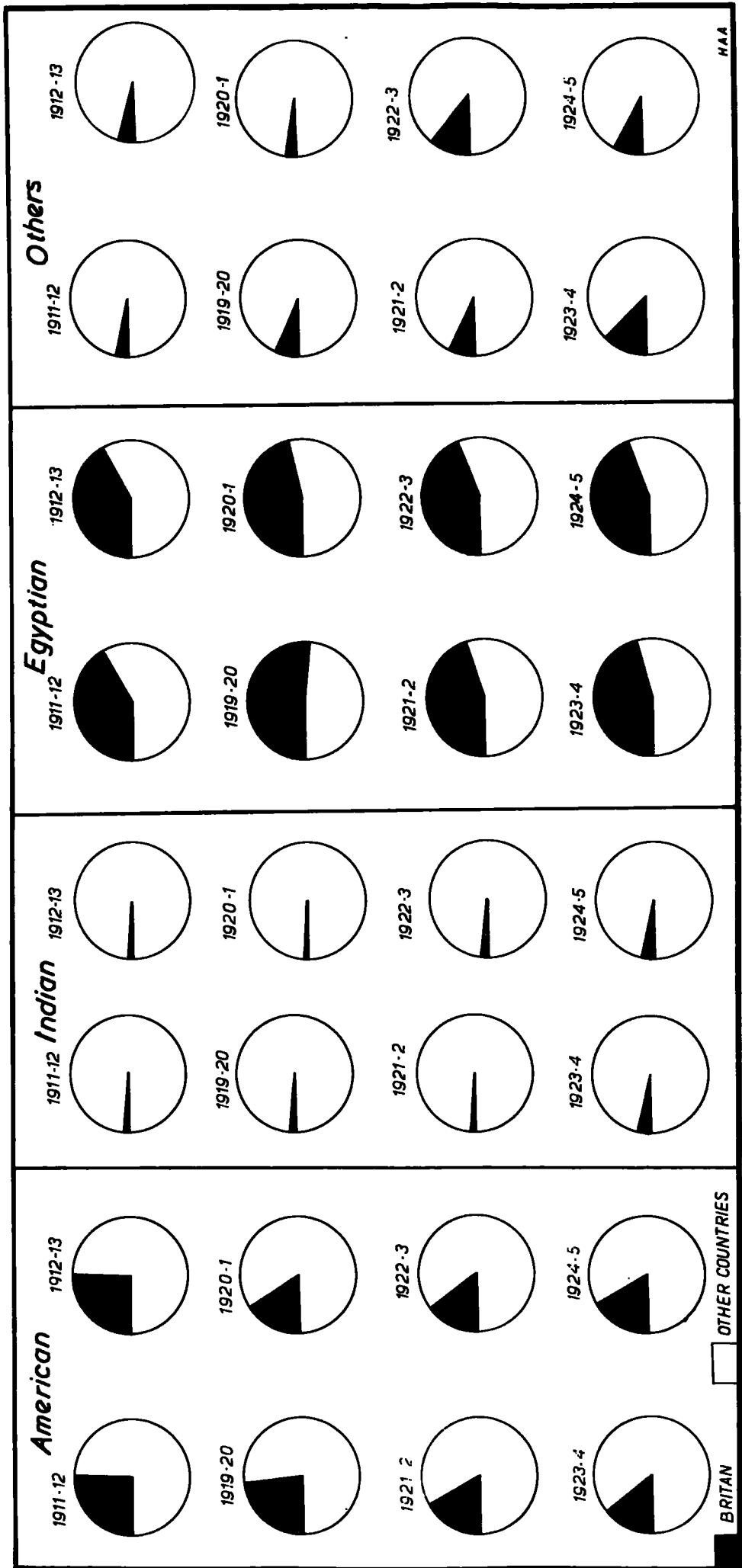
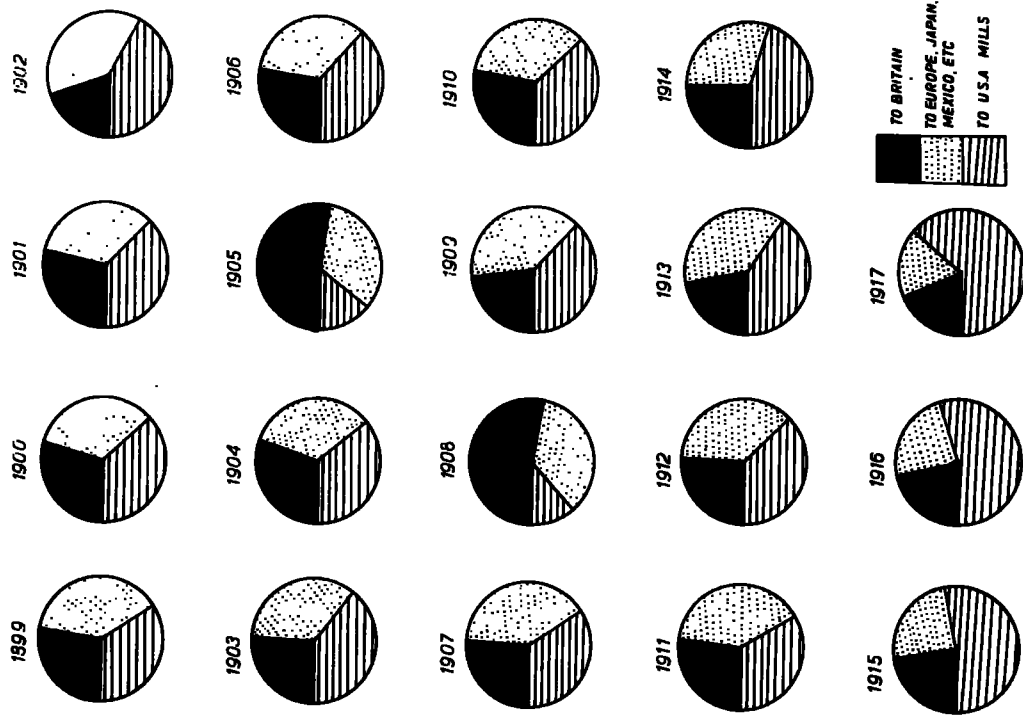


FIG. 43. and

FIG. 44.

**FIG. 43**

DISTRIBUTION OF THE AMERICAN COTTON CROP, 1899-1917



**FIG. 44**

B- AFRICAN COTTON CROPS (EXCEPT EGYPT) 1902-18, AND SUDAN'S SHARE

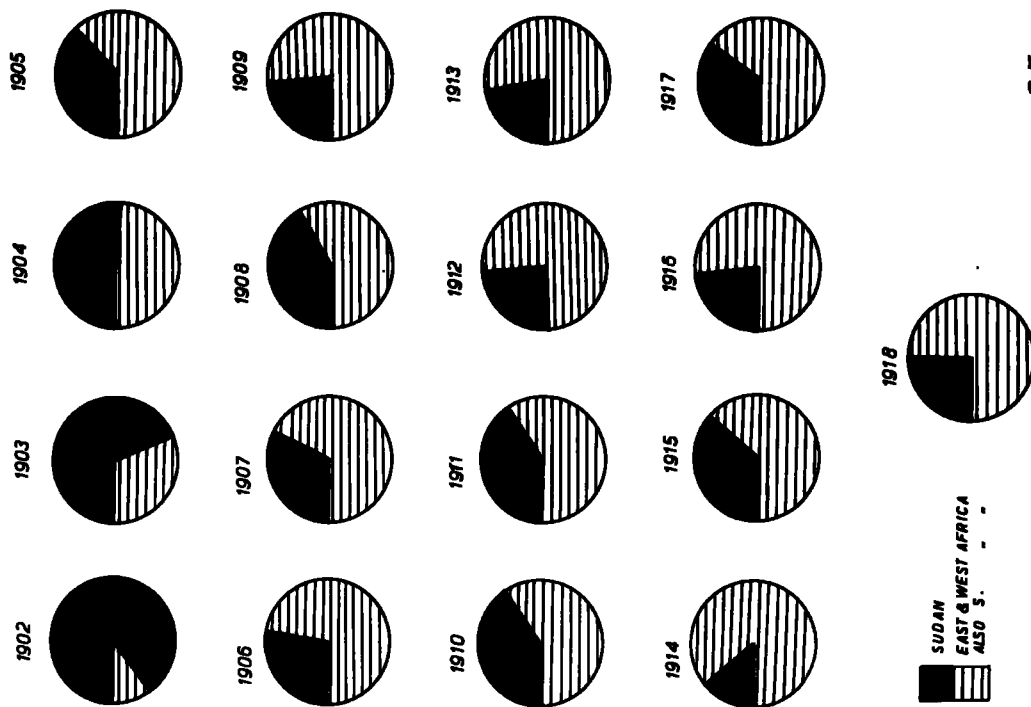


FIG. 45 and  
FIG. 46.

FIG. 48 A PLAN OF GEZIRA RESEARCH FARM (1918-1926)

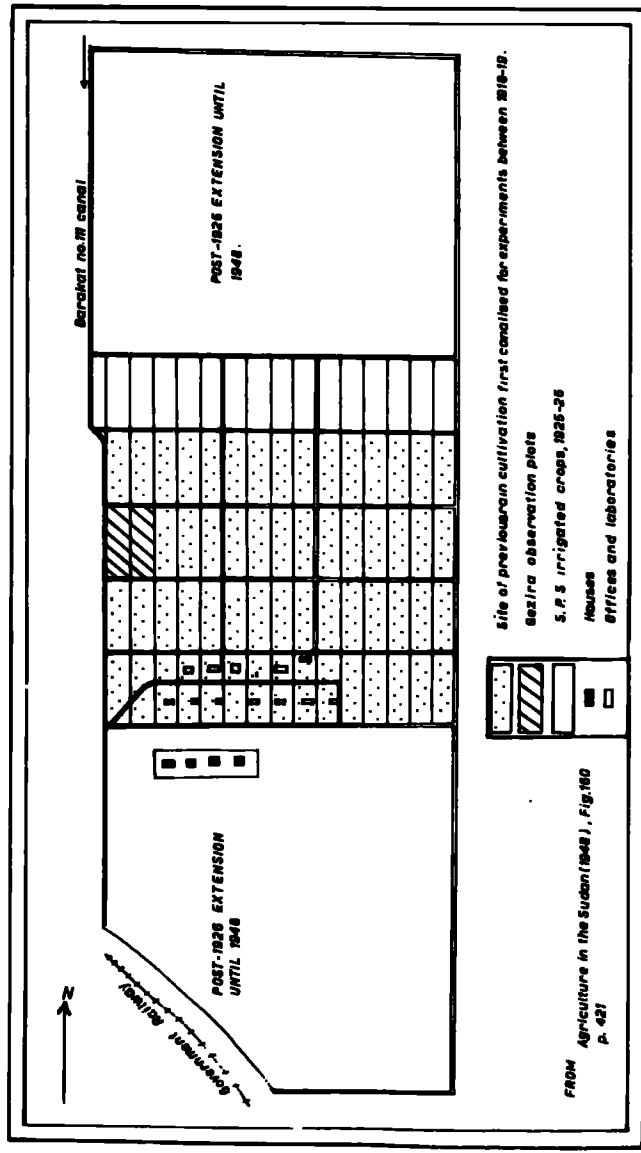


FIG. 46 THE BLUE NILE PROJECT

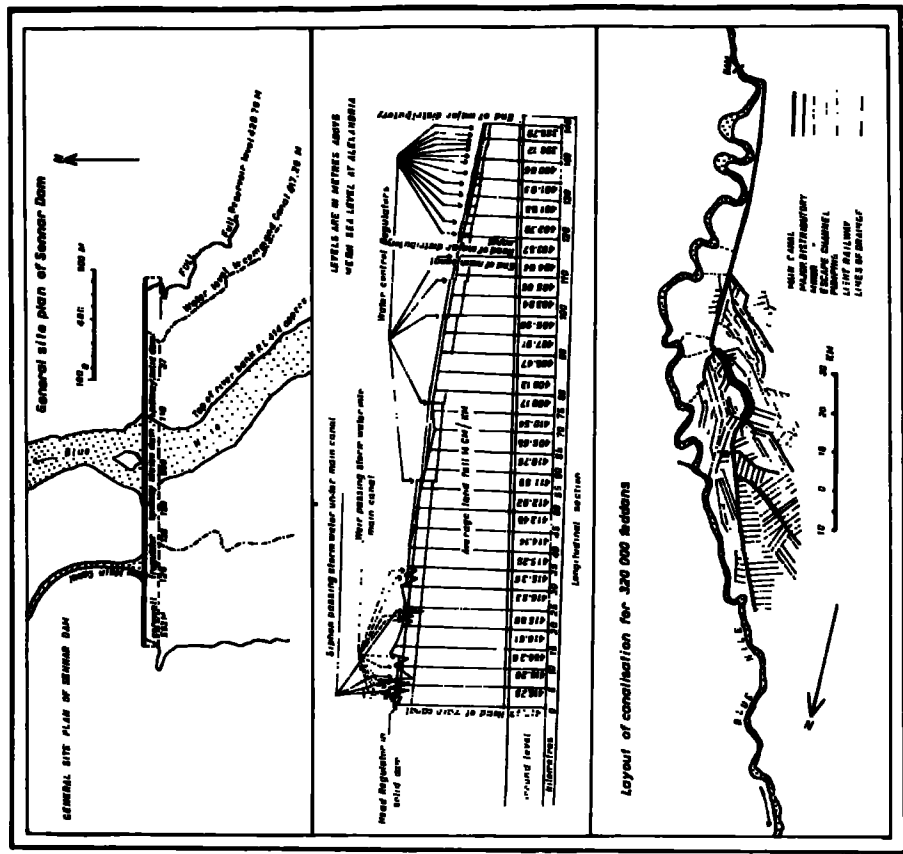
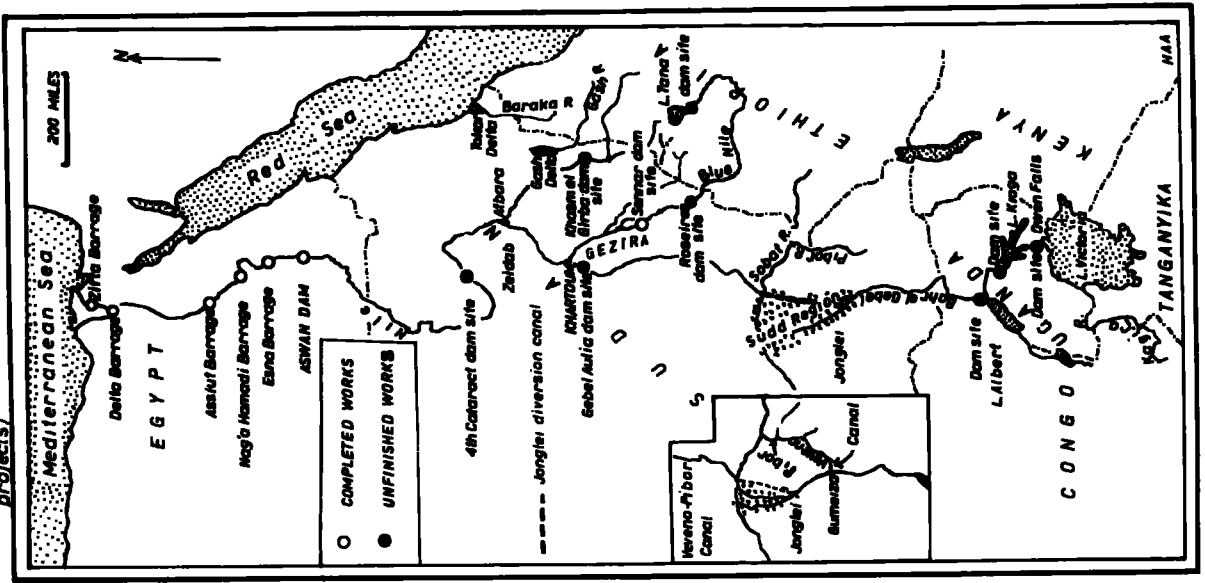


FIG. 47. and  
FIG. 48.

**FIG. 48**  
**NILE CONTROL WORKS TO 1924 (inset map shows Sudd diversion projects)**



**FIG. 47** **GEZIRA: RELIEF, MODERN SCHEME & PROPOSED IRRIGATION AREAS**

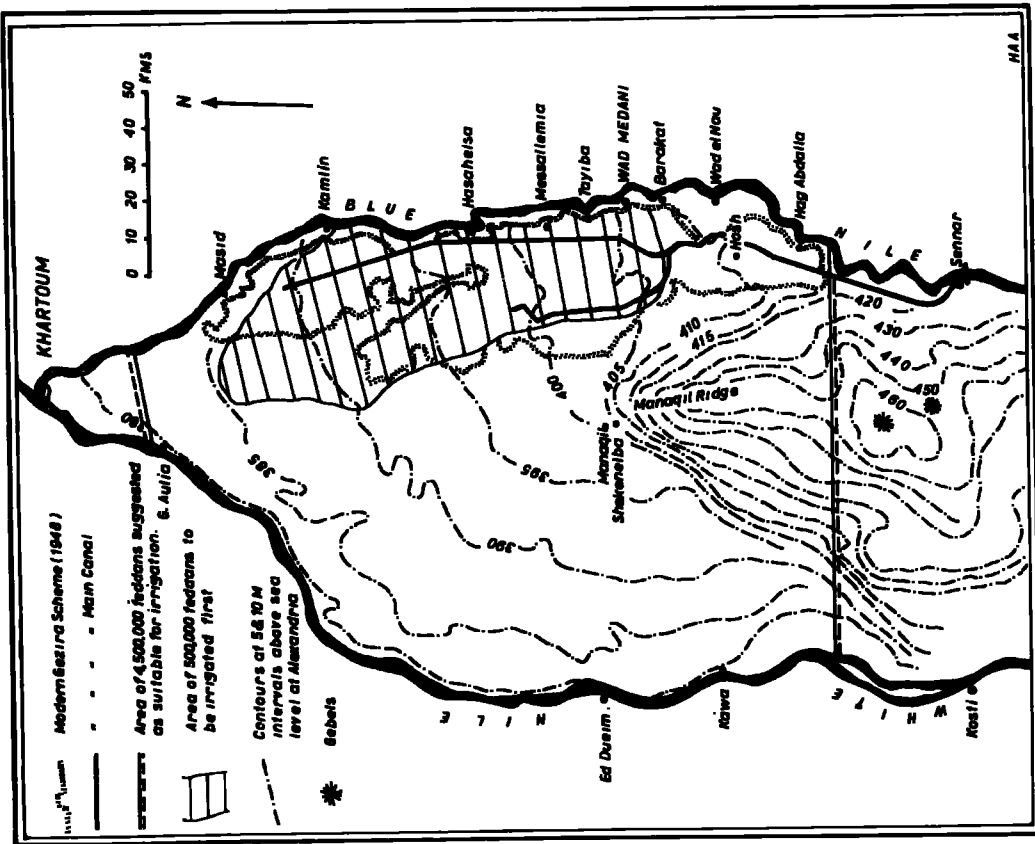


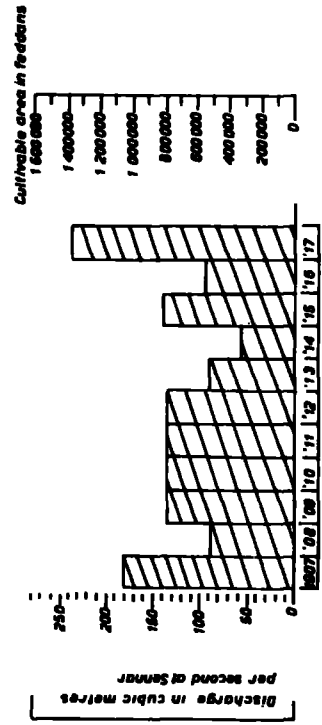


FIG. 49. and  
FIG. 50.

**FIG. 49**

**NATURAL SUPPLY & AREA CULTIVABLE**

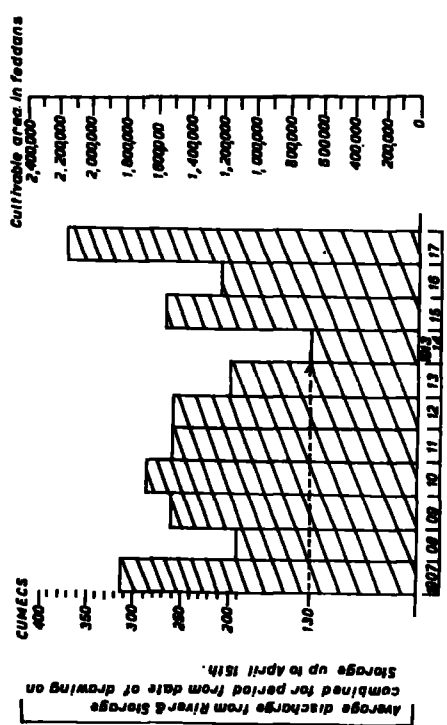
Diagram showing the maximum Areas cultivable from the Blue Nile without Storage, i. e., the Areas cultivable on the lowest 15 day period previous to April 15th.



**NOTE** In all years except 1907 and 1908 the lowest 15 day period was April 1-15 but in these years it was March 28-April 10, and March 18-31 respectively.

**STORAGE**

AREAS cultivable with the discharge of the Blue Nile combined with effective storage of 400 million M<sup>3</sup> showing dates on which storage would have been first used had the proposed works at Sennar been carried out or completed before those years.



**NOTE** Calculations have been made to the nearest 50,000 faddans.

1913-14 being so low, water would have been drawn from the Reservoir in December, whereas in all other years this would not have occurred until February. It follows that, as the demand in December and January is greater than in the succeeding months, the average supply per day for 1913-14 is relatively greater than for other years.

**FIG. 50 RAILWAYS, EXPERIMENTAL COTTON GROWING PLACES AND BOUNDARIES**

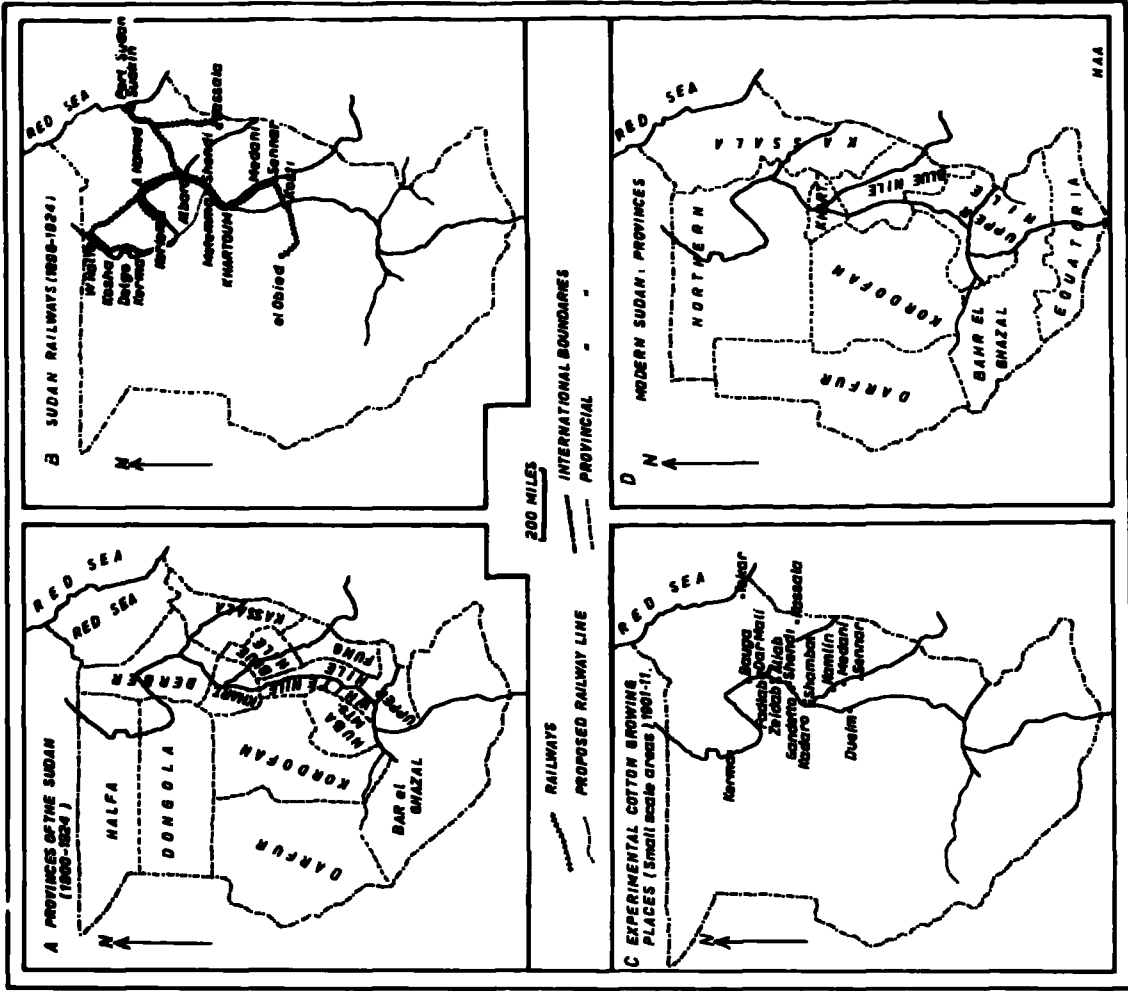


FIG. 51.

FIG. 51

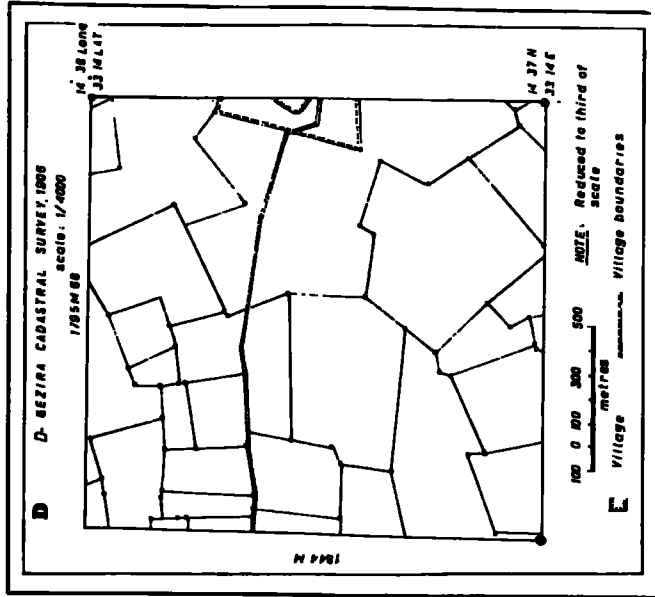
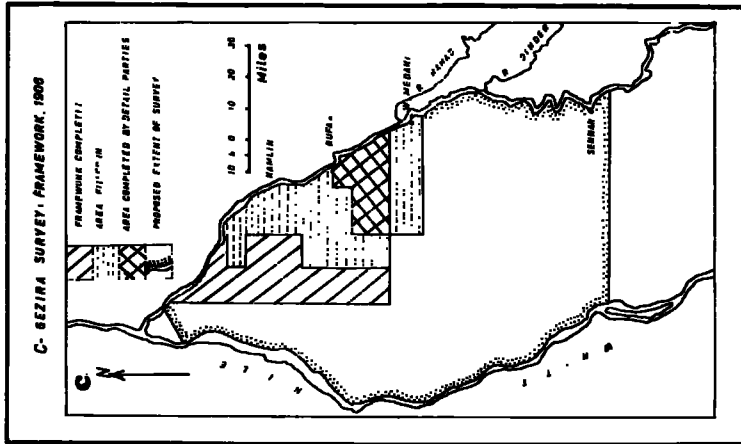
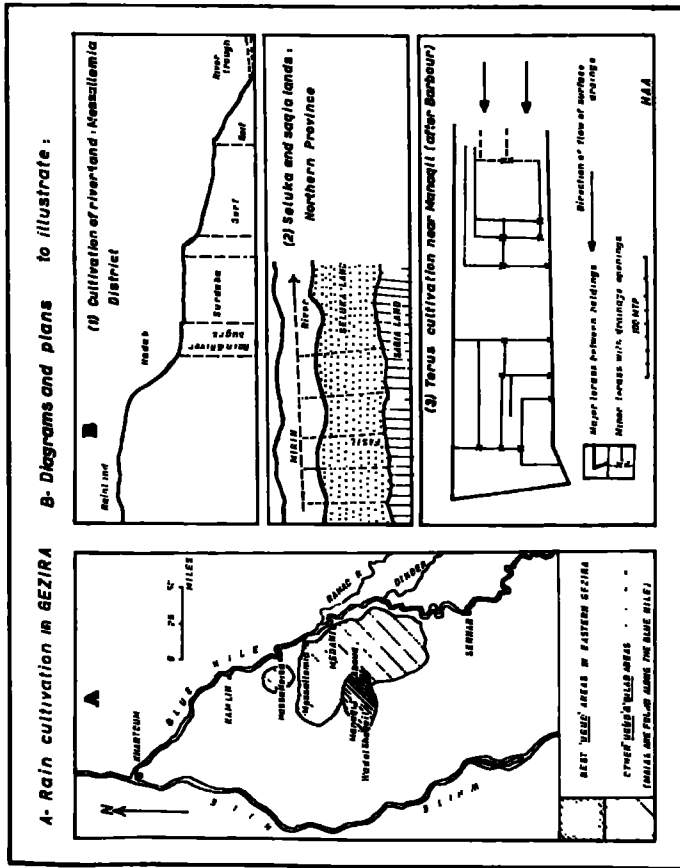


FIG. 52.

**FIG 52** GEZIRA CADSTRAL SURVEY, ARBAGI SECTION, 1906



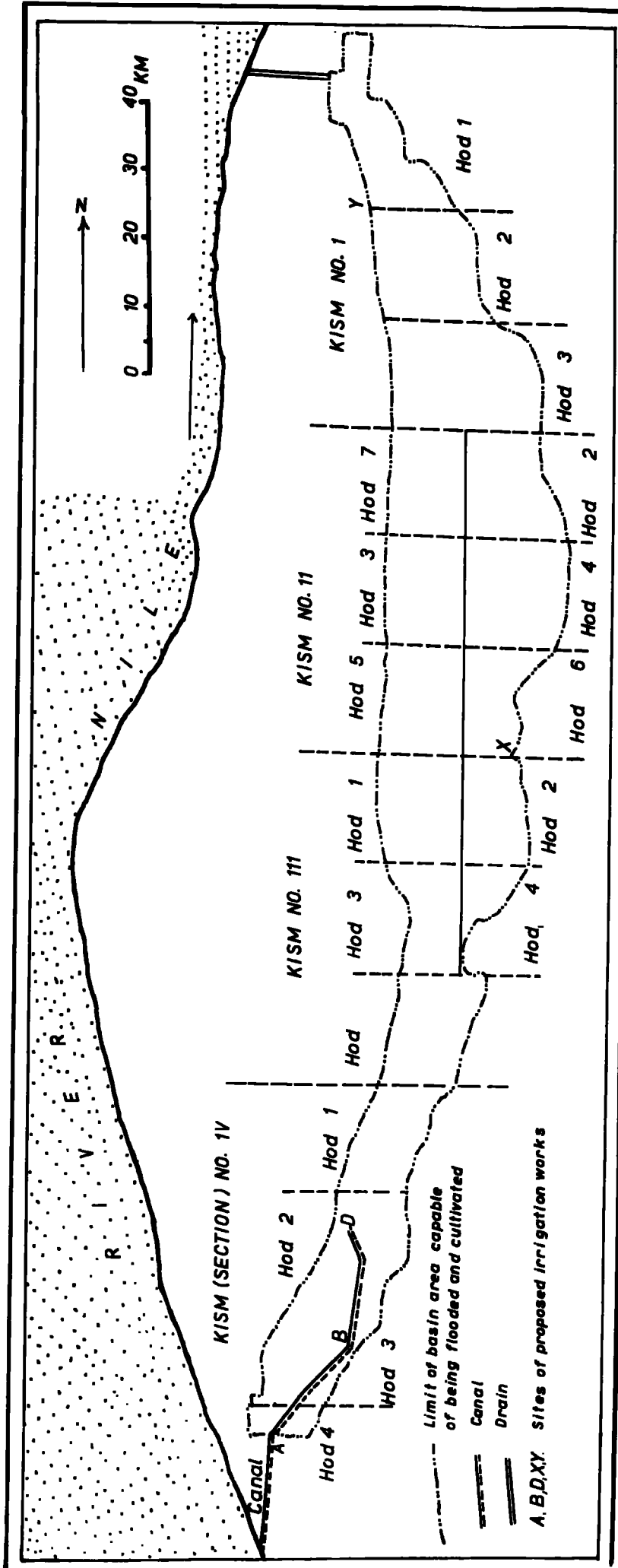
FIGURE 52. PLACED (1902)

PLEASE NOTE :

FIGURES 53, 54, 55, and 56 HAVE BEEN MISPLACED  
IN BINDING. AS FOLLOWS: 54, 53. 56,55.

FIG. ~~54~~. 54

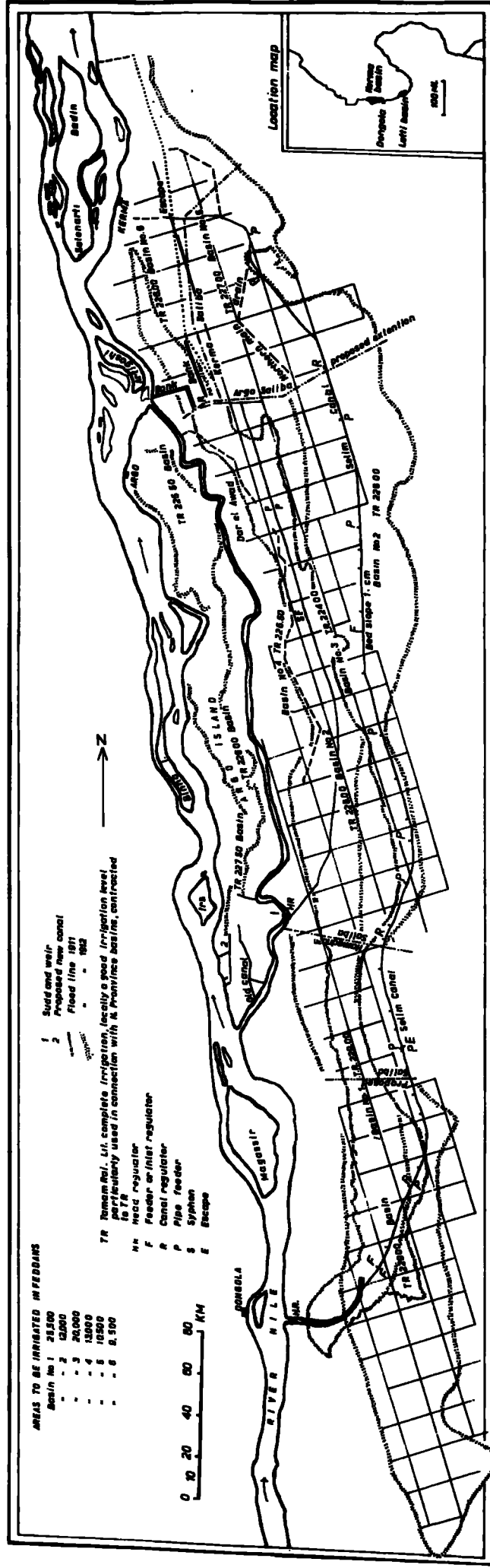
**FIG.54 PLAN OF LETTI BASIN ( For location see inset map A ) 1912**





FIG, 53.

FIG. 93 PLAN OF KERMA BASIN & PROPOSED IRRIGATION WORKS, 1911-12



FROM SUDAN ARCHIVES, BOX NO. 112/1

FIG. 56.

**FIG. 56 ZEIDAB CONCESSION : NORTHERN & SOUTHERN EXTENSIONS**

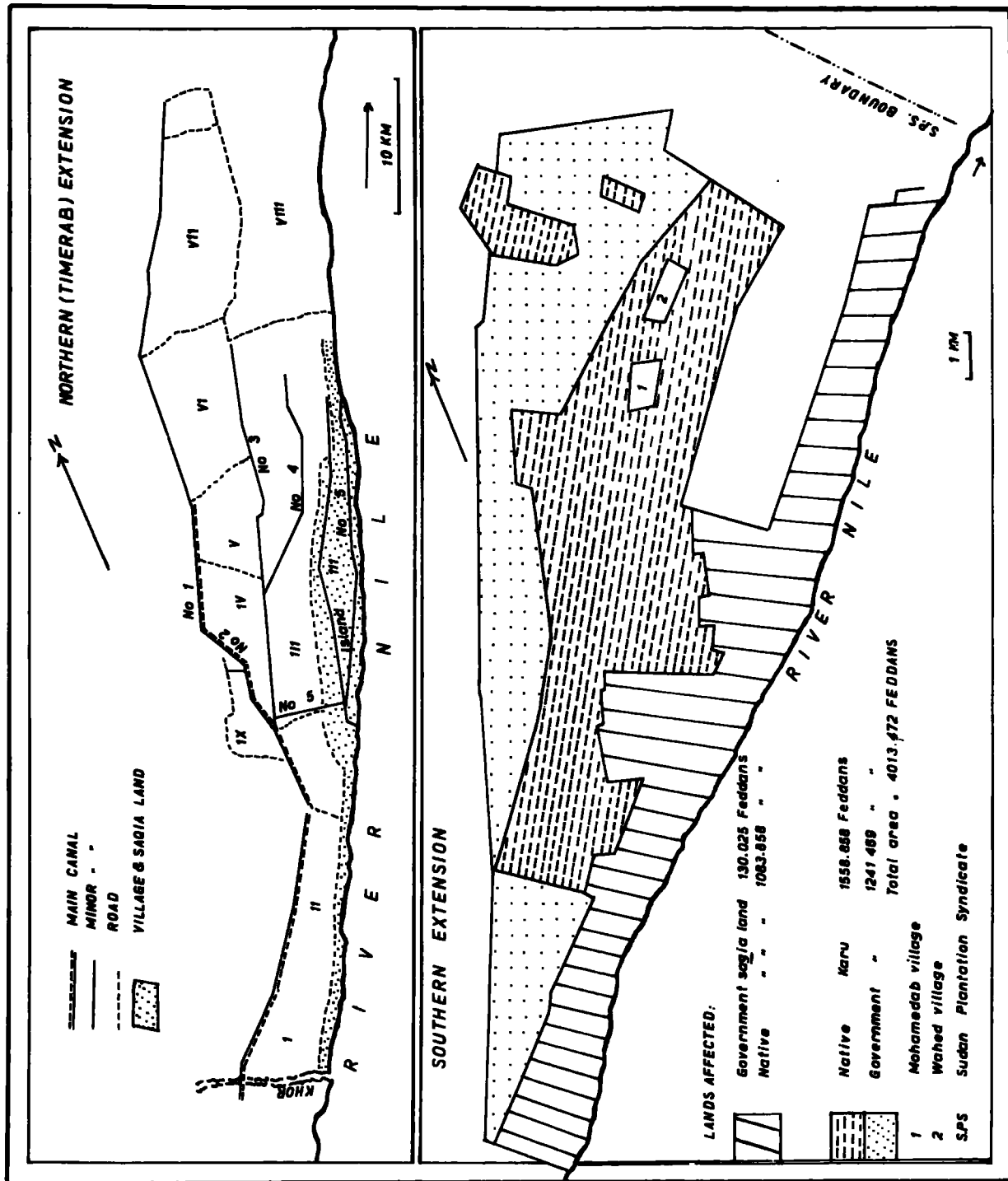


FIG. 55.

**FIG. 55 ZEIDAB CONCESSION AREA & CANALISATION**

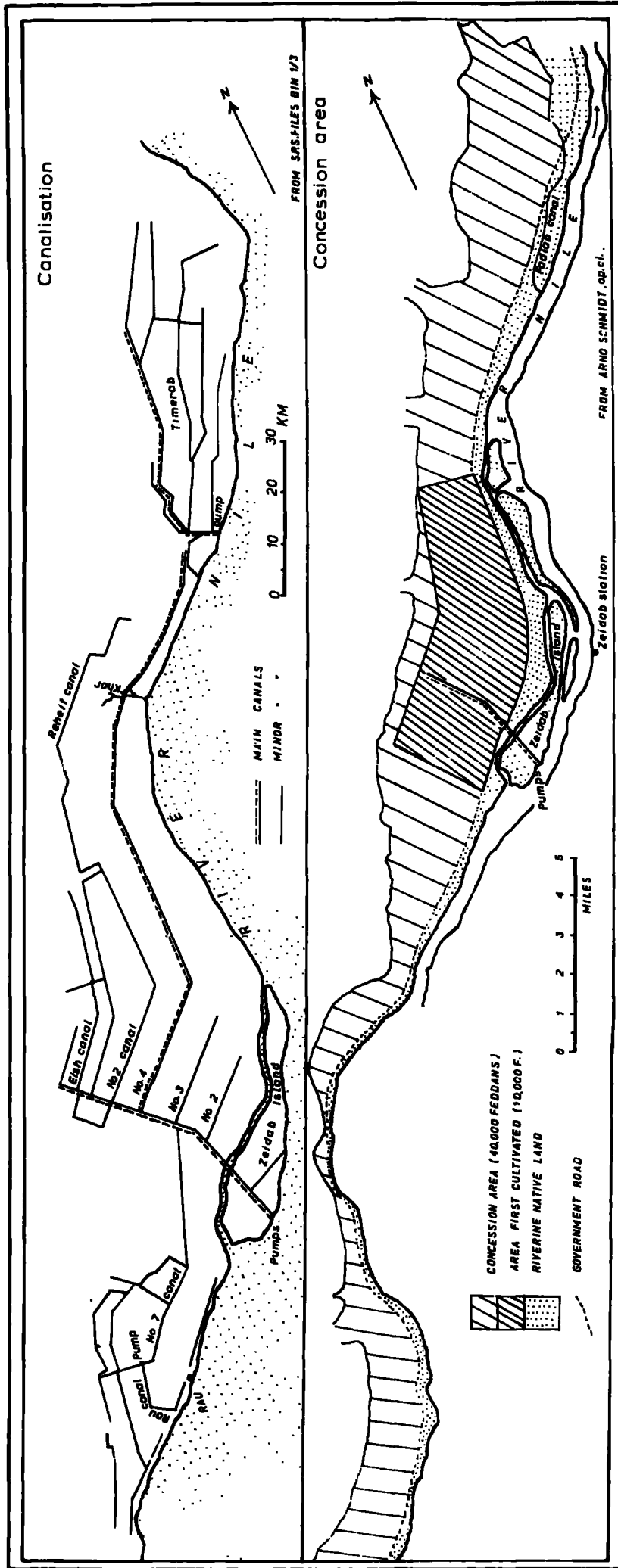
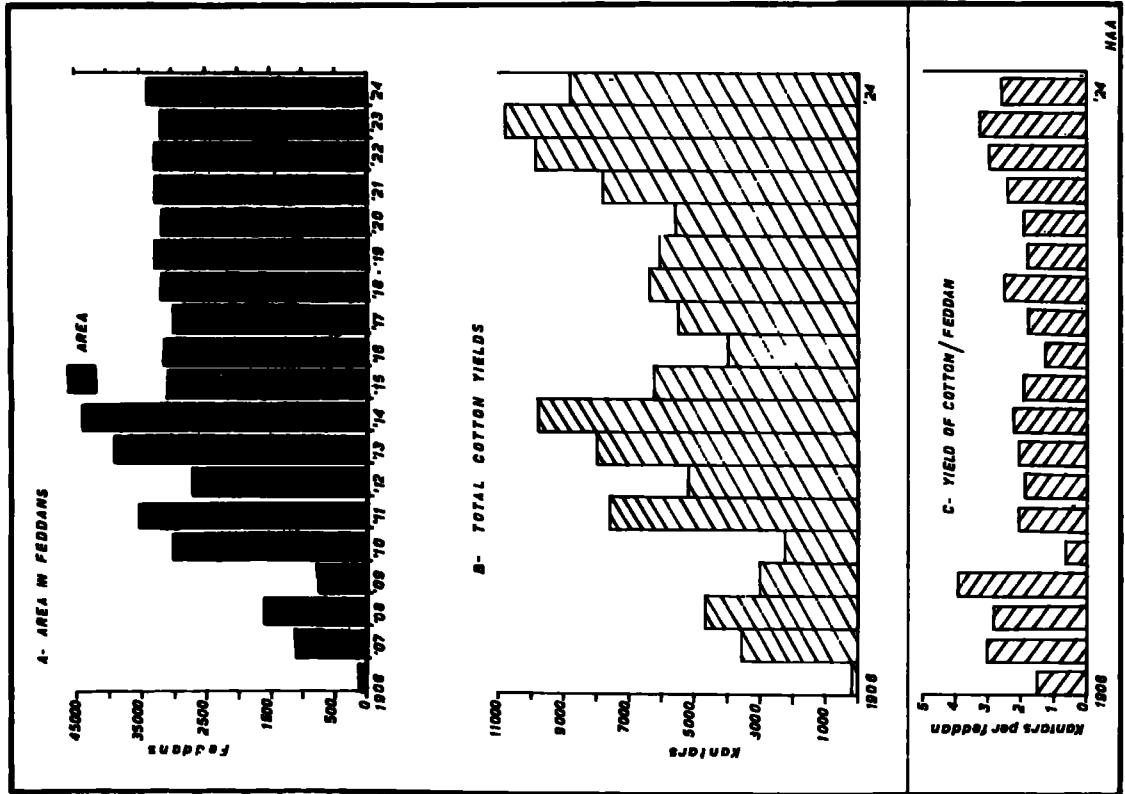


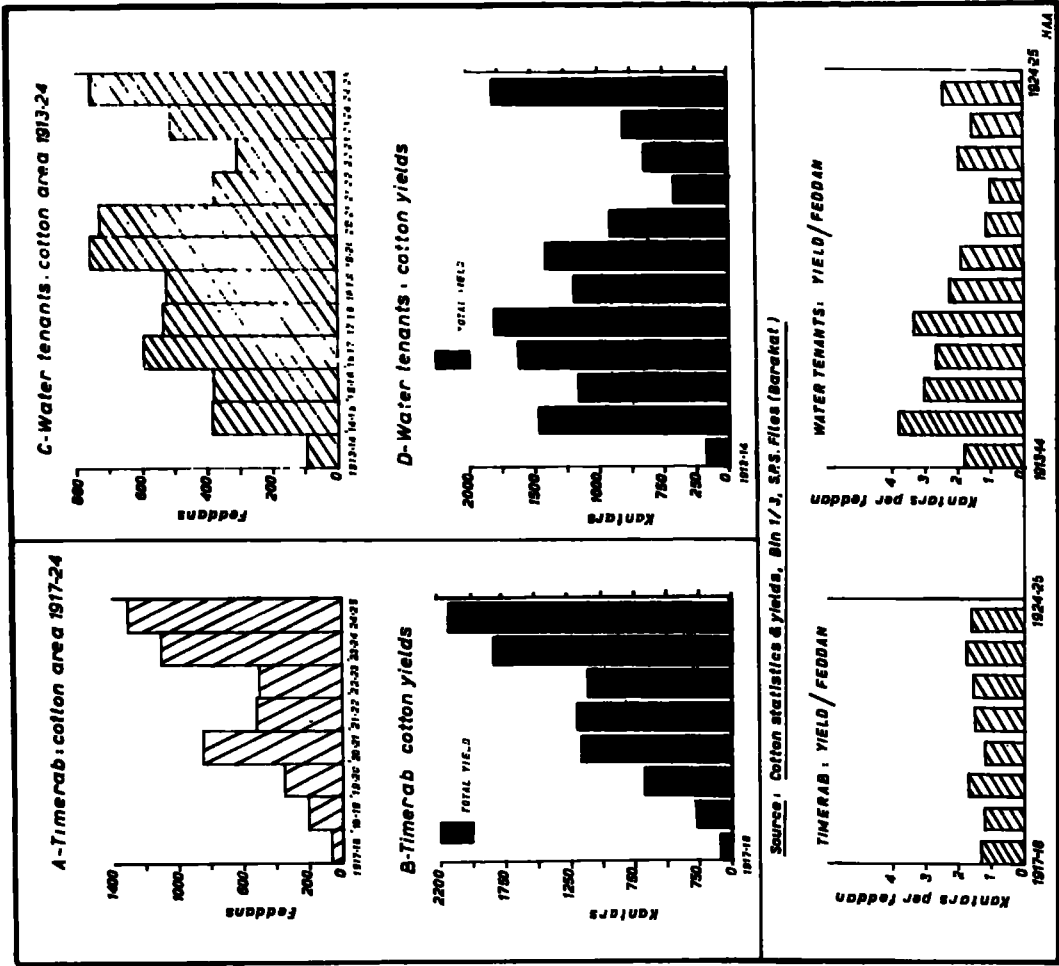
FIG. 57. and  
FIG. 58.

**FIG. 87 THE ZEIDAB ESTATE, YIELDS, 1906-24.**



SOURCE SURFILES ZEIDAB YIELDS BIN 1/3 HAA

**FIG. 88 THE ZEIDAB SCHEME YIELDS 1913-24**



HAA

SOURCE SURFILES ZEIDAB YIELDS BIN 1/3 HAA

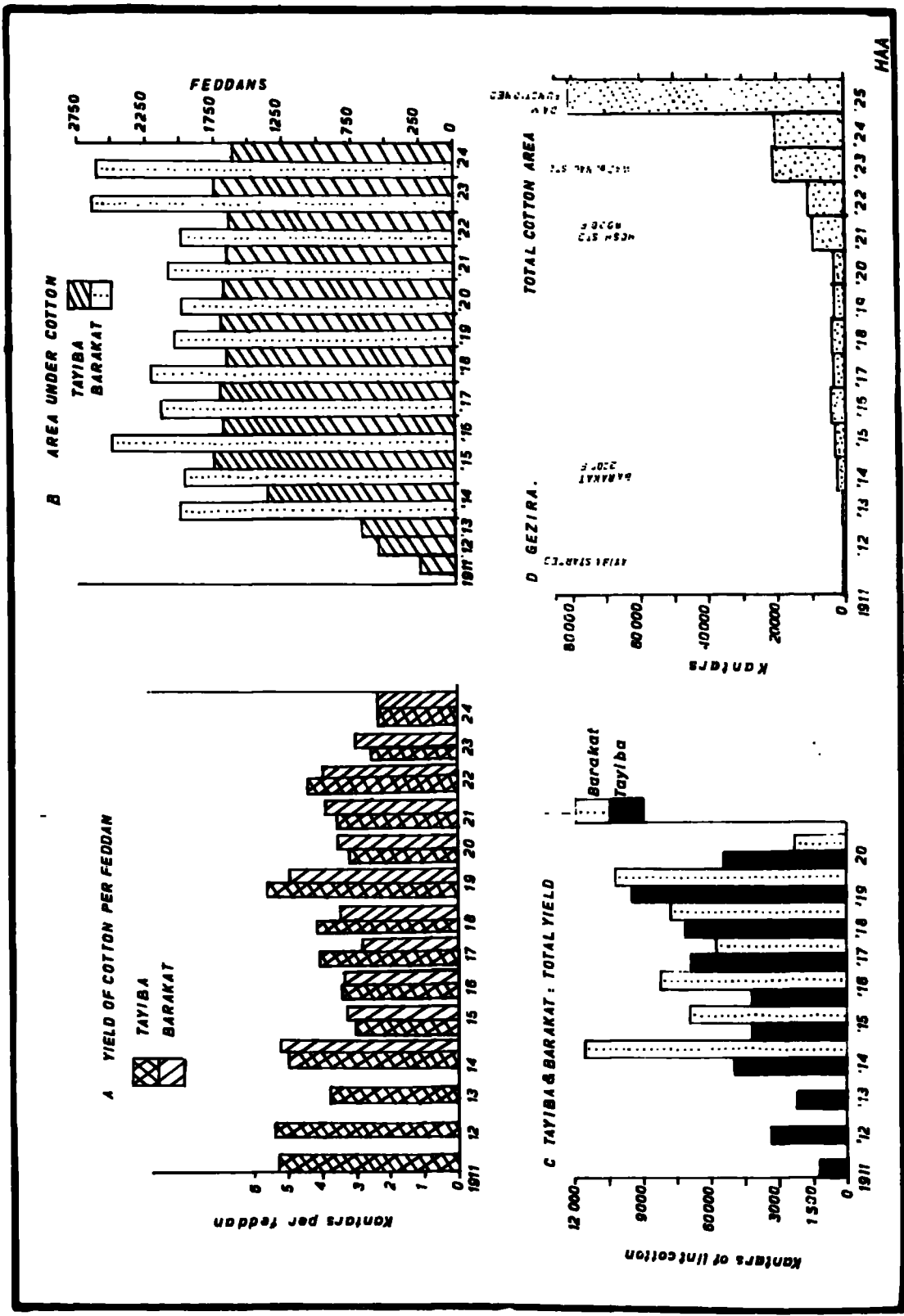


FIG. 59. and  
FIG. 60.



FIG. 61.

**FIG. 61 THE GEZIRA EXPERIMENTAL STATIONS : TAYIBA AND BARAKAT, YIELDS**



SOURCE S.P.S. FILES BIN 2/12  
3/12  
AGRICULTURAL RES. IN SUDAN. REPT FOR 1926-29, p. 17

FIG. 62. and  
FIG. 63.

FIG. 62 HOSH EXTENSIONS, 1920-21.

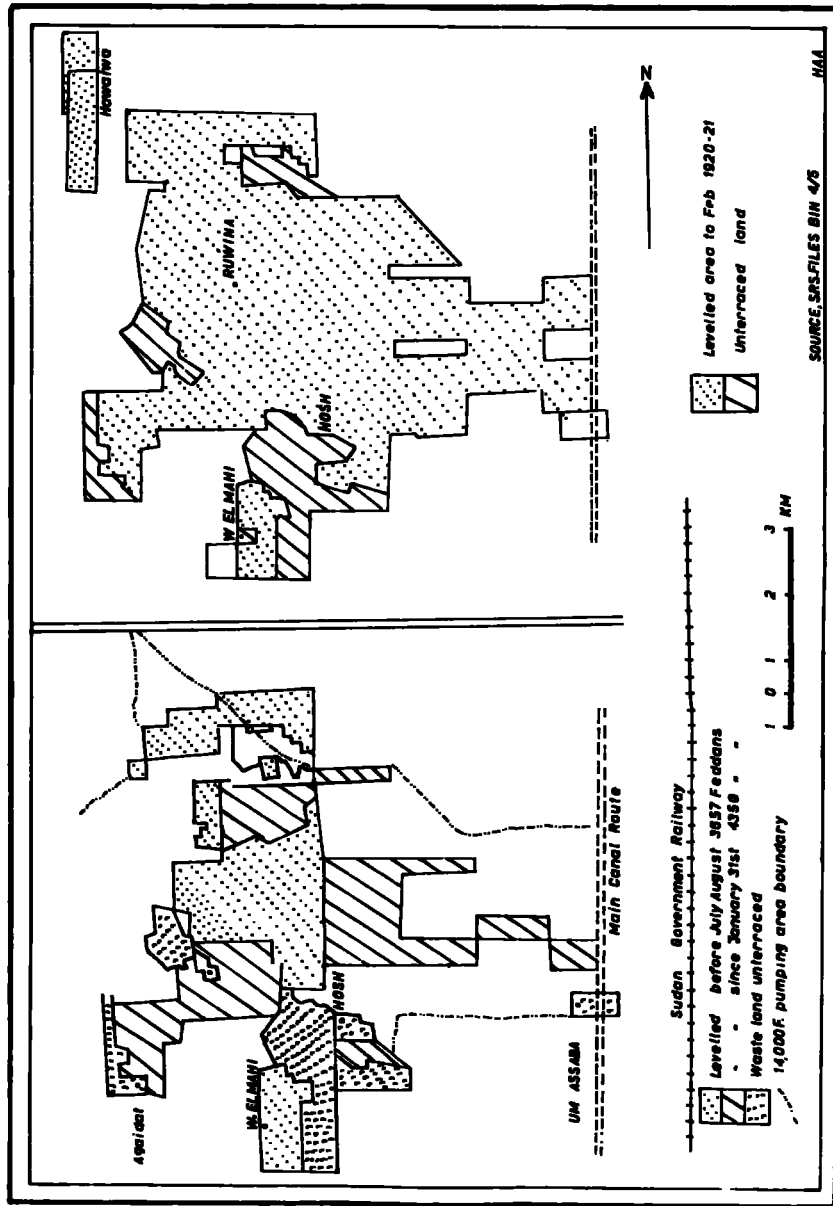


FIG. 63 PLAN OF WADEL NAU SCHEME (showing wheat & dura area ) 1923-4

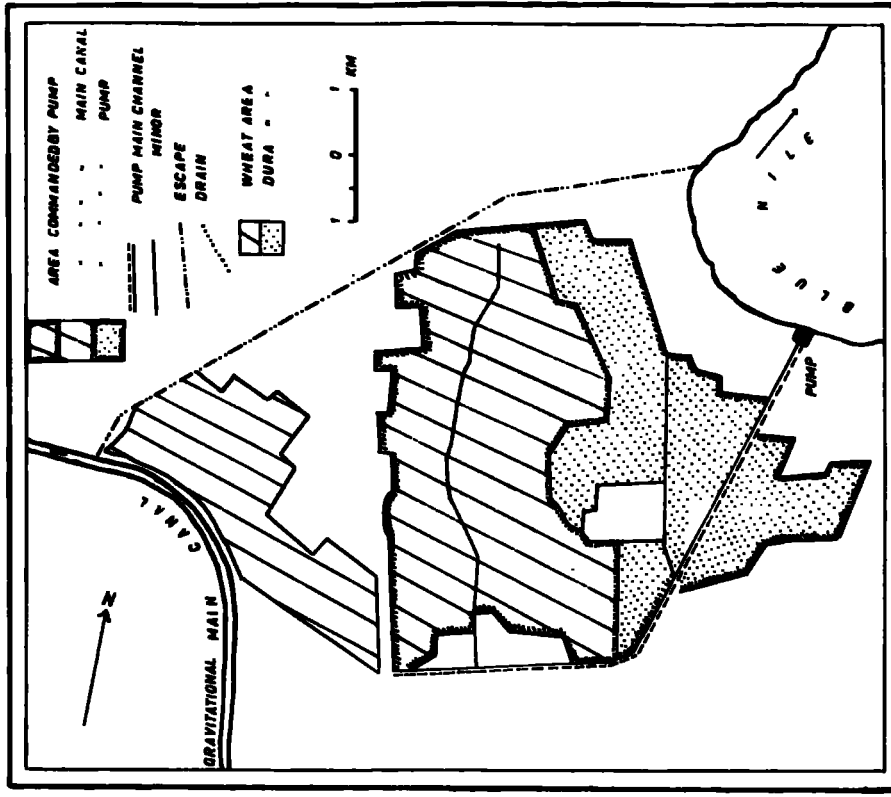
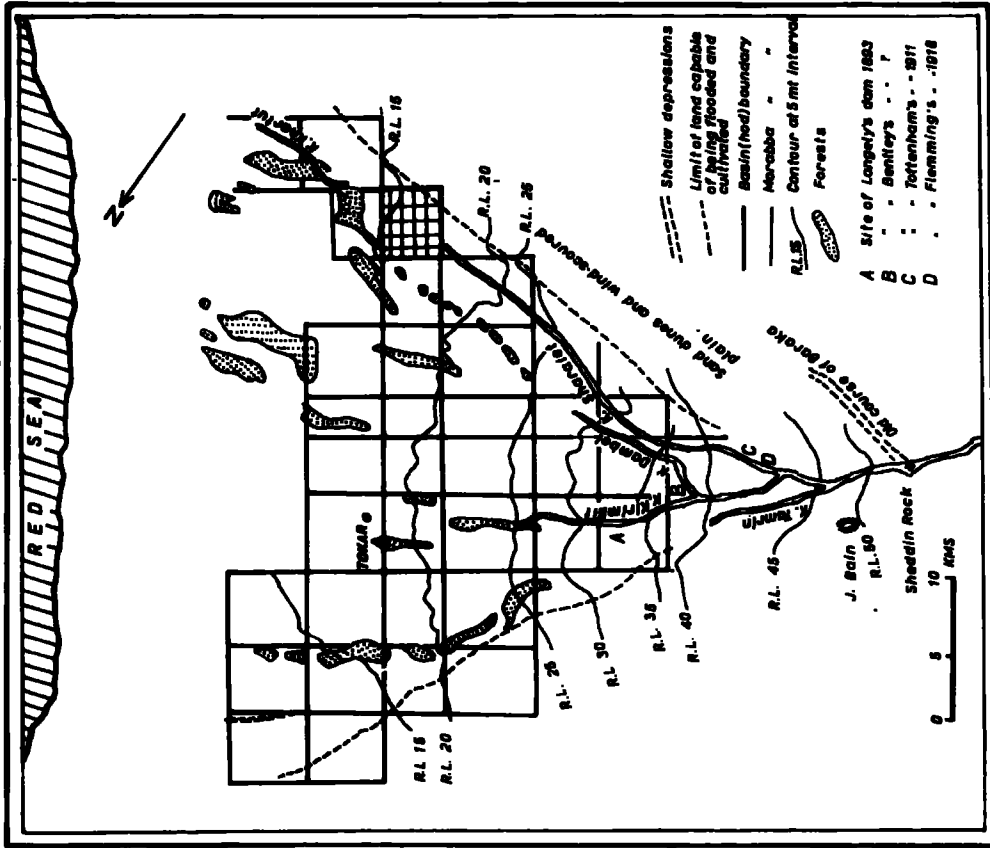


FIG. 64. and  
FIG. 65.

**FIG. 6-4 TOKAR (BARAKA) DELTA: DEMARCATION & CONTROL WORKS  
(1993-1978)**



**FIG. 6-5 GASH DELTA: DEMARCATION SYSTEM**

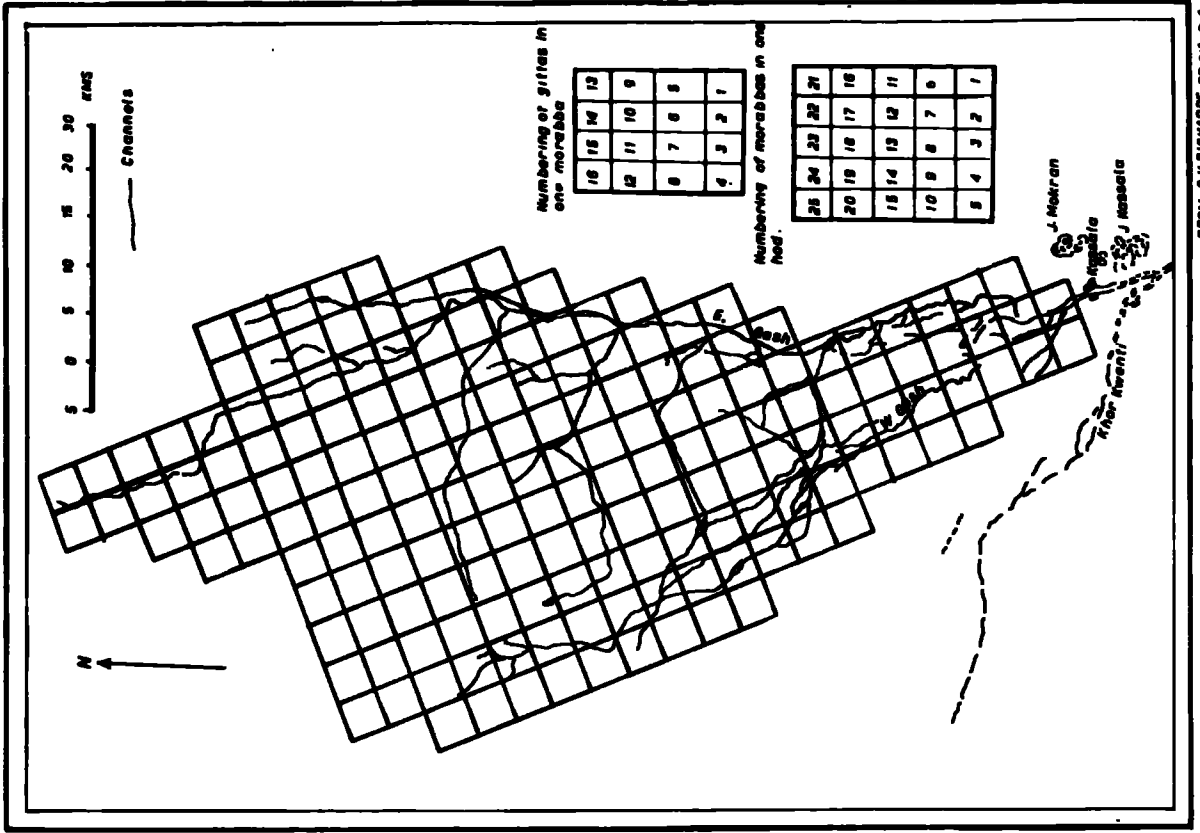
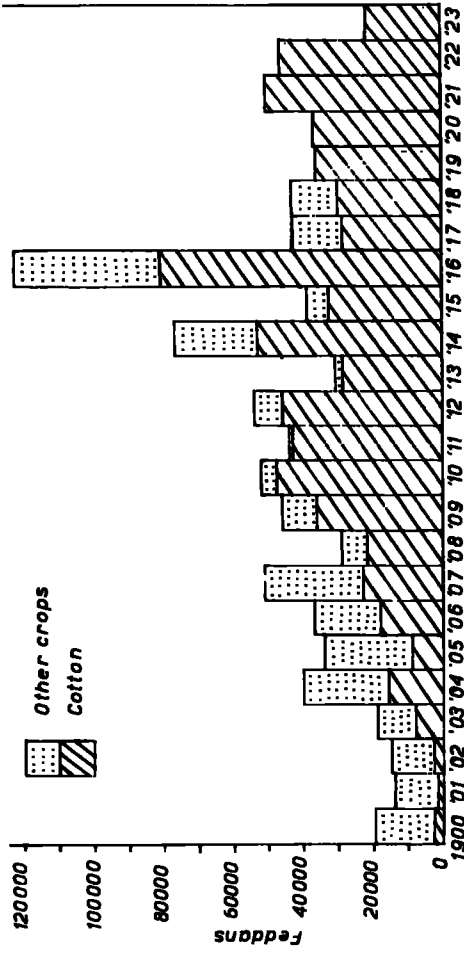




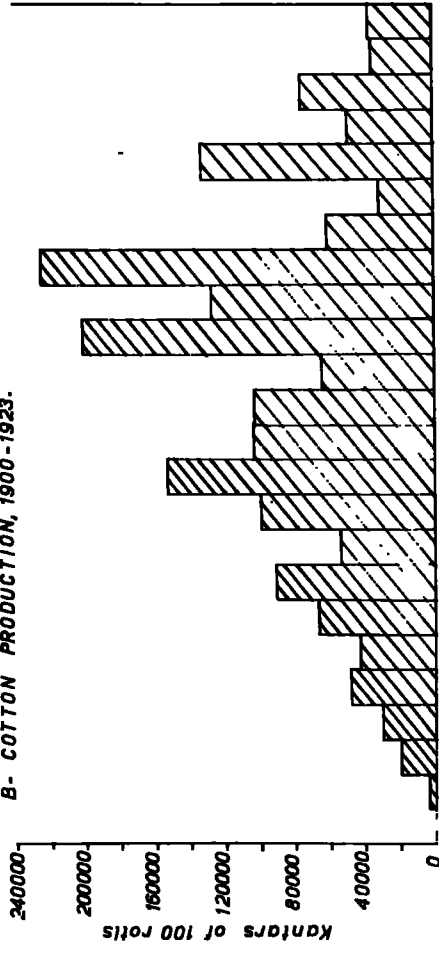
FIG. 66. and  
FIG. 67.

**FIG. 66 BARAKA DELTA, ACREAGE AND YIELDS**

**A- TOTAL AREA UNDER CROPS, 1900 - 1923.**



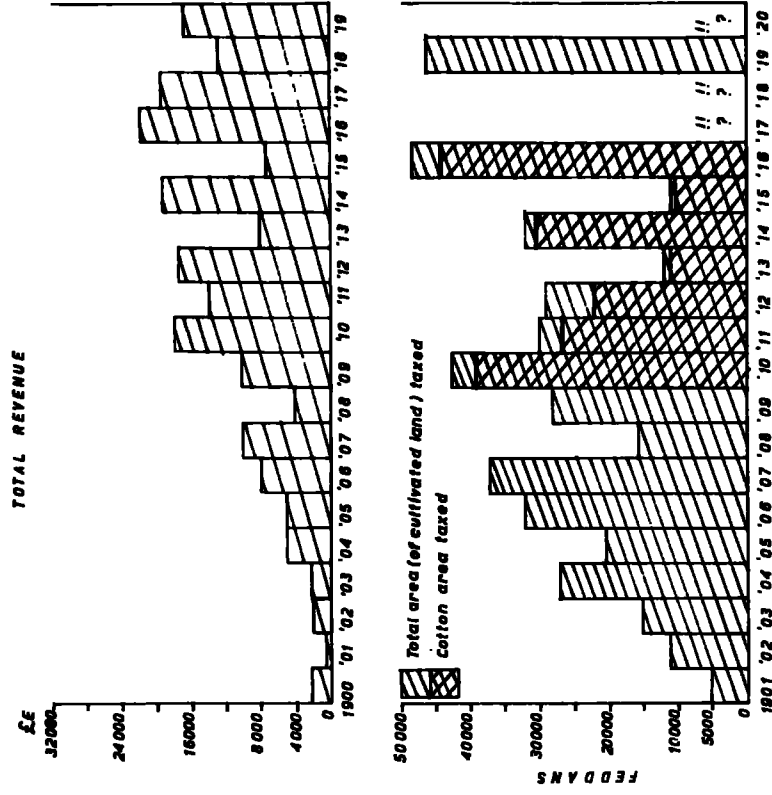
**B- COTTON PRODUCTION, 1900 - 1923.**



Source 'Report on Tokar', App. IV, p. 32

HAA

**FIG. 67 BARAKA DELTA, REVENUE FROM LAND**



? Figures not available. !! In 1917-18 Govt. took as tax 1/6 of cotton crop; from 1919-20 1/5 of cotton crop marketed as tax.

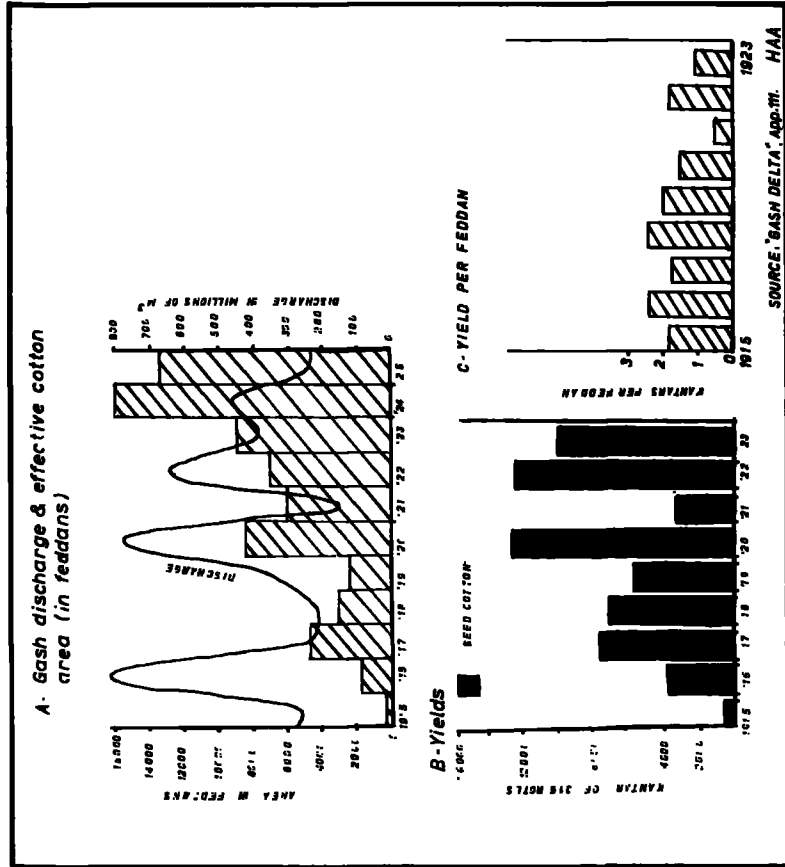
SOURCE SAME AS ' 66

HAA

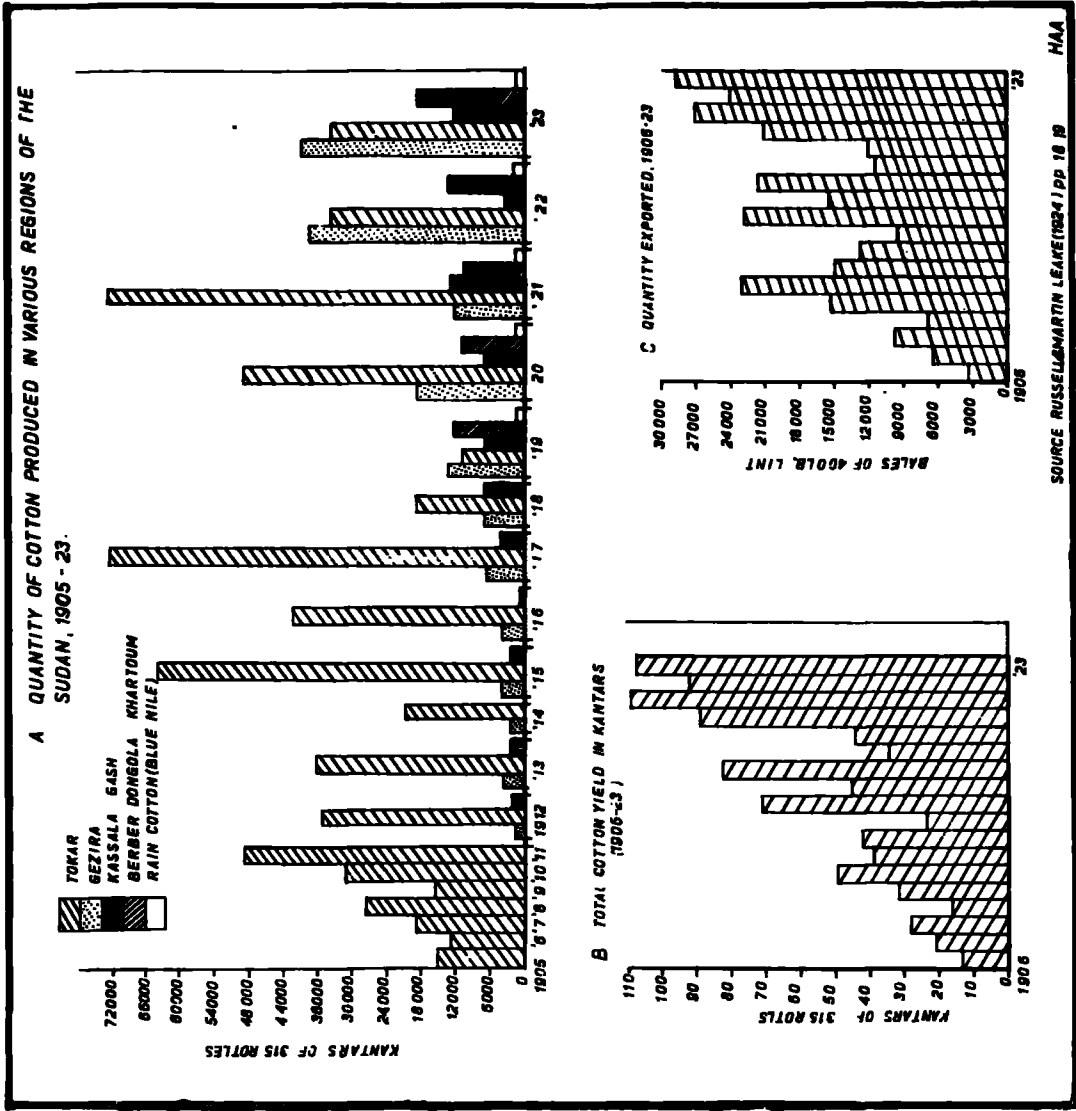
FIG. 68. and

FIG. 69.

**FIG. 68. THE GASH DELTA, DISCHARGE, ACREAGE & YIELDS**

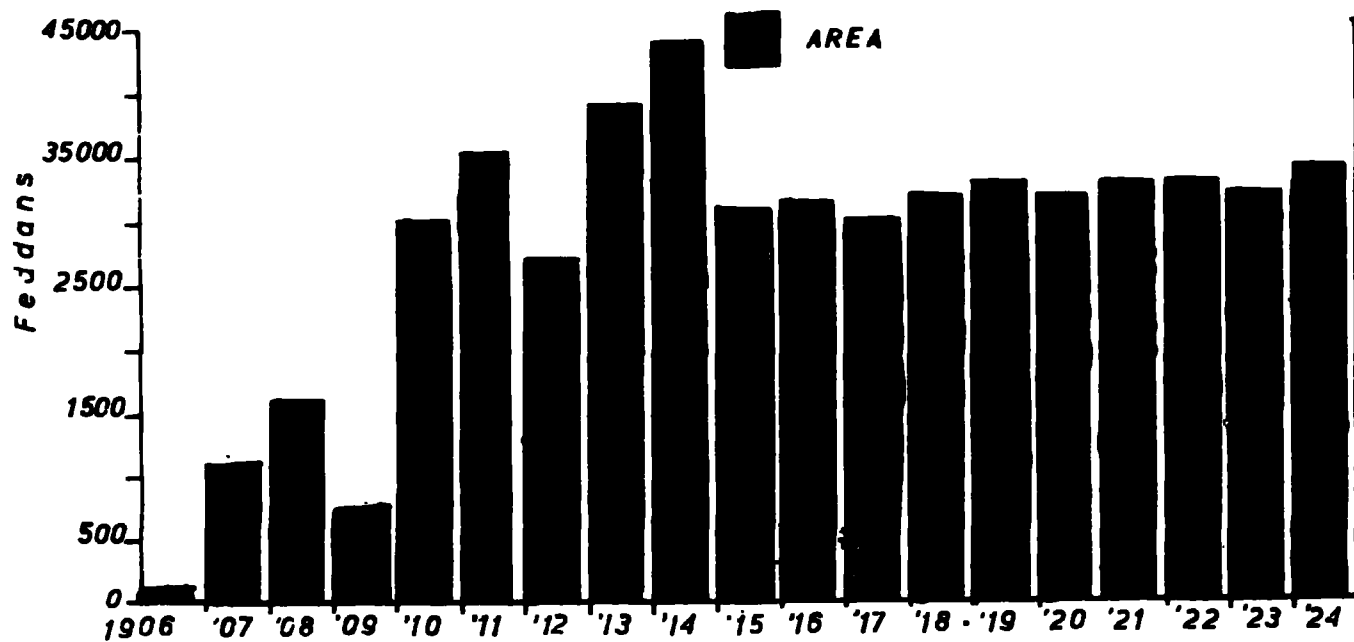


**FIG. 69. PRODUCTION AND EXPORT OF COTTON, SUDAN (1905-23)**

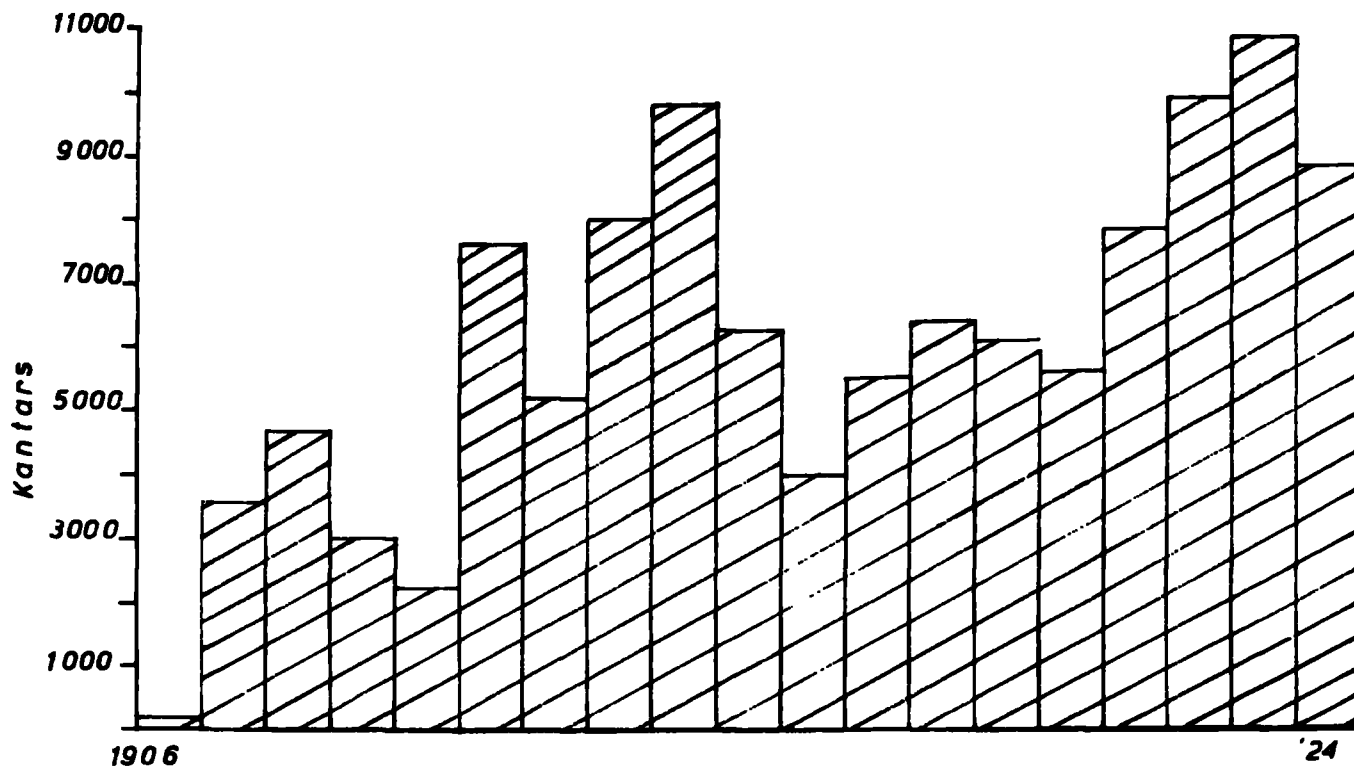


**FIG.57 THE ZEIDAB ESTATE, YIELDS, 1906-24.**

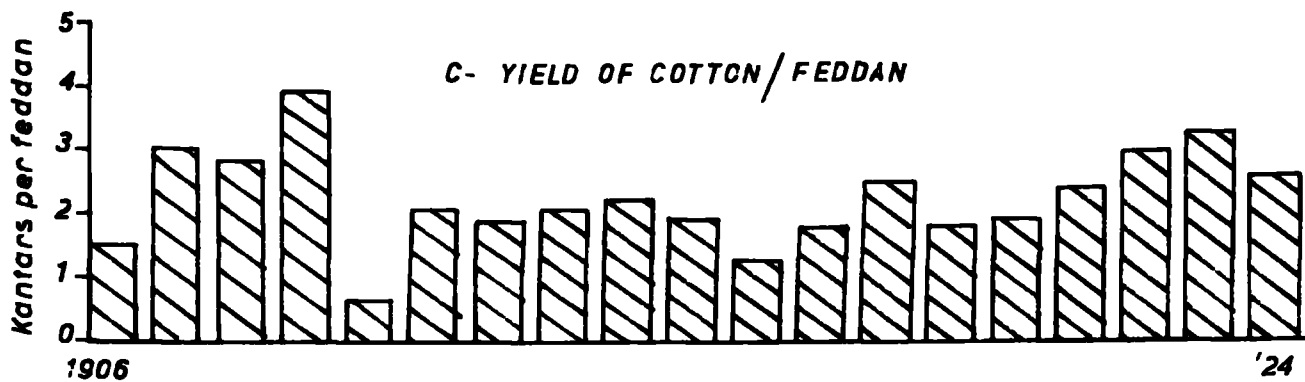
**A- AREA IN FEDDANS**



**B- TOTAL COTTON YIELDS**



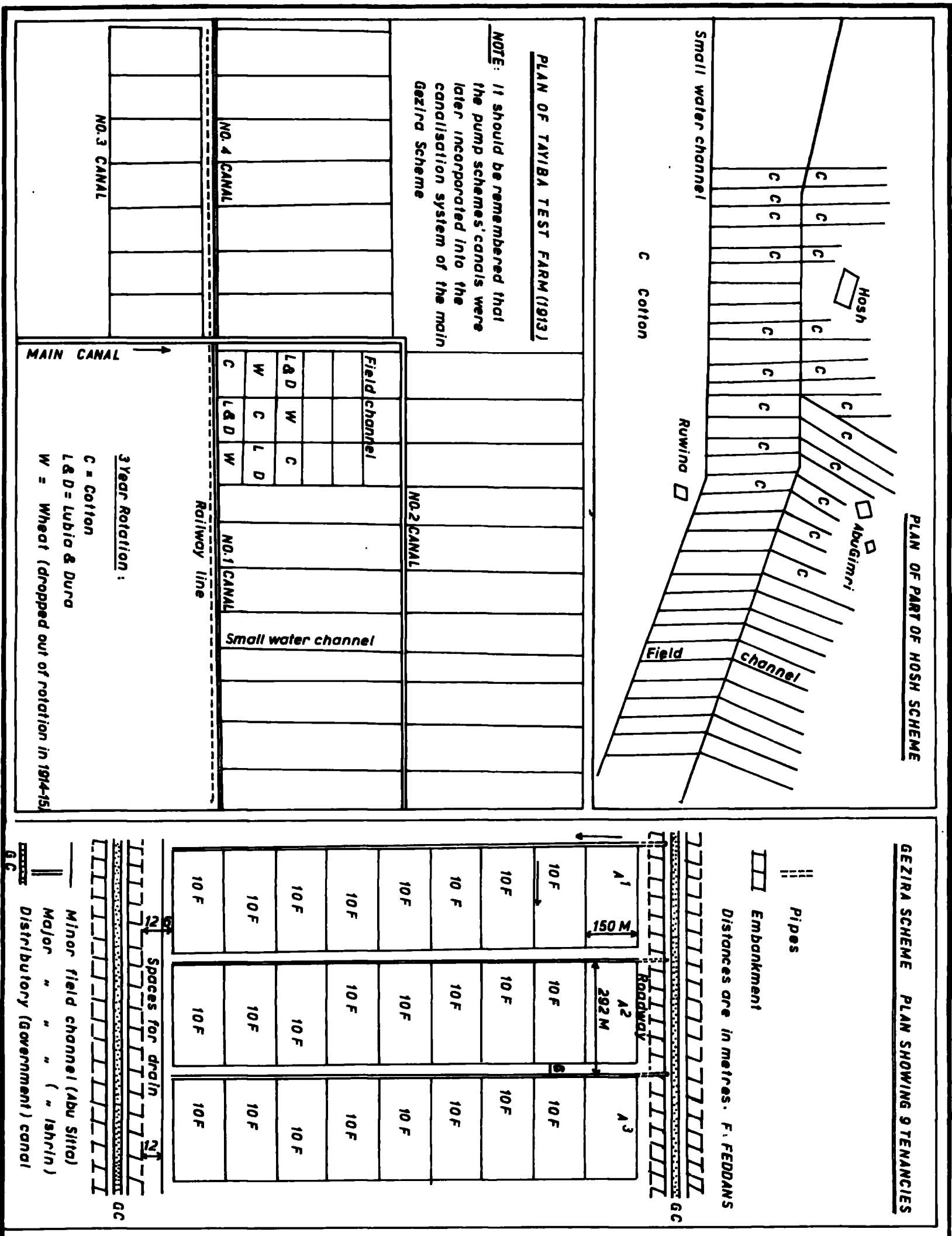
**C- YIELD OF COTTON/FEDDAN**



HAA

SOURCE S.P.S. FILES ZEIDAB YIELDS  
BIN 1/3

**FIG. 59** MINOR CANALISATION AND SYSTEM OF IRRIGATION IN THE PUMP & MAIN GEZIRA AREAS



**FIG. 60 GEZIRA EXPERIMENTAL PUMP STATIONS & THEIR PRE-1925 EXTENSIONS.**

