Some problems of economic geography in Northern tripolitania: a study of agriculture and irrigation on the Jefara plain

R. W. Hill

PART TWO

References

Appendices

I Explanation of Administrative Boundaries

II Conversion Figures for Weights, Currency, Areas, Distances, Lifts, Volumes and Discharges

III Selected Farm Studies

IV a Temperatures-Tripoli, Idris Airport, Azizia, Zuara, El Wotia, & Garaballi

b Monthly Rainfall -Tripoli

c Monthly Rainfall -Azizia

d Annual Rainfall Tripoli 1879/80 - 1956/7

e Rainfall for Certain Jefaran Stations

f Five Year Running Means & Accumulated Deficits for Tripoli

V a Key to Diagram of Water Levels of Certain Selected Wells taken from Italian Logs

b Notes on the Diagram of Water Levels of Certain Selected Wells taken from Italian Logs

c A Summary Table of Artesian Wells

d Notes on a Summary Table of Artesian Wells

VI a Production of Olives, Olive Oil & Sansa Oil in Tripolitania

b The Number of Olive Trees in Tripolitania

c Distribution of Libyan Olive Trees 1932(after Ferrara)

VII a Distribution of Numbers and Areas of Citrus Trees in Tripolitania in 1953/4

b Numbers & Production of Citrus on INPS Farms 1953/4 - 1956/7

c Monthly Export of Citrus 1957/8

VIII a Monthly Export of Groundnuts for the Agricultural Years 1956/7 & 1957/8

b Groundnuts Exported 1956/7 & 1957/8

IX a Production of Barley & Wheat in Tripolitania 1930/1-1957/8
b Provincial Distribution of Barley & Wheat in Tripolitania
c Production & Areas of Barley on INPS Demographic Farms
d Production & Areas of Wheat on INPS Demographic Farms
e Yields of Wheat & Barley on INPS Demographic Farms

X Buying Figures of the State Tobacco Monopoly in Tripolitania

INTRODUCTION.

1. Barclays Bank, D.C.O.: 'Overseas Survey 1957', Libya pp.110-118. Barclays Bank, D.C.O., London.

2. British Embassy: 'Libya - Economic Report No. 16, July-December 1956'. (Restricted). British Embassy, Tripoli.

3. Canady, H.M.: 'The agricultural economy of Libya'. Foreign Agricultural Service, United States Department of Agriculture, FAS-M-I, March 1956.

4. Central Office of Information: 'Libya'. Reference Division, Central Office of Information, London, No. R3682, Classification 1.2c. 13.8.57.

5. Higgins, B.: 'The economic and social development of Libya'. United Nations, ST/TAA/K/Libya/3, 12 October, 1953.

6. Lockwood, A.N.: 'Libya - building a desert economy'. International Conciliation, No. 512, March 1957, Carnegie Endowment for International Peace.

7. Royal Institute of International Affairs: 'Libya - a brief political and economic survey'. Chatham House Memorandum, May 1957.

8. The Economist Intelligence Unit: 'Egypt - Sudan - Libya'. E.I.U. Three Monthly Economic Review, no. 24. January 1959.

9. Thomas, H.H.: 'Libya - Economic and commercial conditions'. Overseas Economic Surveys, December 1955. H.M.S.O. London.

10. United Kingdom of Libya: 'Libyan Commercial Information'. Ministry of National Economy, U.K. of Libya, 1957.

11. United States Department of Commerce: 'Basic data on the economy of Libya'. Economic Reports, World Trade Information Service, part 1, no. 57-80, October 1957.

CHAPTER I.

Morphology: a descriptive and genetic study.

1. Ahlmann, H.W.: 'La libye septentrionale - études de géographie physique et humaine'. Geografiska Annaler, vol. X, 1928. Stockholm.

2. Amato, A.: 'L'attività del servizio geologico in Tripolitania nel primo anno della sua istituzione'. Boll. Geog. Lib., Tripoli, 1934.

3. Amato, A.: 'Conziderazioni geo-idrologiche sulla zona occidentale della pianura tripolina'. Boll. Geog. Lib., Tripoli, 1935. n. 8 pp. 23-29.

4. Archambault, J.: 'Quelques aspects de la géologie et de l'hydrogéologie de la Djeffara Tripolitaine'. Service Geologique, Tunis 1947.

5. Bernet, E.: 'Contribution a l'étude géologique de la Tripolitaine'. Bull. Soc. Géol. France, Tome XVIII, 1912, pp. 385-413.

6. Brichant, A.L.: 'A broad outline of the geology and mineral possibilities of Libya'. Report. A/AC.32/TA.27. United Nations. 20.6.52.

7. Brichant, A.L.: 'Sur la découverte du Trias au pied du Djebel Garian'. Comptes Rendus Academie des Sciences, tome 234, pp. 1456-1458. Paris, 1952.

8. Castany, G., Dégallier, Domergue, Ch.: 'Les grands problèmes d'hydrogéolique en Tunisie'. Monographies Regionales, 2nd Serie, nos. 3, pp. 129-134, Tunis, 1952.

9. Christie, A.M.: 'Geology of the Garian map area - Tripolitania, and logs of the wells drilled by LATAS between March 1953 and March 1954'. United Nations, Report no. LIB/TA.23. 1955.

10. Comel, A.: 'Ricerche pedologiche sui terreni della Tripolitania'. Boll. Soc. Geol. It. Vol. 51, 1932, fasc. 2 pp. 317-342.

11. Desio, A.: 'Problemi geologici della Libia'. Atti 2 Congresso Studi Coloniali, Florence, 1936.

12. Desio, A.: 'Le nostre conoscence geologiche sulla Libia sino al 1938'. Annali del Museo Libico di Storia Naturale, Vol. I pp. 13-54. Tripoli, 1939.

13. Desio, A.: 'Le condizioni geologiche della Libia fra il Pliocene ed il Quaternario'. Report 18th Session Int. Geol. Congress, Great Britain, 1948, part IX, pp. 26-29. London, 1950.

14. Desio, A.: 'Cenno riassuntivo sulla costituzione geologica della Libia'. Report 18th Session Int. Geol. Congress, Great Britain, 1948. Part XIV pp. 47-52. London, 1950.

15. Desio, A.: 'Brève synthèse de l'évolution morphologique du territoire de la Libye'. Bulletin de la Société Royale de Géographie d'Egypte, pp. 9-21. March, 1953.

16. Despois, J. 'Le Djebel Nefousa'. Chapter 1. 'Les terrains et les formes du relief', pp. 9-45. Larose - Editeurs, Paris, 1935. 349 p.

17. Domergue, E., Dumon, E., Lapparent, A.F.de and Lossel, P.: 'Sud et Extrême-Sud tunisien'. Monographies Regionales, 2nd Serie, No. 7, Tunis, 1952.

18. Goudarzi, G.H.: 'Terminal Report of mineral investigation programme Aug. 1954- June, 1957'. United States Geological Survey, associated with Agriculture and Water Resources Division of U.S.O.M. Libya.

19. Krenkel, E.: 'Geologie Afrikas', Libya p. 1465. Gebrüdes Boratraeger, Berlin, 1938.

20. Libyan Public Development and Stabilisation Agency.: 'Aménagement de l'Uadi Megenin: Rapport Général - Part I, Memoire Explicatif'. R.C.T. 139, S.F.B.A. C.O.T.H.A. L.P.D.S.A. Tripoli, Libya, July, 1954.

21. Lipparini, T.: 'Tettonica e geomorfologia della Tripolitania'. Bollettino della Societa Geologica Italiana, Vol. LIX pp. 221-301. Rome, 1940.

22. Maranboni, P.: 'Su alcune sabbie della Tripolitania'. Rend. Reale Istituto Lombardo Scienze e Lettere, Serie 2, Vol. 62. Milan, 1929.

23. Parona, C.F.: 'Impressioni di Tripolitania - Note geomorfologiche sulla Gefara'. Natura, Vol. 6, Milan, 1915.

24. Parona, C.F.: 'Il Gebel Tripolino e sua fronte sulla Gefara'. Rivista Tripolitania, no. 2, pp. 307-320. Roma, 1925-6.

25. Pervinquière, L.: 'Sur la géologie de l'extrême - sud tunisien er de la Tripolitaine'. Bull. Soc. Géol. France, 4th series, Paris, 1912.

26. Pfalz, R.: 'Geologie und Morphologie von Libyen'. Berich. Freib. Geol. Gesell. XVIII pp. 84-100. Freiburg in Sachen, 1941.

27. Regny, P. Vinassa de.: 'Contribuzioni alla conoscenza della Libia'. Bollettino della Società Geologica Italiana, Vol. 2. Roma, 1932.

28. Sandford, K.S.: 'The geology of Italian North Africa'. Geographical Journal, No. 94 pp. 50-53. London, 1939.

29. Sanfilippo, I.: 'Missione mineralogica per studi e ricerche nella Libia - Part I, Attraverso la Tripolitania e il Fezzan, cerni sulla costituzione dei terreni'. Banco di Roma.

30. Silvestri, A.: 'Sulla formazione miocenica dei dintorni di Homs'. Bollettino Società Geologica Italiana, Vol. LXV pp. 49-56. Roma, 1947.

31. Solignac, J.M.: 'Rapport sur un voyage géologique en Tripolitaine'. Service Géologique, Tunis, 1932.

32. Stefanini, G.: 'I terrazzi fluviali e marini dell' Africa Italiana'. Int. Geogr. Union, 2nd Rep. of the Commission on Pliocene and Pleistocene Terraces pp. 23-29, 1930.

33. Wittschell, L.: 'Der Tripolitanische Djebeli eine grosse denudationstufe'. Zeitschrift fur geomorfologie, vol. IV pp. 74-80, 1929.

34. Zaccagna, D.: 'Itinerari geologici nella Tripolitania Occidentale'. Mem. Descrittive Carta Geologica d'Italia, Vol. 18. Roma, 1919.

CHAPTER 2

Agriculture and Land-Use.

1. Andreoli, S.B.: 'Memorandum on agricultural policy in Libya'. General Manager of the Libyan Finance Corporation. 24th June, 1955.

2. Cillis, E. De.: 'La tecnica colturale indigena'. Ricerche e Studi Agrologici sulla Libia. Min. Agr. Ind. e Comm. Roma, 1912 pp. 258-274.

3. Cillis, E. De: 'L'Oasi di Tripoli'. Bollettino d'Informazioni Economiche del Ministero delle Colonie, no. 7-9, 1920.

4. Cillis, E.De:'Aridocoltura nei terreni tropicali e sub-tropicali' Atti VIII Congresso Int. Agr. Trop. e Sub-Tropicale, Tripoli, 1939.

5. Cheesman, W.J.W.: 'Background of Agricultural Credit and Co-operation in Libya'. Middle East Development Division, March 1956. British Embassy, Beirut.

6. Clarke, J.I.: 'Studies of semi-nomadism in North Africa'. Economic Geography, vol. 35 no. 2, April 1959, pp. 95-108.

7. Della Gatta, L.:'Una meta da raggiungere: maggiore estensione della cultura irrigua. Boll. R. Uff. Servizi Agrari della Libia, Tripoli, 1935. No. 7 p. 177.

8. Della Gatta, L.: 'Il problema dell' irrigue nella pianura tripolina'. Agricoltura Libica, 1938, no. 5 pp.217-223.

9. F.A.O.: 'Report to the Government of Libya on Agriculture'. Report no. 21. Roma, 1952.

10. Fisher, W.B.: 'Agriculture in Modern Libya'. Geographical Magazine, vol. 25 pp.184-194. August, 1952.

11. Goodchild, R.G.: 'The decline of Libyan agriculture'. Geographical Magazine, vol. XXV no. 3, July 1952, pp147-156.

12. Goodchild, R.G.: 'Agriculture in Ancient Libya'. Geographical Magazine, June-July 1952.

13.Governo della Tripolitania: 'Tripolitania Economica - la Colonizzazione a tutto i'l 1933'. Notiziario Economico, no. 1, Anno VII.

14. International Review of Agriculture: 'International Chronicle of Agriculture in Libya'. International Review of Agriculture, Year 30, no. 3, March 1939 pp. 110E-114EI, 53-54.

15. Leone, G.; Miele, A.C.; and Tappi, M.: 'Nuovo contributo al Censimento Agrario delle oasi della Tripolitania'. Agricoltura Coloniale, Anno XX - 1926, no. 11.

16. Leone, G.: 'Colonisation rurale de peuplement en Tripolitaine'. Congrès de la Colonisation Rurale, Alger, 1931. 22 p.

17. Leone, G.: 'Le coltivazione agrarie e gli ordinamenti aziendali nella Libia'. Atti. Soc. It. Progress Scienze, 1937 - XXV Riunione, vol. 4, fasc. 2 pp.389-400.

18. Lista, M.: 'Il Dry Farming e la conquista dei deserti'. Rivista Africa Italiana, 1922, p.88. Roma.

19. Morgantini, A.M.: 'Commercio e statistiche dei prodotti agrari della Tripolitania'. Agricoltura Libica, Anno 10, nos. 6-7, June-July, 1941 pp. 4-27.

20. Mascaro, T. and Palloni, G.: 'Primo censimento generale delle aziende agrarie metropolitane della Libia al 21 April, 1937'. Ministero Africa Italiana, 1941. Roma.

21. Miele, A.C.: 'Il censimento agrario delle oasi di El-Alalga, El-Agelat e Zuara'. Annuario del R. Istituto Sperimentale Agrario in Sidi Mesri, 1928 pp.221-241.

22. Nazara of Agriculture: 'Note on crop results and prospects in Tripolitania for 1953 harvest'. Statistics Section, Nazara of Agriculture, Administration of Tripolitania.

23. Palloni, G.: 'Statistiche sulla colonizzazione della Libia'. Agricoltura Libica, Anno VI - Luglio, 1937 - XV - N.7. Tripoli.

24. Papini, I.: 'Agricoltura Indigena e colonizzazione in Libia'. Rivista 'Africa', Roma 1947, no. 3 pp.54-56.

25. Pra Sisto, V.T.: 'Report to the Government of Libya on range problems'. F.A.O. Report no. 239, Roma, 1954.

26. Qureshi, A.I.: 'System of land rights and taxation in Tripolitania'. United Nations, Lib/T.A.8.

27. Robb, R.L. and Rowland, J.W.: 'Survey of Land Resources in Tripolitania'. British Military Administration. Dept. of Agriculture, 1945. 156 p.

28. Russell, E.J.: 'Agricultural colonisation in the Pontine Marshes and in Libya'. Geographical Journal, London, vol. 94, Oct. 1939 pp.273-292.

29. Serraj, M.: 'Arab traditional farming and the need for reform'. March 1954. Tripoli. T.R/617.

30. Sullan, V.B.: 'The agriculture of Northern Libya'. Foreign Agriculture, Washington, July, 1944 pp.159-168. U.S. Dept. of Agriculture.

31. Sinclair, D.: 'Observations on agriculture in Western Province, Tripolitania'. M.S. May, 1945. B.M.A.

32. Theodorou, N.: 'Indigenous and Italian Farm, Enterprises in the Zawia area'. F.A.O. Report no. 259, April 1954.

33. United Kingdom of Libya and the Republic of Italy: 'ACCORDO - Tra l'Italia e la Libia di collaborazione economica e di regolamento delle questioni derivanti dalla risoluzione dell' Assemblea Generale delle Nazioni Unite del 15 Dicembre 1950 e scambi di note'. Allegato H. 'Piano di ulteriore avvaloramente dell' opera di colonizzazione in Tripolitania'.

34. United Kingdom of Libya: 'Statistica Agraria della Tripolitania' Regno della Libia, Amministrazione della Tripolitania, Nazara dell' Agricoltura, Ufficio Statistica.

35. United Kingdom of Libya: 'Export and Import of Agricultural Crops'. Monthly Bulletin of Agricultural Statistics, Nazarat of Agriculture, Statistics Division, Administration of Tripolitania.

36. Viguerie, P. de: 'Comment l'Italie met en valeur la Tripolitaine'. Journal d'Agriculture Practique (Paris) vol. 59, pp.12-16, 33-35 and 56-58. 1933.

37. Vivoli, G.: 'Per una maggiore diffusione delle colture erbacee asciutte nelle aziende agrarie della Tripolitania'. Boll. Uff. Servizi Agr. della Tripolitania, 1932 no. 1, p.5.

38. Vivoli, G.: 'Lo stato attuale della agricoltura della Libia. Atti Convegno Agronomi Coloniale di Tripoli, 1937 pp.28-38.

39. Wheatley, O.J.: 'Report on the agriculture of Libya'. F.A.O. Report no. 13, December 1951.

40. Wheatley, O.J.: 'Some aspects of Libyan agriculture to be considered in setting up project planning, financing and executive agencies'. F.A.O. Agricultural Expert, 24.12.51. A/AC32/Mon/R.36.

CHAPTER 3

Soil and Soil Material

1. Angelis, A.M. de.: 'Osservazioni su alcune sabbie della Libia'. R. Accademia d'Italia, 1934.

2. Borzi, A.: 'Condizioni di clima e di suolo della Libia'. Ministero Esteri. Monografie coloniali N. 6. 1912 p. 10. Roma.

3. Brade-Birks, S.G.: 'Good Soil'. English Universities Press, London. 1949.

4. Burvill, G.H.: 'Soil salinity of the agricultural area of Western Australia'. Journal of the Australian Institute of Agricultural Science. Vol. 13, nos. 1-2 June, 1947, pp. 9-19.

5. Caswell, A.E.: 'Land classification and soil survey report'. L.A.T. A.S. (Point 4). Natural Resources Division. Libya.

6. Cillis, E.de.: 'Caratteri agrologici del terreno della Tripolitania'. La Tripolitania settentrionale, Vol. 1. pp. 161-190. G. Bertero, Roma, 1913.

7. Comel, A.: 'Ricerche pedologiche sui terreni della Tripolitania'. Boll. Soc. Geol. It. Roma, 1932.

8. Crema, C.: 'Sulla serie dei terreni nella Tripolitania settentionale'. Boll. Soc. Geol. It., No. 4. Roma, 1913.

9. Della Gatta, L.: 'Analisi di terreni della Tripolitania'. Boll. Uff. Servizi Agrari della Tripolitania, 1932/3 pp. 27-28.

10. Della Gatta, L.: 'Il fosforo nei terreni della Tripolitania'. Boll. Uff. Servizi Agrari della Tripolitania, 1932/3 p. 113.

11. Della Gatta, L.: 'Conoscenze attuali nella costituzione e composizione dei terreni agrari della Libia'. Agricoltura Coloniale, Firenze 1939 pp. 344-351
1940 p. 148.

12. Despois, J.: 'La Colonisation Italienne en Libye'. Soils pp. 10-13. Paris, 1935.

13. Dominicis, A. de.: 'Fattori pedogenetici condizioni pedologiche e caratteri agrologici delle sabbie aride della Tripolitania'. Atti. Soc. Progr. Scienze. Riun XXV, 1936, vol. 5 fasc. 1, pp. 252-260. Roma.

14. F.A.O.: 'Report to the Government on Libya on Agriculture'. Soils, pp. 59-62. F.A.O. Report, No. 21. Rome, 1952.

15. F.A.O.: 'Using salty lands'. Food and Agriculture Organisation of the United Nations. Rome, Italy.

16. Franchi: 'Il terreno, sua genesi e costituzione mineralogica'. Studi e ricerche agrologiche sulla Libia, Vol. 1. La Zona di Tripoli, pp. 97-123. Arti Graf. Bergamo, 1912.

17. Gaddini, L.: 'Sulla analisi chimica dei terreni della Libia occidentale'. Agricoltura Coloniale, Firenze, No. 3, 1940, pp. 94-99.

18. Hausmann, G.: 'Terreni della Libia occidentale alla luce dell' analisi fisiologica'. Agr. Col. Firenze,
no. 1, 1940 pp. 16-28.
no. 2, " pp. 71-78.

19. Lewis, R.H.: 'Irrigated Land - Use and Irrigation Report'. L.A.T.A.S. (Point 4) Libya.

20. Libyan Public Development and Stabilisation Agency: 'Aménagement de l'Uadi Megenin: Rapport Général'. L.P.D.S.A. Tripol Libya. R.C. 2, 129, Sept. 1954. C.O.T.H.A.

21. Mangano, G.: 'L'utilizzazione delle dune mobili nella Tripolitania'. Agricoltura Col. Firenze, 1919. no. 7, pp. 223-236.

22. Principi, P.: 'I principali tipi di suolo della Tripolitania'. Riv. Agr. Trop. e subtrop. Firenze Ist. Agron. A.I. 1947, nos. 7-9, p. 195.

23. Regny, P. Vinassa de.: 'Terreni ed acque - vita e coltura della nuova colonie. Ricerche ed osservazioni originali ed analisi chimiche dei terreni Fatte dall'autore durante la sua permanenza in Libia'. Manuale Hoepli, Milano, 1913, vol. 1, p. 214.

24. Russell, E.J.: 'Soil conditions and plant growth'. Longmans, Green & Co. London, 1958.

25. Thorne, D.W. and Peterson, H.B.: 'Irrigated Soils'. Blakiston Company, Philadelphia, 1949.

26. Thorp, J. and Smith, G.D.: 'A classification of the Great Soil Groups'. Soil Science, Vol. 67, No. 2, p. 118.

27. Vivoli, G.: 'Principali aspetti e problemi della granicoltum nella Tripolitania settentrionale'. Agricoltura Libica, Anno XI. 8-9, 1941. pp. 3-39.

28. Wheatley, C.J.: 'Draft Report on Agriculture of Libya'. Soils, pp. 21-24. F.A.O. /51/0/1840. 1951.

Chapter 4.

CLIMATE AND AGRICULTURE

1. Anon.: 'The Libyan climate and its relationship to settlement and colonisation'. T/234 1942.

2. Asheb, D.: 'On the importance of dew in Palestine'. Journal, Palestine Oriental Society. Vol. 16, no. 4 pp. 316-321. 1936.

3. Blaney, H.F.: 'Climate as an index of irrigation needs'. Water. The Yearbook of Agriculture, 1955, pp. 341-36. U.S. Dept. of Agriculture.

4. Fantoli, A.: 'Le pioggie della Libia'. Ministero dell' Africa Italiana, Roma, 1952. 529 p.

5. Gadoli, G.: 'Le pioggie della Libia e l'attività solare'. Annali di Geofisica, Vol. 6, no. 1, January 1953, pp. 125-135.

6. Golding, E.W.: 'The utilisation of wind power in desert areas'. Desert Research, Proceedings International Symposium, Research Council Israel, Special Publication no. 2, Jerusalem 1952, pp. 592-604.

7. Governo della Tripolitania: 'Bolletino Meteorologico della Tripolitania 1924-34'. Reale Ufficio Meteorologico. P. Maggi, Tripoli.

8. Lunson, E.A.: 'Sandstorms on the North African Coast east of Tunisia'. Meteorological Office, London, 1946.

9. Martonne, E. de: 'L'areisme et l'indice d'aridité'. Comptes Rendus, de l'Academie des Sciences, Paris. Vol. 182 pp. 1395-1398. 1926.

10. Martonne, E. de: 'Regions of interior basin drainage'. Geographical Review, 1927, pp. 397-415.

11. Meteorological Office: 'Weather in the Mediterranean - Vol. General Information'. H.M.S.O. London. 1937.

12. Meteorological Office: 'Aviation meteorology of route Castel Benito - Cairo'. Meteorological Reports, no. 5, London, H.M.S.O. 1950.

13. Ministry of Agriculture and Fisheries: 'The calculation of Irrigation need'. Technical Bulletin, no. 4, 1954. H.M.S.O. London.

14. Mitchell, P.K.: 'The moisture characteristics of the Maltese climate and their implications for Agriculture'. Studies in the Agrarian Geography of Malta. A report to H.M. Colonial Economic Research Committee. Dec. 1958 July 1959.

15. Oppenheimer, H.R.: 'Summer drought and water-balance of plants growing in the Near East'. Journal of Ecology, vol. 39, 1951, pp. 356-361.

16. Thornthwaite, C.W. and Mather, J.R.: 'The water budget and its use in irrigation'. Water: the Yearbook of Agriculture 1955, pp. 346-357. U.S. Dept. of Agriculture.

17. U.N.E.S.C.O.: 'Climatology - Reviews of Research'. Arid Zone Research, U.N.E.S.C.O. 1958. Paris.

18. United Kingdom of Libya: 'The Climate of Tripolitania'. Prepared by the Meteorological Service, Ministry of Communications.

19. United Kingdom of Libya: 'Weather Bulletin'. Monthly Bulletin prepared by the Meteorological Service, Ministry of Communications.

20. Went, F.W.: 'Preliminary report on some results of a study of the role of dew on plant growth in arid regions'. U.N.E.S.C.O./NS/AZ/128.

21. Went, F.W.: 'Fog, mist, dew and other sources of water'. Water, the Yearbook of Agriculture, 1955, pp. 103-109. U.S. Dept. of Agriculture.

CHAPTER 5

Surface Water: a neglected resource.

1. Cortini, G.: 'L'Uadi Megenin - Raccolta di notizie utili per lo studio della regolarizzazione dell' alveo nei pressi di Fonduc Scerif e utilizzazione delle alluvioni invernali'. Rivista Coloniale, p. 565, 1919.

2. Davis, D.: 'End of Tour Report, 1953-56'. Range Management Expert, U.S.O.M.

3. Davis, D.: 'Special Report on Waterspreading'. United States Operations Mission, Libya.

4. Dumont, R.: 'Sheep, cereals, trees and water in North Africa'. Types of Rural Economy - Studies in World Agriculture, pp. 184-208, Methuen & Co. Ltd. London, 1957.

5. Food and Agriculture Organisation.: 'Water Resources and Irrigation - surface waters'. F.A.O. Report to the Government of Libya on Agriculture, 1952. pp. 156-165.

6. Lewis, R.H.: 'Terminal Report, May 18th, 1957.' Chief of Agriculture and Natural Resources Programme of U.S.O.M.

7. Libyan Public Development and Stabilisation Agency: 'Aménagement de l'Uadi Megenin: Projet d'un ouvrage de dérivation (Sidi Giland). C.O.T.H.A. Grenoble, R.C.T. 139 Tripoli, Libya, July 1954.

8. Libyan Public Development and Stabilisation Agency: 'Aménagement de l'Uadi Megenin: Rapport Général'. C.O.T.H.A. September, 1954 - Tripoli.

9. Libyan Public Development and Stabilisation Agency: 'Aménagement de quelques uadis de la plaine de la Gefara: Rapport Général'. C.O.T.H.A. Grenoble. Tripoli, December 1954.

10. Libyan Public Development and Stabilisation Agency: 'Aménagement de l'Uadi Megenin: Projets des zones d'épandage' C.O.T.H.A. Grenoble. R.C.T. 167, 6 parts, Tripoli, Libya. May 1955.

11. Muckel, D.C. and Schiff, L.: 'Replenishing groundwater by spreading'. Water, Yearbook of Agriculture, 1955 pp. 302-310. U.S. Dept. of Agriculture.

12. Pioger, R.: 'Management of Surface Waters'. Water Resources and Development in Libya p. 24 and pp. 54-64. United Nations, A/AC.32/TA.37.

13. Rivista delle Colonie Italiane: 'La diga dell' Uadi el Hira'. Riv. delle Col. It. Anno V no. 5 pp. 410-417. Roma, 1930.

14. Stewart, J.H. 'A Study of Wadi Megenin floods'. Division of Agriculture and Water Resources United States Operations Mission to Libya July, 1956.

15. Stroppa, F.: 'L'idrografia della Tripolitania a la politica idraulica romana'. Rivista Coloniale, no. 14, pp. 489-496. 1919.

16. Vajda, A. de: 'Some aspects of surface water development in arid regions'. F.A.O. Development Paper, no. 21. Rome, 1952.

17. Vieli, G.: 'Fiumi d'acqua portati alla superfici'. Rivista Libia, no. 10, 1939. Tripoli.

CHAPTER 6

Groundwater Reserves

1. Adams, D.P.: 'Water for the North African Campaign'. Military Engineer, Vol. 38 No. 246. April 1946 pp. 159-162.

2. Addison, H. and Shotton, F.W.: 'Water supply in the Middle East Campaigns: III Collecting galleries along the Mediterranean coast of Egypt and Cyrenaica'. Water and Water Engineering, Vol. 49 No. 606. Aug. 1946 p. 427.

3. Ahmed, A.A.: 'Underground water Resources - p. 27 et seq'. Found in 'The Role of electric power in the economic development of Libya'. United nations. A/AC. 32/ TA.2/ Rev. 1. 1952.

4. Amato, A.: 'Considerazioni geo-idrologiche sulla zona occidentale della Pianura tripolitana'. Bolletino Geografico, Uff. Stud. No. 8 pp. 23-29. Tripoli 1935.

5. Archambault, J.: 'Quelques aspects de la géologie et de l'hydrogéologie de la Djeffara Tripolitaine'. Service Géologique, Tunis 1947.

6. Balbi, C.: 'Le acque in Tripolitania'. Corriere di Tripoli, May 13th 1951.

7. Bignami, P.: 'Terra ed acque in Tripolitania ed in Cirenaica'. Nuova Antologia, t. XLVII pp. 522-538. Roma, 1912.

8. Boccard, R. de.: 'Il pozzo artesiano di Zuara'. Boll. Soc. Geografica, No. 7 pp. 811-814. Roma, 1914.

9. Caponera, D.A.: 'Water Laws in Moslem countries'. Libya pp. 152-157. F.A.O. Development Paper, No. 43. Rome. March, 1954.

10. Castigliola, O.: 'Sorgenti artesiane solfuree in Tripolitania'. Rassegna Economica Coloniale, p. 127. Roma, 1932.

11. Cederstrom, D.J.: 'The Salt-water intrusion problem at the Ricotti-Prina Orchard'. Agriculture and Water Resources, Libyan Gov. Joint Services, Aug. 1956. 22 p.

12. Cederstrom, D.J.: 'Terminal Report 31st July 1957'. Chief of Groundwater Geology Programme of U.S.O.M./Libya. ICA/Washington. TOICA-95.

13. Crema, C.: 'Sulle manifestazioni di idrocarburi del pozzo artesiano di Sidi Mesri presso Tripoli'. La Miniera Italiana, Anno X, No. 2. Feb. 1926 pp. 49-50. Roma, 1926.

14. Crema, C.: 'L'estrazione delle acque sotterranee in Tripolitania'. Rassegna della Colonie, Fasc. 7-8. 1928.

15. Crema, C.: 'I problemi idrologici della Libia'. Atti I Congresso di Studi Coloniali, Vol. III pp. 145-164. Firenze, 1931.

16. Desio, A.: 'Verso la soluzione del problema delle acque profonde in Libia'. Rivista Libia, Ann. II No. 7 pp. 3-8. July, 1938.

17. Desio, A.: 'Le acque profonde della Libia e loro importanza per l'agricoltura'. L'Agricoltura Coloniale, Anno XXXIV, No. 8 p. 3. Firenze, 1940.

18. Desio, A.: 'Sulla posizione geologica e sull' origine delle falde aquifere artesiane della, Gefara Tripolina e del Misuratino. Istituto di Geologia di Milano, Ser.6. Publ. N. 13. Milano, 1940.

19. Dorato, M. 'L'acque per la Libia'. Nazione Militare, No. 7-8 pp. 470-474. 1940.

20. Fantoli, A.: 'Le acque sotteranee in Tripolitania'. Rassegna Economica della Colonie, No. 5-6. 1931.

21. Fireman, M. and Hayward: 'Irrigation water and saline and alkali soils'. Water, Yearbook of Agriculture, 1955, pp. 321-327. U.S. Dept. of Agriculture.

22. Gatta, L. della: 'Richerche sulle acque di irrigazione della Tripolitania'. Agricoltura Libica, Anno X, No. 6-7. June - July 1941.

23. Lerson, P.D.: 'End of tour Report - Sept. 19th 1954 to June 5th 1957'. Chief of Agriculture and Water Resources, United States Operations Mission, Libya.

24. Laurenti, S.: 'Le acque artesiane in Libia'. Ann. Afr. It. Vol. III - IV pp. 919-940. Roma, 1938.

25. Laurenti, S.: 'Le acque sotterance in Libia'. Materie prime d'Italia e dell Impero, Vol. 4 pp. 81-98. 1939.

26. Lewis, R.H.: 'Irrigated Land-Use and Irrigation Report'. L.A. T.A.S. (Point 4). Libya.

27. Mengano, G.: 'I pozzi artesiani della regione di Tripoli'. L'Agricoltura Coloniale, Anno V No. 6, pp. 238-241. Firenze 1912.

28. Marroni, U.: 'The utilisation of brackish water in Tripolitania with particular reference to water of Artesian origin - its importance for the development of the country's Agricultural Economy.' TR/394. Tripoli, March, 1954.

29. Maugini, A.: 'La scoperta dell' acqua profonda nella Tripolitania settentrionale'. L'Oltremare, No. 3, 1929 pp.144-148.

30. Maxey, G.B.: 'Water resources investigation in Libya - Progress Report 1952-54'. (Restricted). United States Department of the Interior Geological Survey, Washington.

31. Niccola, E. and Casini, V.: 'Composizione chimica delle acque artesiane profonde nel sottosuolo della Libia occidentale e loro utilizzazione a scopo di colonizzazione agraria'. Annali Africa Italiana, Anno II, No. 3 pp. 257-278. Tripoli, 1940.

32. Osenga, T. 'Il pozzo artesiano di Sidi Mesri'. Boll. d'Informazione, Ministero Colonie Anno VIII, Roma, 1920.

33. Pantanelli, E.: 'Irrigazione con acque salmastre in Libia'. Agricoltura Coloniale, No. 9, p. 340. Firenze, 1941.

34. Perrau Le Roy, Ploger R., M.A.: 'Water Resources and Irrigation', pp. 150-206. Report to the Government of Libya on Agriculture, F.A.O. Report No. 21. Rome, 1952.

35. Ploger, R. 'Water resources and development in Libya'. A/AC. 32/TA.37. United Nations.

36. Regny, P. Vinassa de,: 'Le acque profonde della Libia'. Boll. Soc. Geol. It. Vol. 51, Roma, 1932.

37. Robert H. Ray Geophysics, Inc.: 'Seismographic Survey - Concession 9 Tripolitania. Water distribution party S - 129'. (Map scale 1:50,000). F. Stapleton, October 1956. Mobiloil, Canada Ltd.

38. Rowland, J.W. and Robb, R.L.: 'Annexure 4 - Water Resource', pp. 95-115. Found in 'Survey of Land Resources in Tripolitania' British Administration, Department of Agriculture, 1945.

39. Sacco, F.: 'Dati geoidrologici sulla Tripolitania'. Boll. Soc. Geol. It. Vol. 51, fasc. 2, pp. 297-310. Roma, 1932.

40. Solignac, J.L.M.: 'Some suggestions for an emergency water law arising from a visit 3rd - 12th June 1957'. F.A.O./57/7/4911.

41. Thomas, H.E.: 'Underground sources of our water'. Water, 1955 pp. 62-77. Yearbook of Agriculture, U.S. Dept. of Agriculture.

42. U.N.E.S.C.O.: 'Utilisation of Saline Water'. Arid Zone Research. Paris, 1956.

43. Viali, C.: 'Data on the Italian well drilling programme'. Statistics supplied by C. Viali, Boring Engineer, Well Drilling Section, Nazarat of Agriculture. Provincial Government of Tripolitania.

44. Viezzer, C.: 'Acque nel sottosuolo tripolitano'. Tripolitania Agricolo, Anno IV, No. 1. Tripoli, 1929.

45. Vitali, G.: 'Il problema del sollevamento delle acque irrique nella Tripolitania settentrionale'. L'Agricultura Coloniale, Firenze, 1930. No. 7 pp. 341-374.

46. Zaccagna, D. 'Sulla missione geo-idrologica nella zona occidentale della Tripolitania'. Boll. Informazioni, Ministero Colonie, No. 10-11 pp. 631-686, Roma, 1915.

47. Zodda, A. 'Analisi chimica e fisico chimica dell' acqua termo-solfidrico di Sidi Mesri (Tripoli). F. Cacopardo, Tripoli, 1934. 23 p.

CHAPTER 7

Water Consumption

1. Corporation Financière Libyenne:

Rapport Annuel 1953-54

" " 1954-55

" " 1955-56

" " 1956-57

Tripoli, Libya. Tip. Commerciale F. LLi Barbiera 1954, 1955, 1956, 1957.

2. Lury, D.A.: 'Statistics from application forms for exemption from customs duty on diesel oil used for agricultural purposes'. Statistics Office, Nazara of Agriculture, Sidi Mesri, Tripoli, Jan. 1956.

3. United Kingdom of Libya: 'Amendments of The 1952 Customs Tariff'. Official Gazette of the U.K. of Libya, No. 16. 8.8.57.

CHAPTER 8

Methods of Raising and Distributing Water.

1. Brown, H.: 'Irrigation, its principles and practice as a branch of engineering'. Constable & Co., London, 1920.

2. Cortini, G.: 'L'idraulica agricola in Tripolitania'. Found in"I problemi dell' acqua nell' Africa Nord Francheso". Tripoli, 1938.

3. Central Board of Irrigation: 'Irrigation in India'. Central Board of Irrigation, Popular Series, Leaflet no. 1. Simla, Jan. 1947.

4. Dixey, F.: 'A practical handbook of water supply'. Thomas Murby & Co. Ltd., London, 1931.

5. Leonard Hill Technical Group: 'World Crops - Water Supply and Irrigation'. Vol. 11, no. 6. June 1959.

6. Ministry of Agriculture and Fisheries: 'Irrigation'. Bulletin No. 138. H.M.S.O. London, 1954.

7. Molenaar, A.: 'Water lifting devices for irrigation'. F.A.O. Agricultural Development Paper no. 60. Rome, 1956.

8. Muckel, D.C.: 'Pumping groundwater so as to avoid overdraft'. Water, Yearbook of Agriculture, 1955, pp. 294-301. U.S. Dept. of Agriculture.

9. Phelan, J.T. and Criddle, W.D.: 'Surface irrigation methods'. Water, Yearbook of Agriculture, 1955, pp. 258-266. U.S. Dept. of Agriculture.

10. Poiree, M. and Ollier, Ch.: 'Irrigation'. Editions Eyrolles, Paris, 1957. 291 p.

11. Prinz, D.G. and Negretti, E.: 'Possibilità economiche dell' irriguo in Tripolitania'. Agricoltura Coloniale, 1934, pp. 304-353.

12. Quackenbush, T.H. and Shockley, D.G.: 'Use of sprinklers for irrigation'. Water, Yearbook of Agriculture, 1955, pp. 267-273.

13. Rohwer, C.: 'Wells and pumps for irrigated lands'. Water, Yearbook of Agriculture, 1955, pp. 285-294.

14. Williams, M.B.: 'Essential Considerations for Irrigation Development'. F.A.O./51/6/713. Rome, May, 1951.

15. Wood, I.D.: 'Pumping for Irrigation'. U.S. Dept. of Agriculture S.C.S. - T.P. 89, Government Printing Office, Washington, D.C. 1950.

CHAPTER 9

Irrigation Costs.

1. Ahmed, A.A.: 'The role of electric power in the economic development in Libya'. pp.117-127. A/AC.32/TA.2/Rev.1. Feb. 1952. United Nations.

2. Bologna, L.M.: 'Preliminary enquiry on the cost of water lifting for irrigation purposes, with different systems'. F.A.O. Libya. Tripoli, March 1956.

3. Lewis, R.H.: 'Irrigation Development from October 7th 1954 - May 1st 1957'. Found in his Terminal Report, May 18th 1957, U.S.O.M. Libya.

4. Molenaar, A. 'Cost of lifting water'. Found in 'Water Lifting Devices for Irrigation, F.A.O. Agricultural Development Paper No. 60 pp.54-68. Rome, 1956.

5. Prinzi, D.G. and Negretti, E.: 'Possibilità economiche dell' irrigue in Tripolitania'. Agricoltura Coloniale, 1934 pp.304-353.

6. Rowland, J.W. and Robb, R.L.: 'Water costs - Schedule A & B'. pp.110-115. Survey of Land Resources in Tripolitania, B.M.A. Tripoli, 1945.

CHAPTER 10

The Olive - dry or irrigated?

1. Broc, A.: 'Orcharding in Tripolitania - The olive tree pp. 32-44. Spring, 1954.

2. Cillis, E. de: 'Alcune considerazioni intorno ai metodi di piantagione dell' olivo nei paesi caldo aridi'. Rivista della Tripolitania, no. 1-2 pp. 116-119, 1924.

3. Combrement, R.: 'Quelques Impressions sur l'Oléiculture Lybyenne.' Ingénieur des Services Agricoles de Tunisie.

4. Fenzio, E.C.: 'Passato, presente e futuro dell' olivicoltura in Tripolitania'. Agricoltura Coloniale, Firenze, no. 6 pp. 201-204.

5. Ferrara, A.: 'L'industria olearia in Tripolitania'. L'Olivicoltura anno XI no. 4 - April 1934 - XII.

6. Ferrara, A.: 'L'olivicoltura e l'oleificio in Libia e nelle isole italiane dell' Egeo'. Atti del Convegno Nazionale di Olivicoltura, 1938. Vol. II, 1938 p.468.

7. Leone, G.: 'L'olivicoltura in Tunisia e in Tripolitania'. Agricoltura Coloniale, Firenze, 1924. no. 11-12 p. 370.

8. Luca, V. de: 'L'oléiculture en Tripolitaine'. Bulletin mensuel de la Fédération Internationale d'Oléiculture, no. 8. Aug. 1937.

9. Luca, V. de: 'Quando la Libia Sara tutto un oliveto'. Rivista Libia, 1937 pp. 14-18.

10. Marroni, U.: 'The olive tree in Tripolitania - the problem of variety'. Tripoli, March - 1954.

11. Martin, H. 'Maladies et insectes nuisibles de l'oliviers en Libye'. F.A. O. Bulletin, Libya.

12. Martin, H.: 'Phytosanitary observations in Cyrenaica'. Olive, pp. 7-9. F.A.O. Bulletin, Tripoli, May 1954.

13. Rascovich, E.M.: 'The improvement of Libyan produced olive oil in the Tripolitanian Gebel'. 1st August 1954. F.A.O. Libya.

14. Rascovich, E.M.: 'United Nations Conference on olive oil convened in Geneva 3rd October'. 1st November 1955. F.A.O. Libya.

15. Rascovich, E.M.: 'Export of Olive Oil'. 2nd February 1956. F.A.O. Libya.

16. Rascovich, E.M.: 'Prospect of the olive oil market'. 14th June, 1956. F.A.O. Libya.

17. Rascovich, E.M.: 'Report to the Government of Libya on Agricultural Marketing'. Olives pp. 25-30. Report no. 883, Rome, February 1958.

18. Romanini, A. and Marroni, U.: 'Aspetti tecnici ed economici dell' olivo in Tripolitania in rapporto all' irrigazione'. Boll. Uff. Serv. Agr. della Tripolitania, 1934, no. 2, p. 44. Tripoli.

19. Rompietti, A.: 'Brevi note sulla olivicoltura libica'. Rivista di Agricoltura Tropicale e sub-tropicale. Firenze 1951, no. 1-2 pp. 47-61, no. 4-6 pp. 200-211.

20. Rowland, J.W. and Robb, R.L.: 'The olive'. Survey of Land Resources in Tripolitania pp. 117-126. B.M.A. 1945.

21. Siniscalchi, A.: 'La nuova olivicoltura della Tripolitania'. Rivista Olivicoltura, Roma, 1949, pp. 10-16.

22. Tripoli: 'Direct approach to Tripolitanian agricultural and export problems - Conference of Dr. Catitti on olive oil exports'. Bolletino Mensile della Camera di Commercio, Industria e Agricultura, no. 39 March 1958 pp. 35-36.

23. United Kingdom of Libya: 'A note on olive cultivation and production etc.'. Prepared by the Statistics Office, Nazarat of Agriculture, Sidi Mesri. Dec. 1955.

24. Vivenza, A.: 'L'olivicoltura in Tripolitania'. L'Olivicoltura, Roma, 1929 no. 13-14.

25. Vivoli, G.: 'L'olivicoltura in Tripolitania'. Rassegna Economica Coloniale, 1931 p. 606.

CHAPTER 11

The steady expansion of citrus.

1. Carraro, G. and Martin, H.: 'Phenomena of deficiency in Tripolitanian Citrus trees'. F.A.O. Mission in Libya. Jan. 1956.

2. Chapman, H.D.: 'The Cultivation of Citrus'.
1. The Management of Citrus Lands (World Crops, Vol. 11, No. 5 May 1959 pp.173-176)
2. Irrigation and drainage. (World Crops Vol. 11, no. 6 June 1959 pp.217-219).

3. Corso, M.M.: 'Una ricchezza della Libia gli agrumi'. Rivista Libia, 1938 pp.16-17.

4. Fenzi, E.O.: 'Agrumi, mandorle e altre frutte nella California e nella Tripolitania'. Firenze, 1916. pp.105-113.

5. Ferrari, E.: 'L'agrumicoltura in Italia e nella Libia'. Manuele Hoepli, Milano, 1914.

6. Hume, H.: 'Citrus Fruits'. Macmillan Company, New York, 1957.

7. Leone, G. 'L'arancio sanguino di Tripoli'. Agricoltura Coloniale, Firenze, 1917. p.341.

8. Martin, H. and Carraro, G.: 'Hydrocyanic fumigations in Tripolitania'. F.A.O. Mission in Libya.

9. Martin, H.: 'Le cocciniglie degli agrumi in Libia'. P. Maggi, Tripoli, 1953, United Nations.

10. Mendel, K.: 'Orange leaf transpiration under orchard conditions'. Agricultural Research Station, Rehovot, Jewish Agency for Palestine. Bulletin 37, Sept. 1945.

11. Ornato, G.Z.: 'Una ricchezza della Libia gli agrumi'. Autarchia - Rivista Mensile, 1942 no. 7-8 pp.24-25.

12. Parrini, U.: 'La coltivazione degli agrumi in Tripolitania'. Agricoltura Libica, Tripoli 1939, pp.398-405.

13. Rascovich, E.M.: 'Survey of Commercial Commodities - Citrus Fruit pp. 9-14'. Report to the Government of Libya on Agricultural Marketing, F.A.O. Report No. 883. Rome, 1958.

14. Trigona, G.: 'Impianto dell 'agrumento nella Libia occidentale'. Agricolture Libica, 1940. pp.114-118, Tripoli.

15. Trigona, G.: 'Questioni agrumicole tripoline'. Agricoltura Libica, no. 4-5, 1941 pp.132-162.

16. Trigona, G.: 'L'agrumicoltura in Tripolitania'. Agricoltura Coloniale, 1942, pp.124-134 and 162-166, Firenze.

17. United Kingdom of Libya: 'Technical Rules for the export of Citrus from Tripolitania'. Administration of Tripolitania.

18. Vivoli, G.: 'Gli aranci di Tripoli'. Riviste Libia, 1939 no. 2 pp.19-22.

CHAPTER 12

Other Tree Crops

1. Arangino, L.: 'L'impianto del vigneto in Tripolitania'. Boll. Uff. Serv. Agrar. della Tripolitania 1934. no. 1 p.8.

2. Arangino, L.: 'La raccotta delle mandorle e la loro conservazione Bo.. R. Uff. Centrale per i Servizi Agr. della Libia, pp.199-204. Tripoli, 1936.

3. Arangino, L.: 'Le uve da tavola in Tripolitania'. Agr. Libica, Tripoli, 1939 no. 12, pp.562-670.

4. Broc, A.: 'Orcharding in Tripolitania'. Ing. E.C.A.T. Farm, Sidi Bènzid (Tunisia). Mission, Spring 1954.

5. Cairano, V.di.: 'Vite e viticoltura in Tripolitania'. Boll. Uff. Servizi Agrari Tripolitania, 1935, p.8.

6. Cairano, V.di.: 'L'impianto del vigneto in provincia di Tripoli'. Agricolture Libica, no. 2, Tripoli 1940, pp.66-68.

7. Carace, E. 'La viticoltura in Tripolitania'. L'Oltremare, 1933 p.441.

8. Cillis E. de: 'Saggio di fecinigrafia Libica. Studi sopra alcune razze di palme da datteri coltivate in Tripolitania'. Boll. Inf. Min. Col. Roma, 1923 no. 6, p. 733.

9. Dowson, V.H.W.: 'Report to the Government of Libya on date processing and packing'. F.A.O. Report no. 491. F.A.O./56/8/5844. Rome, August 1956.

10. Fenzi, E.O.: 'Agrumi mandorle e altre frutta nella California e nella Tripolitania'. Agricoltura Coloniale, 1916 pp. 105-113.

11. Nannizzi, A.: 'La coltivazione del carrubo nella Libia'. Vedetta Agricola, Siena, 1913 no. 5.

12. Nannizzi, A.: 'La coltivazione del fico nella Libia'. Vedetta Agricola, Siena, 1913 no. 5.

13. Nazirate of Finance and Economics (Statistics): 'Agricultural Statistics - Almonds in Tripolitania'. Monthly Bulletin of the Chamber of Commerce, Industry and Agriculture, March 1956 pp.31-32.

14. Ornato, G.Z.: 'La viticoltura in Libia'. Rivista Mensile, Autarchia No. 3-4 1942, pp.16-17.

15. Ragab, V.: 'la vitâcoltura in Tripolitania'. Giornale Vinicolo Italiano, 1927, no. 32 pp.380-381.

16. Ragab, V.: 'vini e uve in Tripolitania'. Giornale Vinicolo Italiano, 1929 no. 35,34,33 pp.392,402,415.

17. Vitale, C.di: 'la coltura del Mandorlo in Tripolitania'. Boll. del R. Uff. Centrale per i Servizi Agrari della Libia. Anno V, December 1936, XV no. 12. Also in Agricoltura Coloniale, Firenze 1937 pp.41-58

18. Whilloud, H.: 'Report on viticulture in Libya'. F.A.O./61/10/ 2505. 28.8.51. Rome.

CHAPTER 13

Groundnuts: the major water consuming crop.

1. Administration of Tripolitania: 'Compulsory standards for the export of edible peanuts'. Export Standard, no. 2. October, 1954.

2. Cairan, V. di: 'Diffondiamo la coltura dell' arachide'. Agricoltura Libica - Tripoli, 1937. no. 3-4 p. 56.

3. Cillis, E. de: 'Istruzioni pratiche per la cottivazione della nocciula americana o arachide nei giardin'. Tipolitografia del Governo, Tripoli, 1917.

4. Cillis, E. de.: 'Sulla coltivazione dell' arachide in Tripolitania'. Bolletino di Informazioni, Ministero della Colonie, Roma, 1917.

5. Dumont, R.: 'Soil exhaustion due to groundnut cultivation in Senegal'. Types of Rural Economy, pp. 114-118, Methuen, London, 1957.

6. Martin, H.: 'Malattie ed insetti nocivi all'arachide in Libia'. Bulletin F.A.O. Mission in Libya. Tripoli, December 1956.

7. Oram, P.A.: 'High quality groundnuts for direct consumption' I and II. World Crops, April and May 1957.

8. Oram, P.A.: 'Importanza della piantagione fitta nella coltivazione delle arachidi'. F.A.O. Mission, Libya.

9. Oram, P.A.: 'Recent Developments in Groundnut production with special reference to Africa'. Parts I and II. "Field Crop Abstracts" vol. 11 no. 1. pp. 1-6. vol. 11 no. 2. pp. 75-84. Prepared by the Commonwealth Bureau of pastures and fieldcrops. Hurley, Berkshire.

10. Oram, P.A.: 'Risultati delle recenti ricerche sulla coltivazione delle arachidi in Libia'. F.A.O. Mission, Libya.

11. Rascovich, E.M.: 'Edible Peanuts'. Found in F.A.O. Report No. 883. Report to G.O.L. on Agricultural Marketing. Rome, 1958, pp. 15-17 and p. 67.

12. United Kingdom of Libya: 'Groundnuts Exported'. Monthly Bulletin of Agricultural statistics, Nazarat of Agriculture, Statistics Division, Administration of Tripolitania.

13. Vivoli, G.: 'L'arachide nella terre irrigue della Tripolitania'. Agricoltura Libica 1937 no. 1-2, pp. 2-11.

14. Whitt, D.M. and van Bavel, C.H.M.: 'Irrigation of tobacco, peanuts and soybeans'. Water, Yearbook of Agriculture, 1955 pp. 378-9. United States Department of Agriculture.

15. Willimott, S.G.: 'Memorandum on Groundnut Investigation in Tripolitania, Libya'. October 1958, Durham.

16. Wood, A.: 'The groundnut affair'. Bodley Head, London, 1950. 264 p.

17. World Crops: 'International Report on Groundnuts - 1958'. World Crops, August 1957
April 1958
March 1959

CHAPTER 14

Cereals and Supplementary Irrigation.

1. Graiff, G.L.: 'Contributo alla cerealcoltura libica'. Agricoltura Libica, January 1941, Anno X no. 1 pp.1-31.

2. Hurwitz, S.: 'The cereal in the crop rotation'. Ktavim, Israel, vol. 4, no. 3 pp.5-24, 1955.

3. Lury, D.A.: 'Cereal harvest 1956'. Statistics Office, Nazara of Agriculture, Administration of Tripolitania, July 1956. Ref. LAG/1.

4. Oram, P.A.: 'Suggerimenti al Coltivatori di cereali'. F.A.O. Mission, Libya.

5. Robb, R.L. and Rowland, J.W.: 'Annexure 6 - Cereal, fruit and other Crops' cereals pp.129-31. Survey of Land Resources in Tripolitania, B.M.A. Tripoli, 1945.

6. Vivoli, G.: 'La coltivazione irrigue del grano in Tripolitania' L'Agricolture Coloniale, no. 10, Oct. 1924. Firenze.

7. Vivoli, G.: 'Significato e importanza dell' epoca di semina nella coltivazione del grano in Tripolitania'. Boll. del R. Ufficio per i servizi agrari, Maggio, 1934, Tripoli.

8. Vivoli, G.: 'I cereali nell' Africa settentrionale italiana'. Bolletino del Centro Sperimentale Agrario e Zootecnico della Libia, Anno VIII - Agosto 1939 no. 8.

9. Vivoli, G.: 'Principali aspetti e problemi della granocoltura nella Tripolitania settentrionale'. Agricoltura Libica, 1941 pp.277-313.

CHAPTER 15

Other Field Crops.

1. ANON: 'La coltivazione del tabacco in Tripolitania'. Boll. Inf. Min. Col. Roma, 1915. p.168.

2. Arangino, L.: 'La produzione di seme di medica'. Boll. R. Uff. Centrale per i Servizi Agrari della Libia, p.232. Tripoli, 1936.

3. Bavly, M. and Bar-Drona, M.: 'Israel's wonder crop - the Mangelwurzel or Mangold'. World Crops, vol. 11, no. 4. April, 1959.

4. Cairano, V. di.: 'La coltivazione dell' erba, medica nella Libia occidentale'. Agricoltura Libica, no. 9 pp.389-404. Tripoli, 1938.

5. Contino, A.: 'Gerian e i suoi tabacchi'. Riv. delle Col. It. 1934, no. 4 pp.318-323.

6. Cortini, G.: 'Il contributo delle oasi nelle produzioni delle primizie.' La Tripolitania Agricola, 1929, no. 7 p.129. Tripoli.

7. Dipartimento di Agricoltura della Tripolitania: 'Consigli ai coltivatori della patata in Libia'. Bollettino no. 1. Tripoli, 1956.

8. Haddock, J.L.: 'Irrigation of sugar-beets'. Water, Yearbook of Agriculture 1955 pp.400-405. U.S. Dept. of Agriculture.

9. Labo', E.: 'Lo sfruttamento della Henna in Tripolitania'. Rivista Essenze e Profumi-Milano, 1932 no. 4, pp.118-119.

10. La Tripolitania Agricola: 'Pratiche per la coltivazione del Salento'. La Tripolitania Agricola, p.62, Marzo 1929.

11. Leone, G.: 'Sulla coltivazione dell' erba medica nell' oasi della Tripolitania'. Agricoltura Coloniale, no. 10. pp.330-336. Firenze, 1924.

12. Leone, G.: 'Sulla tabacchicoltura in Tripolitania'. Boll. Tecn. dell' Istituto Sper. per la Coltivaz. dei Tabacchi "Leonardo Angeloni" Scafati-Salerno, 1926. no. 3 pp.131-142.

13. Martin, H.: 'I nemici e le malattie della patata'. F.A.O. Mission Libya, Tripoli, January 1956.

14. Mazzocchi-Alemanni, N.: 'Esperimenti sulla coltivazione dei tabacchi leggeri gialli in Tripolitania'. Boll. Inform. Min. delle Col. Roma, 1916. nos. 7-8-9, p.302.

15. Mazzocchi - Alemanni, N.: 'La coltivazione dell' erba medica nell' oasi tripolina'. R. Ufficio Agrario della Tripolitania, Tip. del Governo, Istruzion, no. 4, Tripoli, 1917.

16. Mazzocchi-Alemanni, N.: 'Istruzioni pratiche per la coltura dei tabacchi da sigarette in Tripolitania, 2nd edition. R. Uff. Agrario della Tripolitania, Tripoli 1918.

17. Mazzocchi - Alemanni, N.: 'Della produzione di erba medica nell agro tripolino in rapporto, al locale fabbisogno di foraggio'. Agricoltura Coloniale, no. 9, pp.330-342. Firenze, 1919.

18. Morgantini, A.M.: 'Le Henna'. B oll. Reale Uff. Centrale Servizi Agrari della Tripolitania, 1934 p.133.

19. Naldoni: 'Primizie coloniali libiche'. L'Italia Coloniale, 1934, p.30.

20. Nazarat of Agriculture: 'Tobacco statistics'. Figures supplied by Statistics Section, Nazarat of Agriculture, Administration of Tripolitania.

21. Oram, P.A.: 'Pasture and fodder crops in rotations in Mediterranean agriculture'. F.A.O. Agricultural Development Paper, no. 57, Rome, 1956, 49 p.

22. Piccioli, A.: 'Manifattura Tabacchi di Tripoli e coltivazione dei tabacchi'. Nuova Italia d'Oltremare, vol. II, 1933 pp.1349-1422.

23. Prinzi, D.G.: 'Aspetti economici della produzione dei tabacchi in Tripolitania'. Notiz. Econ. 1933 no. 9-10 p.5. Boll. R. Uff. Serv. Agric. 1933 p. 125 Tripoli.

24. Prinzi, D.G.: 'La coltivazione e lavorazione del tobacco in Tripolitania'. Rass. Econ. Col. p.986. Roma, 1933.

25. Prinzi, D.G.: 'Possibilità economiche dell' irriguo in Tripolitania'. Agricoltura Coloniale 1934, pp.304-358.

26. Rands, G.A.F.: 'Notes on various tobacco plants - Perustiza, Fezzani, Burley, Salento'. Administration of Tripolitania, State Tobacco Monopoly, Tripoli.

27. Rands, G.A.F.: 'Report on Tobacco variety trials at Sidi Mesri, Tripoli, 1957'. Administration of Tripolitania, State Tobacco Monopoly, Tripoli. 1.12.57.

28. Rands, G.A.F.: 'Results of 1958 tobacco experiments at Sidi Mesri'. Personal Communication. GAFR/IM. 13th Oct. 1958. State Tobacco Monopoly.

29. Rassegna Economica delle Colonie: 'Coltivazione di patate in Tripolitania'. Rass. Ec. Col., p. 437. Roma, 1928.

30. Rassegna Economica delle Colonie: 'La coltivazione del tabacco in Tripolitania'. Rass. Econ. Col. 1929 p.278. Roma, 1929.

31. Rassegna Economica delle Colonie: 'Norme per la coltura irrigua dei tabacchi in Tripolitania'. Rass. Econ. Col. p.1183. Roma 1929.

32. Stanberry, C.O.: 'Irrigation practices for the production of Alfalfa'. Water. Yearbook of Agriculture, 1955 pp.435-443.

33. State Tobacco Monopoly: 'Tobacco cultivation in Tripolitania - Buying figures 1925 to 1957'. Personal Communication, G.A.F. Rands, (Cultivation Manager) 15th Nov. 1958.

34. Trigona, G.: 'Le possibilità del pomodoro da primizia e di altre colture erbacee da grande reddito in Tripolitania'. Bell. del Centro Sper. Agrario e Zootecnico della Libia, Anno IX no. 9-10. 1940.

35. Trigona, G.: 'Primizie orticole e agricoltura intensiva in Tripolitania'. Agricoltura Coloniale, no. 36 pp. 205-208, 246-251, 274-279. 1942.

36. Vivoli, G.: 'Sul preteso poterre sfruttante dell' erba medica nei terreni irrigui della Tripolitania'. Boll. Uff. Servizi Agrari della Tripolitania, pp.22-26, 1932-33.

37. Vivoli, G.: 'Sul valore colturale dell' erba medica in Tripolitania'. Agricoltura Libica no. 9, pp. 347-355, Tripoli, 1937.

38. Whitt, D.M. and Van Bavel, C.H.M.: 'Irrigation of tobacco, peanuts and soybeans'. Water. Yearbook of Agriculture, 1955 pp.378-9. U.S. Dept. of Agriculture.

CHAPTER 16

Summary and Conclusions

1. Adams, F.: 'Community Organisation for irrigation in the United States'. F.A.O. Development Paper no. 19, Rome, 1952.

2. Addison, H.: 'Land, Water and Food'. London, 1955, 248 p.

3. Bologna, L.M.: 'Report to the Government of Libya on Settlement planning'. F.A.O. Report no. 732. Rome, 1957.

4. Cary, D.D.: 'Recent agricultural developments in Saudi Arabia'. American Geographical Review, vol. 41, pp.366-383 1951.

5. Daryll-Forde, C.: ' Irrigation in South Africa'. Geographical Journal, vol. 65, 1925 pp.342-349.

6. Dumont, R.: 'Types of Rural Economy - Studies in World Agriculture'. Methuen & Co. Ltd. London, 1957.

7. F.A.O.: 'Agriculture in the Near East - Development and Outlook' F.A.O. Rome, November 1953.

8. Gottman, J.: 'The pioneer fringe in Palestine - settlement possibilitbes south and east of the Holy Land'. American Geographical Review. Vol. 27, 1937. pp.550-565.

9. Granot, A.: 'The land system in Palestine - history and structure'. Eyre and Spottiswoode, London 1952, 359 p.

10. Gregor, H.F. 'The Southern California water problem in the Oxnard area'. American Geographical Review, vol. 42, 1952 pp. 16-36.

11. Hardy, E.: 'Cultivation of arid zones: research and progress in the Near East'. World Crops, vol. 5, no. 2, pp.32-35. 1953.

12. Ionides, M.G.: 'The Water Resources of Transjordan and their Development'. Government of Transjordan.

13. Jacks, G.V. and Whyte, R.O.: 'The rape of the earth - a world survey of soil erosion'. Faber and Faber Ltd., London, May 1949. 312 p.

14. Jansen, A.C.: 'Key problems of agricultural development in the Near East'. Monthly Bulletin of Agricultural

Economics and statistics, vol. 3, no. 12, Dec. 1954 pp.1-8. U.N./ F.A.O.

15. Keen, B.A. 'Agricultural Development of the Middle East'. H.M.S.O. 1946.

16. Lowdermilk, N.C.: 'Across North Africa with a soil conservationist'. American Forests (Washington D.C.) July 1939, v. 45, pp.342-345.

17. Loudermilk, W.C.: 'The conquest of land through seven thousand years'. Agricultural Information Bulletin No. 99. U.S. Dept. of Agriculture, Soil Conservation Service, Washington, Aug. 1953.

18. Meigs, P.: 'Water problems in the United States'. American Geographical Review, vol. 42, 1952 pp.346-366.

19. Bowers, W.L.: 'Soil and land-use capabilities in Iraq'. American Geographical Review, vol. 44, 1954 pp.373-380.

20. Skrine, C.: 'Economic Development in Israel'. Geographical Journal, vol. 117, 1951 pp.307-327.

21. Stebbing, E.P.: 'The threat of the Sahara'. Journal of the Royal African Society, extra supplement, 25th May 1937 pp.3-35.

22. Twitchell, K.S.: 'Water resources of Saudi Arabia'. American Geographical Review, vol. 34, 1934, pp.365-386.

23. Willatts, E.C.: 'Some geographical factors in the Palestine Problem'. Geographical Journal, 1946, vol. 108, pp.146-179.

Appendix I

Explanation of Administrative Boundaries

The United Kingdom of Libya is a federation of the three states of Tripolitania, Cyrenaica and Fezzan. Each state is known as a 'Wilayet' in Arabic and has a Wali (governor) who is the King's representative.

The state of Tripolitania is sub-divided into Muqaṭa'ah (provinces) whose general administration is controlled by the Nazara of the Interior. Each Muqaṭa'ah is divided into Mutaṣarrifiyah (districts) which in their turn are sub-divided into Mudiriyah. A Government officer, known as a Mudir, administers each Mudiriyah and he is usually responsible for a number of cabila (tribes) rather than a given area. It is difficult therefore to work out precise bounderies and those shown in the frontispiece are arbitrary, particularly so in the Dune Jefara.

Tripolitania is composed of Tripoli and Western Province, Central Province and Eastern Province, and they in turn are broken down into the following Mutaṣarrifiyah:-

Muqaṭa'ah	Mutaṣarrifiyah
Tripoli and Western Province	Tripoli City Suq el Jiuma'a Zewia Zuara
Central Province	Gharian/Mizda Yefren Nalut
Eastern Province	Misurata Zliten Khoms

Eastern Province (cont'd)	Tarhuna
	Sirte
	Beni Ulid

The whole of Tripoli and Western Province lies within the Jefara Plain together with only parts of the other two provinces. The following Mudiriyah are included in Tripoli and Western Province and their location on the administrative map is indicated by the numbers they are given.

Mutaserrifiyah	Mudiriyah
Suq el Jiuma'a	1) Suq el Jiuma'a
	2) Tajiura
	3) Garabulli
	4) Akkara
	5) El Alawna
	6) Aulad Cucin
	7) El Kanafda
	8) Ez-Regiat
	9) El Khetna
Zavia	10) Zavia
	11) Bir el Ghnem
	12) Sorman
	13) Zanzur
	14) Azzahra
	15) Maamoura
	16) Sabrata
	17) Ajelat
Zuara	18) Zuara
	19) Regdalin
	20) El Assa

There are three Mudiriyah on the Jefara Plain which belong to

the other two provinces:

Muqaṭa'ah	Mutaṣarrifiyah	Mudiriyah
Central Province	Nalut	21) Tiji
		22) Jaush
Eastern Province	Khoms	23) Gasr el Khiar

All of the sedentary cultivated land lies within Tripoli and Western Province except that in the extreme east round the Mudiriyah of Gasr el Khiar, which is in Eastern Province. Since the latter area is one of predominantly dry cultivation, statistics for irrigated crops, given for Tripoli and Western Province, can be taken as those for the Jefara as a whole. Statistics for dry land crops, such as cereals and olives, present difficulties. Barley for example is grown on the Inner Jefara by a cabila from the Gharian Mutaṣarrifiyah, and figures for the area and production of this crop are included in those for Central Province. Likewise, figures for the number of olive trees and their yields in the Gasr el Khiar Mudiriyah are included in those for Eastern Province. Whenever statistics and percentages for dry land crops, based on Tripoli and Western Province, are quoted for the whole Jefara, it is essential to remember that they are incomplete.

Recently the number of Muqaṭa'ah has been increased from three to four; Khoms, Tarhuna and Beni Ulid Mutaṣarrifiyah being placed together in the newly created Northern Province, with the Mutaṣarrifiyah of Misurata, Zliten and Sirte remaining in the Eastern Province. What is shown as Eastern Province in the frontispiece is in fact now part of Northern Province.

Appendix II Conversion Figures for Weights, Currency, Areas, Distances, Lifts, Volumes and Discharges

A. Weight

General

1 kilogram = 2.20462 lbs.
100 kilograms = 1 quintal = 1.968 cwt.
1,000 kilograms = 10 quintals = 1 metric ton (short ton) = 2,205 lbs.
1,016 kilograms = 1 English ton (long ton) = 2,240 lbs. 1 cubic metre = 0.973 tons.

Local

Wheat and broad beans = 6 marta = 100 kgs.
Barley and dates = 8 marta = 100 kgs.
Dried paper = 1 marta = 1.25 kgs.
Olive Oil 108 litres = 100 kgs.

B. Currency

Present Day

10 milliemes = 1 piastre = 2.4 pence.
5 piastres = £L.05 = 1/-
50 piastres = £L.5 = 10/-
100 piastres = £L1 = £1 Sterling.

Period of British Military Administration

1 military admin. lira = 2.12 milliemes.
480 M.A.L. = £1 Sterling.
171.2756 M.A.L. = $ 1

C. Area

General

1 Sq. metre = 10.7639 sq. feet = 1.196 sq. yards.
10,000 sq. metres = 1 hectare (ha.) = 2.471 acres.
100 hectares = 1 sq. kilometre = 247.1 acres.
258.2 ha. = 1 sq. mile = 640 acres.

Local

1 jedula = 4 sq. metres
312.5 jedavi = 1 jiabia
8 jiabia = 1 ha. = 2,500 jedavi.

D. Distances

10 millimetres = 1 centimetre = 0.394"
100 centimetres = 1 metre = 39.37"
1,000 metres = 1 kilometre = 1,0931.61 yards.
1 mile = 1.609 kilometres.

E. Equivalent units of lift

Conversion to	metres	Centimetres	Feet	Inches
Metres	1.0	100	3.281	39.372
Centimetres	0.01	1.0	0.0328	0.3937
Feet	0.3048	30.48	1.0	12.0
Inches	0.00254	2.54	0.0833	1.0

F. Equivalent units of volume

Conversion to	Cubic feet	U.S. gals.	Imp. gals.	Acre/ins.	Litres	Cubic metres	Ha. centi-metres
Cubic feet	1.0	7.48	6.25	0.000275	28.317	0.0283	0.000283
U.S. gals.	0.1337	1.0	0.833	0.000037	3.785	0.0038	0.000038
Imp. gals.	0.1605	1.201	1.0	0.000045	4.546	0.0045	0.000045
Acre/ins.	3,630.0	27,152.0	22,611.0	1.0	102,790.0	102.79	1.0279
Litres	0.0353	0.2642	0.22	0.0000097	1.0	0.001	0.00001
Ha-cms.	3,531.0	26,420.0	22,000.0	0.973	100,000.0	100.0	1.0
Cubic metres	35.315	264.2	220.0	0.00973	1,000.0	1.0	0.01

G. Equivalent units of discharge

Conversion to	Cubic feet per sec.	U.S. gals. per min.	Acre/ins. per hr.	Litre per sec.	m3. per hour	Ha. cms. per hr.	Imp gals./min.
Cub. ft./sec.	1.0	448.8	0.992	28.32	101.94	1.0194	375.0
U.S.gals./min.	0.00223	1.0	0.00221	0.06308	0.2271	0.002271	0.833
Imp.gals./min.	0.00267	1.2	0.00265	0.0755	0.272	0.00272	1.0
Acre/ins./hr.	1.01	452.4	1.0	28.55	102.79	1.0279	376.0
Litres/sec.	0.0353	15.853	0.035	1.0	3.6	0.036	13.205
m3/hour	0.0098	4.403	0.0097	0.278	1.0	0.01	3.668
ha.-cms./hr.	0.981	440.33	0.973	27.77	100.0	1.0	366.79

Appendix III Selected Farm Studies

The information given in the following studies was collected either by visiting farms or sending out questionnaires. The classification used is very generalised and the farms included in this appendix should not be considered as necessarily typical of the class into which they have been placed. The main value of the farm studies is the fact that they give some idea of cropping trends and farm policy during the last three years.

Part A. Specialised Commercial Farms

Two citrus orchards, and one commercial farm growing early vegetables, groundnuts and olives.

Part B. Italian Concessions

These farms vary in size from 18 ha. to 1,029 ha.; they are all Italian owned. Studies are included for the following localities: Zavia (2), El Maia, Gargaresh, Gurji, Collina Verde (Hadba el Khadra), Tajiura and Gasr Ben Gashir.

Part C. Libyan Hawāza

All the larger farms in Tripolitania are called Hawāza, whether Libyan or Italian. The farms included in Part C are all Libyan owned and are over 10 ha. in size; many of them were originally Italian Concessions. Farm studies are confined to Ajelat, Sabrata, Zawia, Azizia, Gasr Ben Gashir (7).

Part D. Demographic Italian

Section I. INPS

a. Jiuddaim (Oliveti) (4)
b. Azzara (Bianchi) (5)
c. Ghanima (Corradini) (3)

Section II ENTE

a. Jiuddaim (Oliveti) (3)
b. Fonduk Et-Togar (3)

Part E. Saniya Farms

Section I. Private Farms. These are small Libyan farms, usually less than 5 ha. in size, but in this classification farms up to 10 ha. have been included. They are best developed in the coastal oases zone, where there is garden cultivation based on water extracted from the first aquifer. Saniya are not numerous away from the coast, but more are appearing as Libyans begin to develop small parts of the Dune Jefara. The following localities are included: Fashlum-Tripoli, Suq El Jiumaa (2), Suani Ben Adem, and Garabulli.

Section II. Demographic. The Tripolitanian Nazara of Agriculture

has now developed the Mesaoura settlement scheme, originally started by the Italians. All the farms occupied are Libyan and are 4 ha. in size. Two farms are studied.

Notes on Compilation

Under each heading the farm studies are arranged according to locality starting in the west and moving eastwards; if there is more than one farm in a certain locality then they are considered in order of decreasing size; in the case of the demographic villages, farms are arranged according to the number of the holding, starting with the lowest. For each farm the information given is generally set out as follows:-

1. General Information
2. Winter Crops
3. Summer Crops with occasional notes on the irrigation of groundnuts
4. Tree Crops, with occasional notes on the irrigation of citrus
5. Water supply and irrigation
6. Future farm policy
7. Notes made by the writer

FARM STUDIES. PART A. SPECIALISED COMMERCIAL FARMS

FARM STUDY No. 1.

Mitchell Cotts. Azienda Agricola S.A.I. Specialised Commercial, English. 846 ha. Km. 25 Tripoli-Zuara Rd.

1. General Information. This is a large farm of 846 ha. (approx. 2115 acres); of these, 525 ha. are irrigable and it is hoped to make the whole farm irrigable in the near future. Crops are generally grown for export. In the summer of 1957 120 ha. of groundnuts were grown and at the time of the visit there were 80 ha. of potatoes in the ground. The groundnut crop covers almost 25% of the irrigable land. The total areas for these two crops is likely to remain the same for the next few years. The potatoes go to the United Kingdom and the groundnuts go to Holland. Olives and asparagus are important but citrus is considered of minor importance (lemons preferred). No tobacco is grown. The normal rotation practised is potatoes, then peanuts and two years fallow.

2. Winter Crops.

Potatoes. All the potatoes grown are the Dutch Bintje from the

N.W. Polder. The farm specialises in early potatoes and there is no main crop grown, and on 1st December, 1957 the last sowing of potatoes was in progress; previous to this there had been several sowings from September onwards. Some of the earliest sown potatoes were ready to lift in early December and a sample potato removed from the ground had good clean scraping qualities (admirably suited to the London market). The Company lost £L20,000 on potatoes in the 1956/7 season, because the crop was a little late on the market and had to compete with tubers from Canary Islands, Algeria and Sicily; prices were low. Early Spring is a critical time in Tripolitania and an unusually cold spell results in Libyan potatoes arriving a week or so late in Europe and missing the best prices. Since Mitchell Cotts is such a large trading company and had such a large farm, other crops grown were able to make good the money lost on potatoes. Irrigation ..... Aiuto Gino, the manager of the Azienda, considers it unwise to irrigate potatoes at sowing particularly if there is some moisture in the ground. If there is no appreciable rainfall the first irrigation is about a week after sowing. The sprinkler pipes are left in place 1/2 - 3/4 of an hour and 300 m3. is given per hectare. Cultivation and Manuring ..... 25 qts. of seed potatoes are planted mechanically per hectare (both home produced and imported seed). Yields are around 100 qts. per ha. 11 qts. of the Compound Fertilizer N.P.K. 11/32/16 (Nitrate, Potash and Phosphate) plus 1 qt. of Sulphate of ammonia are applied per hectare.

Asparagus. 8 ha. were grown in 1957/8. There is a little irrigation in the summer but more in the winter particularly after February.

3. Summer Crops.

Groundnuts. Two varieties are grown, Valencia and Virginia Bunch. Good quality large nuts are produced and this farm is the most advanced as regards the harvesting, sorting and drying of the nuts. Large concrete drying floors have been constructed. When this crop is irrigated the sprinklers are left in place for one hour and 400 m3 are given to one hectare of crop land, at each irrigation.

4. Tree Crops.

Olives. At the moment there are 10,000 trees on the farm but in the next year or so this figure will be increased to 20,000. Up to the time of the visit the trees have only received incidental irrigation when interplanted crops (such as peanuts) have been watered. The official policy is now that all trees should be irrigated since this will increase yields considerably. The use of water on the farm is therefore bound to increase. Although there has been some grafting the Italian Frantoio is

preferred to the Shemlali since it gives better quality fruits. The average yield of the Frantoio is 100-120 kgs. per tree. Harvesting of the fruit takes place over a period of time.

Eucalypts. 40,000 trees have been planted recently.

5. Water Supply and Irrigation. At the moment there are ten wells on the farm which used to draw on average 15-25 m3/hr. from the first aquifer, which lies 5-10 metres from the ground surface. However, too much water was extracted and the water level in certain of Ricotti's wells, which lie between the Mitchell Cotts Farm and the sea, started to fall and at the same time the quality of the water deteriorated as its salt content increased. After an investigation it was decided to cease the pumping of water from the first aquifer and the wells were sealed. Water is now taken from what is called the third aquifer which lies about 50 metres down. This is appears is much more productive. Generally wells are spaced at 600 metre intervals and each 600 metre section has 2,400 metres of irrigation lines which need four men to handle them. Some of the wells can give 100 m3/hr. but when they are used 60 m3/hr. is the usual maximum amount taken from any one well. In the dry season, no more than seven wells will be pumped at one time during crop irrigation. Three more wells are to be sunk in order to make the whole farm irrigable. Irrigation is all by the sprinkler method (Austrian Bauer equipment is used). The spray is of the low pressure type and distributes one m3. of water per hour. The underground pipes which carry water to the hydrants are made of asbestos and are 250 mm. in diameter (10-12").

Power .... The farm has its own power plant which was installed 20 months ago at a cost of £L23,000. There are two diesel engines of 275 h.p. each. The electricity produced is distributed by a high tension grid of 3,000 volts and at each well there is a transformer that reduces this high voltage to 380 volts. Each well has a 35 h.p. submerged electric pump which has a maximum capacity of 100-150 m3. but is usually operated at 60 m3. These pumps have a manometric head of 70 metres at a pressure of 35 metres.

Water Costs. 20 hours running of the diesel-generator plant takes 1,000 litres of oil (220 gallons). This cost £L20 and provides power for six wells. During this period of time labour costs £L2 and 7,200 m3. of water are raised. At each well four men are needed to attend to the sprinkler pipes and these are paid 18 piastres a day each. If six wells work at once the cost for 20 hours of this labour will be at least £L5. The total cost of 7,200 m3. is about £L27. One cubic metre of water on the land costs therefore 3.7 milliemes.

6. Future Farm Policy. To produce high quality early vegetables for the London markets, particularly potatoes, asparagus and carrots. Groundnuts will continue to be grown in large

quantities. The Frantoio olive is to be retained because it produces a good quality fruit, but irrigation is essential.

7. Notes. This is the only farm that is making a real attempt to break into the European early vegetable market. It can only do this because of the enormous financial resources at the disposal of the Mitchell Cotts Trading Company.

FARM STUDY No. 2.

Ing. Cesare Ricotti-Prina. Villa Sidi Bilal. Specialised Commercial. Italian. 600 ha. Km. 24 Tripoli-Zavia Rd.

1. General Information. Ricotti has been farming this land for 34 years. The total area of the farm is 600 ha. but 200 ha. of this lies near the sea and is rocky and waste land. The other 400 ha. are however all good. The farm is devoted entirely to Citrus and the Eucalypt, 100 ha. of the former and 300 ha. of the letter. Ricotti thinks that there is no future in the olive and the vine but that Oranges and Eucalypts will find expanding markets in the future. Most of the olives have been cut down and destroyed but a few have been planted as wind breaks.

2. Citrus. The citrus orchards are divided into two parts; the old part of mature trees and the new part with recent plantings of trees (4 years and under). The older groves are laid out in the Sicilian system and the young groves in the American System. Altogether there are 100 ha. of citrus, 50 ha. mature and 50 ha. immature. They are made up as follows: approx. 40,000 oranges (moro blood orange mainly), 7,000 tangerines and a few lemons and grapefruits.

The 1957/58 crop was sold on the tree for £L18,000 and the total yield was probably 8,000 qts. Well kept trees will give a yield of 100 kgs. and Ricotti thinks that his trees probably average 50 kgs.

Planting: Bitter rootstocks are always planted first and then a better variety is grafted on to this.

Manure: Ricotti believes in animal manure and to obtain this he keeps 100 beast. Each tree is given 50 kgs. of organic manure every 3 years, then the next year it receives 3 kgs. Superphosphate, 1 kg. of Sulphate of Ammonia and 1 kg. of Sulphate of Potash. In the third year each tree may be given 8 kgs. of Tunny Fish manure.

3. Citrus and Irrigation.
a) Sicilian system of the Mature groves. The sprinkler system is not used in these orchards since the trees are very crowded and the spray would wash off insecticides. A square pattern is made round the producing trees (like the Jedula) and water is led by channels into these squares. It is irrigation by gravity flow. The citrus trees are allowed to grow big and are only

about 3m. apart. The orchards are therefore very crowded. This system may have been all right in Sicily which has a higher winter rainfall, but seems inadvisable in Libya.

b) American system. Young trees are planted 3.5 metres apart with the rows 6 metres apart. The trees are kept in bush form since this discourages weed growth and allows mechanical cultivation between rows. The American system aims at 4 ditches between the rows when the trees are mature. Using these, one man can irrigate 2 ha. a day and in this area labourers are only paid 16-18 piastres a day (as against 25-30 piastres a day in the Tripoli area). For the moment, however, the sprinkler system is being used to irrigate the young trees. With this system the pipes are placed 5 m. apart and the nozzles are at 5 m. intervals on the pipes. 40 sprays operate at once giving 2.5 litres a second. The pipes are left in place one hour and therefore the area covered by the 40 sprays (approx. 194.7 sq. m.) will receive 9 m3. This works out at approx. 450 m3/ha. The artificial rain is all delivered at a low pressure of 10-15 metres. Low pressure is preferred since it does not water the higher parts of the tree or bush and it also costs less.

General note on Irrigation. In the winter if there is no rain for a month then the trees have to be irrigated. In the summer there is a fixed frequency of watering since the tree is not so susceptible to Chiblis as a plant crop. It is thought that an irrigation every eight days is desirable but in practice an irrigation every twelve days is given.

Eucalypts. These are likely to find an expanding market and at the moment Italian factories are anxious to buy this wood. The tree needs no attention and after 10-12 years can be cut, altogether there may be 5-6 harvests. Sheep can be grazed amongst trees.

4. Water Supply and Irrigation. There are nine wells on the farm drawing water from the first aquifer, and since the farm is near the sea this aquifer can be found as little as 2 metres down. Other water levels are not used. When Mitchell Cotts started using water from the first aquifer nearby, saline conditions started to develop in certain of Ricotti's wells near the sea. This tendency seems now to have been checked since Mitchell Cotts has started using a lower aquifer. The capacity of the wells varies, e.g. 43 m3/hr., 25.2 m3/hr., 36 m3/hr. and 54 m3/hr. All the wells have electric pumps of 2.5 - 6 h.p., and the water is taken round the farm by underground concrete pipes to be finally distributed by sprinklers or gravity flow into squared land.

5. Notes. The problem of increasing salinity in Ricotti's wells was studied by Cederstrom, and the latter's report concluded

that it was the result of continuous overpumping for many years to supply the needs of the citrus trees, and had no connection with the sinking of new wells by Mitchell Cotts. There is a real danger of a salt-water intrusion problem along the coast.

FARM STUDY NO. 3.

Gargour et Fils, Citrus Farm. Specialised Commercial Palestinian. 186 ha. Tajjura.

1. General Information. The farm was formerly owned by an Italian and it was bought by the Gargour family in 1953 at a price of £L8,000. The sum of £L129,000 has subsequently been spent on development. The farm is 186 ha. (465 acres), nearly all of which is irrigable and 125 ha. are under citrus. Gargour divides the farm into two halves, old and new: the old farm was under citrus during Italian ownership whereas the new farm was under olives and vines. The citrus have remained but the olives have largely been removed and the vines have disappeared in order to make way for new plantings of citrus. The policy for the farm is one of making it completely citrus as soon as possible, and potatoes and groundnuts will only be grown until all the trees come into full production.

2. Winter Crops. 1958.

Wheat and Barley 4-5 hectares.

Potatoes. Dutch Bintje 10-15 ha. mainly sown in the middle of October. This crop is heavily manured and also irrigated.

3. Summer Crops.

Groundnuts. About 32-35 ha. are grown each year as a fill-in crop. In 1958 the Valencia type was the only variety growing (Tripoli 4). Tripoli 4 is preferred to Tripoli 2 since it takes one month less to mature and it commands a better price in the United Kingdom and Germany. Yields of this Valencia groundnut are 20-30 qts/ha. whereas the Egyptian gives 30-35 qts/ha.

4. Tree Crops.

Citrus. There are 65,000 trees on the farm covering 135 ha., 15,000 lemons, 2,000 grapefruits, 2-3,000 tangerines and the remainder, about 40,000, oranges. The varieties of each type of fruit are varied and give an export from October-April. Tangerine varieties are Clementina and Sessima; oranges are Jaffa, Demi, Valencia, Washington, Callabria, Moro (dark blood). In many respects lemons are preferred to oranges; their yields,

particularly under adverse conditions, are better; they are more resistant to disease and they command a higher price on world markets. However the orange has certain advantages, the main one being that it lives 70-80 years against the lemon's 50-60 years.

The old part of the farm has 3,200 citrus trees of which 2,500 are mature. Gargour has planted 600-700 trees since he took over the farm. The crop from the trees already mature at take-over in 1953, was 400 qts. (a low figure due to the fact that trees were in very poor state). In 1957 3,000 qts. were produced (7.5 times the 1953 figure); this represents a big increase but this yield is not really satisfactory since there is considerable trouble with the Mediterranean Fly and the Cochineal. The trees on the old part of the farm are spaced 5 m. x 5 m. or 5 m. x 4 m. They require organic manure every two years, plus chemical fertilisers, and the period between each irrigation should not exceed 9-10 days.

New Farm. After the removal of the olives etc. a four year programme of intensive citrus planting was carried out. Most of the trees, which are now about 3 years old, were imported from Italy, since this country's graftings are better than local ones. These young trees are irrigated once every 10-12 days and each hectare of citrus grove receives on average 60 m3. per day.

Olives. What is called the new farm was empty except for olives and a few vines. The olives which were of Italian variety did not yield very well and as a result most of them have been moved and planted along tracks as wind-breaks. Grafting with the Tunisian olive has been necessary and now there are 4,000 olive trees on the farm and they cover 18 ha.

Other trees. Tamarix and Castor are used as wind breaks. The castor bean is collected and marketed. There used to be 35 ha. of vines but these were old and not profitable. They were removed and replaced by 2 ha. of young table vines. Apricots, peaches and apples cover a very small area and are only there for home consumption.

5. Water Supply and Irrigation. Electricity is generated on the farm by four generators. The cost of producing this power is about the same as that supplied by SNCI but it allows Gargour a much greater independence. In the main shed there are two diesel generators, one of 180 h.p. (cost £16,000) and the other of 150 h.p. Only one is used at a time and it will provide electricity for ⅔ of the farm. There are also two smaller generators of 70 h.p. each. There are 15 wells on the farm of which 13 have been drilled by the present owner. There is no evidence that the water level, which is about 45-50 metres down, is dropping.

Well No. 2 Case sample. This well is 50-60 metres deep with the static water level at 45-48 metres. There is a

submersible pump of 15 h.p. which usually pumps up 60-70 m3/ha., but has a greater capacity than this if necessary. Each well on the farm has a storage tank and well No. 2 has one of 300 m3. capacity. Water is pumped from this tank by two pumps which send the water into the sprinklers at a pressure of 2 atmospheres. By using this method and not pumping the water directly from the well into the sprinklers, a more even pressure is maintained. Each well is intended to irrigate 15 ha., but having two pumps it can irrigate more if necessary: furthermore, although each well operates independently, the complete pipe network on the farm allows the transfer of water should an emergency arise. All irrigation is by sprinklers, which give rain to a radius of 3 metres, and are left in place 1-1.5 hours for groundnuts and citrus. There is such an enormous amount of watering to be done that irrigation is carried out all night and all day, i.e. continuously. Lights have been installed to give illumination at night so that work will not cease.

Gargour favours Sprinkler Irrigation for the following reasons:-

1) Simple and easy to handle. Less chance for the labourers to make mistakes.
2) Needs less attention and therefore easier to use at night.
3) More efficient distribution of water.
4) Some loss by evaporation (no greater than from canals) but there is no loss in transit.
5) Can be used for liquid manure and insecticides.
6) Small capital outlay and less maintenance.
7) Can be used just as effectively on undulating land.

6. Future Farm Policy. Continue expanding citrus and when all trees are in full production cease to cultivate groundnuts and potatoes etc.

7. Notes. The best example of a large specialised citrus farm. It will take another five years before the 'New Farm' starts producing. Gargour is hoping to sell substantial quantities of fruit in the United Kingdom and Western Europe, as he used to do at one time when he owned a citrus farm in Palestine.

FARM STUDIES. PART B. ITALIAN CONCESSIONS

FARM STUDY No. 4.

Clementi Balbi Italian Concession. 1029 ha. Zavia

1. General Information. Started in 1934, this is one of the largest farms on the Jefara Plain. In 1958 739 ha. were under dry cultivation and only 70 ha. irrigated. 50 ha. of land lies fallow all the year, and there is a triennial rotation. There is 950 ha. of interculture of olives, almonds and vines.

2. Winter Crops. In the years 1956/7 and 1957/8 dry and irrigated wheat and barley were grown, and also irrigated broad beans and potatoes.
Yields. Yields for dry cultivated wheat are about 5 qts., and irrigated wheat 25 qts. The potatoes are Majestic and Bintje, which are grown partly for export, and give yields 5-10 times the amount of seed sown.

3. Summer Crops.

	1956	1957	1958
Tripoli 2 (Groundnuts)	20 ha.	50 ha.	50 ha.
Lucerne (Perennial crop)	10	5	5
Salento Tobacco	5	5	5

Irrigation of Groundnuts. This crop is irrigated 16 times in an average year as in 1958, and 20 times if the season is extraordinarily warm. 400 m3. is given per hectare at each irrigation, so that in 1958 a total of 6,400 m3/ha. was applied.

4. Tree Crops.

Citrus. At the moment there are 800 orange trees on the farm covering 2 ha. of land. A further half a hectare is to be planted to citrus. The trees are irrigated 12 times a year with 400 m3/ha. per irrigation; total amount 4,800 m3/ha.

Almonds. There are 35,000 almond trees interplanted with olives on 700 ha. of land. Not all the trees are in full production. There are hard and soft shelled varieties grown.

Olives. There are 37,000 Frantoio trees interplanted with almonds over 740 ha. There is some irrigation of olives but no grafting. The Frantoio variety is considered best if there is irrigation.

Vines. 20 ha. and numbers not declining.

Eucalypts. Some have already been planted and it is hoped that there will be more in the future.

5. Water Supply and Irrigation. There are ten wells on the farm, all about 30 metres deep with the water about 11 metres below the surface. Capacities vary from 30-90 m3/hr., and there has been a drop in water level of two metres in the last few years. Water costs 2 milliemes per m3., and is lifted by submersible pumps. Low pressure sprinkler irrigation for the 70 ha.

6. Future Farm Policy. The farmer intends to develop more land for irrigation with sprinklers.

7. Notes. This is still largely a dry farm for only about 5% of the land is irrigated. All the olives are Frantoio and it

seems likely that an increasing number of these will be irrigated in the future.

FARM STUDY No. 5.

Angelo Tutini. Italian Concession, 93 ha. Zawia

1. General Information. This concession farm was started in 1936. 30 ha. are irrigable and were in fact irrigated in 1958. 31 ha. of the farm have always remained dry and have never been irrigated. 30 ha. lie fallow for part of the year; there is a triennial rotation and 61 ha. of the farm is under inter-culture.

2. Winter Crops. In 1956/7 and 1957/8 both dry and irrigated wheat were grown and in some years potatoes and broad beans are grown. Irrigated wheat yields are 20 qts. as opposed to 5 qts/ha. for dry wheat. Potatoes are usually grown for local consumption - varieties are Majestic and Bintje.

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Tripoli 2	1 ha.	2 ha.	6 ha.
Tripoli 4	-	2 ha.	2 ha.
Lucerne (perennial)	2 ha.	2 ha.	2 ha.
Pomidoro	1 ha.	1 ha.	1 ha.
Maize	1 ha.	1 ha.	1 ha.
Salento tobacco	1 ha.	1 ha.	1 ha.

4. Tree Crops.

Citrus. 400 oranges cover 1 ha. of land. They are irrigated 12 times a year with 300 m3/ha. at each irrigation; total amount 3,600 m3/ha.

Almonds. 100 mature soft shelled variety trees.

Vines. 8 ha.; numbers decreasing.

Olives. 800 Tunisian trees cover 16 ha., all of them are mature and none is planted with almonds. There is no irrigation or grafting. Tunisian varieties are recommended.

Eucalypts. Some trees have been planted but no future plantings are envisaged.

5. Water Supply and Irrigation. There are four wells on the farm, all about 30 metres deep. The water-table has not dropped over the last few years and remains static at about 26 metres below the surface. Each well has an electric pump at 6 h.p. with a capacity of 40 m3/hr. Water cost 2 milliemes per m3. Irrigation is by sprinklers.

6. Future Farm Policy. To increase the number of citrus trees and expand irrigation.

7. Notes. Groundnut average is increasing. Citrus likely to take the place of olives, as the most important tree crop.

FARM SUDY NO. 6.

Errera G. Batista Italian Concession, 107 ha. El Hain

1. General Information. This concession farm was started in 1935 and now has 8 ha. irrigated and 99 ha. under dry cultivation. There is no fallow land but there is a triennial rotation. 90 ha. are interplanted with tree and herbaceous crops.

2. Winter Crops. Both dry and irrigated wheat and barley were grown in 1956/7 and 1957/8. Irrigated broad beans and potatoes were also grown in the same years. Irrigated wheat has four times the yield of dry wheat. Bintje and Di Napoli varieties of potatoes are grown for local consumption.

3. Summer Crops.

	1956	1957	1958
Tripoli 4 (Groundnuts)	2 ha.	2 ha.	3 ha.
Tripoli 2	-	2	3
Lucerne (Perennial)	1	2	2
Salento tobacco	1	1	1

Some peas and vegetables also grown.

Irrigation of groundnuts. Normally 18 irrigations are given per life-cycle, but in 1958 only 16 were needed. If the summer is very warm 20 irrigations may be given. 400 m3. is given at each irrigation. Yields usually 20 qts. per ha.

4. Tree Crops.

Citrus. No trees at the moment but the farmer intends to plant oranges in the future and irrigate them with 600 m3. per ha. at each irrigation.

Almonds. None.

Vines. 35 ha. with no anticipated fall in numbers.

Olives. 2,750 trees covering 55 ha., half of them are immature. There is no irrigation or grafting but the farmer thinks that Frantoio olives need to be irrigated.

Eucalypts. None.

5. Water Supply and Irrigation. One well 35 metres deep with water 3 metres below the surface and a capacity of 40 m3/hr.; the water-level has dropped in recent years. Water is raised by an 8 h.p. electric pump sited in the evamporzo, at a cost of 2 milliemes per m3. Sprinkler irrigation is available for all the eight irrigated hectares.

6. Future Farm Policy. To increase the number of citrus trees and extend the sprinkler irrigation network.

7. Notes. Both wheat and barley are irrigated, and the groundnut acreage is expanding. El Mala is near Tripoli and has a rainfall over 300 m.m. but the farmer still thinks that Frantoio olives need irrigating.

FARM STUDY No. 2.

Augusto Solino — Italian Concession, 18 ha. — Garyarash

1. General Information. This farm was started in 1935. Eight hectares are irrigated and the other ten are dry and inter-planted with olives and vines. There is no rotation for the irrigated land and there is very little fallow.

2. Winter Crops. In 1956/7 and 1957/8 both dry and irrigated wheat and barley were grown; also broad beans and potatoes with irrigation.
Yields. Irrigated wheat yields 20 qts. per ha., and dry wheat 5 qts. per ha. The potatoes grown are Bintje and Majestic, both for local consumption.

3. Summer Crops.

	1956	1957	1958
Groundnuts	2 ha.	3 ha.	3 ha.
Lucerne (Perennial)	1	1	1
Tomatoes	0.5	0.5	0.5
Tobacco	1	1	1

Irrigation of Groundnuts. Irrigated 16 times during the normal summer, as in 1958, and 20 times if there is a high incidence of Ghiblis during the growing season.

4. Tree Crops.

Citrus. 350 oranges and 50 lemons on 1 ha. of land. The farmer intends to plant another hectare of orgnges in the future. The trees are given 12 irrigations a year of 400 m3/ha. each, making a total of 4,800.

Almonds. None.

Vines. 4 ha. with numbers decreasing.

Olives. 500 olives, all of them Italian varieties, cover 10 ha. of land. There is no irrigation or grafting of olives, but it is realised by the farmer that irrigation of the Frantoio variety gives increased yields.

Eucalypts. None.

5. Water Supply and Irrigation. There is one 25 metre deep well with water 4 metres below the surface (probably second aquifer); capacity 30 m3/hr. with no evidence of a fall in static level over the last few years. Water is raised by electric pump and distributed round the farm by 2,000 metres of canals.

6. Future Farm Policy. The farmer intends to install sprinkler irrigation and increase the area under citrus.

7. Notes. Another concession farm wanting to expand citrus. One of the few farmers who has installed an electric pump who is still using canal irrigation.

FARM STUDY No. 8

N. Scialona Italian Concession, 400 ha. Gurili

1. General Information. This concession farm was started in 1930. In 1958 80 ha. were irrigated and the 320 ha. remaining were devoted to the interculture of vines, olives and citrus, with some of the land lying fallow each year. A triennial rotation is practised.

2. Winter Crops. In the years 1956/7 and 1957/8 wheat and barley were grown under dry and irrigated conditions, broad beans and potatoes only being grown with irrigation. Yields for dry wheat are 5 qts. per ha., and for irrigated wheat 20 qts. Majestic and Arran Banner potatoes are grown for export and yields are 5-10 times the amount of seed sown.

3. Summer Crops.

	1956	1957	1958
Groundnuts	30 ha.	30 ha.	50 ha.

Lucerne is grown but no figures given.

Irrigation of groundnuts. 15 irrigations are given in a normal year and up to 20 if the summer is unusually hot. 400 m3. is given per ha. at each irrigation and yields are 20 qts./ha.

4. Tree Crops.

Citrus. 1,600 trees covering 4 ha., some of which are not yet in full production. Another 40 ha. will be planted in the future. 12 irrigations each year with 500 m3/ha. at each irrigation; total of 6,000 m3/ha.

Almonds. None.

Vines. 2 ha. of vines but numbers are slowly declining.

Olives. There are 500 trees on the farm, all of which are either Italian or Tunisian and at the same time immature. None is irrigated or grafted.

Eucalypts. None.

5. Water Supply and Irrigation. There are eight wells on the farm all about 26 metres deep; their water levels have dropped in recent years. Water costs 2 mills. per m3. and is raised by electric pump. Irrigation is by gravity flow and canals.

6. Future Farm Policy. Intends to develop citrus, plant crops particularly lucerne, and install sprinkler irrigation.

7. Notes. The groundnut acreage has increased but it seems that citrus will be the most important crop in the future. The farmer is abandoning canal irrigation in favour of sprinkler irrigation.

FARM STUDY No. 9

Cesare Alessarento Italian Concession. 22 ha. Collina Verde

1. General Information. This farm was started in 1932 and 15 hectares are irrigable, all being irrigated in 1958; 7 ha. of land always remain under dry cultivation. There is triennial rotation and the whole farm is intercropped.

2. Winter Crops. Dry and irrigated wheat and barley were grown in 1956/7 and 1957/8 and in some years irrigated broad beans and potatoes are also planted. Dry wheat yields about 4 qts. per ha., whereas irrigated wheat yields 15-20 qts./ha. The varieties of potatoes grown are Bintje and Majestic; these give yields 5-7 fold and are exported.

3. Summer Crops.

	1956	1957	1958
Groundnuts	1 ha.	2 ha.	3 ha.
Forage	1 ha.	1 ha.	1 ha.
Tomatoes	½ ha.	½ ha.	½ ha.

Irrigation of Groundnuts. Normally 20 irrigations are given, as in 1958, but if the summer is very hot then up to 25 may be given. Yields are around 25 qts./ha.

4. Tree Crops.

Citrus. No trees at the moment but the farmers intends to

plant 1 ha. of oranges in the future.

Almonds. There are 500 soft shelled variety trees on the farm of which 200 are immature.

Olives. Altogether there are 400 Frantoio olives on the farm covering 9 ha. There is no irrigation or grafting and the Frantoio olive is recommended. 200 trees are immature.

5. Water Supply and Irrigation. There is one well on the farm which is 20 metres deep and has a capacity of 50 m3/hr. The 10 h.p. electric pump raises water at a cost of 2 millienes per cubic metre. The pump is in the avamposzo and water is distributed to the 'jedavi' by 2,000 metres of canals.

6. Future Farm Policy. The farmer would very much like to install sprinkler irrigation. 'Incrementare la coltura degli agrumi e immettere un impianto a pioggia'.

7. Notes. The groundnut acreage is increasing. This farmer is one of two who recommend that Frantoio olives should be grown under dry cultivation. With the installation of sprinklers and the planting of citrus water requirements will increase.

FARM STUDY No. 10

U. Mazzoni — Italian Concession, 597 ha. — Tajiura

1. General Information. Six hectares of the land are irrigated and the remainder are devoted to the dry interculture of olives and almonds. There is no rotation on the irrigated land. The farm was started in 1935.

2. Winter Crops. In the winter seasons 1956/7 and 1957/8 both dry and irrigated wheat and barley were grown; potatoes and broad beans were also grown in both years with irrigation.

3. Summer Crops.

	1956	1957	1958
Groundnuts	2 ha.	2 ha.	2 ha.
Lucerne (Perennial)	2 ha.	2 ha.	2 ha.
Maize	1 ha.	1 ha.	1 ha.

Various vegetables.

Irrigation of groundnuts. Irrigated 20 times in a normal summer, as in 1958, and 25 in a very hot summer. 400 m3. of water given per hectare, and yields 20 qts. per ha.

4. Tree Crops.

Citrus. None.

Almonds. 15,000 trees altogether of hard and soft shelled varieties; 5,000 trees are still immature.

Vines. 10 ha. and numbers diminishing.

Olives. 15,000 trees interplanted with almonds on 400 ha., 5,000 trees are immature. There is no irrigation of olives or grafting and the Frantoio variety is recommended.

Eucalypts. There are already some trees on the farm and more will be planted in the future.

5. Water Supply and Irrigation. There is one well which is 25 metres deep and has a capacity of 60 m3/hr. (probably second aquifer). The water-level has dropped recently. Water costs 2 milliemes per m3. and is raised by a 6 h.p. electric pump. Gravity irrigation with canals.

6. Future Farm Policy. The farmer intends to continue with olives and almonds, but would also like to install sprinkler irrigation.

7. Notes. Only about 1% of this farm is irrigated and the farmer intends to continue with dry-land olives and almonds. These tree crops find the best climatic conditions in the area around Tripoli.

FARM STUDY No. 11

Guilio Macri. Italian Concession, 42 ha. Gasr Ben Gashir

1. General Information. 1934 Concession farm which has 30 ha. irrigated and the remainder dry. The whole farm is planted with olives and almonds intermixed.

2. Winter Crops. Wheat and barley grown in 1956/7 and 1957/8 under dry and irrigated conditions; potatoes and broad beans grown with irrigation in the same seasons. Dry wheat yields 5 qts. per ha., and irrigated 20 qts. per ha. Italian and Majestic potatoes are grown for export; yields being 5-12 times sowings.

3. Summer Crops.

	1956	1957	1958
Groundnuts	5 ha.	5 ha.	5 ha.
Lucerne (Perennial)	1 ha.	1 ha.	1 ha.

Irrigation of Groundnuts. 16 irrigations during a normal summer as in 1958, but sometimes 20 are needed if the weather is very hot. 400 m3. of water are given at each irrigation and yields average 20 qts. per ha.

4. Tree Crops

Citrus. None.

Almonds. None.

Vines. 60,000 total, and no fall in numbers anticipated.

Olives. 1,400 trees spread over 40 ha. with 400 of the trees not yet mature. All the trees are Frantoio, partly irrigated but not grafted. Yields of Frantoio are much better with irrigation.

Eucalypts. None.

5. Water Supply and Irrigation. 2 wells, which are 35 metres deep, have water 31 metres below the surface and a capacity of 60 m3. Each has an electric pump of 10 h.p. which delivers water at the surface at a rate of 60 m3/hr. and at a cost of 2 mills. per cubic metre. The pumps are sited in the 'avampozzo'. The water-table has dropped a little recently. Irrigation is by 4,000 metres of concrete canals and furrows.

6. Future Farm Policy. The farmer intends to install sprinkler irrigation.

7. Notes. Groundnut acreage steady. Canal irrigation likely to be replaced by sprinklers.

FARM STUDIES. PART C. LIBYAN HAWĪZA FARMS

FARM STUDY No. 12

Salim el Arbash — 82 ha. — Aielat

1. General Information. This is one of the largest Libyan farms to be found in the coastal oasis zone. It is entirely a private farm which is only 8 years old. 25 ha. are irrigated and the rest remains dry. One third of the land lies in fallow all the year. There is no rotation and plant crops are grown between the trees.

2. Winter Crops.

	1956/7	1957/8
Wheat	None	
Barley	10 ha. dry	10 dry ½ irrigated
Broad beans	3 ha. irrigated	-
Potatoes	1 ha. irrigated	1½ ha. irrigated

3. Summer Crops.

	1956	1957	1958
Tripoli 4 Groundnuts	2 ha.	3 ha.	1 ha.
Tripoli 2 Groundnuts	1 ha.	1 ha.	3 ha.
Tomatoes	½ ha.	½ ha.	½ ha.
Pepper	½ ha.	½ ha.	½ ha.
Lucerne	½ ha.	½ ha.	½ ha.

3. Irrigation of Groundnuts. Once every week.

4. Tree Crops

Citrus. 20 trees planted on non-private land; most of them are immature.

Almonds. None.

Olives. 100 trees on 2 ha. of land; 80% of total number are immature.

Castor. 15 qts. of oil produced from the last harvest (1958).

5. Water Supply and Irrigation. There is one well on the farm which is 31 metres deep and is fitted with a diesel pump. The water-table is 11 metres below the surface. Irrigation is by sprinkler and there is a storage tank of 60 m3.

6. Future Farm Policy. Expansion of area under herbaceous crops.

7. Notes. The farmer remarks that although this farm is only 8 years old it is giving good results and after a few years may equal other regions in agricultural production. The impossible has been done in establishing a big farm in this area since it is difficult to find sufficient financial and technical assistance. Since the farm is a new farm it is natural to find only a small number of trees. It is interesting to note that in 1957/8 4 ha. of barley was grown under irrigation. Potatoes and groundnuts have been introduced into the Ajelat area clearly showing that the irrigation water is of good quality. The groundnut acreage increased from 1956 to 1957 and then steadied; there has been a switch from the production of Tripoli 4 to Tripoli 2.

FARM STUDY No. 13

Mabruk Abdu Salam El-Mabruk, Khaṭaṭbah cabila. 89 ha. Sabrata

1. General Information. 20 ha. of this farm are irrigated and up to 20 ha. lie fallow for part of the year at least.

2. Winter Crops.

	1957/8	
Wheat	5 ha. irrigated	2 ha. dry
Barley	10 ha. irrigated	10 ha. dry
Broad beans	3 ha. irrigated	-
Potatoes	2 ha. irrigated	-

3. Summer Crops.

	1958
Groundnuts (Tripoli 4)	9 ha.
Groundnuts (Tripoli 2)	6 ha.
Pepper	2 ha.

Irrigation of Groundnuts. The crop is irrigated once every six days.

4. Tree Crops.

Citrus. 4 lemons.

Almonds. 20 soft shelled variety.

Olives. There are 1,200 trees on the farm, of which only 10 are immature.

Date Palms. 45 Date palms.

Figs. 10 trees.

Castor. 35 qts. harvested.

5. Water Supply and Irrigation. There are five wells on the farm. Two are worked by the 'dalu' and are very shallow. The other three are 36, 45, and 50 metres deep and are fitted with diesel motors. One well has a pump of 2½ h.p. with a capacity of 30 m3/hr., another with an 8 h.p. pump with a capacity of 70 m3.; both these pumps are inside the well. The third well has a 21 h.p. diesel electric unit which is outside the well. The water from two of the wells is distributed by canals, and from the third by sprinkler.

6. Future Farm Policy. ?

7. Notes. This could well be an Italian Concession farm which has been taken over by a Libyan. The farm is situated beyond the limits of the Tripoli electricity grid and therefore has two diesel motors driving pumps, and a diesel-electric generator driving an electric pump. With five wells, the farmer is able to sustain a large area under irrigation. In the winter of 1957/8 the whole irrigable 20 ha. were being used for the growing of wheat, barley, broad beans and potatoes under irrigation. Most of the irrigable land is used in the summer also.

FARM STUDY No. 14

Mohammed Bernawi 422 ha. Zavia

1. General Information. 200 ha. of this large farm is irrigated and 50 ha. is permanently dry. Up to 200 ha. is left fallow each year because of the sandy nature of the soil. Inter-cropping is practised. At one time this farm was an Italian Concession.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	-	10 ha.	-	-
Barley	150 ha.	-	100 ha.	50 ha.
Beans (Autumn French)	-	3 ha.	-	1½ ha.
Spring Broad)				

3. Summer Crops.

	1956	1957	1958
Groundnuts	23 ha.	91 ha.	65 ha.
No maize	-	-	-
Lucerne (Perennial)	?	1 ha.	1 ha.
Tomatoes	½ ha.	½ ha.	½ ha.
Pepper	½ ha.	½ ha.	½ ha.
Tobacco	½ ha.	-	-

Irrigation of Groundnuts. Irrigated every 7 days by sprinkler.

4. Tree Crops.

Citrus. 150 trees covering ¾ ha. Three tangerines and the rest oranges.

Almonds. None.

Olives. 5,000 trees covering 300 ha.; only 200 trees are immature.

Figs. None.

Castor. 300 kgs. sold in 1958.

5. Water Supply and Irrigation. Altogether there are 6 wells on the farm; 2 wells have 20 h.p. diesels, one a 1 h.p. electric pump, and the rest are only just being fitted with pumps. The farm is served by sprinkler irrigation. There are two storage tanks of 360 m3. and 60 m3.

6. Future Farm Policy. Expension of irrigation with installation of more pumps.

7. Notes. This farm was originally started as a dryland concession, hence the large number of olive trees. The Libyan owner has turned part of the farm over to sprinkler irrigation. In the winter of 1957/8 50 ha. of barley were grown under irrigation.

FARM STUDY No. 15

Mostafa Ali Tentush 30 ha. Azizia

1. General Information. On this farm about 6 ha. are irrigated, 15 ha. are under dry cultivation and 9 ha. lie fallow all the year. There is a rotation, but no details are given.

2. Winter Crops. (all dry)

	1956/7	1957/8
Wheat	6 ha.	6 ha.
Barley	10 ha.	6 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Tripoli 4	3 ha.	3 ha.	4 ha.
Tripoli 2	1 ha.	1 ha.	1 ha.
Tomatoes	3 ha.	1 ha.	1 ha.
Pepper	1 ha.	1 ha.	1 ha.

Tobacco 2-3 ha.

4. Tree Crops.

Citrus. None.

Almonds. 50 soft and hard shelled varieties.

Olives. 450 trees covering 25 ha.

5. Water Supply and Irrigation. The one well on the farm is 62 metres deep and has water at 42 metres below the surface (first water-table). Water is raised by a 12 h.p. electric pump driven by a 25 h.p. diesel generator. The pump is sited at the bottom of the well. Irrigation is by 'jedula' and sprinkler. There is one storage tank of 320 m3.

6. Future Farm Policy. No details.

7. Notes. Water is not plentiful because it has to be pumped from a considerable depth. Winter crops are all grown under dry cultivation. The barley acreage dropped in the year 1957/8; in 1958 groundnut acreage is slightly up on 1956 and 1957 with a continued preference for Tripoli 4.

FARM STUDY No. 16

Mohammed Barka Abu Ghunumah 48 ha. Gasr Ben Gashir

1. General Information. This is probably an Italian Concession farm that has been taken over by a Libyan. 30 ha. of land are irrigated, 10 ha. remain under dry cultivation and up to 7 ha. of land lie fallow at least for part of the year. There is a rotation practised and there is interculture.

2. Winter Crops. 1957/8

	Area ha. Irrigated	Area ha. Dry	Yields Total
Wheat	2	3	150 marta
Barley	4	6	400 marta
Beans	1	2	120 marta
Potatoes	1	2	100 qts.

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Tripoli 2 (local)	20 ha.	25 ha.	30 ha.
Maize	2 ha.	3 ha.	4 ha.
Tomato	0.5 ha.	2 ha.	5 ha.
Pepper	0.5 ha.	2 ha.	3 ha.
Tobacco	0.2 ha.	0.3 ha.	-
Lucerne (Perennial)	?	?	1 ha.

4. Tree Crops.

Citrus. A total of 900 trees on the farm, made up of 110 tangerines, 100 oranges, 690 lemons, and covering 4 ha. 100 trees are not yet in full production. The oranges are blood oranges.

Almonds. 700 trees altogether, of which 500 are of the hard shelled variety and 200 of the soft. 100 trees are not yet in full production.

Olives. 1,250 trees are spread over the whole farm and are interplanted with almonds. 150 trees are immature.

Figs. 150 trees.

Castor Bush. 4,000 bushes yielding 400 qts. of nuts per annum.

5. Water Supply and Irrigation. There are seven wells on this intensely irrigated farm, most of which are 40 metres deep. Water is found at 15 metres in two of the wells and 24 metres in five of the wells (first aquifer). There are two 20 h.p. diesel pumps, 2 diesel/electric units, and 3 electric pumps of 5 h.p. Two of the pumps are outside the wells and the rest are in the 'avampozzi'. Sprinkler and gravity irrigation with channels and jedula are used; there is a storage tank of 400 m3.

6. Future Farm Policy.

7. Notes. One of the most heavily irrigated farms in the Gasr Ben Gashir area. Note the heavy increase in the groundnut acreage. The water demands of the farm are very high.

FARM STUDY No. 27.

Aind M. Lafi 30 ha. Formerly Italian Concession G.Ben Gashir

1. General Information. This 30 ha. farm has 20 ha. irrigable

and the remaining 10 ha. always under dry cultivation. Some of the land lies fallow but only for part of the year. There is interculture of tree crops and plant crops.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	5 ha.	3 ha.	2 ha.	3 ha.
Barley	8 ha.	5 ha.	3 ha.	5 ha.
Beans (broad)	1 ha.	1 ha.	-	1 ha.
Potatoes	3 ha.	3 ha.	-	3 ha.

Note on the Cultivation of the 1957/8 Potato Crop.

Ploughing on the farm for the above crop was done by a contractor at a cost of £12.5 per hectare. Organic manure was applied, plus refuse, which is bought at a cost of 60 p. a cubic metre. When the farm was visited in early December, the crop was being irrigated following several days rain. The reason given for this was that the water used was from a well and it would be quite warm; this warmth, it was maintained, would encourage the growth of the potato. It is interesting to note, however, that towards the end of December many potatoes had died off. Up-to-Date is the name of the variety grown.

3. Summer Crops.

	1956	1957	1958
Groundnuts - Trip. 4	7	8	10
Groundnuts - Trip. 2	-	-	2
Maize	-	-	-
Tomato	1	1	1
Pepper	1	1	1

4. Tree Crops.

Citrus. 1,000 trees on 3 ha. (400 immature); 200 of the trees are tangerines, the rest mainly oranges.

Almonds. Total of 500 trees of which 100 are immature. The almonds are both hard and soft shelled varieties.

Olives. Total of 1,200 trees covering 10 ha. with olives alone and 5 ha. with olives and almonds. 300 olives are still immature.

5. Water supply and Irrigation. There are two wells of about 30 metres depth with the water-table at 25 metres below the surface. Each well has an electric pump of 6 h.p. which will deliver 20 cubic metres of water an hour. Irrigation is by gravity flow and sprinkler. The gravity flow method uses

concrete channels, earth canals and Jedawl. Storage tank of 50 m3.

6. Future Farm Policy. Small expansion of irrigation.

7. Notes. This is one of the best Libyan farms visited. The land is well utilised in both summer and winter. In 1957/8 the area of irrigated wheat and barley exceeded the area of dryland under these crops. The groundnut acreage has expanded steadily.

FARM STUDY No. 18

Aied M. Lafi 30 ha. Formerly Italian Concession G. Ben Gashir

1. General Information. 25 ha. of this farm can be irrigated. All the land is private, there is no Cabila land. Up to 20 ha. of land may lie fallow for part of the year. There is inter-culture of trees and plant crops.

2. Winter Crops.

	1956/7	1957/8
Wheat	2 ha. irrigated	?
Barley	8 ha. irrigated 2 ha. dry	?
Potatoes		
Autumn	8 ha.	3 ha.
Spring	7 ha.	?

3. Summer Crops.

Groundnuts ..... 3 ha. of Tripoli 2 and Tripoli 4.

Tomatoes ..... ½ ha.

4. Tree Crops.

Citrus. There are 800 oranges and 400 lemons. Half the oranges are still immature.

Almonds. Total of 70 trees of hard and soft shelled varieties, grown intermingled with olives.

Olives. There are 1670 trees which are spread over most of the farm. 400 trees are not yet in full production.

Figs. 10 trees.

5. Water Supply and Irrigation. There are two wells on the farm and the water is raised by a diesel pump and an electric pump. These pumps each raise 40 m3/hr. and the water is distributed over the land by sprinklers.

6. Future Farm Policy. To continue with the same crops as at present.

7. Notes. Sprinkler irrigation is preferred. The diesel pump operates in a well which lies well away from the electricity grid lines which run along the G. Ben Gashir - Suk-Es-Sebt road. More barley is grown under irrigation than under dry cultivation.

FARM STUDY No. 19.

Ahmed Mohammed Addala — 30 ha. — Gasr Ben Gashir

1. General Information. This farm was formerly an Italian Concession. Ten hectares are irrigated and the rest remains under dry cultivation; there is some fallow and some form of rotation, but no details given.

2. Winter Crops.

	1956/7		1957/8	
	Irrigated	Dry	Irrigated	Dry
Wheat	-	3 ha.	1 ha.	2 ha.
Barley	-	6 ha.	-	5 ha.
Beans	2 ha.	1 ha.	2 ha.	-
Autumn Potatoes	5 ha.	5 ha.	4 ha.	3 ha.
Spring Potatoes	2 ha.	-	2 ha.	-

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Tripoli 2 (local)	7 ha.	8 ha.	8 ha.
Tomatoes	0.5 ha.	0.5 ha.	0.5 ha.
Pepper	0.33 ha.	0.33 ha.	0.33 ha.

4. Tree Crops.

Citrus. There are 900 trees on the farm and they cover 3 ha. The trees are made up of 30 tangerines, 20 lemons and the rest oranges; 400 trees are immature.

Almonds. 70 trees of hard and soft shelled varieties.

Olives. 800 trees are interplanted with almonds on 30 ha. of land; 300 are immature.

5. Water Supply and Irrigation. There are two wells on the farm, both about 27 metres deep (first aquifer); the water-table is 24 metres below the surface. Each well has an electric pump in the 'avampozzo'. Irrigation was originally by furrows but sprinkler has been installed and is now more important.

important.

6. Future Farm Policy. No details.

7. Notes. A typical Italian Concession farm with interplantings of olives and almonds, which has been modified by the introduction of more irrigation. In 1957/8 winter cereals were irrigated for the first time; the acreage of groundnuts remains steady. With 400 immature citrus trees in it, there must have been plantings of young trees during the last few years. With the installation of sprinklers an expansion of irrigation can be expected.

FARM STUDY No. 20.

Mohammed Abu el Asa'ad el A'alim. 30 ha. Gasr Ben Gashir

1. General Information. Sixteen hectares of this farm can be irrigated, 10 are always dry, four ha. lie fallow for at least part of the year. There is a rotation of cropping and fallowing in alternate years.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	2 ha.	1 ha.	2 ha.	2 ha.
Barley	3 ha.	4 ha.	3 ha.	3 ha.
Beans	1 ha.	1 ha.	2 ha.	2 ha.
Potatoes	1.5 ha. (Autumn)	2 ha. (Spring)	2 ha. (Autumn)	2 ha. (Spring)
Onions	?			

3. Summer Crops.

	1956	1957	1958
Tripoli 2 (groundnuts)	1 ha.	2 ha.	3 ha.
Maize	1 ha.	1 ha.	1.5 ha.
Tomatoes	2 ha.	2 ha.	3 ha.
Pepper	3 ha.	3 ha.	4 ha.
Tobacco	2 ha.	2 ha.	2 ha.

4. Tree Crops.

Citrus. 200 immature trees cover 1 ha. They are made up of 100 lemons, 50 oranges and 50 tangerines.

Almonds. 400 trees of hard and soft shelled varieties; 100 are not yet in full production.

Olives. 700 olive trees are interplanted with almonds on 16 ha. of land. They are all immature.

Eucalypts. 3,000

Castor Bushes. Yields are 10 qts. per annum.

5. Water Supply and Irrigation. There are two wells of 30 metres depth, with a water-level of 24 metres below the surface (first aquifer). There is an electric pump sited in the 'avampozzo' which is used for sprinkler irrigation. There are still a few fedula. The one storage tank on the farm is of 100 m3.

6. Future Farm Policy. No details.

7. Notes. This farm seems to be developing. Many of the trees are immature — all the citrus, all the olives and 100 of the almonds. Both wheat and barley are grown with irrigation; autumn sown potatoes are grown without irrigation; the groundnut area has increased during the three years listed. Sprinkler irrigation is ousting gravity irrigation.

FARM STUDY No. 21.

Omran el Hakim — 15 ha. — Gasr Ben Gashir

1. General Information. On this farm of 15 ha. 12 ha. are irrigated and the remaining three are dry. 7 ha. of land lies fallow for part of the year and there is a rotation.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	3 ha.	3 ha.	3 ha.	4 ha.
Barley	3 ha.	3 ha.	-	-
Beans	2 ha.	2 ha.	3 ha.	4 ha.
Autumn Potatoes	2 ha.	2 ha.	2 ha.	3 ha.
Spring Potatoes	-	1 ha.	-	1 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Tripoli 2 (local)	3.0 ha.	4.0 ha.	5.0 ha.
Tomato	1.0 ha.	1.0 ha.	1.0 ha.
Pepper	0.5 ha.	0.5 ha.	0.5 ha.

4. Tree Crops.

Citrus. Only a few trees.

Almonds. None.

Olives. A total of 400 trees covering 15 ha; 100 trees are immature.

5. Water Supply and Irrigation. There is one well on the farm with the ground-water 24 metres from the surface (first water-table). There is a diesel engine and generator which drives a 12 h.p. electric pump sited in the 'avampozzo'. There is one storage tank of 100 m3. capacity; all irrigation is by channels and jedula.

6. Future Farm Policy.

7. Notes. In 1957/8 more irrigated than dry wheat was grown, and barley disappeared from the list of winter crops. Groundnuts continue to increase in importance.

FARM STUDIES No. 22.

Farmani Mohamed el Jabu — 12 ha. — Gasr Ben Gashir

1. General Information. 10 ha. of the farm is irrigable. The farmer can sow cereals on part of the 2,600 ha. that the cabila owns. There is intercropping between the trees.

2. Winter Crops.

	1956/7	1957/8
No wheat, barley or beans.		
Potatoes	1 ha.	½ ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts (Trip. 4)	6 ha.	5 ha.	8 ha.
Tomatoes	½ ha.	½ ha.	½ ha.
Pepper	½ ha.	½ ha.	½ ha.
Tobacco	2 ha.	2 ha.	-

4. Tree Crops.

Citrus. 130 oranges, 110 tangerines and 70 lemons, all immature, cover ¾ ha.

Almonds. 95 trees, both hard and soft shelled varieties.

Olives. 295 trees cover 10 ha., sometimes interplanted with almonds. 100 trees are immature.

Figs. 6 trees.

Eucalypts. None.

5. Water Supply and Irrigation. There are two wells on the farm with the water-table 18 metres below the surface. Each has an electric pump in the 'avampozzo'; one has a capacity of 35 m3/hr, and the other 24 m3/hr. Irrigation is by cement canals and 'jedula'. There is a storage tank of 30 m3.

6. Future Farm Policy.

7. Notes. Although a smaller farm, the irrigable area is comparable to that on many of the larger 'hawazah'. The groundnut acreage fell in 1957 but rose again in 1958.

FARM STUDIES. PART D. DEMOGRAPHIC ITALIAN.

SECTION I INPS

(a) Jiuddaim (Oliveti)

FARM STUDIES No. 23

Alfredo Gianferrari. Demographic Italian. INPS. Jiuddaim(Oliveti) Holding No. 16.

1. General Information. This farm was started in 1938. All the land is irrigable, but in 1958 only 8 ha. was in fact irrigated. About half the land is intercropped.

2. Winter Crops.

About 8 ha. of irrigated wheat was grown in 1956.

3. Summer Crops.

	1956	1957	1958
Groundnuts (Trip. 2)	11.5 ha.	6 ha.	2 ha.
Groundnuts (Trip. 4)	4 ha.	7.5 ha.	7.4 ha.
Lucerne (Perennial)	5 ha.	4.5 ha.	6 ha.

Irrigation of Groundnuts. This crop is irrigated 20 times in an ordinary summer and 25 times if there is a spate of ghiblis. In 1958 20-22 irrigations were given. Yields are 30 qts./ha.

4. Tree Crops.

Citrus. None.

Almonds. None.

Olives. Total number of trees is 600, of which 300 are Tunisian and 300 are immature. The farmer recommends local and Tunisian varieties.

5. Water Supply and Irrigation. There is one well which is about 40 metres deep; the water-table is 39 metres below the surface. Water is raised by an electric pump of 30 m3./hr. capacity, at a cost of 3 milliemes per m3. The pump is located in the 'sawanpozzo' and the water is put on to the land by low pressure of sprinklers of 2 atmospheres. There is a storage tank of 100 m3.

6. Future Farm Policy. No details.

7. Notes. General fall in groundnut acreage since 1956, largely a result of the reduction of the area under Tripoli 2. The farmer has not planted any citrus, probably because he is still controlled by the settlement Agency, and he prefers the local and Tunisian olive to the Italian variety. Gravity irrigation has been superseded by a low pressure sprinkler system.

FARM STUDY No. 24

Attilio Grosa. 17 ha. Demographic Italian, ENPS. Miuddaim (Oliveti) Holding No. 51.

1. General Information. The whole of this farm, which was started in 1938, is irrigable, but in 1958, however, only 1.95 ha. were in fact irrigated. On average there is 13 ha. of land which lies fallow for part of the year. There is a rotation of beans, groundnuts, potatoes and vegetables, and 1½-2 ha. are intercropped with olives, oranges and forage.

2. Winter Crops. Generally there are no winter dry land crops, since wheat, barley, broad beans and potatoes (autumn and spring) are grown with supplementary irrigation. In 1956 15 qts. of vetch and oats were harvested.

3. Summer Crops.

	1956	1957	1958
Groundnuts	2 ha.	2.1 ha.	1.95 ha.

Irrigation of groundnuts. Under normal summer conditions 16 irrigations are given but in a Ghibli summer 18-20 are the rule; in 1958 17 irrigations were in fact given. Yields are 20.5 qts./ha.

4. Tree Crops.

Citrus. There are 400 trees altogether on the farm of which 8 are lemon. ¼ of the trees are immature and all trees are given 4-5 irrigations a year.

Almonds. ?

Vines. Vines are grown with olives on 2 ha. of land; they are decreasing in numbers.

Olives. 360 trees are spaced over the whole farm. The farmer prefers the local and Tunisian olive, and has grafted a few Italian trees with the Shemlali variety.

Eucalypts. Some have already been planted but the programme is now complete.

5. Irrigation and Water Supply. There is one well on the farm

which is 32 metres deep, and the water-table is 29 metres below the surface, having dropped in recent years. A 7.5 h.p. electric pump has been installed at the base of the 'avampozzo'; this pumps water into sprinklers at medium pressure. Underground distribution pipes have a diameter of 12.5 cms. and surface pipes 89.9 mms. The storage tank has a capacity of 100 m3.

6. Future Farm Policy. Concentrate on olives, almonds, groundnuts and bee-keeping.

7. Notes. The area of irrigated land under groundnuts is small and has fallen slightly. The farmer has not started to irrigate his olives, instead he is trying grafting. Sprinkler irrigation has been installed at the expense of canal irrigation.

FARM STUDY No. 25.

Giuseppe Sella. 12ha. Pomegranate Italian. EIPS. Jiuddaim (Olivetti) Holding No. 57.

1. General Information. This farm was started by the EIPS agency in 1938 and is now owned by the farmer. All the land is irrigable but in 1958 only 4 ha. was irrigated. 8 ha. of land lies fallow for a part of the year. There is a rotation on the irrigated land of wheat, groundnuts and beans. Crops are grown between the olives.

2. Winter Crops.	1956/7	1957/8
Wheat	2 ha. irrigated	2.5 ha. irrigated
Barley	2 ha. irrigated	1.5 ha. irrigated
Potatoes (Autumn)	0.5 ha. irrigated	1.5 ha. irrigated
(Spring)	-	1.0 ha. irrigated

Average yield of potatoes is 9.6 qts. per ha.

3. Summer Crops.	1956	1957	1958
Groundnuts			
Local White (Tripoli 2)	1 ha.	0.5 ha.	3.5 ha.
Local Red (Tripoli 4)	1.5 ha.	2.2 ha.	-
Virginia (Tripoli 2)	-	-	0.5 ha.
Lucerne (Perennial)	0.5 ha.	0.5 ha.	0.75 ha.
Tomatoes	0.5 ha.	-	-
Maize	0.5 ha.	0.5 ha.	0.5 ha.

Irrigation of Groundnuts. 12 is the average number of

irrigations per life-cycle, but up to 16 may be given in a hot summer; 15 irrigations of 1,200 m3./ha. were given in 1958, giving a total amount of water of 18,000 m3./ha. Yields average 25 qts. per ha.

4. Tree Crops.

Citrus. There are 420 trees on the farm, mainly oranges, of which 200 are immature. No new plantings are envisaged in the future. Each tree is given 5 irrigations a year of 5 m3. i.e. a total of 25 m3.

Almonds. None.

Vines. None.

Olives. 275 Tunisian olives are spread over most of the farm and 40 are still immature. All olives are irrigated and Tunisian varieties have been grafted on to all Italian trees.

Eucalypts. There are a few on the farm but no more will be planted.

5. Water Supply and Irrigation. One well, with 'avampozzo' of 35 metres and trivellazione of 20 metres, has a capacity of 40 m3/hr. The water-table which is now 40 metres below the surface has dropped in recent years. Water is raised by an 8.5 h.p. electric pump which can lift 30-40 m3./hr. at a cost of 5 milliemes per cubic metre. Water is distributed by gravity flow and also by low pressure sprinkler. The farmer owns 400 metres of surface tubing and 350 metres of underground piping. There is no storage tank.

6. Future Farm Policy. No expansion of citrus.

7. Notes. Like many of the farms at Jiuddain, the whole area could be irrigated if more money is invested in additional capital equipment. All winter cereals are irrigated and the overall acreage of groundnuts has increased, although land under Tripoli 4 has decreased. Note the fact that American groundnuts were introduced in 1958 and that all olives are irrigated and the Italian variety is being grafted. If the irrigation figures are correct then the farmer is giving too much water to his groundnuts.

FARM STUDY No. 26.

Alberto Gessini. 39 ha. Demographic Italian. Jiuddain (Olivetti) Holding No. 72.

1. General Information. This farm was started by the agency in 1938 and is now owned by the farmer. All the holding is irrigable but in 1958 10 ha. were in fact irrigated. 15 ha. of land lies fallow, consisting of half dry and half irrigated. There is a rotation on the farm, but no details are given.

2. Winter Crops.

	1956/7	1957/8
No wheat		
Barley	4 ha. irrigated	2 ha. irrigated
Broad beans (Autumn)	2 ha. irrigated	2 ha. irrigated
(Spring)	2½ ha. irrigated	3 ha. irrigated

Some spring sown potatoes are grown.

The yields of dry cultivated wheat is 3 qts./ha., and for irigated wheat 18 qts./ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts (Trip. 2)	4 ha.	6 ha.	7 ha.
Groundnuts (Trip. 4)	2 ha.	2 ha.	3 ha.
Lucerne (Perennial)	1 ha.	1½ ha.	1½ ha.
Maize	1 ha.	2 ha.	2½ ha.

Irrigation of Groundnuts. During a normal summer this crop is given 21 irrigations, but if there is high incidence of ghiblis there may be up to 28 irrigations. With 300 m3 given at each irrigation 6,300 m3./ha. is the total amount of water applied in an average summer. Yields are 22 qts./ha.

4. Tree Crops.

Citrus. None at the moment but the farmer hopes to plant 400 trees in the future.

Almonds. 350 hard shelled variety trees, all in full production.

Vines. None.

Olives. There are 200 tunisian varieties and 750 Italian covering 39½ ha., and partly growing with almonds. All trees are irrigated and give yields 8 times those given by olives under dry cultivation.

Eucalypts. With 50 trees on the farm plantings are complete.

5. Water Supply and Irrigation. There is one well 38 metres deep and with an evampozzo 21 metres. The water-table is 25 metres below the surface. The 7½ h.p. electric pump in the evampozzo has a capacity of 45 m3./hr. High pressure sprinkler irrigation is available for 25 ha. Storage tanks of 200 m3. and 108 m3. of underground pipes.

6. Future Farm Policy. The farmer intends to develop citrus (400 trees), groundnuts, nut and fruit trees.

7. Notes. The groundnut acreage has increased from 6 ha. in 1956

to 10 ha. in 1958. All the olive trees on this farm are irrigated and are reported to give yields 8 times those obtained before irrigation was introduced.

FARM STUDIES. PART D. DEMOGRAPHIC ITALIAN

SECTION I. INPS

b. Azzara (Bianchi)

FARM STUDY No. 27.

Angelo Fiorito. 20.99 ha. Demographic Italian. Azzahra (Bianchi) Holding No. 29.

1. General Information. This holding, which is now owned by the farmer, was allotted by INPS in 1937. All the 18 ha. of irrigable land were irrigated in 1958; 10 hectares of land lie fallow for part or whole of the year. The rotation is legumes, cereals, forage (lucerne) and groundnuts. On 7 ha. of the land there is intercropping of groundnuts between olives.

2. Winter Crops. All receiving irrigation.

	1956/7	1957/8
Wheat	1.5 ha.	1.5 ha.
Barley	1 ha.	1 ha.
Broad beans	1 ha.	1 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Tripoli 2 (Mgiziana)	-	0.5 ha.	0.5 ha.
Tripoli 2 (Virginia)	4 ha.	5 ha.	5 ha.
Forage	0.5 ha.	1 ha.	1 ha.
Lucerne (Perennial)	-	0.25 ha.	0.25 ha.

Irrigation of Groundnuts. 25 irrigations are given during a normal year but this is stepped up to 30 in a hot year when Ghiblis are prevalent. In 1958 23 irrigations were necessary. 680 m3. is given at each irrigation, so the total amount of water applied during an average year is 17,000 m3./ha. Yields are 20 qts./ha.

4. Tree Crops.

Citrus. There are 330 orange trees, 50 of which are not yet in full production. No more citrus plantings are envisaged. Each tree is irrigated every 10 days with 200 litres of water.

Almonds. None.

Vines. These cover 1 ha. of land between olive trees; their numbers are decreasing.

Olives. There are 350 Italian variety olives and 200 local variety olives; none of these are mixed with almonds. 480 trees are still immature. All these trees are irrigated and there is no grafting. The farmer does not like the Italian olive, and he recommends that the Tunisian and local olives should be grown, the first with irrigation and the second with dry farming.

Eucalypts. Some trees are already on the farm but no more will be planted.

5. Water Supply and Irrigation. The one well on the farm is 32 metres deep and the water in it is 20 m. below the surface, having dropped 6 metres in recent years. The 5 h.p. electric pump is sited at the base of the 'avampozzo' and has a capacity of 40 m3./hr.; it delivers water at a cost of about 3 milliemes per cubic metre. Water is distributed by canals, 1,000 metres of which are cement. The underground distribution pipes are 150 mms. in diameter. Storage tank of 100 m3. is available.

6. Future Farm Policy. The farmer intends to continue with forage and cereals in the winter and groundnuts in the summer. He would like to install sprinkler irrigation.

7. Notes. It is interesting to discover that a farmer, using channel irrigation with gravity flow, wants to install sprinkler irrigation. The groundnut acreage has steadied. All winter crops and all olive trees are irrigated.

FARM STUDY No. 28.

Antonio Paladini. 30.87 ha. Demographic Italian. Azzara
Holding No. 40. INPS (Bianchi)

1. General Information. This INPS farm of 30.87 ha. was allotted in 1937. 20 ha. of the farm is irrigable (about 66%) but in 1958 only 6 ha. were irrigated; 10 ha. of the dry land lie fallow for the whole year. The rotation is legumes, cereals, forage and groundnuts. There is 4 ha. of interculture of olives and groundnuts.

2. Winter Crops. All irrigated.	1956/7	1957/8
Wheat	1 ha.	-
Barley	1 ha.	2 ha.
Broad Beans	2 ha.	2 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts.			
Tripoli 4	3 ha.	0.5 ha.	1 ha.
Tripoli 2 (Virginia)	1 ha.	3 ha.	3 ha.
Lucerne (Perennial)	0.5 ha.	0.5 ha.	0.5 ha.

Irrigation of Groundnuts. During a normal summer the crop is given 22 irrigations; this compares with 23 in 1958 and 26 during a hot summer. Yields are 30 qts. per ha.

4. Tree Crops.

Citrus. There are 639 orange and 3 lemon trees on the farm, with 250 of the former as yet immature. 200 more trees will be planted in the next few years. The citrus grove is irrigated every 15 days, 1,500 litres of water being given to each plant (i.e. around 600 m3. ha. with 5 metre spacing).

Almonds. None.

Vines. 1 ha. growing between olives; numbers are decreasing.

Olives. There is a total of 402 olive trees on the farm, made up of 80 local, 150 Tunisian, 172 Italian. These cover 16 ha. (20 m. spacing). Over half the trees are immature (260). All olives are irrigated and there is no grafting. Irrigation gives much better yields.

Eucalypts. 1,200 trees already planted and there are no plans to increase this number.

5. Water Supply and Irrigation. The one well on the farm is 26 m. deep (first aquifer) and has a static water-level 18 metres below the surface. A 6 h.p. electric pump has been installed at the bottom of the 'avamposso' and has a capacity of 40-50 m3./hr., raising water at a cost of 2.5 milliemes per m3. The water level has dropped 8 metres in recent years. Gravity irrigation by canals is in use at the moment but the farmer would like to install sprinklers. Underground distribution pipes are 200 mm. in diameter and the total length of canals is 1,200 metres; the storage tank is 100 m3.

6. Future Farm Policy. To increase forage, groundnuts, olives and citrus.

7. Notes. Another farmer who thinks that olives can only give profitable yields if irrigated; like many other Italians on the Jefara he prefers to irrigate his Italian variety trees rather than graft Shemlali on to them. His future policy will mean that more water will be used on the farm and it is highly

probable that sprinkler irrigation will be installed.

FARM STUDY No. 29.

Angelo Ungaro. 55 ha. Demographic Italian. Azzara (Bianchi)
Holding No. 86. INPS

1. General Information. This INPS farm of 55 ha. was allotted in 1938. All the 30 ha. of the irrigable land were irrigated in 1958. 15 ha. lies fallow each year and there is a rotation of cereals, legumes, forage and groundnuts. 15. ha. of the area under olives is planted with herbacious crops such as cereals in the winter and groundnuts in the summer.

2. Winter Crops.

	1956/7 Irrigated	1957/8 Irrigated
Barley	5 ha.	10 ha.
Broad Beans	2 ha.	2 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts Local, Egisiana	10 ha.	10 ha.	2 ha.
Americano	-	-	10 ha.
Maize	-	1 ha.	1 ha.

Irrigation of Groundnuts. During a normal summer, as in 1958, 24 irrigations are given but in a Ghibli summer this will be increased to 28. Yields 18 qts./ha.

4. Tree Crops.

Citrus. 270 oranges, 1 lemon and 5 tangerines. 170 of the trees are still immature.

Almonds. None.

Vines. 1 ha. planted with olives. Numbers decreasing.

Olives. There are 215 local trees and 600 Italian trees covering 52.5 ha., 770 of the total being immature. Only the Italian trees are irrigated and there is no grafting.

Eucalypts. 1683 trees.

5. Water Supply and Irrigation. There are two wells on the farm about 32 m. deep and water is found 19 m. below the surface. The capacity of each well is 35-40 m3./hr. Water level has dropped 6 m. in recent years. Water costs per cubic metre are 2.8 mill. in the tank and 5 mills. in the sprinkler. There are two pumps of 5 h.p. each with capacities of 35-40 m3./hr.; they are sited in the 'avampozzo'. Low pressure sprinkler irrigation has been installed for 30 ha. The diameters of the

underground pipes are 150 and 125 mm. The tank holds 100 m3.

6. Future Farm Policy. To continue with groundnuts in the summer and wheat and forage in the winter. Olives and citrus will be the main tree crops.

7. Notes. This is a larger farm and its irrigated area alone is as big as many other farms in the Azzahra region. It would appear to be well balanced since it is of a reasonable size, has a fair acreage of cash crops, and yet still retains tree crops.

FARM STUDY No. 30.

Mario Ricci. 30 ha. Demographic Italian. Azzahra (Bianchi)
Holding No. 119. IRPS

1. General Information. This 30 ha. farm was started in 1938. In 1958 25 ha. were irrigated, i.e. just over 83% of the farm. 12 ha. of the irrigated land lie fallow for six months. The normal rotation is cereals, groundnuts and then forage. The farm has 12 ha. of intercropping, mainly groundnuts and olives.

2. Winter Crops. All irrigated. 5-6 irrigations during life-cycle.

	1956/7	1957/8
Wheat	1 ha.	1.5 ha.
Barley	8 ha.	8 ha.
Broad beans	1 ha.	1 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts.			
Tripoli 4	-	2 ha.	2 ha.
Tripoli 2 (Virginia)	4 ha.	10 ha.	10 ha.
Lucerne (Perennial crop)	1.5 ha.	2 ha.	2 ha.
Tomatoes	0.25 ha.	0.25 ha.	0.25 ha.

Irrigation of Groundnuts. 20 irrigations are given in a normal summer, as for instance in 1958; however, if the summer is very hot as a result of a high incidence of Ghibli winds then the number of irrigations is increased to 25. The amount of water which is given at each irrigation varies according to the method of irrigation; with the sprinkler system 520 m3. is given per ha., but with gravity irrigation along channels etc. 700 m3. Total amounts given in an average summer are therefore 10,400 m3./ha. using sprinklers and 14,000 m3. using canals. Yields of groundnuts ..... 18-20 qts. per ha.

4. Tree Crops.

Citrus. At the mbment there are 185 immature orange trees on the

farm, and in the next year or so the farmer intends to plant 200 more orange trees. Each tree is given 12 irrigations of a 100 litres per year (assuming a close spacing of 4 or 5 metres then something in the range of 40-60 cubic metres are given per ha. at each irrigation).

Almonds. 235 trees, all of the hard shelled variety and all immature.

Vines. 1 ha. with a thousand vines, all growing alone. There has been no diminution in numbers in recent years.

Olives. 576 trees altogether, made up of: 120 local, 150 Tunisian, 306 Italian. These trees cover 20 ha. (approx. 15-20 metre spacing). All the trees are irrigated and in addition to this Tunisian olives are being grafted on to Italian olives. The farmer suggests that the local and Italian olives should be irrigated, but that the Tunisian olive should be grown under dry conditions.

Eucalypts. 525 trees have been planted, but this number is not likely to be increased in the future.

5. Water Supply and Irrigation. There are two wells on the farm both about 37 metres deep, but in one the water is 18 m. down and in the other 22 m. The wells tap the first aquifer and have capacities of 20 and 30 m3./hr. Unfortunately the water level on this farm has dropped 8 metres in the last 6 years. Water costs about 3 milliemes per cubic metre when it is put on the land. Both the wells have 5 h.p. electric pumps positioned at the foot of the 'avampozzo'; one pump can raise 35-39 m3. in an hour and the other 20-30 m3. Most of the irrigation is by artificial rain (capable of irrigating 24.5 of the 25 ha. irrigated) but there are 300 m. of canals for gravity irrigation. The diameter of the underground pipes is 15 centimetres and sprinkler pipes 10.6 cms. The sprinkler system is a low pressure type of 1.4 atmosphere. A 100 m3. storage tank is available.

6. Future Farm Policy. The farmer hopes to increase the production of animal fodder and winter cereals and also to plant more olives, almonds and citrus at the expense of the groundnut acreage.

7. Notes. The groundnut acreage jumped from 4 ha. in 1956 to 12 ha. in 1957, but the farmer has now decided to reduce the area of land under this crop. Originally he used to irrigate by gravity flow along canals but like most farmers in the Bianchi region he has now switched to sprinkler irrigation. He is one of the few farmers who states that more water is needed when irrigating by means of canals and furrows etc., than when irrigating with sprinklers. Citrus is definitely on the increase.

FARM STUDY No. 31.

Facusso Calogero. Holding No. 125. 29.42 ha. Demographic Italian. INPS Azzahra (Bianchi)

1. General Information. This INPS farm of 29.42 ha. was allotted in 1938. 25 ha. are irrigable and 4.2 ha. are always under dry cultivation; in 1958 all the irrigable land was irrigated. 10 ha. lie fallow for a part of the year or the whole year, and there is a rotation of legumes, forage, groundnuts and cereals. 13 ha. of land have olives and almonds and interplantings of herbaceous plants such as groundnuts.

2. Winter Crops. All are irrigated.

	1956/7	1957/8
Wheat	1.5 ha.	1.25 ha.
Barley	6 ha.	3 ha.
Broad beans	1 ha.	1 ha.

3. Summer Crops.

Groundnuts	1956	1957	1958
Tripoli 2 (Egisiana)	-	0.5 ha.	4 ha.
Tripoli 2 (Virginia)	4 ha.	12 ha.	9 ha.
Lucerne (Perennial)	1 ha.	2 ha.	2.5 ha.

Irrigation of groundnuts. Normally 20-22 irrigations are given but up to 25 are thought necessary when there is a summer with a high incidence of Ghibli winds. In 1958, 22 irrigations of 630 m3. per ha. were given, a total of 13,860 m3. (by sprinkler). Yields are 18 qts./ha.

4. Tree Crops.

Citrus. 342 orange and 2 lemon trees are planted on flat and protected land; all are immature and the farmer intends to plant a further 200 trees in the future. Each tree is irrigated 12 times a year and receives 100 litres at each watering (1,200 litres).

Almonds. 180 hard shelled variety and immature trees.

Vines. 1 ha. of land is planted entirely to the vine. The number of vines is not declining.

Olives. There is a total of 531 immature trees on the farm; of these 130 are local and 401 Italian. All the olives are being irrigated and Tunisian olives are being grafted on to Italian olives. The farmer thinks all Italian olives should be irrigated and all local olives should be cultivated dry.

Eucalypts. 500 trees have been planted but no future plantings are anticipated.

Water Supply and Irrigation. There are two wells on the farm; they are both about 39 metres deep with the water of the second aquifer found 24 metres down. The capacities are 20 and 25 m3./hr. The water level has dropped 6 metres in the last 5 years. Water costs are 3 milliemes per cubic metre. At the base of each avamposzo is installed a 5 h.p. electric pump with a capacity of 25 m3./hr. Half of the farm can be irrigated by concrete canals of which there are 400 metres. Low pressure sprinklers are also available over 20 ha. of the farm.

6. Future Farm Policy. An expansion of citrus. No other information.

7. Notes. When the farms were established by INPS at Bianchi only enough citrus trees to supply home demands were planted. Many farmers, like this one, have been expanding the area of land under citrus during the last few years. Olives are being both irrigated and grafted.

FARM STUDIES. PART D. DEMOGRAPHIC ITALIAN

SECTION I. INPS

c. Ghanima (Corradini)

FARM STUDY No.32

Silvio Barison. Holding No. 8. — 84.13 ha. Demographic Italian. — Ghanima (Corradini)

1. General Information. This farm was started in 1939 by INPS and is now owned by the farmer. It is a larger demographic farm than those to the west. This is because it is largely under dry cultivation with only 2 ha. irrigable. In 1958 no land was in fact irrigated, the whole farm being under dry cultivation.

2. Winter Crops. All dry.

	1956/7	1957/8
Wheat	4 ha.	3 ha.
Barley	4 ha.	4 ha.

3. Summer Crops.

	1956	1957	1958
Groundnuts	0.2 ha.	0.2 ha.	-
Lucerne (Perennial crop)	0.02 ha.	-	-

Irrigation of groundnuts. Because of scarce water resources groundnuts are only irrigated 7-8 times during a normal year but this frequency is increased enormously in the summer if the summer is extraordinarily hot 20 - 25 times.

4. Tree Crops.

Citrus. One orange and two lemons, planted near the house, which are given 10-12 irrigations a year.

Almonds. There are 1,222 hard shelled variety trees of which 800 are immature.

Vines. Numbers are remaining stationary at 37,000 covering 23 ha.

Olives. There are 1,144 trees made up of 300 local varieties and 844 Italian; they cover 45 ha., on 4 ha. of which they are interplanted with the almond. 744 trees are immature. A 50% increase in yields is reported for the 30 olives which are irrigated. No grafting is being carried out.

Eucalypts. 959 general forestry trees have been planted but no increase in numbers is envisaged in the future.

5. Water Supply and Irrigation. In 1958 a well was used communally with holdings 7 and 9. This well is about 60 metres deep with the water 48 metres below the surface. A wind pump is used to raise the water and its capacity is 3-4 m3./hr.; the water level has not dropped in recent years. Irrigation is by gravity methods and there is 140 metres of canals which is used sometimes to water 0.2 ha. of land. Sprinkler irrigation is preferred if possible. A new well was under construction in August, 1958.

6. Future Farm Policy. Because of the scarcity of water the present tree crops will be retained.

7. Notes. In 1956 and 1957 small patches of groundnuts were cultivated but insufficient water was available for irrigation, and yields were very low. Dry cultivation will continue unless water can be raised cheaply by mechanical means. Note that even on a farm where underground water is scarce and the rainfall above 300 mms. irrigation of olives is being tried, although only on a very small scale.

FARM STUDY No. 33.

Nicolo Naselli. 52 ha. Demographic Italian. Ghanima (Corradini) Holding No. 33. INPS.

1. General Information. This 52 ha. farm was started in 1939 by INPS. The whole farm can be considered dry since in 1958 only 0.1 ha. were irrigated. 5 ha. of land lies fallow for the whole year.

2. Winter Crops. All dry.	1956/7	1957/8
Wheat	3 ha.	1 ha.
Barley	6 ha.	6 ha.

3. Summer Crops.

	1956.	1957	1958
Groundnuts	0.1 ha.	0.1 ha.	0.1 ha.

A few vegetables are grown for domestic use.

Irrigation of groundnuts. 10-12 irrigations in an average summer, 20 if there are a large number of Ghiblis, 12 in 1958. 500 m3. is given per hectare at each irrigation and yields are 10-12 qts.

4. Tree Crops.

Citrus. 11 oranges and 2 lemons are found near the house. Each tree is irrigated once a month with 6.5 m3.

Almonds. A total of 571 trees have been planted on this farm and 250 of these are not yet in full production. The total trees are made up of 70% hard and 30% soft shelled varieties.

Vines. Numbers are stable at 20,000 on 11 ha.

Olives. 773 trees are found on an area covering 36 ha.; however on 15 of these hectares olives are intermixed with almonds. 150 trees are immature and 200 trees are Italian varieties, 20 of them having been grafted with local varieties. There is no irrigation of olives.

Eucalypts. There are no trees on the farm as yet but the farmer may well plant some in the future.

5. Water Supply and Irrigation. One well has to be shared with holdings 34 and 36. It is 86 metres deep and the water lies 46 metres below the ground surface. The water is raised by wind-mill and submersible pump, with very small capacity not exceeding 3-4 m3./hr. With such small demands on the ground-water reserves there is no evidence of a cone of depletion developing. Irrigation water is distributed by canals and gravity flow.

6. Future Farm Policy. The farmer would like to install sprinkler irrigation but he realises that this is impossible under given conditions. He prefers tree crops, especially vines and olives. According to him, the almond does not find ideal climatic conditions in this area.

7. Notes. Olives, vines and winter cereals seem to be the chief crops.

FARM STUDY No. 34.

Masiero Giovani Battista. Holding No. 54. 89.4 ha. Demographic Italian INPS. Ghanima (Corradini)

1. General Information. INPS started this large farm in Nov. 1939 and it is now owned by the farmer. Like all the farms at Ghanima, this one only practises dryland cultivation, since although 2 ha.

are irrigable only 0.2 ha. was irrigated in 1958.

2. Winter Crops. All dry.

	1956/7	1957/8
Wheat	3 ha.	0.5 ha.
Barley	4 ha.	4 ha.
Broad beans	2 ha.	0.5 ha.

3. Summer Crops.

	1956.	1957	1958
Groundnuts.			
Tripoli 2 (Egiziana)	0.1 ha.	0.1 ha.	0.1 ha.

Vegetables, tomatoes and maize are grown in small quantities for domestic use.

Irrigation of groundnuts. 15-20 irrigations are given under average summer temperatures but this is increased to 25 in a year when Ghibli winds are frequent: in 1958 20 waterings were deemed necessary. The amount of water given each time seems high at 1,000 m3. Yields are 12-15 qts. per hectare.

4. Tree Crops.

Citrus. 3 lemons and 3 oranges round the farm-house for domestic use.

Almonds. A total of 1,023 hard shelled variety trees of which 923 are not yet in full production.

Vines. There are 22,000 vines on 22 hectares. Numbers have decreased on this holding.

Olives. There are 1,122 trees on the farm of which 200 are of the local variety and 922 Italian. Olives cover 45 ha. of the farm and there is no interplanting with the almond. 470 trees are still immature. No irrigation is practised but 50 Italian trees have been grafted with Tunisian varieties.

Eucalypts. With 670 trees on the farm plantings are complete.

5. Water Supply and Irrigation. The well has to be shared with Holding No. 58. It is 72 metres deep and has water 46 metres below the surface. The wind pump is the means of raising water 3-4 m3./hr. There is gravity irrigation along 100 metres of canal, sufficient to irrigate 0.1 ha. The diameter of the underground distribution piping is 100 millimetres.

6. Future Farm Policy. The farmer will continue with olives, almonds and vines. He would like to install sprinkler and go in for more irrigation, but he realises that this is impossible. Only a few vegetables are irrigated.

7. Notes. Yields of groundnuts at 12-15 qts./ha. are low, for farmers in the west usually obtain over 20 qts./ha. - low yields reflect insufficient application of water. This farmer has had 50

Italian olives grafted with a Tunisian variety.

FARM STUDIES. PART D. DEMOGRAPHIC ITALIAN.

SECTION II BARI

a. Jiuddaim (Oliveti)

FARM STUDY No. 35.

Guiseppe Nicolini. 44.38 ha. Demographic Italian. Jiuddaim (Oliveti)
Holding No. 41. BARI

1. General Information. This demographic farm is now owned by the farmer. 36 ha. are irrigable, but in 1958 only 15 ha. were in fact irrigated; there is thus about 30 ha. of dry cultivation. 10 ha. of the dry land lies fallow for all the year. There is a rotation on the irrigated land. Olives and vines are grown together.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	4 ha.	1 ha.	4 ha.	1 ha.
Barley	10 ha.	-	10 ha.	-
Broad beans (Autumn)	-	1 ha.	-	1 ha.
(Spring)	-	1 ha.	-	-
Potatoes	-	0.2 ha.	-	0.2 ha.

Yields of irrigated wheat are 4-5 times those of dry wheat.

3. Summer Crops.

	1956.	1957	1958
Groundnuts - Local White	4 ha.	4 ha.	4 ha.
Groundnuts-Virginia Bunch	-	1 ha.	2 ha.
Lucerne (Perennial crop)	0.3 ha.	0.3 ha.	0.3 ha.
Tomatoes	1.5 ha.	2.0 ha.	2.0 ha.

Some household vegetables.

Irrigation of Groundnuts. 16-18 irrigations under normal summer conditions, 18-20 if a hot summer; 1958 16 irrigations. 300-350 m3./ha. is given at each irrigation.

4. Tree Crops.

Citrus. 130 oranges and 20 lemons planted on 0.4 ha. This tree crop is usually irrigated 20 times a year with 400 m3./ha. per irrigation.

Almonds. 100 mature trees of the hard shelled variety.

Vines. 5 ha. Numbers decreasing.

Olives. 206 Italian trees and 400 local and Tunisian covering 39 ha., although in part growing with vines. Many of the Italian olives are being irrigated and some which are being retained under dry cultivation are being grafted with Tunisian varieties. The Tunisian olive is recommended both for dry and irrigated cultivation.

Eucalypts. A few have already been planted but future plantings are not envisaged.

5. Water Supply and Irrigation. There is one well with an avamponzo of 25 metres and a trivellazioni of 20 metres. The water-table is 26 metres below the surface at present and has dropped in recent years. The well's capacity is 30 m3./hr. and the 5½ h.p. electric pump in the avamponzo can pump 26 m3./hr. Low pressure sprinkler irrigation is available for 15 ha. and there is a 100 m3. storage tank. The diameter of the distribution pipes is 100 mms.

6. Future Farm Policy. No details.

7. Notes. Like many other farms, this one has a falling water-level in its well.

FARM STUDY No. 36.

Alfonso Laudadio. Holding No. 13. 27.95 Demographic Italian. MATA Giuffrain (Olivetti)

1. General Information. The farmer now owns this holding and he considers that 25 ha. are irrigable, although in 1958 he only irrigated 15 ha. Olives and vines are grown together.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	-	2 ha.	-	2 ha.
Barley	9 ha.	1 ha.	9 ha.	1 ha.
Beans - Autumn	-	1 ha.	-	1 ha.
Spring	-	1 ha.	-	1 ha.

No potatoes.

Irrigated wheat yields 4-5 times dry cultivated wheat.

A few vegetables are grown.

3. Summer Crops.

	1956	1957	1958
Groundnuts	3 ha.	5 ha.	4 ha.
Lucerne (Peremnial crop)	0.3 ha.	0.3 ha.	0.3 ha.
Tomatoes	1 ha.	2 ha.	1.5 ha.

Irrigation of Groundnuts. 16-18 irrigations in normal year; 18-20 in ghibli year; 16 in 1958. 350 m3. is given to each hectare at each irrigation, making a total of 5,600 m3./ha.

4. Tree Crops.

Citrus. None.

Almonds. 50 hard shelled variety trees.

Vines. 4 ha. and numbers are declining.

Olives. A total of 380 trees, made up of 180 Italian, 200 local, covering 19 ha. and some growing with vines. Olives are irrigated whenever possible and those Italian olives remaining under dry cultivation are being grafted with Tunisian olives. Tunisian and local olives are preferred both for irrigated and dry cultivation.

Eucalypts. Some have been planted but no more in the future.

5. Water Supply and Irrigation. One well with evampozzo of 29 metres, trivellazioni of 20 metres. The water-table is 31 metres below the surface, lower than what it used to be. A 7 h.p. electric pump has been installed at the bottom of the evampozzo and is capable of raising 29 m3./hr. at a cost of 3-3.4 milliemes per cubic metre. There is a storage tank of 100 m3. and sprinkler irrigation for 15 ha.

6. Future Farm Policy. No information given.

7. Notes. Wheat is only grown under irrigation; the groundnut acreage is small and has fallen slightly. Italian olives are either being irrigated or grafted.

FARM STUDY No. 37.

Bruno Serafino. Holding No. 14. 24.19 ha. Demographic Italian. MATE. Miuddein (Olivetti)

1. General Information. This farm is now owned by the farmer. 20 ha. are irrigable but in 1958 only 12 ha. were in fact irrigated. The only intercropping is that of olives with vines.

2. Winter Crops.	1956/7	1957/8
Wheat	1 ha. irrigated	1 ha. irrigated
Barley	8 ha. dry	8 ha. dry
Broad beans (Autumn)	1 ha. irrigated	1 ha. irrigated
(Spring)	1 ha. irrigated	1 ha. irrigated
Potatoes	0.2 ha. irrigated	0.2 ha. irrigated

Wheat yield. 4-5 times greater if the crop is irrigated.

3. Summer Crops.

	1956	1957	1958
Groundnuts (Trip. 2)	4 ha.	4 ha.	4 ha.
Lucerne (Perennial crop)	0.25 ha.	0.25 ha.	0.25 ha.
Tomatoes	1 ha.	1½ ha.	2 ha.

Irrigation of Groundnuts. 16-18 irrigations under normal summer conditions, but 18-20 if there is a high incidence of Ghiblis. In 1958 there were only 15 irrigations. Each irrigation is 350 m3./ha.

4. Tree Crops.

Citrus. 75 oranges and 25 lemons planted on ¼ ha.; these are irrigated 20 times a year with 400 m3./ha. at each irrigation.

Almonds. None.

Vines. 3½ ha. with numbers decreasing.

Olives. A total of 329 trees, made up of 150 Italian and 179 local or Tunisian. The trees cover 20.7 ha. of the farm and they are irrigated whenever possible since yields are more regular and abundant with irrigation. There is no grafting.

Eucalypts. A few have been planted but no increase in numbers is envisaged.

5. Water Supply and Irrigation. One well with an evamposzo of 28 metres and trivellazioni of 21 metres. The water-table is 30 metres below the surface; this has dropped in recent years. Water is raised at a cost of 3.5-4 milliemes per m3. by a 7 h.p. electric pump which is located in the evamposzo and has a capacity of 29 m3./hr. There is a storage tank of 100 m3. and sprinkler irrigation for 12 ha. Diameter of distribution pipes is 100 mms.

6. Future Farm Policy. No information given.

7. Notes. Groundnut acreage steady; only a small number of citrus trees.

FARM STUDIES. PART D. DEMOGRAPHIC ITALIAN

SECTION II MUTE

b. Fonduk Et-Togar

FARM STUDY No. 38.

Giuseppe Amato. 30.16 ha. Demographic Italian. Fonduk Et-Togar
Holding No. 11. MOTS

1. General Information. Like all the other farms on the Fonduk settlement scheme this one is now owned by the farmer. He considers that 25 ha. of land could be irrigated, but in 1958 only 2 ha. was in fact irrigated. 28 ha. can be considered as under dry cultivation each year. Tree crops are interplanted - olives with almonds, and olives with vines.

2. Winter Crops.

	1956/7	1957/8
Wheat	5 ha. dry	5 ha. dry
Barley	5 ha. dry	5 ha. dry
Broad beans (Autumn)	0.5 irrigated	0.5 irrigated
(Spring)	0.5 irrigated	0.5 irrigated

No potatoes.

3. Summer Crops.

	1956	1957	1958
No Groundnuts.			
Lucerne (Perennial crop)	0.2 ha.	0.2 ha.	0.2 ha.
Tomatoes	0.5 ha.	0.5 ha.	0.5 ha.

Other crops are artichokes and vegetables.

4. Tree Crops.

Citrus. 55 oranges and 5 lemons recently planted, with 45 trees already bearing fruit. The farmer hopes to plant more trees in the future.

Almonds. 1,050 mature trees composed of two thirds hard shelled variety and one third soft shelled variety.

Vines. 5 ha. with numbers declining.

Olives. 1,072 local and Tunisian trees interplanted with almonds and vines on 27.5 ha. of land. 50 olive trees are irrigated.

Eucalypts. There are a few trees already on the farm but it is intended that more should be planted in the future.

5. Water Supply and Irrigation. There is one well, with an avamposzo of 20 metres and a trivellazioni of 15 metres. Water is found at 22 metres below the surface and the well in fact taps the first and second aquifers. The well has a capacity of 25 m3./hr., but the wind pump installed is only capable of raising 5 m3./hr. Water on the land cost about 5 milliemes a cubic metre. Irrigation is by canals and 'jedawl' and there is a storage tank of 100 m3.

6. Future Farm Policy. The farmer wants to install an electric pump so that he can introduce sprinkler irrigation for 10-15 ha. Number of citrus will be increased.

7. Notes. Only a small part of the farm is under plant crops in the summer because of the scarcity of water. The wind-pump is inadequate.

FARM STUDY No. 39.

Salvatore Riccobene. 24.92 ha. Demographic Italian. Fonduk Holding No. 12. [illegible] Et-Tozar

1. General Information. The farm is now owned by the farmer. 20 ha. of the farm could be irrigated but in 1958 only 12 ha. were in fact irrigated. There is intercropping of olives with vines, and olives with almonds.

2. Winter Crops.

	1956/7		1957/8	
	Dry	Irrigated	Dry	Irrigated
Wheat	-	1 ha.	-	1 ha.
Barley	4 ha.	-	5 ha.	-
Broad beans (Autumn)	-	1.5 ha.	-	1.5 ha.
(Spring)	-	1 ha.	-	-

No potatoes.

Yields of irrigated wheat are five times as great as yields of dry wheat.

3. Summer Crops.

	1956	1957	1958
Groundnuts			
Local White	3 ha.	3 ha.	3 ha.
Tripoli 4	-	1 ha.	1 ha.
Virginia Bunch	-	-	1 ha.
Lucerne (Perennial crop)	0.25 ha.	0.25 ha.	0.25 ha.
Tomatoes	1 ha.	1.5 ha.	1.5 ha.

Other crops are asparagus, artichokes, various vegetables - carrots and onions.

Irrigation of Groundnuts. During an average summer 15-18 irrigations are given but if there is a high incidence of ghiblis then 18-20; in 1958 16 irrigations were given. The amount of water given per irrigation is 300-350 m3./ha. Average yields are 24 qts./ha.

4. Tree Crops.

Citrus. There are 52 mature trees and 220 young trees covering 2 ha. Two of the trees are lemons and the rest are oranges. Citrus are given 22 irrigations of 400 m3./ha. per irrigation - total amount 8,900 m3./ha.

Almonds. 250 mature trees.

Vines. 6 ha. with numbers declining.

Olives. 400 local and Tunisian trees and 200 Italian covering 19 ha.; 9 ha. of this area have olives growing with almonds. Whenever possible the olives are irrigated because yields are more regular and abundant. Tunisian variety is preferred.

Eucalypts. There are a few trees on the farm and planting is now complete.

5. Water Supply and Irrigation. One well with avampozzo 20 metres and trivellazioni 20 metres. The water-table is 21 metres below the surface. Well taps first and second aquifers; water level has dropped in recent years. A 5.5 h.p. electric pump has been installed and this raises 28 m3./hr. at a cost of 2.5-3 milliemes per cubic metre. There is a 100 m3. storage tank and low pressure sprinkler irrigation is in use.

6. Future Farm Policy. Expand irrigation.

7. Notes. The wind-pump has been replaced by an electric pump and now 6 ha. of irrigated summer crops can be grown.

FARM STUDY No. 40.

Francesco D'aguanno. 60.8 ha. Demographic Italian. Fonduk Holding No. 18. MATR Et-Togar.

1. General Information. Owned by the farmer, this farm has 30 ha. of land that could be irrigated but in 1958 only 2.5 ha. were in fact irrigated. 50% of the land is always under dry cultivation; about 10 ha. of total land lie fallow each year. 50 ha. of land are intercropped with olives and

almonds and olives and vines.

2. Winter Crops.

	1956/7	1957/8
Wheat	10 ha. dry	10 ha. dry
Barley	10 ha. dry	10 ha. dry
Broad beans (Autumn sown)	0.5 ha. irrigated	0.5 ha. irrigated
(Spring sown)	0.5 ha. irrigated	0.5 ha. irrigated

No potatoes but a few vegetables.

3. Summer Crops.

	1956	1957	1958
No groundnuts			
Lucerne (Perennial crop)	0.2 ha.	0.2 ha.	0.2 ha.
Tomatoes	0.5 ha.	0.5 ha.	0.5 ha.

No maize or tobacco.

4. Tree Crops.

Citrus. 233 mature trees and 454 not yet producing. 25 lemons and the rest oranges. 22 irrigations are given a year with 400 m3./ha. per irrigation = total = 8,800 m3./ha.

Almonds. 1,850 trees, one third soft shelled variety and two thirds hard shelled variety. All trees are in full production.

Vines. 9 ha. and numbers are decreasing.

Olives. 1,856 mature trees, all of local or Tunisian variety and interplanted on 47 ha. Tunisian olives are preferred.

Eucalypts. There are a few trees on the farm but no more will be planted in the future.

5. Water Supply and Irrigation. There is one well with a 20 metre 'svempozzo' and 18 metres trivellazioni. The water-table is 22 metres from the surface and has dropped slightly in recent years. The well has a capacity of 30 m3./hr., but the wind pump is only capable of raising 5 m3./hr. Water is put on the land at a cost of approx. 4 milliemes per m3. Water is distributed by canals and 'jedula'. There is a storage tank of 100 m3.

6. Future Farm Policy. To install an electric pump in the

well and buy sprinkler equipment in order to irrigate 12-15 ha.

7. Notes. This farmer will very shortly replace his wind pump with an electric pump. At the moment the small amount of water lifted is barely sufficient to supply the needs of the mature citrus trees, without taking into account his recent plantings of 454 young trees. On most Italian farms, except at Ghanima, the number of vines is declining.

FARM STUDIES. PART E. SAHIYA FARMS

SECTION I. PRIVATE

FARM STUDY No. 41.

Abdu Assalam. 1.5 ha. Fashlum Aren - Tripoli

1. General Information. This farm lies in Tripoli just South of the Del Mehari Hotel. It is owned by the Buru and Khoja family and was at one time let to an Italian but now a Libyan, Abdu Assalam, rents it at a payment of £163 a year. The farm is 12 jiebia i.e. 1.5 ha.; it is consolidated and all of it is irrigable. Trees are numerous and are found closely spaced over the whole of the farm.

Fallow, Rotation and fertilizers. During the 1958 summer 2 jiebia lay fallow i.e. one sixth of the farm and in the winter 1958/9 4 jiebia i.e. one third of the farm. Rotation is for 2½ years; lucerne the first summer, then perhaps wheat the following winter, then tobacco or peanuts and in the second winter a lighter crop such as vegetables. Manure is applied, organic first then chemical.

2. Winter Crops.

Wheat. 1956/7 2 jiebia, 1957/8 2 jiebia. No barley is grown. All wheat is irrigated; in the period November to the end of January 1-2 irrigations, February and March once a week. 100 m3. per irrigation.

Onions. Only a quarter of a jiebia in 1958.

Broad beans. The farm is too small to grow this crop.

Potatoes. Autumn sown (6 months growing) 1 jiebia. Same irrigation as wheat.
Spring sown (3 months growing) 1 jiebia.

3. Summer Crops.

Groundnuts. One jiebia of Valencia type groundnuts is grown

each year and the 1958 crop had already been lifted at the time of the visit (August 1958). Groundnuts are irrigated every 15 days when young and every 10 days as the plant becomes bigger. At each irrigation every jisbis receives about 100 m3. i.e. 10 hours pumping (tank plus 55 m3.). For his groundnuts the farmer was obtaining anything from 7-12 piastres per kg. (although generally 10-12 piastres per kg.) on the local markets.

Tobacco. No tobacco in 1958 but 2 jisbis were grown in 1957. This plant needs irrigating each week when small and then twice a week as it grows bigger.

Maize. Does not exceed ½ a jisbis each year and is only for home consumption.

Tomatoes. One jisbis approx. is grown each year.

Lucerne. Quite an important crop since it supplies fodder for the animals on the farm. Lucerne is irrigated every four days and is given 200 mc. per jisbis at each irrigation. Lucerne must be given fertilizer.

Time of irrigation. Generally 7-10 a.m. for all crops with flowers like pepper, tomatoes, groundnuts, tobacco. In the morning the ground is cold, therefore the crop does not receive such a shock when it is given cold water.

4. Tree Crops.

Date Palms. 80 trees, varieties are Hamury, Ba'udi, Ta'buni and there is one Khurra. Each tree yields 1.5-2 matar.

Olive. There are 40 trees on the farm and all of them are local varieties, Induri and Laghiani. The olives are irrigated incidentally when the crops beneath them are irrigated, however if there are no crops growing then the trees themselves are directly irrigated. Irrigation starts at the end of Spring and continues through the summer. Each olive tree yields 40-50 matar (600-750 kgs.). One matar of olives will give two litres of oil.

Pomegranate. 15 trees.

Apricots. 4 trees.

Figs. 2 trees.

Vines. Two table vines which together yield 50 kgs. of fruit a year.

5. Water Supply and Irrigation. There is one well on the farm

which is 18 metres deep and has 1.5 metres of water in the bottom of it. Water is raised by a 2 h.p. centrifugal pump which is situated just above the water and can raise 11 m3./hr. The storage tank holds 45 m3. of water. In summer there is pumping every day for 8 hours, 6 a.m. - 2 p.m. (88 m3.). The pump is only used during dry spells in winter and on average only 10 m3. is used every day in contrast to the 80 m3. used every day in the summer. Irrigation is by gravity flow via earth channels and jedula.

6. Future Farm Policy. Little change.

7. Notes. Farm seems to be fully utilised throughout the year and plant crops and trees are grown very close together. The total amount of water used for irrigation is small, but the amount on a per hectare basis is large.

FARM STUDY No. 42.

El Cantari Ben Ali Esh-Sharif. 2 ha. Suq el Jiuma Cabila El Harat Mashauna.

1. General Information. This is a typical 'senyah', small garden farm, the whole area of which is irrigable. There is no cabila land used by the farmer and he practises no rotation. There is a considerable amount of interplanting of herbaceous crops between trees.

2. Winter Crops. 1957/8

Wheat	1,000 sq. metres, irrigated
Barley	1,000 sq. metres, irrigated
Beans	1,000 sq. metres, irrigated
Potatoes	1,000 sq. metres, irrigated

3. Summer Crops.

	1956	1957	1958
Groundnuts	-	-	1,000
Maize	500 sq. m.	600 sq. m.	500 sq. m.
Tomatoes	500 sq. m.	600 sq. m.	500 sq. m.
Pepper	1,000 sq. m.	1,000 sq. m.	1,000 sq. m.

Tobacco - the farmer is allowed 2,500 sq. metres by the State Tobacco Monopoly but in 1958 he did not grow any.

4. Tree Crops.

Citrus. 200 productive trees cover 2,500 sq. m. 12 of the trees are tangerines.

Almonds. None.

Olives. 40 trees scattered around the farm.

Figs. 4 trees.

Castor. None.

Eucalypts. None.

5. Water Supply and Irrigation. There is one well which is 7 metres deep and has the water-table at 3 metres below the surface. A diesel pump of 2½ h.p. has been fitted inside the well. Water is distributed by canals.

6. Future Farm Policy. ?

7. Notes. All plant crops grown are irrigated. The farmer has abandoned the 'dalu' in favour of a diesel pump.

FARM STUDY No. 43.

Abdul Hafid Sherrif. 1½ ha. Suq el Jiumaa Cabila Ma-Sawelem.

1. General Information. One hectare of land is irrigated and ½ ha. lies fallow for the whole of the year. There is rotation but no details are given. Herbaceous crops are grown between the trees.

2. Winter Crops.	1956/7	1957/8
Wheat	½ ha. dry	500 sq. metres
Barley	½ ha. dry	?
Broad Beans	?	?
Potatoes	1,000 sq. metres	?

3. Summer Crops.	1956	1957	1958
Groundnuts (Trip. 4)	-	1,000 sq. m.	1,000 sq. m.
Maize	500 sq. m.	500 sq. m.	1,000 sq. m.
Tomatoes	200 sq. m.	357 sq. m.	558 sq. m.

No tobacco.

4. Tree Crops.

Citrus. 100 mature trees covering 600 sq. metres of land.

Almonds. None.

Olives. 25 trees of all types of varieties scattered throughout the farm.

Castor. None.

5. Water Supply and Irrigation. The well is 8 metres deep, but the water is only 2 metres below the surface. Water is lifted by a cow raising a 'dalu' and is distributed by earth canals and 'jedawl'.

6. Future Farm Policy. ?

7. Notes. Groundnuts were introduced as a result of the good market conditions in 1956. Little more than 3,000 sq. metres are being irrigated in the summer, emphasizing the limitations of the 'dalu'.

FARM STUDY No. 44.

Il Hadi Ben Sada. 1-1½ ha. Suani Ben Adem

1. General Information. The farm lies just to the east of the back road from Suani to Tripoli near Ben-Negila and between the railway line and sand dunes. The size of the farm is about 10,000 jedula.

2 & 3. Winter and Summer Crops.

Crops, 1957. The cultivated area will be expanded next year.

Barley. 5,000 jedula.

Groundnuts. 2,000 jedula.

Tomatoes. 200 jedula.

Tobacco. 1,000 jedula.

Beans. 500 jedula. (For human consumption)

Onions. 200 jedula.

Total land under crops 8,900 jedula.

Barley. If the weather is dry then this crop is watered for 10 hours. Assuming other crops are not irrigated at the

same time this means 300 m3. at each watering. This would cost about £L1. 15 kg. of seed are applied per 1,000 jedula. The yield for the 5,000 jedula is 30 qts. giving 6 qts. per 1,000 jedula. (1:40 ratio)

Groundnuts. The 2,000 jedula of groundnuts are watered for 15 hours, i.e. 450 m3. at a cost of £L1.5. For 2 qts. sown 60 qts. are harvested. £L8 is received for a quintel (£L480).

Beans. This is a winter crop. If there is no rain the 500 jedula of beans are watered for 10 hours being given 300 m3. of water at a cost of roughly one Libyan pound. For one quintal sown there is a harvest of 20 qts.

Tobacco. A very small amount of seed is needed. The 1,000 jedula of tobacco give a yield of 50 qts. This crop needs 20 hours of watering at each irrigation i.e. 600 m3. at a cost of £L2. Tobacco is given more water per irrigation than any other crop.

Tomatoes. The 200 jedula are irrigated for 3 hours and given 60 m3. of water at a cost of 30 piastres.

Onions. The 200 jedula are irrigated the same as tomatoes.

Other crops, such as vegetables and pepper, are grown in small quantities.

4. Tree Crops. The trees are three year old olives scattered among the 'jedula' - incidental watering.

5. Water Supply and Irrigation. In the middle of the farm there is a well with water about 13 metres down tapping the first aquifer. A petrol pump has been installed (8 h.p.) with a capacity of 30 m3./hr. It cost about £L1 to run for 10 hours and it therefore costs about 3.5 milliemes to bring one m3. to the surface. Water is distributed first of all by an underground metal pipe. This then feeds into concrete canals (these precast canals cost 10 piastres a metre) size - 6.5" wide and 5" deep with a semi-circular cross-section. Water is lead from these canals into 'jedawl' with some wastage due to percolation. The 'jedawl' on this farm vary in size but generally speaking they are rectangular 1 x 2 m. with an area of 1.5-2 sq. m. The whole of the farm is some 10,000 jedula so its size can be estimated in the range of one to one and a half hectares.

6. Future Farm Policy. The cultivated area will be expanded next year.

7. Notes. A new Saniya farm in the Dune Jetara.

FARM STUDIES. PART E. SANIYA FARMS

SECTION II. DEMOGRAPHIC

FARM STUDY No. 45.

Sa'ad Yussef Azzabi. Demographic Libyan 4 ha. Mansoura Holding No. 35.

1. General Information. This is a small farm of only four hectares and was started by the Nazarat of Agriculture. Two ha. are irrigated and two dry. One hectare of land lies fallow for six months; there is no rotation and crops are grown intermingled with trees.

2. Winter Crops. In the years 1956/7 and 1957/8 dry and irrigated wheat, barley and beans were grown; all the potatoes grown in the same period were irrigated.

3. Summer Crops.

	1956	1957	1958
Italian Groundnuts	2⅔ ha.	2⅔ ha.	2⅔ ha.
Local or American groundnuts	2⅔ ha.	2⅔ ha.	2⅔ ha.
Maize	.25 ha.	.25 ha.	.25 ha.
Tomatoes	.2 ha.	.2 ha.	.2 ha.
Pepper	.66 ha.	.66 ha.	.66 ha.

Irrigation of Groundnuts. Irrigated every eight days.

4. Tree Crops.

Citrus. A total of 30 mature and 200 immature trees cover 166 ha.

Almonds. None.

Olives. There are 300 trees covering 2.66 ha.; 200 olives are immature.

5. Water Supply and Irrigation. There is one well 8 metres deep with the water-table 7 metres below the surface (first aquifer). Near the bottom of the well there is an electric pump of 1.25 h.p. Irrigation is by channel and jedula.

6. Future Farm Policy.

7. Notes. Small farm(with half the land irrigable), may well

become more numerous in the future. None of them rely on one crop alone.

FARM STUDY No. 46.

Maaduf el Wahishi. Demographic Libyan ½ ha. Maamoura Holding No. 70.

1. General Information. A four hectare farm typical of this settlement scheme; 2 ha. are irrigated each year, one ha. is dry and one lies fallow.

2. Winter Crops. Wheat, barley, beans and potatoes are grown but no details are given.

3. Summer Crops.

	1956	1957	1958
Italian groundnuts	0.5 ha.	2.0 ha.	1.0 ha.
American or local groundnuts	1.0 ha.	0.5 ha.	?
Tomatoes	0.5 ha.	0.5 ha.	0.5 ha.
Lucerne (Perennial)	0.5 ha.	0.5 ha.	0.5 ha.

Irrigation of Groundnuts. Once every eight days.

4. Tree Crops.

Citrus. 150 trees spread over .5 ha.; 50 are immature.

Almonds. None.

Olives. 300 trees spread over 1.5 ha.; 100 trees being immature.

Figs. Five trees.

5. Water Supply and Irrigation. One well 10 metres deep with its water 8 metres below the surface. A 1.8 h.p. electric pump is installed at the bottom of the well. All irrigation is through canals into 'jedawl'.

6. Future Farm Policy.

7. Notes. A slightly larger pump is needed on this farm because the water is 2 metre deeper than on the previous farm. All the farms at Maamoura have electric pumps.

Appendix IVa

Temperatures in degrees F.

Station	Months	Daily Mean	Mean of monthly Max.	Min.	Absolute Highest	Lowest recorded
Tripoli (Mean for the year is 67°F. Period 1879-1936 (11 p.26).						
	Sept.	78	98	65	109	61
	Oct.	73	93	59	102	53
	Nov.	65	84	50	95	42
	Dec.	54	72	43	79	39
	Jan.	54	68	40	79	35
	Feb.	55	75	43	90	37
	Mar.	60	83	44	95	40
	Apr.	65	93	49	104	45
	May	68	95	54	104	49
	June	74	101	61	109	57
	July	78	98	66	109	62
	Aug.	79	97	68	106	64
Idris Airport (Mean for the year 66°F. Period 1924-1946 (11 p.27).						
	Sept.	79	108	58	121	49
	Oct.	73	103	51	109	44
	Nov.	64	90	44	107	38
	Dec.	55	76	37	85	32
	Jan.	53	75	35	84	25
	Feb.	55	82	36	93	32
	Mar.	60	91	37	113	34
	Apr.	67	103	42	113	35
	May	73	109	46	119	39
	June	79	111	54	121	45
	July	82	114	57	124	54
	Aug.	82	113	60	125	54
Azizia (Mean for the year 70°F. Period 1923-36 (11 p.28).						
	Sept.	83	111	59	121	53
	Oct.	75	103	52	115	47
	Nov.	65	90	45	98	40
	Dec.	55	77	39	83	32
	Jan.	53	74	37	85	33
	Feb.	55	82	37	91	33
	Mar.	61	94	39	112	34
	Apr.	69	105	45	117	42
	May	73	109	50	121	45
	June	81	116	58	125	55
	July	84	114	62	119	55
	Aug.	85	114	61	128	51

Station	Months	Daily Mean	Mean of Monthly Max.	Min.	Absolute Highest	Lowest recorded
Zuara (Mean for the year 66.92°F. 16 year period. (16).						
	Sept.	77.72	85.64	69.8	114.44	50.0
	Oct.	72.68	81.5	63.86	106.26	39.2
	Nov.	64.22	73.5	54.86	92.48	42.44
	Dec.	55.76	65.66	45.86	84.2	32.36
	Jan.	52.52	60.62	44.24	81.68	32.18
	Feb.	55.76	64.4	46.94	91.4	34.16
	Mar.	59.54	68.0	51.08	99.68	36.14
	Apr.	64.4	74.12	55.04	107.7	39.02
	May	68.36	76.46	65.48	109.04	44.6
	June	74.3	82.22	66.63	119.3	44.6
	July	78.62	87.26	69.98	116.6	50.18
	Aug.	79.7	87.26	72.14	114.8	50.0
El Motia (Mean for the year 69.37°F. 11 year period.						
	Sept.	80.6				
	Oct.	71.78				
	Nov.	62.6				
	Dec.	54.5				
	Jan.	51.98				
	Feb.	63.68				
	Mar.	60.08				
	Apr.	67.82				
	May	72.4				
	June	80.96				
	July	83.3				
	Aug.	82.76				
Garabulli (Mean for the year 69.04°F. 6 year period.						
	Sept.	77.9				
	Oct.	74.3				
	Nov.	65.48				
	Dec.	55.94				
	Jan.	55.4				
	Feb.	59.54				
	Mar.	62.06				
	Apr.	67.28				
	May	70.7				
	June	78.08				
	July	80.78				
	Aug.	80.96				

Appendix IVb

Rainfall in millimetres for Tripoli - Agricultural Years.

Note: Figures taken from Pantoli and Files at Libyan Meteorological Service: Calendar years converted to Agricultural years.

	Sept	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Year
1879-80	8.2	30.8	61.8	169.6	67.7	107.0	33.7	24.1	2.5	0.0	0.0	0.0	505.4
1880-81	26.0	77.0	23.2	123.5	5.0	47.0	7.5	0.0	14.5	1.5	0.0	0.0	325.2
1881-82	1.0	50.0	31.5	137.5	92.3	79.0	38.0	9.1	0.0	2.0	0.0	0.0	440.4
1882-83	1.5	24.0	53.1	82.8	74.1	34.5	16.7	4.4	2.3	0.0	0.0	0.0	359.4
1883-84	11.0	48.0	86.0	80.0	94.0	8.0	16.0	0.0	7.0	15.0	5.0	4.0	374.0
1884-85	0.0	79.5	201.0	128.0	77.0	16.0	24.5	4.0	0.0	0.0	0.0	0.0	530.0
1885-86	1.5	24.0	53.1	82.8	74.1	21.6	4.0	0.0	2.0	0.0	0.0	0.0	309.3
1886-87	38.0	0.0	4.0	108.0	51.3	23.3	4.5	0.0	0.1	0.0	0.0	0.0	284.6
1887-88	0.0	112.5	3.0	1.0	118.0	10.0	23.5	0.0	0.5	0.0	0.0	0.0	268.5
1888-89	1.5	128.0	66.5	4.5	20.0	31.0	18.0	0.0	4.0	0.0	0.0	0.0	273.5
1889-90	0.5	0.0	71.0	117.0	74.1	34.5	16.7	4.4	2.3	0.0	0.0	0.0	344.2
1890-91	1.5	24.0	53.1	82.8	74.1	34.5	16.7	4.4	2.3	0.0	0.0	0.0	375.9
1891-92	1.5	24.0	53.1	82.8	21.1	13.6	0.5	16.5	14.8	0.7	0.0	0.0	383.1
1892-93	8.8	27.2	160.6	34.0	138.3	71.2	46.4	14.8	0.3	0.0	0.0	0.0	501.6
1893-94	0.0	84.5	41.5	217.2	204.8	55.5	25.9	3.7	0.0	0.0	0.0	0.0	633.1
1894-95	0.0	0.0	90.7	377.7	21.5	11.0	9.0	4.0	1.6	0.0	0.0	0.0	515.5
1895-96	2.4	11.3	22.3	129.9	180.3	41.9	52.7	36.9	7.9	0.0	0.0	0.0	485.6
1896-97	0.0	10.3	30.5	109.8	4.6	161.9	4.8	81.2	10.5	0.0	4.5	0.0	418.1
1897-98	1.3	54.8	45.8	154.5	21.6	63.3	23.7	8.0	1.2	0.0	2.0	0.0	396.5
1898-99	12.3	196.1	24.0	266.7	75.1	20.6	36.4	3.6	6.8	12.4	0.0	0.0	654.0
1899-1900	0.0	15.2	233.1	55.7	82.8	5.2	9.6	34.2	0.0	0.0	0.0	0.0	435.8
1900-01	1.4	19.3	9.6	110.8	144.3	18.2	16.7	2.5	22.3	0.0	0.0	0.0	345.1
1901-02	0.0	52.0	29.5	13.3	100.0	13.0	47.0	0.0	22.0	0.0	0.0	0.0	276.8
1902-03	0.0	37.5	10.5	76.0	63.0	44.5	24.0	6.6	0.0	0.0	0.0	0.0	262.1
1903-04	7.5	10.0	12.5	82.8	114.0	137.7	27.9	0.0	0.0	0.0	0.0	3.0	395.4
1904-05	53.7	81.4	63.1	91.3	74.1	55.8	8.1	6.5	34.0	0.0	3.5	0.0	471.5
1905-06	0.0	26.7	16.8	155.0	60.7	54.0	0.2	1.5	10.3	1.0	0.0	1.5	327.7
1906-07	93.5	27.7	189.8	82.8	153.7	33.6	19.3	38.3	1.5	0.0	0.0	0.0	640.2
1907-08	9.0	46.3	12.5	10.3	26.5	34.5	59.2	2.0	0.0	5.5	0.0	0.0	201.5
1908-09	0.0	7.0	40.0	88.2	114.2	20.4	11.2	7.5	6.6	0.0	0.0	28.1	323.2
1909-10	0.0	35.0	89.6	17.8	125.5	161.1	5.2	0.5	3.2	0.0	0.0	0.0	437.9
1910-11	28.4	0.0	1.3	54.0	117.8	42.8	41.5	26.5	0.0	1.0	2.5	0.0	315.8
1911-12	0.0	24.0	57.1	82.8	94.9	1.0	2.2	18.1	0.5	3.4	0.0	0.0	322.5
1912-13	22.3	1.7	165.6	100.8	43.2	85.0	19.7	1.0	8.2	0.0	0.0	0.0	447.5
1913-14	0.0	87.8	61.0	63.2	37.3	32.4	7.1	3.8	0.3	0.0	0.0	0.0	292.9
1914-15	0.0	10.5	79.7	27.0	24.8	33.0	16.6	6.2	3.1	4.0	0.0	0.0	204.9
1915-16	12.3	32.0	6.4	27.7	72.0	39.2	2.5	4.0	10.1	0.2	0.0	0.4	206.8
1916-17	0.1	2.7	60.7	28.1	44.8	73.0	3.9	2.7	0.0	4.8	0.0	0.0	220.8
1917-18	0.0	20.3	293.7	14.0	7.1	36.0	90.1	6.5	1.4	0.6	0.3	0.0	470.0
1918-19	1.1	63.5	51.3	131.1	123.6	26.9	32.9	6.2	23.8	1.3	0.6	3.6	465.9
1919-20	1.3	44.8	45.3	109.2	29.2	68.5	11.9	0.0	2.3	1.4	0.0	1.0	314.9
1920-21	13.4	94.6	142.8	63.8	134.8	5.3	58.0	27.5	12.4	0.2	0.0	0.0	552.8
1921-22	8.7	24.6	103.0	206.3	27.4	19.9	12.1	5.1	5.1	5.6	0.0	0.0	417.8
1922-23	1.2	2.2	138.2	145.9	170.5	5.9	6.6	18.2	1.4	5.0	0.0	0.0	495.1
1923-24	19.0	2.7	110.5	37.4	61.5	3.5	2.1	0.0	10.6	0.0	9.3	0.0	256.6
1924-25	3.9	39.7	0.7	238.9	101.7	48.2	87.9	19.0	23.1	0.2	0.0	1.0	564.3
1925-26	7.2	148.9	104.7	20.8	65.3	59.7	25.1	24.7	0.0	3.9	0.0	0.0	460.3
1926-27	4.5	5.2	8.5	74.9	93.1	27.7	46.7	4.6	4.3	0.1	0.0	0.0	269.6
1927-28	0.0	1.0	3.3	15.9	104.6	72.0	0.8	4.4	0.0	0.0	0.0	0.0	202.0
1928-29	0.2	0.9	65.1	93.5	141.1	57.1	23.6	0.2	0.7	2.9	0.0	0.4	385.7
1929-30	91.8	1.5	20.3	33.9	28.0	66.6	11.4	7.6	13.2	1.0	0.0	0.0	275.3
1930-31	1.1	66.9	53.1	22.5	82.8	68.1	0.0	0.0	3.6	0.0	0.0	0.0	298.1
1931-32	42.9	5.0	23.5	127.2	91.1	46.1	16.2	1.2	0.0	0.0	0.0	6.5	359.7
1932-33	6.1	51.0	79.8	68.9	85.2	51.2	260.4	0.0	4.4	2.1	0.0	0.0	589.1
1933-34	0.0	0.0	29.8	115.4	99.6	63.6	12.1	0.1	2.7	0.0	0.0	0.0	323.3
1934-35	4.5	98.6	108.9	37.9	100.5	41.5	7.0	4.0	0.2	0.0	0.0	0.9	404.0
1935-36	3.7	3.6	37.2	75.7	11.7	2.5	2.0	35.6	10.8	0.0	0.0	0.0	182.8
1936-37	0.0	49.6	60.0	86.3	29.7	27.3	10.4	12.1	0.0	1.5	0.0	0.0	276.9
1937-38	5.3	16.8	34.5	92.1	136.3	99.1	41.8	41.6	0.8	0.0	0.0	0.0	468.3
1938-39	0.5	24.0	67.3	243.1	45.4	59.4	27.3	8.4	3.7	0.0	0.0	1.2	479.3
1939-40	2.5	0.0	123.4	26.6	38.2	0.0	5.8	9.2	1.6	0.0	0.0	0.0	207.3
1940-41	65.8	21.9	21.0	160.7	39.0	12.8	20.6	2.6	9.0	3.8	0.2	0.0	357.4
1941-42	3.3	1.0	83.7	70.8	35.9	24.1	15.8	0.0	0.0	0.7	0.0	0.0	235.3
1942-43	1.4	12.9	55.0	58.2	41.2	35.1	54.9	1.9	4.0	6.5	0.0	0.0	265.1
1943-44	0.0	49.6	194.3	21.2	209.6	68.0	14.7	28.6	0.2	8.4	0.0	0.0	594.6
1944-45	25.0	7.6	32.2	67.5	119.3	60.7	33.5	0.1	11.8	0.0	10.7	0.0	368.4
1945-46	0.7	107.8	116.2	132.8	36.0	13.8	16.7	6.0	0.2	0.0	0.0	0.0	430.2
1946-47	38.7	5.9	15.8	244.5	45.9	3.8	0.0	16.1	0.0	0.0	0.0	0.0	370.7
1947-48	0.0	11.0	9.3	77.4	5.3	0.8	34.1	2.8	0.9	0.0	0.0	0.0	141.6
1948-49	8.2	12.6	182.0	124.8	..	..	..	..	..	..	..	..	511.8
1949-50	..	..	..	..	..	..	..	..	..	..	..	..	400.1
1950-51	..	..	..	..	..	..	..	..	..	..	..	..	273.7
1951-52	..	..	..	..	..	..	..	..	..	..	..	..	314.9
1952-53	..	..	..	..	..	..	..	..	..	..	..	..	260.7
1953-54	..	..	..	..	..	..	..	..	..	..	..	..	379.1
1954-55	..	..	..	..	0.5	51.3	16.5	52.3	0.0	0.0	0.0	0.0	402.2
1955-56	3.4	70.9	46.4	54.1	15.9	42.4	30.1	0.0	0.0	0.0	0.0	0.0	263.2
1956-57	8.6	14.4	29.9	100.7	136.3	0.2	6.2	33.5	22.0	4.0	0.0	0.0	355.8
1957-58	..	..	..	..	..	..	..	..	..	..	..	..	..

Appendix IVc

RAINFALL IN MILLIMETRES FOR AZIZIA - AGRICULTURAL YEARS

Note: Figures taken from Pantoli and files of the Libyan Meteorological Service: colendar years converted to Agricultural years.

Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Year
1926/7	0.0	0.0	11.6	39.2	40.9	17.5	27.5	8.3	2.9	0.0	0.0	0.0	147.9
1927/8	0.0	16.0	3.9	10.8	35.3	22.5	3.2	1.0	1.8	0.0	0.0	0.0	94.5
1928/9	0.0	0.9	21.2	97.4	101.0	68.2	22.0	3.3	2.0	7.2	0.5	0.0	323.7
1929/30	18.6	19.4	18.6	13.1	27.1	32.9	24.6	10.9	2.2	0.0	0.0	0.0	167.4
1930/1	0.0	8.4	28.4	29.9	50.2	38.0	0.0	0.0	9.2	0.0	0.0	0.0	164.1
1931/2	42.9	7.4	3.4	66.0	132.4	26.9	37.7	1.2	0.0	0.0	0.0	0.0	317.9
1932/3	16.7	22.1	46.0	33.8	33.1	60.1	88.6	0.0	3.7	1.8	0.0	0.0	305.9
1933/4	0.0	0.0	23.0	98.7	107.5	67.6	7.8	0.0	0.0	0.0	0.0	0.0	304.6
1934/5	3.5	42.0	41.3	24.0	52.3	1.7	28.1	2.1	0.0	0.0	0.0	1.2	196.2
1935/6	19.8	2.2	23.3	4.8	24.8	1.6	0.0	25.5	10.9	0.0	0.0	0.0	112.9
1936/7	0.0	28.5	42.0	87.3	38.8	34.5	7.4	14.1	0.0	0.0	0.0	0.0	252.6
1937/8	1.3	20.3	9.4	7.9	66.2	52.5	39.8	38.0	0.2	0.0	0.0	0.0	235.6
1938/9	0.0	1.0	16.4	93.1	49.2	37.2	27.3	31.2	0.0	0.0	0.0	0.0	255.4
1939/40	6.8	0.0	62.1	26.2	26.0	0.0	9.2	21.8	0.0	1.8	0.0	0.0	153.9
1940/1	43.0	9.0	8.0	100.8	5.2	34.0	21.5	0.0	3.7	0.0	0.0	0.0	225.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-
1944/5	14.7	1.5	22.7	22.5	31.6	74.6	4.6	0.0	8.3	0.0	0.0	0.0	180.5
1945/6	0.0	112.3	6.9	63.4	21.8	45.6	11.2	6.3	2.5	0.0	0.0	0.0	260.0
1946/7	16.4	2.1	3.3	26.3	19.3	0.0	0.0	2.7	1.0	0.0	0.5	0.0	71.6
1947/8	0.4	5.1	35.2	14.5	5.5	0.8	6.0	2.4	0.4	0.0	0.0	0.0	70.3
1948/9	6.5	27.5	91.0	13.7	43.9	106.4	32.7	13.7	1.5	0.0	0.0	0.0	336.9

Appendix IVd

Rainfall figures for Agricultural years for Tripoli 1879/80 - 1956/57

Arranged in order of decreasing value.

653.2	447.5	345.1	269.6
640.2	440.4	327.7	268.5
633.1	437.9	325.3	265.1
594.6	435.8	323.3	263.2
589.1	430.2	323.2	263.1
564.3	418	320.5	262.1
552.8	417.8	315.8	260.7
530	404	314.9	256.6
515.5	402.2	314.9	235.3
511.8	400.1	298.1	229.2
504.4	395.4	293.4	228.6
495.1	395.7	293	220.8
485.6	379.1	292.9	207.3
479.1	376.2	280	206.8
471.5	374	276.9	204.9
470	370.7	276.8	202
468.3	368.4	275.3	201.5
465.9	359.7	273.7	182.8
460.3	357.4	273.5	141.6
	355.8		
	354.8		

APPENDIX IVe

Rainfall for certain Jefaren stations in recent years.

(in millimetres)

Station	1949/50	1950/51	1951/52	1952/53	1953/54	1954/55	1955/56
Tripoli	400.1	273.7	314.9	260.7	379.1	402.2	263.2
Sidi Mesri	380.0	295.4	340.6	252.7	304.3	392.9	250.6
Sorman	254.5	162.3	314.4	185.9	245.2	172.6	127.0
Bu Argub	222.3	214.6	390.5	174.1	158.1	248.0	179.8
Azizia (Mich)	216.5	205.6	323.0	146.0	122.4	206.3	133.3
Ain Zara	400.6	209.9	349.6	269.2	262.3	336.4	289.9
Hashian	246.7	174.3	250.3	206.4	224.5	232.7	133.3
Miani	471.1	270.1	387.0	260.6	346.2	432.1	209.8
Micca	314.9	269.1	411.8	237.7	227.9	267.6	197.8
Oliveti	219.5	204.1	273.6	196.6	218.3	208.9	215.4
Suani B. Ad.	399.6	290.3	283.5	267.3	261.5	291.5	157.0
Taijura	393.5	181.4	378.5	263.4	347.1	396.8	290.3
Zawia	235.0	212.4	340.3	209.0	247.2	244.2	205.8
Zanzur	359.2	256.7	252.0	238.0	327.8	306.2	191.2
Agelat	203.4	190.5	220.4	117.4	215.9	186.0	173.2
Zuara	281.0	115.0	164.7	100.5	252.3	150.4	194.2
Regdalin	240.8	-	158.3	135.5	210.7	144.2	152.5
Pisida	211.0	63.4	180.5	63.0	220.1	157.8	123.5
Bianchi	307.5	209.2	369.5	205.8	209.4	210.6	148.2
Bir Ghnem	151.8	120.2	148.5	67.0	47.5	156.5	90.0
Bu Gheilan	318.4	158.0	343.9	133.0	151.0	241.9	180.0
B. Cashir	336.2	243.0	395.0	-	174.7	347.0	230.7
F. el Allus	517.0	252.2	364.3	357.7	292.3	246.5	314.0
Garabulli	355.8	241.6	354.8	297.3	225.0	276.6	228.7
Gasr Chiar	280.7	169.3	307.0	212.3	142.9	162.1	-
Corradini	417.1	245.0	403.0	380.0	232.7	266.4	318.5
Jaush	-	68.0	101.5	126.6	39.2	17.0	156.0
Tiji	-	35.0	60.0	61.7	36.0	119.5	119.0

Appendix IVf

Five Year Running Means and Accumulated Deficits for Tripoli.

Five year Running Means		Accumulated Deficit.	
1913-18	279.1 mms.	1913-14	-61.6 mms.
1914-19	313.7	1914-15	-211.2
1915-20	333.6	1915-16	-359.2
1916-21	404.8	1916-17	-493
1917-22	443.3	1917-18	-377
1918-23	449.3	1918-19	-265.7
1919-24	407.04	1919-20	-305.4
1920-25	457.3	1920-21	-107.2
1921-26	438.8	1921-22	-43.9
1922-27	429.2	1922-23	+ 96.6
1923-28	350.5	1923-24	-1.4
1924-29	376.5	1924-25	+ 208.3
1925-30	318.6	1925-26	+ 313.7
1926-31	286.1	1926-27	+ 228.7
1927-32	284.2	1927-28	+ 76.1
1928-33	381.4	1928-29	+ 107.2
1929-34	369	1929-30	-27.9
1930-35	394.8	1930-31	-29
1931-36	371.8	1931-32	+ 210.6
1932-37	355.5	1932-33	+ 180.3
1933-38	331.1	1933-34	+ 229.7
1934-39	362.3	1934-35	+ 58
1935-40	322.9	1935-36	+ 93.4
1936-41	357.8	1936-37	+ 238.2
1937-42	349.5	1937-38	+ 90.9
1938-43	308.9	1938-39	+ 93.7
1939-44	331.9	1939-40	-25.6
1940-45	384.1	1940-41	-115.1
1941-46	377.9	1941-42	+ 125.7
1942-47	405.8	1942-43	+ 139.5
1943-48	381.1	1943-44	+ 215.1
		1944-45	+ 231.2
		1945-46	+ 18.3
		1946-47	+ 41.43
		1947-48	-171.54

Appendix Va

Key to diagram of water levels of certain selected wells taken from Italian logs.

Coastal	No. of well in Summary table.
1. Pisida	1
2. Agelat	4
3. Sabrata	5
4. Oliveti	7
5. Ingegnoli	9
6. Zenzur	11
7. Sidi Mes.i, Conc. Gherardi	16
8. Sidi Mesri, Conc. S.I.R.I.E.M.	17
9. Mellaha, Conc. S.A.C.I.A.	22
10. Tajiura, Conc. Cagno	19
11. Castel Verde,	39
12. Garabulli, Conc. Variani.	38
13. Garabulli, Conc. F.A.T.M.A.	41
14. Gasr Khiar.	44
Inland West of Tripoli	
A. Gargaresh, Conc. Onorato	12
B. Suani B. Adem, Conc. Soto Casa	14
C. Azizia, Conc. Micheli	15
East of Tripoli	
X. Mellaha, Conc. Rigiorno	18
Y. Ain Zara, Conc. F.A.T.M.A.	24
Z. Bir es-Sbea, Conc. Morabito	27

Notes.

Arrows indicate the piezometric head of each water level; if the arrow head is omitted then it is only known that the well is gushing, no figures being available for piezometric head.

Appendix Vb

Notes on the diagram of water levels of certain selected wells taken from Italian logs.

Locality	Water levels below the surface, in metres.	Static levels in relation to the surface, in metres.	Yields m3/hr.	Quality	Nature of aquifer
1. Pisida	0.8	0.8	?	?	sandy
	165-170	+1	5.8	?	siliceous and chalky sand.
	228-233	+0.95	30	?	sand
	287-290	+1.5	7.2	?	sand
	398-400	?	7.2	?	sand and pebbles
	488-491	gushing	40	saline water	sand and pebbles
2. Agelat	16-19	-16	10	?	?
	291-	?	5	?	?
	508	?	?	?	?
	641-653	gushing	25	?	?
	775-770	gushing	43	?	?
	780-799	+45.5	82	?	?
3. Sabrata	18.75-22.5	-14.8	?	sweet water	sand
	66.6-	-15.1	?	sweet water	sand
	159.4-170	-16.5	?	sweet water	?
	205-209	-12	?	saline water	?
	355-367	+8.5	2.5	saline water	?
	483-	+10.5	0.06	saline water	?

Locality	Water levels	Static levels	Yields	Quality	Nature of aquifer
Sabrata cont'd	544-548	+26.5	2.1	saline water	?
	591-606	+50	22	saline water	?
	604-646	+60	80	saline water	?
4. Oliveti, (Conc. Fattoria)	18.3	-18.55	?	sweet water	sand
	140.4-147	-14.5	?	sweet water	sand
	239.5-240.6	gushing	negligible	sweet water	limestone
	254-257.5	+3.53	43	sweet water	marl
	280-303	+8.85	1.86	sweet water	marl
	344-348	+10.5	100	saline water	calcareous marl
	426-429	gushing	5.0	saline water	soft sandstone
	437-443.5	gushing	21	saline water	soft sandstone
	496-500	+43	138	saline water	gravel
5. Saiad (C.) Ingegnoli)	14-20	-14	?	sweet water	?

Locality	Water levels	Static levels	Yields	Quality	Nature of aquifer
Saiad cont'd	53-82	-14	?	?	sand
	141-	-21.6	?	sweet water	limestone
	191-194	-16.6	?	sweet water	sand
	223-234	+2.65	18	sweet water	limestone
6. Zanzur	18-25.5	-18	8	sweet water	?
	422-427	?	1	saline water	?
	438-453	?	4	saline water	?
	517-523	?	9	saline water	?
	572-580	+45	100	saline water	?
7. Sidi Mesri (Conc. Gherardi)	19.2-21	-19	?	sweet water	sand
	448-449	+37	25	saline water	sand and gravel
	474.8-491	+45	300	saline water	?
8. Sidi Mesri (Conc. S.I.R.I.E.M.)	19-	?	?	sweet water	?
	271	?	?	saline water	fossiliferous limestone
	344-345.5	?	?	saline water	calcareous sandstone

Locality	Water levels	Static levels	Yields	Quality	Nature of aquifer
Sidi Mesri cont'd	362-365	?	?	saline water	limestone
	435-446	?	?	saline water	limestone
	446-450	+42	300	saline water	sandstones and gravels
9. Taijura (Conc. S.A.C.I.A.)	18-24 metres	-18	?	sweet water	sandstone
	32-34	-15	?	sweet water	limestone
	206	-8.5	?	saline water	marl
	259-261	?	?	saline water	sand
	292-296	+12	8	saline water	white limestone
10. Taijura (C. Cagno)	3-7.5	-3	60	?	sandstone
	22.26	-3	150	?	sand and sandstone
	239-241	+10.5	?	?	greensand
	364-370	+17	?	?	argillaceous sand
	427-463	+57	50	?	quartz sandstone
	463-480	+57	225	?	sand
11. Castel Verde, (INPS. No. 2)	41.5-42.5	-36	?	sweet water	?
	198.5-	-28.5	16	saline water	?

Locality	Water levels	Static levels	Yields	Quality	Nature of aquifer
12. Garabulli (Conc. Variani)	22.7-25	-19.7	?	?	limestone
	35-41	-19.7	?	?	limestone
	93.6-112	+4	8	?	?
	185-187	+8	300	?	?
13. Garabulli (Conc. F.A.T.M.A.)	33-36.5	-31	?	?	quartz sandstone
	130-138.8	-20	?	?	mainly sandstone
	154.5-164.3	-14.5	55	?	sand and limestone
	266-272	-14.5	22	?	?
14. Gasr Chiar (Conc. Calo)	42.4-91 metres	-44.8	1	?	limestone, molasses and sandstone
	176-210	-37	?	?	sandstone
	228.3-239.5	-27	?	?	sandstone
	339.5-342	-22	100	?	sandstone
A. Gargaresh (Conc. Onorato)	8.8	-8.8	?	sweet water	?
	36.5	-8.8	?	sweet water	sand
	69.5-77	-8.5	?	sweet water	?
	306-316	gushing	?	?	?
	402-403	gushing	?	?	limestone
	500	gushing	?	?	limestone
	515	gushing	?	?	limestone
	544-547	+50	140	?	?

Locality	Water levels	Static levels	Yields	Quality	Nature of aquifer
B. Suani B. Adem (Conc. Soto Casa)	4-21	-4	?	sweet water	sand
	285-291	+11.8	?	saline water	limestone
	404-420	+11.8	0.14	?	greensand
C. Azizia (Conc. Micheli)	53-64.5	-43.6	?	sweet water	conglomerate
	135-139.1	-42.6	?	sweet water	calcareous sand
	323.5-328	-43.1	300	?	?
X. Mellaha (Conc. Rigiorno)	6-17	-5.5	?	?	limestone
	37-55.3	-5.5	?	?	white limestone
	259-260	gushing	?	?	limestone
	308-310	gushing	?	?	limestone
	447.5-458	+57	400	?	sandstone
	482.5-484	+57		?	sand
Y. Ain Zara (Conc. FATMA)	23	-26.5	?	sweet water	limestone
	32	-26	?	sweet water	limestone
	215-216	-22	?	?	limestone
	300.5	-5	?	sweet water	?
	349.5	?	?	saline water	sandy limestone
	361-368	-5	100	saline water	sandy limestone

Locality	Water levels	Static levels	Yields	Quality	Nature of aquifer
Z. Bir es-Sbea (Conc. Morabito)	142.4-145.2	?	?	muddy water	sand
	243-255	?	?	sweet water	sandstone
	289-299	-30.2	60	?	limestone

Appendix Vc

A summary table of artesian wells.

WELL AND LOCATION	DATE COMPLETED	WELL DATA				AQUIFERS			CAPACITIES		QUALITY OF WATER				CLASS OF WELL
		RESULT	ALTITUDE metres above sea-level	DEPTH OF WELL metres below surface	DIAMETER millimetre	DEPTH OF AQUIFER metres below surface	STATIC LEVEL metres in relation to surface	PUMPING LEVEL metres in relation to surface	NATURAL FLOW M3/hr.	PUMPING FLOW M3/hr.	TEMP. F.	SPECIFIC CONDUCTANCE Micromhos at 25°c.	DISSOLVED SOLIDS P.P.M.	SALINITY p.p.m. as Cl	
1. Fields, Police headquarters	1926	Positive	1.3	501	254	491	gushing	-	40	-	75	6,000	10,554	?	Class 3 very poor
2. Fields, S.W. of Fields	?	Positive	?	?	?	?	gushing	-	?	-	80	6,000	16,830	?	Class 3 very poor
3. Zuara, Zuara Marina	1915	Positive	0.8	341	130	239	+1.65	-	42	-	76	6,000	5,786	?	Class 3 poor
4. Agelat, 2 kms. S. of	1940	Positive	?	673	180	765 779	+45	-	120	-	109	6,000	6,500	652	Class 3, poor
5. Zebrata, C. Paterno	1939	Positive	19	684	216	591 640	+50	-	100	-	86	5,900	3,982	1,814	Class 3, fair
6. Zuwia, C. Delbi	1941	Positive	40	578	191	572	+80	-	73	-	130	?	?	3,160	Class 3 very poor
7. Oliveti, C. Fattoria	1940	Positive	28	500	180	496	+30	-	157	-	104	6,000	5,384	2,143	Class 3, poor
8. Oliveti, INPS.	1940	Positive	?	584	217	563	+42	-	270	-	110	+6,000	6,693	3,085	Class 3, poor
9. Zaied, C. Ingegnoli	1937	Positive	24	252	298	233	+2.65	-	18	-	84	4,500	3,980	969	Class 3, moderate
10. Hammoura	1940	Negative	-	-	-	-	-	-	-	-	-	-	-	-	-
11. Kansur	1940	Positive	18	580	216	572	+33	-	100	-	106.5	6,000	6,849	3,240	Class 3, poor
12. Gargaresh, C.Chortato	1940	Positive	11	544	216	532	+50	-	160	-	112	3,200	2,037	855	Class 3, good
13. Collina Verde, C. Pipitone	1939	Positive	31	495	192	452	+15	-	163	-	96	3,600	2,298	872	Class 3, good
14. Suani Ben Adam, C. Bottacasa	1936	Negative	36	469	180	404	+11.9	-	0.14	-	88	?	?	3,705	Class 3, very poor
15. Azizia, C. Micheli	1938	Sub-Artesian	112	453	?	323	-43.15	-50.15	-	300	80.5	?	1,957	332	Class 2
16. Bidi Msari, C. Gherardi	1917	Positive	21	491	120	450	+42	-	300	-	92	6,000	3,998	?	Class 3, fair
17. Bidi Msari, C. S.T.R.I.E.M.	1936	Positive	21	740	216	447	+42	-	300	-	104	6,000	3,957	1,090	Class 3, fair
18. Mellaha, C. Migliorno	1938	Positive	6	484	254	447	+57	-	400	-	111	5,200	3,564	1,065	Class 3, fair
19. Tajiura, C. Cagno	1938	Positive	7.2	480	142	427	+56	-	270	-	106	5,000	3,562	1,480	Class 3, fair
20. Tajiura, C. S.A.C.I.A.	1940	Positive	?	1,700	?	?	?	-	?	-	96	2,750	1,743	?	Class 2
21. Tajiura, C. S.A.C.I.A.	1940	Positive	?	1,400	?	?	?	-	?	-	122	5,900	3,841	?	Class 3, fair
22. Tajiura, C. Cini C. S.A.C.I.A.	1938	Positive	27.5	327	180	292	+10 +27.5	-	0	-	124	4,100	2,660	1,882	Class 3 moderate
23. Sghdida	?	Positive	?	?	?	?		-	369	-	154	?	?	?	Class 3, poor
24. Ain Zara, C. FATNA	1935	Sub-Artesian	68	368	?	348	-5	?	-	100	89.8	?	?	1,166	Class 3, fair
25. Misani, C. Russo	?	Positive	?	?	?	?	?	-	?	-	93	4,400	2,908	?	Class 3, moderate
26. Buk es-Sebt, C. Augugliaro	1940	Negative	95	112	?	?	-	-	-	-	-	-	-	-	-
27. Bir Ubes, C. Marabito	1940	Sub-Artesian	118	480	?	289	-30.2	-42.2	-	60	82.4	?	?	453	Unclassified
28. Buk es-Sebt, C. Cortini-Campari	1938	Sub-Artesian	97	393	?	305	-25.3	-43	-	108	82.4	?	?	320	Unclassified
29. Es-Sbahli, C. Ostuni	1935	Positive	41	260	250	251	+20	-	180	-	98	3,400	2,206	1,020	Class 3, good
30. El Ouea, Gov. Farm. km. 49	1953	Positive	?	311	?	250-300	gushing	-	100	-	?	?	?	2,564	Class 3, fair
31. El Ouea, Gov. Farm	1957	Positive	?	405	?	160-180 243-269 342-375	gushing	-	160	-	?	?	?	?	Class 3, fair
32. El Ouea, Gov. Farm	1957	Positive	?	?	?	137-144	gushing	-	85.2	-	?	?	?	?	Class 3, fair
33. El Ouea, Gov. Farm	1958	Positive	?	?	?	213	gushing	-	300	-	?	?	?	?	Class 3, fair
34. Gov. Farm km 52 Tripoli-Garabulli road	1958?	Positive	?	?	?	?	gushing	-	?	-	?	?	?	?	Class 3, fair
35. Gov. Farm km 52 Tripoli-Garabulli road	?	?	?	?	?	?	?	-	?	-	?	?	?	?	Class 3, fair
36. Gasr Garabulli, INPS No. 1 Sheep ranch	1937	Positive	52.4	193	254	163 181	+6.5	-	290	-	86	3,600	2,328	525	Class 3, good
37. Gasr Garabulli Sheep ranch	1957	Positive	?	?	?	?	gushing	-	?	-	?	?	?	?	Class 3, good
38. Gasr Garabulli, C. Varisni	1937	Positive	50.6	187.2	275	185	+8	-	300	-	85	3,600	2,297	847	Class 3, good
39. Gasr Garabulli, INPS No. 2	1940	Sub-Artesian	85	538	?	198.5	-30.5	-55	-	16	?	?	?	?	Unclassified
40. Gasr Garabulli, INPS No. 3	1940	Sub-Artesian	85	251	?	198.5	-17	-19.2	-	60	?	?	?	803	Unclassified
41. Gasr Garabulli, C. F.A.T.E.A.	1957	Sub-Artesian	55.1	308	?	272	-16.5	-20.8	-	70	93	?	?	760	Unclassified
42. Gasr Garabulli, C. F.A.T.M.A.	1940	Sub-Artesian	?	264	?	147 163	-2.5	?	-	?	97	?	?	670	Unclassified
43. Gasr Garabulli, C. Berag	?	Positive	33	195	?	?	+14.50	-	?	-	?	?	?	?	Unclassified
44. Gasr Shier, C. Cole	1938	Sub-Artesian	80	370.5	?	350-360	-22	?	-	100	75	3,178	1,961	699	Class 2

Appendix Vd

Notes on 'A summary table of artesian wells'

Mainly after Lewis, Vialli and Maxey.

1. Unused and needs major repair. The water is of very poor quality and is toxic to all crops and only supports halophytic vegetation; camels are the only animals that can drink it.

2. Again this well needs major repairs but it is still used for watering stock. It is situated 6 kilometres South-west of Pisida. Most of the water, which is very saline, runs to waste and sinks into the ground a short distance from the well. It is doubtful if it can be used for agriculture since only extreme salt tolerant crops can be grown. The well is used to water the animals of the Cabila Ulad Ali Ben Zuiet.

3. This well is in a good state of repair but is in fact capped. At one time it was used for agriculture and prior to the war vegetables were irrigated with it. Unfortunately the area chosen for cultivation had poorly drained soils and saline conditions soon developed. If good drainage could be established then crops could be grown, but only those which are salt tolerant.

4. This well is located amid sand dunes about two kilometres south of Agelat. Here, water is flowing from the well and sinking into the ground nearby; the well itself being unused and needing some repair. The water is quite saline but

would probably be all right for some of the more salt tolerant crops. There is a possibility that this water could be taken to Agelat and mixed with sweeter water from the shallower aquifers, but this entirely depends on the amount of water available in the Quaternary deposits.

5. Water from this well on the Concessione Paterno was used at one time to irrigate crops and trees, although before being used it had to be mixed with water from one of the shallow aquifers. It was reported however that crops suffered and even olive trees became stunted. As a result the well was capped in 1948. This water could again be utilised if mixed with sweet water and then applied to salt tolerant crops; it could be pumped straight away to cabila lands in the south-west, where it could be utilised by stock. The well is in good condition and is ready for use.

6. Attempts were made to use the water from this well on the Balbi farm but these failed because olive and citrus trees were badly affected by salinity. The water was deemed useless and was diverted from the farm and eventually the well was capped in 1951. The well needs some repair before it can be used again.

7. This well has not been used since it was obstructed as a result of an earthquake in 1946. It was reported that before then its water had been used to irrigate lucerne with fair results but that it was too saline for tree crops. The well needs major repair before it can be used again.

8. This well also was obstructed by the 1946 earthquake. It is found on farm no. 16 of the INPS demographic settlement at Oliveti. Major repairs are needed if it is to be used again.

9. In 1953 this well was used for watering stock and irrigation. The water, which is sulphurous and moderately saline, was irrigating grass and grain. The well was at that time in need of repair and the new owners of the farm have sealed it up.

10. This is an unsuccessful well.

11. This well is found in buildings north of the Tripoli-Zawia road at kilo 19. It is capped, needs some repair and the water is moderately saline.

12. No information available. The well would appear to be used for domestic purposes.

13. This is one of the few wells on the Jefara which is being successfully exploited by a private farmer. Water is being used for domestic and irrigation purposes, although it has to be mixed with sweet water from a shallow aquifer first. Lucerne and grains are being grown and no harmful effects are evident. Two farms in fact use the water; Concessione Mateo and Concessione Pipitone.

14. This is considered a negative well since although there is water under sufficient pressure to flow at the surface, yields are negligible; furthermore it needs major repair.

15. Water in this well is sub-artesian. The well was capped for

a time but was re-opened after the 1939/45 War and water is now being pumped from 340 metres depth. The water is of good quality and is used for all kinds of crops including the sensitive tobacco and groundnut.

16. This well needs major repair and is unused, but it is not known whether it is capped.

17. Moderately saline water is found in a well which is in need of some repair. At the moment this water is unused but since there is a good supply of sweet water from the shallow aquifers, the two could be mixed and supplied to the Vocational Agricultural Training Centre.

18. The well is reported to now yield 350 m3 an hour; this is sufficient to irrigate 30-35 hectares of land or semi-irrigate 60-70 hectares. The water is hot, sulphurous and moderately saline. Located within the bounds of the American Air Base, Wheelus Field, some of the water is used by the camp and a small amount by local farmers.

19. This capped well is found on the Cagno Concession south of Tajiura. Although it needs some repair its water is not terribly saline, and with a flow of 270 m3/hr. could be used to irrigate up to 20 hectares.

20. This well is found 2.5 kms. south of Sghedeida Nursery, originally being an oil test well. It is now capped. The water is fairly good and the well is ready for use.

21. This, like the one above, is a capped oil test well on the S.A.C.I.A. Concession. The water is moderately saline.

22. This well is also on the S.A.C.I.A. farm and is situated on a hill. Its capacity is low, barely 8 m3/hr., and it is not used for irrigation. There is no reason why the capacity could not be increased by pumping so that irrigation of salt tolerant crops could be introduced.

23. This well at Sghedeida has been capped because the water is too hot and sulphurous.

24. No information.

25. This well is located on Concessione Russo on the Miani-Ain Zara road. Although it needs some repair, its water, despite its temperature, is being used in small amounts for irrigation.

26. This well was unsuccessful and drilling on it was suspended.

27. No information.

28. No information.

29. Read Lewis is full of praise for this well. The artesian water is used extensively for irrigation without being mixed with shallow aquifer water and furthermore all kinds of crops profit from it including citrus. On the Ostuni Concession is one of the best examples of the use of moderately saline water on Tripolitanian soils.

30.) These four wells have been drilled since 1953 at the Government
31.)
32.) forage farm at El Guea. The water smells sulphurous but is
33.) good enough to permit the irrigation of some 50 hectares of lucerne.

34.) A new government farm has been developed at km. 52 on the
35.) Tripoli-Garabulli road. By August 1958 one artesian well had been drilled and another was planned.

36. A well was drilled by the Italians on the INPS settlement of Castelverde near the main Tripoli-Homs road at Km. 56. After the war the well was unused and most of the water flowed to waste except for a small amount which was used by local Arab farmers to irrigate a small patch of peanuts. The water is comparable to that used at Concessione Variani (38) and when the Government Sheep farm was established this water was utilised to irrigate lucerne and in 1958 about 6 hectares were under this crop. At the time of drilling by the Italians the yield of the well was 290 m3/hr. but today it is about 200 m3/hr.

37. This is another well on the above farm which has only been drilled recently by the government. It should allow the expansion of the irrigated area to 20-30 hectares.

38. The water from this well is used for watering stock, for irrigation and for domestic consumption. As at well no. 29 most crops, including olives and citrus, are being irrigated with no apparent harmful effects.

39. No information.

40. No information.

41. No information.

42. No information.

43. No information. This well has not been located and is not shown in fig. which gives the distribution of artesian wells.

44. No information.

Appendix VI(a)

Production of Olives, Olive Oil & Sansa Oil in Tripolitania

(metric tons)

Year	Olives	Olive Oil	Sansa Oil
1927	?	900	?
1928	?	1,000	?
1930	?	500	?
1931	?	2,500	?
1932	?	800	?
1933	?	1,500	?
1934	?	2,000	?
1935	?	900	?
1936	?	2,300	?
1937	250	37	?
1938	19,700	2,700	?
1939	5,000	800	?
1940	9,000	1,600	?
1941	12,000	1,800	?
1942	25,000	3,400	?
1943	10,000	1,200	?
1944	20,000	3,300	?
1945	13,000	2,000	?
1946	5,500	700	?
1947	6,500	936	?
1948	10,000	1,500	?
1949	50,000	9,000	?
1950	42,700	7,700	?
1951/2	30,000	5,000	600
1952/3	5,000	1,000	150
1953/4	40,000	6,500	1,100
1954/5	10,000	1,800	300
1955/6	16,000	2,700	450
1956/7	10,300	1,850	306

Note - The figures given above are taken from files in the Statistics section of the Masara of Agriculture. Since they are only estimates, they are not accurate, and must be taken only as a general indication of production trends. Figure 22 gives the conversion ratio for olives, olive oil and sansa oil, and by using this, estimates for the production of olives and sansa oil can be worked out for the years preceding 1937. Up to the year 1950 inclusive it is not known whether the figures listed refer to Agricultural or Calendar years.

Appendix VI (b)
The number of olive trees in Tripolitania

Year	Productive	Ottoman	Arab	European	Total
1910	450,000	50,000	450,000	-	500,000
1914	?	?	550,000	-	?
1920	550,000	50,000	600,000	-	600,000
1925	?	?	?	680,000	?
1929	?	?	676,000	?	?
1930	?	?	?	954,000	?
1931	700,000	700,000	?	?	1,400,000
1933	?	?	?	1,342,000	?
1934	?	?	?	1,418,000	?
1935	?	?	828,000	1,545,000	2,373,000
1937	850,000	1,650,000	?	1,745,000	2,500,000
1940	?	?	?	2,054,000	?
1944	?	?	970,000	2,411,000	3,381,000
1947	?	?	?	?	3,280,000
1953	1,200,105	1,407,408	827,928	1,770,655	2,607,583
1955	1,400,000	1,600,000	?	?	3,000,000

Appendix VI (a)
Distribution of Libyan Olives 1932 - after Forrara

Locality		Young Trees	Adult Trees	Total Trees
Khoms		5,735	5,373	9,108
Ajelat		252	285	537
Aleija		1,289	2,555	3,844
Sorman		2,762	7,253	10,015
Zawia		10,754	23,960	34,714
Zanzur		4,553	10,557	15,110
Garguresh		126	280	406
Gurji		618	1,628	2,246
Tripoli	(El Menshia	4,000	9,000	40,581
	(Es-Sahel	13,370	27,211	13,000
Gsar Ben Gashir		?	?	472
Azizia		?	?	810
Gsar Garabulli		?	?	612
Tajiura		705	926	1,631
			Total	133,174

Appendix VII.

Distribution of Numbers and Area of Citrus Trees in Tripolitania in 1953/4

LOCALITY	ORANGES No.	ORANGES Trees	LIMES No.	LIMES Trees.	LEMONS No.	LEMONS Trees.	GRAPE-FRUIT No.	GRAPE-FRUIT Trees
Azizia	26	13,000	9	4,500	1	400	?	?
Zawia-Sorman El Mola-Zonsur	116	58,000	30	15,000	7	3,000	?	?
Tripoli	80	40,000	12	6,000	8	3,200	?	?
G. Ben Gashir	30	15,000	4	2,000	25	10,000	?	?
Tajiura	80	40,000	10	5,000	18	9,000	?	?
Gasr Garabulli	6	3,200	1	600	1	400	?	?
Suk El Jiuma	180	90,000	20	10,000	20	8,000	?	?
Misurata*	4	2,000	1	500	2	800	-	-
Tripoli Oasis	120	60,000	20	10,000	60	30,000	?	?
TOTAL	642	321,200	107	53,600	142	64,800	?	4,500

* Not located on the Jefara Plain.

Appendix VIIb

Numbers and production of Citrus on INPS Farms, 1953/4 to 1956/7

	1953/4	1954/5	1955/6	1956/7
Olivetti				
Total No.	5,000	5,000	5,000	5,000
No.productive	4,564	4,564	4,564	4,564
Total Yields	342.8 qts.	280	?	600
Bianchi				
Total No.	25,305	27,190	28,760	30,656
No.productive	16,991	17,484	17,668	16,372
Total Yields	1,876	3,329.92	2,738.8	2,540
Meshian				
Total No.	1,960	2,075	2,075	2,075
No.productive	1,604	1,663	1,663	1,664
Total Yields	80.2	107.5	?	170
Giordani				
Total No.	13,701	13,812	12,123	14,301
No.productive	7,552	7,332	6,673	6,178
Total Yields	487.35	619	154.15	700
Micco				
Total No.	4,387	5,803	4,138	?
No.productive	774	780	793	781
Total Yields	43	110	5.505	110
Corradini				
Total No.	609	570	459	518
No.productive	21	22	27	420
Total Yields	0.25	0.54	-	40

Annendix VIIc
Monthly Export of Citrus 1957/8
(Kgs)

Month	Oranges	Lemons	Tangerines	Grapefruit
September	-	94,030	-	3,300
October	7,050	14,110	600	10,115
November	245,740	22,940	53,240	8,770
December	459,940	20,950	90,250	18,070
January	606,750	1,200	63,550	11,800
February	622,170	53,850	1,520	7,000
March	813,690	-	1,400	-
April	337,000	-	-	-
May	148,500	-	-	-
June	-	-	-	-
July	-	-	-	-
August	-	-	-	-
TOTAL	3,240,840	116,680	210,560	59,055

Appendix VIIIa

Monthly Exports of Groundnuts for the agricultural years 1956/7 and 1957/8
(metric tons)

Month	Total Exports	Exports-Tripoli 4	Exports-Tripoli 2
September 1956	105	?	?
October	1,577	718	859
November	2,489	1,061	1,428
December	1,578	339	1,239
January 1957	1,638	462	1,176
February	662	159	503
March	405	159	246
April	148	29	119
May	101	15	86
June	-	-	-
July	-	-	-
August	-	-	-
September	300	287	13
October	1,976	1,005	971
November	1,665	710	955
December	960	195	765
January 1958	1,012	366	646
February	843	324	519
March	603	195	408
April	485	12	473
May	650	182	468
June	193	45	148
July	209	100	109
August	621	81	540

Appendix VIIIb
Groundnuts Exported

Agricultural Year 1956/7

Importing Country	Tripoli 2 Mercantile	Tripoli 2 Standard	Tripoli 4 Mercantile	Tripoli 4 Standard	Totals. Tons.
United Kingdom	156	1104	737	1287	3284
Germany	420	1299	-	16	1735
Italy	1099	109	153	66	1427
Holland	263	556	15	181	1015
Tunisia	71	6	453	-	530
Belgium	196	53	-	-	249
Malta	167	1	51	-	219
Switzerland	58	99	-	-	157
France	-	73	-	54	127
Austria	30	-	-	-	30
	2460	3300	1409	1604	8773

Agricultural Year 1957/8.

Importing Country	Tripoli 2 Extra	Tripoli 2 Stand.	Tripoli 2 Mercant.	Tripoli 2 Sotto	Tripoli 4 Stand.	Tripoli 4 Mercan.	Tripoli 4 Sotto	Totals
Italy	7	285	2016	471	26	228	50	3083
U.K.	-	54	-	-	1540	712	-	2306
Germany	-	1242	290	-	-	-	-	1532
Holland	-	865	209	-	304	-	-	1378
Malta	-	-	267	73	-	103	24	467
Tunisia	-	-	17	-	-	397	-	414
Belgium	-	98	-	-	-	-	-	98
Switzerland	-	54	10	-	-	-	-	64
France	-	34	-	-	-	-	-	34
	7	2639	2809	544	1870	1440	74	9376

Appendix IXa

Production of Barley and Wheat in Tripolitania, 1930/1 - 1957/8
(metric tons)

Statistics for barley and wheat are very unreliable and there are large discrepancies between figures supplied by the Nazara of Agriculture, and those taken from Agricultural Reports, Tithe assessments and the Chief Administrator Report of the Foreign Office Working Party. When several conflicting figures are available for any given year, the one considered to be most accurate has been included in the table below.

Year	Barley	Wheat
1930/1	22,000	3,500
1931/2	32,000	2,200
1932/3	63,000	4,100
1933/4	30,000	6,600
1934/5	41,000	8,700
1935/6	3,000	1,200
1936/7	32,000	6,500
1937/8	42,000	13,500
1938/9	16,000	5,400
1939/40	11,000	2,500
1940/41	9,760	3,400
1941/2	13,560	7,500
1942/3	26,500	3,680
1943/4	125,000	13,000
1944/5	95,000	12,000
1945/6	71,200	8,000
1946/7	1,700	1,046
1947/8	22,010	2,530
1948/9	135,000	8,000
1949/50	85,000	8,000
1950/51	53,700	6,200
1951/2	74,650	5,000
1952/3	11,572	13,181
1953/4	30,000	9,000
1954/5	35,000	8,900
1955/6	80,520	17,410
1956/7	76,125	22,221
1957/8	37.100	12,400

Appendix IXb

Provincial distribution of Barley in Tripolitania
metric tons (hectares)

Year	Tripoli & Western Province	Eastern Province	Central Province
1944/5	29,000 (158,000)	45,000 (300,000)	21,000 (100,000)
1945/6	45,000 (94,000)	15,000 (30,000)	10,800 (14,000)
1946/7	831 (2,830)	870 (6,420)	- (-)
1947/8	?	?	?
1948/49	?	?	?
1949/50	35,000 (100,000)	40,000 (150,000)	10,000 (30,000)
1950/1	? (?)	? (?)	?
1951/2	36,000 (200,000)	23,000 (96,000)	6,000 (40,000)
1952/3	54,811	51,702	9,209
1953/4	?	?	?
1954/5	22,750	3,000	10,050
1955/6	39,550	18,900	22,070
1956/7	48,076 (105,357)	15,678 (132,708)	12,372 (37,848)
1957/8	18,900 (110,000)	12,200 (96,000)	12,372 (60,000)

Provincial distribution of Wheat in Tripolitania
metric tons (hectares)

Year	Tripoli & Western Province	Eastern Province	Central Province
1944/5	8,500 (47,500)	2,500 (20,000)	1,000 (6,500)
1945/6	5,100 (16,500)	1,600 (3,000)	1,300 (3,500)
1946/7	538 (1,030)	508 (7,120)	- -
1947/8	?	?	?
1948/9	?	?	?
1949/50	4,800 (12,000)	1,600 (4,000)	1,600 (3,500)
1950/1	?	?	?
1951/2	3,000 (12,000)	1,250 (5,000)	750 (3,000)
1952/3	8,538	4,102	540
1953/4	?	?	?
1954/5	5,650	1,500	1,750
1955/6	9,600	4,210	3,600
1956/7	11,479 (27,380)	2,927 (32,943)	8,150 (20,049)
1957/8	5,000 (22,000)	5,200 (20,500)	2,200 (15,000)

Appendix IXc

Production and areas of barley on IRPS Demographic Farms 1952/3 - 1956/7

	Dry		Irrigated	
	Ha.	Qts.	Ha.	Qts.
1952/3				
Oliveti	82.7	477.19	8.65	104.8
Bianchi	86.30	248.68	28.52	233.10
Hashian	14.5	33.0	3.84	33.0
Giordani	3.0	8.5	14.74	274.16
Micca	84.1	305.08	26.39	291.57
Corradini	120.5	254.0	-	-
1953/4				
Oliveti	111.0	272.25	3.08	64.87
Bianchi	98.55	283.85	22.37	201.31
Hashian	5.75	16.40	4.45	44.9
Giordani	18.0	62.63	18.82	274.96
Micca	96.0	238.0	21.05	237.0
Corradini	97.9	224.0	-	-
1954/5				
Oliveti	71.6	146.2	16.8	206.0
Bianchi	78.3	136.7	41.9	381.0
Hashian	1.5	5.0	15.0	150.0
Giordani	5.0	13.8	28.2	474.19
Micca	181.05	726.0	44.3	788.0
Corradini	69.0	97.2	-	-
1955/6				
Oliveti	39.5	114.0	77.8	1,043.2
Bianchi	8.6	34.5	97.8	1,218.1
Hashian	-	-	32.6	657.0
Giordani	17.5	40.0	87.02	1,260.5
Micca	74.2	203.0	133.88	2,149.0
Corradini	98.0	289.0	-	-
1956/7				
Oliveti	39.0	120.0	90.0	1,750.0
Bianchi	6.0	20.0	180.0	3,400.0
Hashian	10.0	25.0	32.0	657.0
Giordani	30.0	80.0	72.0	1,341.0
Micca	71.0	189.0	124.0	2,380.0
Corradini	58.0	172.0	-	-
Castelverde	3.0	10.0	-	-

Appendix IXd

Production and areas of wheat on ETFS Demographic Farms 1952/3 - 1956/7

	Dry		Irrigated	
	Ha.	Qts.	Ha.	Qts.
1952/3				
Oliveti	-	-	96.6	1,513.63
Bianchi	6.87	33.1	230.4	2,620.98
Hashian	-	-	18.17	215.0
Giordani	-	-	243.32	5,050.53
Micca	24.05	89.5	162.67	2,190.98
Corradini	205.7	590.5	-	-
1953/4				
Oliveti	-	-	104.7	1,364.56
Bianchi	11.8	54.52	217.58	2,723.88
Hashian	0.25	0.3	15.55	192.8
Giordani	-	-	245.05	4,462.65
Micca	7.85	30.0	178.2	2,471.0
Corradini	134.4	439.0	-	-
1954/5				
Oliveti	-	-	115.05	1,733.0
Bianchi	5.0	15.5	231.7	3,231.57
Hashian	-	-	15.55	196.0
Giordani	1.5	3.0	271.74	5,150.11
Micca	15.0	67.0	198.57	3,335.0
Corradini	48.5	46.7	2.55	11.2
1955/6				
Oliveti	-	-	90.9	1,254.0
Bianchi	-	-	213.8	3,049.7
Hashian	-	-	17.15	258.0
Giordani	1.0	2.0	226.58	4,117.6
Micca	0.25	1.0	179.49	2,583.0
Corradini	119.0	531.0	-	-
1956/7				
Oliveti	-	-	100.0	1,500.0
Bianchi	-	-	250.0	3,600.0
Hashian	-	-	20.0	310.0
Giordani	-	-	250.0	3,804.0
Micca	-	-	166.0	2,396.0
Corradini	150.0	650.0	-	-
Castelverde	10.0	40.0	-	-

Appendix IXe

Yields of Wheat and Barley on the Demographic Farms (qts./ha). INPS

a) Wheat	1952/3	1953/4	1954/5	1955/6	1956/7
Oliveti					
Dry	-	-	-	-	-
Irrigated	15.66	13.03	15.09	13.8	15.0
Bianchi					
Dry	4.8	4.65	3.1	-	-
Irrigated	11.46	12.55	14.0	14.29	14.4
Hashian					
Dry	-	1.2	-	-	-
Irrigated	11.83	12.3	12.85	15.4	15.5
Giordani					
Dry	-	-	2.0	2.0	-
Irrigated	20.75	18.2	19.0	18.18	15.22
Micca					
Dry	3.7	3.88	4.47	4.0	-
Irrigated	13.46	13.87	16.78	14.42	14.4
Corradini					
Dry	2.87	3.27	0.964	4.46	4.3
Irrigated	-	-	4.4	-	-
Castelverde					
Dry	-	-	-	-	4.0
Irrigated	-	-	-	-	-
b) Barley					
Oliveti					
Dry	5.77	2.45	2.21	2.882	3.075
Irrigated	12.11	21.0	12.0	13.42	19.48
Bianchi					
Dry	2.80	2.86	1.74	4.1	3.33
Irrigated	8.17	9.0	9.1	12.45	18.8
Hashian					
Dry	2.27	2.82	3.3	-	2.5
Irrigated	8.59	10.0	10.0	20.9	20.6
Giordani					
Dry	2.83	3.48	2.76	2.284	2.66
Irrigated	18.59	14.6	16.8	14.45	18.65
Micca					
Dry	3.62	2.48	4.01	2.735	2.662
Irrigated	11.04	11.12	17.8	16.0	19.41
Corradini					
Dry	2.1	2.29	1.41	2.94	2.962
Irrigated	-	-	-	-	-
Castelverde					
Dry	-	-	-	-	3.33
Irrigated	-	-	-	-	-

STATE TOBACCO MONOPOLY

TOBACCO CULTIVATION IN TRIPOLITANIA

FIGURES NETT WT RECEIVED

RUNNING FIGURES

YEAR	Salento Incilato KGS.	Erzegovina Gigante KGS.	Perustitza KGS.	Samsoun KGS.	Near Eastern KGS.	Eritrean KGS.	Peszani KGS.	Tombac KGS.	Tripoli KGS.	Burley KGS.	F.C. Virginia KGS.	Brasile Leccese KGS.	Brasile Benev. KGS.	Spadone KGS.	Campano KGS.	Nyasaland KGS.	Lower Leaves KGS.	Akhisar KGS.	Dumbara KGS.	Maryland KGS.	Java KGS.	WAP.& SP. KGS.	TOTAL KGS.
1925	-	1,113	-	-	-	-	61,978	708	37,855	-	518	420	-	1,571	-	-	13,831	-	-	-	-	-	118,000
1926	-	28,319	-	-	-	-	31,843	9,263	22,240	-	215	-	-	2,920	-	-	6,719	-	-	-	-	-	101,519
1927	-	7,946	-	-	-	-	53,039	6,950	25,450	-	-	-	-	-	-	-	9,450	-	-	-	-	-	102,825
1928	8,103	14,399	612	-	-	-	48,952	3,227	37,879	-	-	-	217	-	-	-	10,979	-	-	-	-	-	124,368
1929	28,928	60,621	1,412	-	-	-	60,659	567	40,232	-	-	-	-	913	-	-	15,233	-	-	-	-	-	208,565
1930	162,891	70,857	6,622	-	-	-	234,590	6,145	16,567	-	-	-	1,500	3,302	-	-	33,986	-	-	-	-	-	536,460
1931	190,720	63,752	4,795	-	-	-	107,292	3,784	53,688	-	-	10,771	1,371	4,915	-	-	30,088	-	-	-	-	-	471,176
1932	240,095	94,056	53,254	-	-	-	132,203	3,473	42,100	-	-	6,059	-	-	-	-	26,720	-	-	-	-	-	597,960
1933	129,890	38,659	69,744	-	-	-	121,046	1,309	7,607	-	-	-	-	-	-	-	17,307	-	-	-	-	-	385,562
1934	129,916	33,497	103,701	-	-	-	244,475	1,855	1,060	-	-	-	-	-	-	-	29,608	-	-	-	-	-	544,112
1935	186,970	33,269	119,579	-	-	-	329,411	2,043	33,429	-	-	-	-	-	-	-	37,570	-	-	-	-	-	732,271
1936	240,526	42,525	22,836	-	-	-	349,856	1,610	48,966	-	-	-	-	-	-	-	73,401	-	-	-	-	-	779,720
1937	301,220	68,160	256,944	-	-	-	198,904	440	71,173	-	-	-	-	-	-	-	44,339	-	-	-	-	-	941,180
1938	419,478	58,486	287,065	-	-	-	171,855	2,936	86,600	-	-	-	-	-	-	-	53,983	-	-	-	-	-	1,082,403
1939	396,090	66,308	291,610	-	-	-	314,066	20,348	48,087	-	-	-	-	11,449	-	-	53,873	-	-	-	-	-	1,201,831
1940	554,495	82,298	121,109	-	-	-	55,348	28,061	28,918	-	-	-	-	2,393	-	-	26,725	-	-	-	-	-	899,347
1941	385,351	43,353	80,335	-	-	-	9,275	3,000	8,129	-	-	-	-	333	-	-	12,773	-	-	-	-	-	542,549
1942	91,706	4,341	37,391	-	-	-	793	-	15	-	-	-	-	-	-	-	2,190	-	-	-	-	-	136,436
1943	9,137	34	56,457	-	-	-	565	-	127	-	-	-	-	-	-	-	152	-	-	-	-	-	66,472
1944	150,062	13,700	22,840	-	-	-	21,259	2,601	2,881	-	-	-	-	-	-	-	9,789	-	-	-	-	-	223,132
1945	524,276	114,539	59,357	-	-	-	173,754	9,643	14,932	-	-	-	2,274	-	5,438	115	48,126	-	-	-	-	-	952,474
1946	930,745	38,738	48,371	-	-	-	128,739	34,805	1,186	-	-	-	36,641	-	94,873	-	94,305	-	-	-	-	-	1,408,403
1947	289,903	-	841	-	-	-	49,113	50,573	-	17,130	-	-	-	-	-	-	33,777	-	-	-	-	-	441,337
1948	-	-	10,786	-	3,127	1,252	113,887	-	-	112,922	-	-	-	-	-	-	31,155	-	-	-	-	-	273,129
1949	145,421	-	105,854	12,617	-	-	77,822	-	-	-	-	-	-	-	-	-	30,224	-	-	-	-	-	371,938
1950	498,895	-	131,564	14,856	-	-	165,111	7,770	-	47,107	-	-	11,500	-	-	-	131,331	-	-	-	-	-	1,008,134
1951	339,748	-	53,557	-	-	-	146,157	-	-	18,390	-	-	-	-	-	-	114,669	-	-	-	-	-	672,521
1952	-	-	122,833	-	-	-	80,945	-	-	158,521	-	-	18,650	-	-	-	59,337	-	-	-	-	-	440,286
1953	329,211	-	360,201	-	-	-	237,860	15,989	-	187,736	-	-	45,940	-	-	-	-	-	-	-	-	-	1,176,933
1954	425,254	-	62,577	-	-	-	324,746	33,212	-	7,487	636	-	78,638	-	-	-	-	-	-	-	-	-	932,550
1955	402,364	-	256,347	-	-	-	491,425	29,965	-	115,714	9,575	-	61,168	-	-	-	-	-	-	-	-	-	1,366,558
1956	457,075	-	238,635	-	-	-	457,150	63,275	-	177,962	-	-	44,495	-	-	-	-	23	-	-	-	-	1,438,615
1957	358,805	-	139,983	-	-	-	313,485	-	-	256,835	-	-	-	-	-	-	-	195	140	436	91	181	1,25