AGRICULTURAL CONDITIONS AND POSSIBILITIES

IN

TRANSJORDAN AND ARAB PALESTINE

BY

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CONTENTS

This report gives an account of the personal observations that were made on agricultural conditions, the information which was collected concerning them and the views which were formed as to the possibilities for agricultural development and increased production in Transjordan and Arab Palestine, during the course of a visit to those territories from 20th May to 3rd June, 1949.

Most of this period was spent in a tour of these countries. It extended in Transjordan from the River Yarmouk in the North to the Gulf of Aqaba in the South, and from the River Jordan and the Dead Sea in the West to a point in the desert as far East as Qasr el Azraq. In Arab Palestine it embraced the area lying between Jenin in the North, Tulkarm and Jerusalem in the West and Hebron in the South, i.e. the whole of the Palestinian territory now absorbed in Transjordan.

On arrival in Amman contact was established immediately with the British Legation and through it with H.E. Khalusi Khairy, who had recently been appointed Minister of Agriculture and Commerce of the Transjordan Government. The composition and functions of the Development Division of the British Middle East Office, and the purpose of my own visit were explained to him. He expressed satisfaction at my arrival, offered the fullest assistance to me and voiced the strong hope that at the end of my tour I would give his Government a report as, he felt confident, it would be of much assistance to the administration. At the conclusion of my tour I again met His Excellency, gave him a general verbal account of my views and promised to send the present fuller account in due course.

I met and had useful discussions with several other ministers and officials of the Transjordan Government. They included :-

H.E. Suleman Pasha Sukkar,	Minister of Finance and Economic Affairs.
H E. Ruhi Bey Abdul Hadi,	Minister of Foreign Affairs.
H.E. Sheikh Amir Shanketi,	Minister of Education.
H.E. Musa Bey Nasar,	Minister of Communications.
Said Bey Durrah,	Acting Director of Education.
Mr. George Walpole,	Director of Lands.

Mr. Walpole personally accompanied me on the first of my visits to the North, in order particularly to show me what has been and is being done in connection with irrigation, soil conservation and forestry, all of which come under his administration. My talks with him on this tour and at subsequent meetings were of the greatest assistance to me.

It was a matter of disappointment and regret that I was unable to meet Nussouh Bey Taher, Director of Agriculture. During the whole of my stay he was absent in Great Britain, on a visit arranged, it is understood, by the British Council. H.E. the Minister of Agriculture, however, placed at my entire disposal for the duration of my visit the services of Mr. Michael Haddad, B.Sc.(Agr.)(Texas), Assistant Director of Agriculture, who accompanied me on all my travels, made arrangements for my halting places and local contacts, and gave me the greatest possible assistance. Mr. Haddad has an extensive knowledge of his country and of its agriculture. He is a pleasant and very acceptable companion on tour and I greatly appreciated all his help day by day. He has returned only a few months ago, scientifically refreshed and his knowledge and outlook broadened by what he has learnt and the contacts which he has made during a year of post-graduate study at Cambridge and other centres in Great Britain.

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In Jerusalem I met Sir Hugh Dow, at present Consul-General. Our acquaintance in India dates back for many years. I had talks with Musa Bey Alami, a former senior official in Palestine, who had been informed of my proposed visit by Sir Hugh Dow and who was anxious to discuss a scheme of land development in Arab Palestine for the resettlement of refugees. We have arranged to meet in England next month when I hope to be able to put him in personal touch with firms and individuals likely to be interested in the research and engineering aspects of his project.

I wish to express my deep appreciation of the assistance which I received everywhere, and of the hospitality which I enjoyed. In these connections I am particularly grateful to Sir Alec Kirkbride, H.E. Khalusi Khairy and Mr. Walpole in Amman, Mr. Littledale, who arranged for me to spend a night at the I.P.C.'s pumping station at H.5, to Abdullah Bey Tel, Governor of Jerusalem, whose guest I was and who went to considerable personal trouble to find accommodation for me during my stay in Jerusalem.

If any of the views or suggestions made in these notes find favour with the Government of Transjordan, and if it be decided to implement them, the British Middle East Office will be happy to assist in the preparation of the necessary working plans, should such assistance be desired.

I

AGRICULTURAL STATISTICS

1. There exists no machinery in Transjordan for the collection of statistics of the exact area or production of the different crops. All available figures are estimates derived from calculations. Thus :-

(a) The area under each of the principal crops is determined from the quantity of seed considered to have been sown. Officers of the Agricultural Department visit each village and collect information on the amount of seed that has been sown. On the basis of a certain average seed rate per donum for each crop the area of that crop is calculated.

(b) The principal fruits are reported in terms of area and not, as in some Middle East countries, according to the number of trees. Actually no land measurements are made and, as is well known, fruit trees are often grown in scattered fashion and not in compact blocks. For each fruit it is assumed that a prescribed average number of trees is necessary to completely plant up a unit area - in this case a donum - and from the total tree count for that fruit the area in terms of donums is derived.

2. In considering the following figures the fact that they are estimates, obtained by these means, should be borne in mind. They have been extracted from the Annual Report of the Department of Agriculture, Transjordan, and relate to the year 1947 - 48 (1st April, 1947 - 31st March, 1948).

Area and Production of the Principal Crops

	Seed Sown (tons)	Seed rate per donum (kilos)	Area (donums)	= (acres)	Production (tons)
Wheat	16,600	10	1,660,000	415,000	100,000
Barley	5,700	10	570,000	142,500	41,000
Lentil	1,700	12	142,000	35,500	7,300
Kersenneh	1,700	12	142,000	35,500	9,200
Vetch	200	14	14,000	3,500	865
Chickpea	30	5	6,000	1,500	1,000
Broadbean	300	25	12,000	3,000	8,600
Simsim	30	2	15,000	3,750	500
Sorghum	70	2	35,000	8,750	5,000
Maize	12	5	2,400	600	-
Tobacco (Turkish)		-	165	40	-
" (Native)		-	3,500	870	-
Vegetables		-	53,000	13,250	-

Area under Principal Fruits

	In 000 donums				In 000 acres			
	1944	1945	1946	1947	1944	1945	1946	1947
Grape vines	65	55	45	40	16.25	13.75	11.25	10.00
Olives	50	51	52	53	12.50	12.75	13.00	13.25
Bananas	6	7	7.5	8.5	1.50	1.75	1.87	2.12
Other fruits	22	25	26	27.5	5.50	6.25	6.50	6.87

Production of fruits

In 000 tons

	1944	1945	1946	1947
Grapes	21	20	18	16
Olives	3.8	10	.85	1.8
Bananas	7.5	9	10	10
Other fruits	5.5	6	6	6.5

Notes: 1. Olive production was exceptionally high in 1945, a complete failure in 1946, and bad in 1947.

2. Most "other fruits" are grown under irrigation.

No. of Livestock (in 000)

	1943	1944	1945	1946	1947
Sheep	265	304	296	264	238
Goats	356	350	307	381	304
Camels	17	10	2.5	6.1	2.2
Bullocks	30	33	40	31	23
Dairy Cattle	17	25	31	31	25
Young stock	15	15	20	14	11.5
Mules	2.3	3.5	1.5	2.4	2.5
Horses	7	8	7.6	7.2	5.8
Donkeys	32	33	32	32.7	25
Poultry	550	560	500	424	385

Notes: (a) The figures for sheep, goats and camels are said to be reliable as these animals are taxed annually. Until 1948 the rate of tax was 5 piastres a head for sheep and goats; 10 piastres a head for camels. In 1949 these rates have been doubled.

(b) The figures for the other animals were obtained by the staff of the Agricultural Department during their village enquiries.

(c) Some violent fluctuations occur in the above figures. In some cases they are said to be occasioned by the emigration of stock from Transjordan to Saudi-Arabia during unfavourable years in the former and by the reverse process of immigration in unfavourable years in the latter country.

(d) 1946 - 1947 was a year of rainfall failure and great drought. It will be observed that the number of almost all kinds of livestock has fallen considerably in that year. The full effect of the drought is not shown, however, by the 1947 figures, which represent data up to 31st March only of that year. It should be found in the 1948 data, which unfortunately were not available, but the Agricultural Department estimates that the proportion of animals which died from the effects of the drought was :-

Sheep	40%	Goats	40%
Cattle	45%	Camels	50%
Horses and Mules	25%		

II

EXPORTS, IMPORTS AND MANUFACTURES OF PRINCIPAL AGRICULTURAL PRODUCTS

3. The following data have been extracted from the Administration Report on Customs, Excise, Trade and Industry and from other reports and notes on Transjordan.

Exports (in tons)

	1944	1945	1946	1947	1948
Wheat	7,452	16,999	27,149	1,300	618
Barley	2,257	4,260	7,579	-	49
Lentils	2,720	8,283	2,304	803	1,430
Kersenneh	4,749	1,153	3,057	1	617
Millets	609	80	657	-	14
Beans	564	1,829	1,041	10	113
Grapes	2,848	5,341	2,939	1,659	-
Raisins	645	435	402	252	2
Fresh Fruits	2,342	1,990	2,832	3,911	2,142
Fresh Vegetables	4,488	2,630	2,933	4,564	4,291
Hides and Skins	-	123	179	252	655
Wool	51	75	54	105	203
Sheep (numbers)	-	-	-	12,465	-
Goats "	-	-	-	8,149	-
Cattle "	-	7,862	1,804	1,158	-

Note: The effect of the failure of the rains in the winter of 1946 - 47 is reflected in the great drop in exports of cereals in 1947. Exports of these commodities have continued to be relatively small in 1948, partly because of the heavy demands made on local food resources by the vast numbers of Palestine Arab refugees now finding shelter in Transjordan.

Imports (in tons)

	1946	1947	1948
Rice	1,481	1,696	8,910
Sugar	2,790	7,109	20,321
Dates	3,024	6,223	7,164
Coffee	1,909	1,420	1,515
Tea	108	286	216
Livestock: (numbers)	183,702	82,396	75,624

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4. The following data covering exports and imports of livestock and its products have been extracted from the Annual Report for 1947 of the Department of Agriculture, Transjordan. It will be observed that in some instances they differ very markedly from those given in the foregoing statements. The exact reasons for these differences have not been ascertained; possibly the much larger numbers given in the agricultural report may include through-trade

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of territories outside the Transjordan frontiers, whilst the smaller returns in the other report may omit such trade. Such a solution however, is merely guesswork and may not be the real explanation.

Exports and Imports of Animals and their Products in 1947.

	Exports	Imports
Sheep (numbers)	40,476	94,341
Goats "	28,236	22,178
Camels "	5,018	5,040
Cattle "	12,830	14,793
Buffaloes"	20	1,576
Horses "	16	57
Mules "	-	29
Donkeys "	-	99
Pigs "	60	-
Hides and skins (tons)	275	35
Wool (tons)	94	2.5
Hair "	3	6.6
Bones "	78	11.6
Fresh Meat (tons)	-	22
Preserved Meat (tons)	-	23
Fat (tons)	2	-

Industrial Production

5. Industries associated with agricultural products appear to be confined to tobacco, wines and spirits. In both cases the output is small.

6. Tobacco. Two factories for the manufacture of tobacco operate in Transjordan. Their output in kilos of manufactured tobacco, during the past three years, has been :-

	1946	1947	1948
National Tobacco Company	107,859	138,698	117,482
Jordan Tobacco Company	20,622	27,085	42,383
Total (kilos)	128,481	165,783	159,865
(in metric tons)	128	166	160

7. Wines and Spirits. Four factories operating in 1948 produced the following wines and spirits. The output is given in litres in each case.

	Wine	Arag	Cognac
1. The New Nasrawi Factory, Es Salt.	1,200	7,753	4,162
2. The Nasrawi Factory, Es Salt.	3,935	10,301	2,183
3. The Samawi Factory, El Fohels (a)	844	3,274	1,283

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	Wine	Arag	Cognac
4. The Musharbash and Boji Factory, El Foheis (b)	-	3,104	150

(a) Factory buildings are said to be old and the plant somewhat primitive.

(b) A modern factory established only in 1948.

III

SOME AGRICULTURAL FEATURES OF THE COUNTRY

8. The notes contained in this section represent general observations which were made during an extensive tour through Transjordan from the River Yarmouk in the North to Aqaba in the South, from the River Jordan in the North-West into the desert as far as the Azraq and as far East generally as the road connecting Amman and Maan.

The Jordan Valley (Western Transjordan)

9. This valley consists of a relatively narrow strip of land running from North to South between the River Jordan and the hills to the East. It lies below sea level to a depth of about 700 feet at the northern extremity and about 1,200 feet where it reaches the Dead Sea in the South. Its total length is about 65 - 70 miles. The hills forming the Eastern boundary of the valley rise probably 1,000 to 2,000 feet above sea level. From these hills a number of Wadis enter the valley throughout most of its length and supply perennial water to it.

10. Adasiya is a very prosperous village close to the River Yarmouk in the extreme North of the valley. Tomatoes, brinjals and other summer vegetables are grown extensively. Cattle also are numerous. Cultivation is by tractors and combines. Southwards the land presents a sea of excellent wheat and barley extending westwards to the River Jordan. Obviously this part of the valley down to the Wadi el Arab and beyond possesses rich land and can grow a wide variety of crops, vegetables and fruits. At present, however, cereal crops occupy a major part of the soil. Tobacco was observed in Bajura village, whilst there is a fair area of bananas around Shuneh, the headworks of the Wadi el Arab, to which reference will be made later. The Rutenberg Hydro-electric Concession on the River Jordan lies about opposite this point. Incidentally, it has not been working for about a year.

11. Continuing South, cereals constitute the main type of crop but occasional fields of tomatoes, cucumbers and egg plants occur. Around Jesr Sheikh Hussain village the fallow land in very weedy and sorghum is being grown in fields which are full of weeds. On the land irrigated from the Wadi El Yabis there is a fair area of tomatoes and onions. Irrigated sorghum is said to be grown here sometimes after the wheat harvest. There is a good flow of water from this Wadi. The wheat crop is excellent, but cultivation of fallow land is poor and weeds are present to such an extent that they must deprive the soil of considerable plant food.

12. Approaching New Kureima there is a stretch of grassland which carries the largest and thickest grass observed during the whole tour of Transjordan. Apparently it is neither grazed nor cut. Among it there are some fields of good wheat.

13. There is a good water supply from the Wadi Kureima but cultivation in many parts of this area is of a low standard. After crossing this Wadi there is a large valley which gives the impression of indifferent development at present.

14. From the Wadi Rajib there is a large flow of water. A great wide stretch of level valley lies between the hills and the Jordan here. It should offer possibilities if properly developed. At present it produces only cereals.

15. The Wadi Zorqa has by far the largest flow of water seen in any of the Wadis in this area.

16. Rough grazing land is met near the hills. Then a great flat plain extends from the hills to the River Jordan. It appears to be totally undeveloped. At present it is grassland but appears to be neither grazed nor harvested. So far as was observed, there is no surface water for irrigation in this locality, unless it can be provided by pumping from the river. It is believed that trial borings have shown that sub-surface water exists here at a reasonable level and could be developed. A boring rig was observed at one point in this stretch of country. 100,000 donums (25,000 acres) of this great plain are said to belong to H.M. the King of Transjordan.

17. Between this area and Shuneh village on the Amman-Jericho road the country appears to be of very limited use agriculturally. At the moment a large refugee camp is located in it.

18. Between Allenby Bridge and Shuneh there is a considerable area of land capable of development, provided irrigation water can be made available. Presumably this could only be by pumping from the River Jordan.

19. The outstanding features of the Jordan Valley at present are :-

(a) the very great preponderance of cereals over all other crops grown in it,

(b) the series of Wadis flowing into it and supplying water for perennial irrigation,

(c) the undeveloped condition of all means of communication through it. The road throughout its length is no more than a track, extremely rough in many places, and crossing a succession of Wadis, some of them difficult to ford at the present time and probably unfordable by ordinary motor transport during times of heavy rain.

(d) the unusual situation at such a depth below sea level.

20. Apart from the combines seen at Adasiya, the only modern harvesting machinery observed in the Jordan Valley was one self-delivery reaping machine. In the valley, as in Transjordan generally, practically the whole cereal crop is harvested with the hand sickle: threshing is done by the usual eastern method - animals tramping out the harvested crop on threshing floors.

The possibilities of developing this area are considered elsewhere in these notes.

Northern Transjordan

21. Around Salt grape vines grow in fair quantity, though it is said that the area has fallen greatly in recent years and continues to diminish, owing to the ravages of Phylloxera. In the Wadi running down from Salt towards the East a variety of fruits is grown: pomegranates, figs and apricots seem to preponderate. Apart from these occasional exceptions the area West of Amman is cereal country.

22. The country northwards is hilly and wheat is its main crop. The cultivation often is bad and the indigenous plough seems unable to overcome the numerous bushy weeds in the cultivated fields. Many fields are very thickly covered with these weeds, to the detriment of the plant food reserves in the soil for succeeding cultivated crops. Either a better type of plough or eradication by hand is needed.

23. The rotation is either wheat-fallow or wheat-legume (usually kersenneh, grown as animal feed). Standing crops are usually good in the stretch of country traversed (Amman - Suweileh - Jerash - Husn).

24. The hills are often much eroded, even down to the bare rock in some cases. A few good gradonl demonstrations and experiments have been made by the Department of Lands. Some have been planted to almonds and some to carobs.

25. East of Mafraq on the Haifa - Bagdad road, the country is desert and there is no cultivation or grass. Much of the land is covered with basaltic stones and boulders. From Mafraq westwards cultivation begins in patches: elsewhere there is some grass. The barley crop here is good. Opposite Rantha the landscape represents a sea of barley, but cultivation is not good and weeds are far too abundant.

26. Approaching Irbid there is a great plain where much excellent wheat and kersenneh are grown. Olives, apples, peaches, cherries, figs and pomegranates all seem to do well under the rainfed conditions in this part of the country. The olive seems particularly suited to it.

27. West of Irbid the country is hilly and the soil rather stoney. A good deal of wheat and barley and some summer vegetables are grown; sorghum also has been sown on a fair scale, but cleaner cultivation is needed. Olives in plenty cover the distant hills to the North and South.

28. Here and there along the way fruits of many kinds are grown and fresh plantings of olives, pomegranates, figs, apricots and grape vines can be seen. Much of the soil is thin and rocky and gives a poor return from the cereals now being grown on it.

29. The conditions which exist over much of this tract in the North appear more suitable for fruits, such as olives and grapes, than for cereals. Cultivators would reap a much greater reward for their labour, capital and enterprise if a large acreage of this region now devoted to marginal cereals were put under suitable fruits or, it may also be, some forest trees. Rainfall is good. In the current year it has been 647 mms. (26") at Umm Qeis, 601 mms. (24") at Irbid, and 672 mms. (27") at Husn. It then tails off rapidly and at Rantha it was only 389 mms. (15½").

Central Transjordan

30. Immediately South of Amman the landscape is bare and the hills eroded down to bare rock. Later the country opens out and a D 2 caterpillar tractor was observed at work. Thereafter the road passes through two large estates of 18,000 donums (4,500 acres) and 100,000 donums (25,000 acres) toward Umm el Amad village where mechanised cultivation is done. Here and for some miles approaching Madaba the countryside presents the appearance of a vast sea of wheat. So great is the area that one looks in vain for fallow land for next year's crop and it appears as though wheat may follow wheat annually on the land. The land is all dry-farmed and the crops are good, even on poor, thin soil. They are said to be the best for many years, because of plentiful and well distributed rainfall. This area, as far as Madaba, appears to possess some of the best land in the country. Madaba is at an elevation of about 2,500 feet above sea level. A feature of the landscape not only here but almost everywhere is its treelessness.

31. South of Madaba there is less wheat and more fallow land which is full of weeds, particularly a type of thistle.

32. The country then becomes rocky and stoney and there is a certain amount of rough grazing. It continues hilly and wild to the Wadi el Wala. Attempts at the growing of wheat are made on the hill top. Another crossing of the deep Wadi el Mujib follows and the country as far as Shihan merely provides rough grazing.

33. Between Sheihan and El Qasr there is a large, flat stretch of country devoted to cereal growing. Near Rabba the Agricultural Department this year opened a seed farm on good land. From Rabba to Kerak cereals are grown on patches whenever suitable conditions can be found. Below Kerak in the Wadi running towards the Dead Sea, apricots, pears and walnuts are grown.

34. South of Kerak up to Hazar the country is poor. Much wheat is sown. It is understood that it is customary in this area to delay sowing till February and that good crops result. Some of the land here might give a much better return from grape vines than from the cereals to which it is entirely devoted now.

35. A steep drop of some hundreds of feet is involved in the crossing of the Wadi Hasa. The village Aina, in the bottom of the Wadi, grows wheat and various kinds of fruit. Laban village in the gorge has also a small area under fruit trees, vegetables, wheat and tobacco.

36. Tafila is situated in hilly country. On approaching and leaving it there is a considerable concentration of olive trees in a small area in the immediate neighbourhood of the village. There are also some walnuts, figs, pomegranates and apricots. The altitude here is about 3,200 feet. To the South barley and wheat seem to have been sown in every and any spot where enough soil exists to cover the seed. Otherwise the countryside consists of bare rocky hills.

The Sherah

37. The stretch of country known as the Sherah (= "highlands") appears to extend from about Rashadiya (which lies between Tafila and Shobak) southwards to Naqb Ashtar (the railway terminus), a distance of the order of 60 miles. The altitude of Rashadiya is probably between 4,000 and 4,500 feet; the hills behind it are over 5,000 feet.

38. For some kilometres South of Rashadiya the country is fairly flat and thickly covered with a wild plant, sagebrush or wormwood (Artemisia herba-alba) which grows in tufts and has a root system which descends several inches into the soil. This plant is a feature of the Sherah country. The indigenous plough seems incapable of uprooting it and, though here and there small areas have been cleared of it and been brought under cultivation, it seems probable that if a serious attempt were being made to cultivate this area, initial breaking up by tractors would be necessary. In any case the difficulty of procuring draft animals in large numbers might make power farming essential.

39. In the few isolated patches where the land has been cleared of sagebrush in the North a cereal crop has been sown. In many cases the resulting harvest will produce little more than the seed which was used in sowing it. In other plots though the result is of a better standard, the crop will gather in extremely lightly. Although there exists no record of rainfall in the immediate neighbourhood, the rainfall during the past winter has been good throughout the country generally and it can be assumed that in this area it has at least not

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been below the average and may well have exceeded it. One, therefore, would expect this year's crop to be representative of the return from a cereal crop on this land in one of the better years of rainfall. On the other hand, it was stated locally that snow lay late on the ground this year and delayed the crop. There was no sign of any water from springs in this locality.

40. On approaching Shobak and Najl there is some cereal cropping. Even in the low-lying lands the crop is only fair: on the higher lands it is very light.

41. At Najl where there are some water springs, fruit trees are growing. Apricots, apples, plums, pomegranates, figs, and olives appear to be included. The growth of these trees is good but they are irrigated. The altitude here may be of the order of 3,000 - 3,500 feet.

42. The local schoolmaster keeps a raingauge. The average annual rainfall at Shobak for 10 years was 437 mms. (17½").

43. South of Najl the country for some distance grows a good deal of cereals. The crop is variable but, taken generally, is light and may yield from 4 to 5 cwts. per acre. In this immediate locality all land capable of cultivation is taken up already, and it seems likely that this land may be owned privately. On one hillside the remnants of a former oak forest are to be seen.

44. The country then becomes hilly and the land stoney. It is good for little, though cereals are being grown where the soil is sufficient to cover the seed. Such conditions continue to Wadi Musa. Even up to Ail (due West of Maan) conditions are not good owing to the stoney and unsatisfactory nature of the land. Between Najl and Wadi Musa there are some small springs. Occasionally they irrigate a few fruit trees or a field or two of cereals but the trickle flowing from others is sufficient for drinking purposes only.

45. South of Ail the stoney country ceases and the sagebrush again appears prominently. For some miles at first the country is of a rolling nature and then becomes more hilly. Here and there patches of land have been cleared of brush and sown to cereals. The resulting crop is very poor: often it seems hardly worth harvesting. Camels and goats were grazing in these areas; the herbage is sagebrush rather than grass. There was no sign of water springs in this part of the Sherah.

46. Naqb Ashtar forms the southern limit of the Sherah. Thereafter all the way to Aqaba the land is entirely desert interspersed with rocky hills.

47. Viewed in depth from West to East between Naqb Ashtar and Maan the country at first is of the same type, i.e. hills liberally covered with sagebrush. Some slopes are very stoney. Sheep and goats were grazing in this area. In low lying areas there were signs of grass but there was no cultivation of any kind. Later a change occurs: bushes become fewer, eventually disappear and the country becomes just a barren desert all the way to Maan. At Maan itself some fruit orchards thrive under irrigation. Its altitude is about 3,300 feet.

48. Rainfall decreases quickly from West to East and whereas at Shobak the 10 years' annual average was 437 mms. (17½"), at Maan the average for the same period was only 48 mms. (2") a year.

49. Seen from the East along the Maan to Amman road and railway, the Sherah is pure desert. Throughout its whole length there is no

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vegetation of any kind save sagebrush and grass in occasional depressions along which some water appears to pass during the rainy season. Whatever may be the possibilities of cultivation with prospects of survival in the western Sherah there are none whatever in the East.

50. Taken as a whole the Sherah at present is an uninviting country. From the description which has been given it appears that any settlement which might be contemplated would have to be mainly in the North and South of the tract. Possibly local tribes, such as the Howaitat, may claim grazing rights on this land.

51. If this year's cereal crops are fairly representative of what can reasonably be expected in an average to good year, they seem as a rule hardly worth the labour and expense of producing them and if cultivation has to be confined to such crops the average settler will be hard put to it to make a living. Unfortunately very little is known of the possibilities of this region. If, as may be the case, certain kinds of fruit or even other trees, could be established under rainfed conditions on part of the area the prospect might be otherwise. There is evidence that certain fruits grow satisfactorily under irrigation. If grown they will require adequate protection against damage and destruction by livestock which presumably will constitute another aspect of husbandry in this area. Trials alone will determine these issues.

52. Unless some such scheme is feasible settlers in the area may be a financial liability rather than an asset: even if it succeeds the liability will exist for some years till the productive stage is reached.

Southern Transjordan

53. The southern end of the Sherah at Naqb Ashtar marks the limit of cultivation and of cultivable land. Between that point and Aqaba the country is pure desert, uninhabited (as far as one saw) and devoid of vegetation except for occasional signs of sparse grass. Scattered throughout its length are high rocky hills. For the last few miles towards Aqaba the road passes through a gorge down which flood waters rush in times of rain, breaching and carrying away the road in many places. From Naqb Ashtar to Aqaba there is an asphalt road - the only road of this type in the South of Transjordan. Aqaba itself is a dry sandy area. In it the Department of Agriculture is attempting to establish a date palm station, a difficult operation because of the strong winds and blowing sand which are features of the locality. Agriculturally southern Transjordan has few possibilities.

Eastern Transjordan

54. Except for a visit to the Qasr el Azraq depression, which lies in the desert about 50 miles due East of Amman, and thence northwards across the desert to the I.P.C.'s H.5. Pumping Station on the Haifa to Bagdad road, the tour of eastern Transjordan was limited to that part which lies along the Maan - Amman - Mafraq road, i.e. the tract immediately East of the cultivated area.

55. North of Maan the country on both sides of the road for 50 miles up to Qal'at el Hasa railway station is entirely barren desert. Some sagebrush here and there and traces of thin grass in depressions along which some water appears to pass in the rainy season represent the only signs of plant life.

At Hasa station the railway has sunk an open well, the total depth of which was stated to be about 30 metres and the depth

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of water 15 metres. The water is sweet. After crossing the hills at the top of the Wadi Hasa the country North of Furfeira railway station opens out into a large flat plain. From here onwards grass begins to appear. It is better towards Furfeira than at Manzil, a station about 12 miles further North where the land is more bare.

56. In this locality camels and goats in small numbers were grazing. The elevation is about 2,800 feet.

57. Good grassland continues along the narrow valley to Qatrana where the Police Post records show that a total rainfall of 5.64 inches was receives this year on 22 days between November and mid-May.

58. The real grazing area begins at Qatrana and continues for 25 miles up to Qal al Daba railway station. Along this whole length there is grass interspersed with some sagebrush as far as the eye can see. In some places, e.g. North of Khan ez Zabib, it appears to cover a vast area. It can be said that the area immediately East of Kerak - Wadi el Wala - is good grazing land.

59. There was no sign of water supplies anywhere from Maan to Qal al Daba but at the latter place and beside an old castle there is a tank, said to be filled by rainfall. Livestock use this tank when grazing in the locality.

60. The possibilities of improving the grazing capacity of this naturally good grazing ground by seeding with better grasses is worth examination. Grassland authorities in Great Britain will be consulted. If improved grazing, coupled with the provision of drinking water for animals by collecting rainwater in tanks, or by other means, could be effected, this area would be a valuable livestock country.

61. Occasional barley fields begin to be seen in depressions between Qal al Daba and Jiza where the grazing area disappears. A feature of Jiza is a large masonry tank filled with rainwater.

62. North of Jiza very good arable land exists and a large area of wheat and barley is grown. One landowner here is said to have 100,000 donums (25,000 acres) of land which he farms by tractors and combines.

63. At Tuneib village were seen as fine crops of wheat and barley as are to be found anywhere in Transjordan, on land said to be owned to the extent of 18,000 donums (4,500 acres) by an Amman merchant and farmed by mechanisation. Good lentil and chickpea crops occupy part of this land whose special feature is good soil, well cultivated. From Yadudh to Amman the country is hilly and rocky: wheat and barley are grown extensively. North of Amman there is some intensive fruit and vegetable cultivation along the Wadi in the Ruseifa - Sukhna area. Pears, plums, apples, apricots, grape vines, pomegranates and walnuts grow here under irrigation. Some of the orchards are very well kept. Others are indifferently maintained and woolly aphis is present.

64. A special feature of the land along this Wadi is the amount of lucerne which is grown. It is cut with the scythe, sun-dried and baled on the spot by means of baling machines operated by horse gears. It is said that the baled lucerne is exported to Palestine and commands a very high price.

65. Beyond this area there is little cultivation all the way North to Mafraq. The country is entirely a grazing area of apparently only mediocre quality.

The Azraq

66. The Qasr el Azraq is a depression in the desert about 50 miles East of Amman as the crow flies (but actually 77 miles by surface transport), at the northern end of the Wadi Sirhan. Its special feature is the existence in it of a number of perennial springs. At present the water of these springs is not being utilised, except in so far as the I.P.C. pumps its requirements of water to H.5. pumping station on the Kirkuk - Haifa pipeline. The possibility of developing these water resources in order to provide irrigated cultivation for the settlement of refugees in the tract has been suggested recently.

67. To reach the Azraq from Amman the Mafraq asphalt road is followed for about 22 miles. Then a track takes off eastwards for a dozen miles through country carrying some grass till Qa Khanna is reached. No animals were seen except some camels. Near the water nomad tents were erected. Qa Khanna is a low-lying piece of country running North and South for 6 - 7 miles. In it run-off water from the surrounding higher land collects during the rainy season, and forms shallow sheets of water, some of them considerable in extent. When the water disappears by evaporation and percolation in the spring and summer months it uncovers flat expanses of soil which has been washed down during the course of years, from the higher adjoining lands, leaving them barren. This soil dries out into a hard surface: the soil itself is heavy and shallow cracks form during the drying-out process. Whether any use could be made of it is doubtful.

68. The track to the Azraq turns South down this depression. All traces of grass disappear and the landscape is bare, washed out, and in many parts stoney all the way to the Police Post at Azraq.

69. The higher land adjoining the depression has been washed clear of surface soil and carries a mass of small stones. A pit dug beneath these stones near the police station revealed sand underneath.

70. Information was not available as to the exact number of springs but the opinion was hazarded locally that there might be 20.

There is said to be no outlet for the water from the depression: the surface water from the springs and rainfall run-off seems to disappear by evaporation and percolation. Local residents said that in the rainy season part of the area is impassable. At present cattle are grazing over it.

71. In the southern end part of the land tends to be swampy and the soil is black and resembles peat. The surface is very rough in places and is thickly covered with rushes: the water table is not far below ground level. In this area alkali salts appear plentifully on the surface everywhere.

72. South of the swampy area somewhat higher ground exists: it carries a thorny shrub which covers the land densely in some places. Other areas are fairly free of this shrub and of rushes but are white with alkali salts.

73. In a small village on the edge of the low lying area below the police post, some cultivators have planted gardens and the result will be well worth watching. One man has installed an engine/pump to irrigate a very small area around his dwelling house. Water is pumped

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from an open sump. The water level lies at about 12 feet from the surface. The soil is alkaline. The cultivator said that at the outset he had to remove the top 2 - 3 inches of soil. For the first two years afterwards he got a very poor return from his crops, but since then there has been an improvement following the application of farmyard manure. He is trying out a number of fruits and vegetables. They include date palms, pomegranates, figs, apricots, bananas (planted in a trench 5 feet deep), lettuce, onions, cucumbers, melons, egg plants and lucerne. The date palms have made a good start. Cucumbers and melons have done best in past years.

74. In another nearby garden date-palms, apricots, grapes, pomegranates, and olives have been planted. The trees are well established: the apricots are fruiting. Maize, onions and summer vegetables also are being grown. Irrigation is done from an open sump. The water here is at a depth of only 3 - 4 feet from ground surface: it is lifted by the Indian dhengli - a pole working on a fulorum and weighted at one end to counterbalance the weight of the water which is raised in a skin or other type of receptacle. The water is sweet.

75. The depression was seen northwards up to the I.P.C. water pumping station.

76. Some points which seem to call for attention in considering the possibilities of this area are :-

(1) The soil is saline, so much so that in the bottom of the depression, and even on the higher land near it, soil reclamation would appear to be an essential preliminary to cultivation. If the salt is mainly sodium chloride reclamation by leaching would not be difficult provided that :-

(a) there can be installed a suitable drainage system into which the drainage water containing the leached salts can be carried off by gravity or can be otherwise removed by pumping;

(b) the water supply is adequate for reclamation purposes.

(2) To clear the land of scrub and to level some of the area tractors and bulldozers would be needed.

(3) So far as is known the discharge of the springs, either separately or combined, is unknown. This information is necessary to determine their capacity for crop irrigation.

(4) Can this supply be supplemented from sub-surface water by drilling and pumping?

(5) Obviously drainage will be necessary in part, if not in the whole, of the area. What are the prospects of providing such a system? Will it have a free fall outlet: if not, can satisfactory disposal of the drainage water be provided by pumping?

(6) Can the water flow and winter flood water be controlled and directed for irrigation purposes: will they irrigate by gravity flow or must some form of lift be provided?

(7) What are the qualities of the soil, apart from alkalinity where it exists? Will it be agriculturally worth the cost of clearance, reclamation and drainage?

77. Until engineering, topographical and soil surveys have provided information along these lines, it will not be possible to determine the exact agricultural possibilities of this tract. It is understood that the Irrigation Engineer of the Transjordan Government is now making an engineering survey but that at present technically trained staff for a soil survey is lacking.

78. If surveys should determine that the cost of development or the suitability of the soil for development is likely to render the scheme economically unsound, it is suggested that the possibility of development on date palm-growing lines might be considered. Conditions of soil, water and climate, in this area are not vastly unlike those in which date palms flourish in parts of some other eastern territories. It seems possible that they might equally succeed here without the necessity of incurring heavy reclamation expenditure, provided that they can be protected adequately from damage and destruction by grazing animals.

79. Since this area was visited it has been stated that North of the I.P.C. pumping station in the Azraq there is good land, free of alkaline salts, which it is thought could be included in the scheme for development of the Azraq. This particular land was not seen and presumably its possibilities both for irrigation and cultivation will be fully examined in the surveys which are an essential preliminary to a final decision on the whole project.

IV

IRRIGATION CONDITIONS AND POSSIBILITIES

80. Cultivation in Transjordan is essentially rainfed. The cultivated area in the Kingdom, whose total extent may be 25 - 30 million acres, has been estimated by one authority as 1,222,500 acres, but it attains that magnitude only through the inclusion of areas in which the annual rainfall is as low as 8 inches. Such a minimum would be considered unsafe for dry-farming purposes in many countries and 10 inches would be regarded as the absolute limit, even allowing for a low standard of living of the cultivator.

81. The same authority has estimated the irrigated area at 65,000 acres, which represent only slightly more than 5% of the total cultivation. Much of the irrigated area lies in the Jordan Valley in the 'Ghor', a terrace of land, far below sea level, varying from about 2 to 5 kilometres in width from near the River Jordan to the bottom of an escarpment, eastwards of which is high plateau country. It derives its irrigation from streams, some of them perennial, which enter it through a number of Wadis at different points throughout its length. Elsewhere in the country irrigated farming is on small-scale patches and is usually confined to the production of fruit and vegetables.

82. As in other Middle East countries depending for their agriculture on rainfall, which often is sparse and precarious, Transjordan agriculture needs to make the fullest use of all water supplies available to it. Surface supplies are concentrated largely in the North-West and consist mainly of the waters of the River Yarmouk, the River Jordan and the series of Wadis which enter the Jordan valley from the East. So far the first two of these sources remain undeveloped whilst the third is used wastefully and uneconomically.

Jordan Valley, Major Project

83. The water resources of Transjordan and their development have been the subject of an extensive survey and report by M.G. Ionides, former Director of Development, Transjordan. He arrived at the following finding :-

> "There is no escape from the conclusion that the only source of water on a scale large enough to affect the capacity of the country to any appreciable extent is from the two main rivers, the Jordan and the Yarmouk."

By the full development of the waters of these two rivers and of the streams which run into the valley he calculated that provision for an irrigated area of 300,000 donums (75,000 acres) could be made. He assumed that 75 out of every 100 acres protected by irrigation would be cropped annually. This would give an annual/area of about 56,000 acres. On this basis he considered that an holding of 30 donums (7½ acres) would be adequate for a family.

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84. Mr. Ionides calculated that on the basis of 1938 prices the aggregate cost of the entire project would amount to £2,650,000 for capital works. Recently the opinion has been expressed that the cost of such a project today would be of the order of £13 millions sterling. This sum includes expropriation compensation, canalisation, housing and equipment of settlers and anti-malaria operations.

85. The scheme, however, is not straightforward in that it is tied up with the Rutenberg Concession which uses the combined waters of the Yarmouk and the Jordan for the development of hydro-electric

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power. In doing so the water drops over 60 feet and it could not afterwards be used for irrigation unless it was raised again to its former level by pumping. This concession has still nearly 20 years to run before the date is reached by which, according to the agreement, it can be terminated. Early termination presumably would involve compensation. Another complication is that Palestine has also a right to the waters of the Jordan and agreement as to their distribution between the two countries will be necessary. Lebanon and Syria, through which these rivers pass before reaching Transjordan, may also have a voice in the disposal of the water.

86. A preliminary survey of the constructional work involved in this project is now being prepared by the British firm of Sir Murdoch MacDonald and Partners, whom the Transjordan Government have appointed for the purpose. The work is expected to take three months.

Jordan Valley, Minor Projects

87. Meantime, improvements are possible in the uses of the water brought to the Jordan valley in the various Wadis. These lie chiefly in better control and distribution, in the prevention or reduction of losses by seepage and in the utilisation of the water for the production of more valuable crops than the cereals which constitute the chief class of crop to which it is applied at present.

88. The first step towards such improvement has been taken by the Department of Lands, which has launched a project for the construction of a barrage type of headworks across the bed of each of the principal wadis near the point where it emerges into the valley. The water is controlled by sluice gates in these headworks: it is led into masonry channels which carry it to the beginning of the cultivated area where it is diverted in different directions through minor channels and eventually passes into ordinary earth channels in the fields. By these means the flow is controlled and properly distributed and losses by seepage in the upper reaches are prevented. A later stage may possibly lie in the provision of smaller masonry channels throughout the cultivated area for the further reduction of loss by percolation from the present earth channels, but this step is not contemplated at present. Not enough is known as to the degree of the present loss by percolation from these channels or whether the saving in water which would result from the construction of masonry channels would be worth-while. Nor has the Department of Lands yet undertaken the distribution of the water thus controlled amongst the different shareholders in the stream but it proposes soon to do so.

89. One such project has just been completed by the Department of Lands on the Wadi el Arab, the most northern of the wadis entering the Jordan Valley, whilst the foundations are being laid for a similar project on the next wadi to the South - the Wadi Ziqlab. The intention is to provide similar control and distribution systems on the nine principal wadis in this area.

90. On the Wadi el Arab project the actual construction work occupied 14 months. From start to finish the time spent was 18 months. Difficulties in getting concrete pipes delayed the work. The cost was L.P. 26,000. The area commanded by this wadi is 16,000 donums (4,000 acres). In this region 1 cumec of irrigation is considered to be adequate for 14,000 donums (3,500 acres): the channel from the headworks is designed to carry a flow of 1.1 cumecs.

91. Although these works are being financed initially by Government, it is not the intention that they will be presented as free gifts to the cultivators whose lands they command. On the contrary, the full cost will be recovered in due course from these cultivators by payments in proportion to their areas. No period has been fixed yet for amortisation of the cost of the headworks. Nor have the annual charges to be made by Government for water been determined, but it is contemplated that the amount may vary from anything up to L.P.1 per donum (L P.4 per acre) in a normal year to less than 25 piastres a donum (L.P.1 per acre) in a bad year.

The Department of Lands will further undertake any special irrigation construction works, such as that of small masonry channels, at the request of a landowner but he will have to pay for them.

92. Some considerations arise from the construction of works of this type on these wadis.

(a) Most of the land in the valley is occupied by cereal crops. In the present year when rainfall has been good in the North of the Jordan Valley an excellent crop has resulted without irrigation and the cultivators do not at present want the Wadi el Arab water for their cereal crops. This difficulty may be expected to disappear in the lower rainfall area on wadis further South, and even in less favourable years on this one.

(b) In normal times it would be difficult for a cereal crop to bear the high water rates which are contemplated. .Cultivators may, therefore, be forced - to their own ultimate advantage - into a reorientation of their cropping programme, so as to reduce very greatly the cereals area and to grow more intensive crops.

(c) Government is proceeding with the scheme and with the proposal to levy water rates on the assumption that it owns the water in these wadis. Possibly cultivators who have been using these waters for years may dispute this view.

(d) To use irrigation water for cereal production anywhere, but particularly in Transjordan where there is so little scope for cultivation under irrigation and where adequate cereals can be grown elsewhere under dry farming conditions, is a great waste of a very valuable asset. A most important line of future development in the country should be a complete overhaul of the present agricultural system in the Jordan Valley and its replacement by intensive cultivation of the variety of highly paying crops for which this valley with its sub-tropical to tropical climate is so well suited. Fruits and vegetables are said to be ready for market a month earlier than similar products in surrounding countries, and to find assured and profitable sale in those countries.

(e) In bringing about this change the cultivators will need advice and guidance. The Agricultural Department must be prepared not only to give the right guidance but to provide the necessary supplies of plants, seeds, etc.

(f) This project does not provide irrigation for new land, except in so far as increased supplies due to reduction of seepage losses and savings through better distribution may make such provision. In any case, the increase would be comparatively small and it would go to land already owned and cultivated. In the present conditions in which land is held and owned there would be neither land nor irrigation water here for fresh settlers.

(g) The agricultural development of the Jordan Valley must be preceded or, at least, accompanied by the development of all-weather road communications throughout its length. It would be unwise to attempt the large-scale production of perishable commodities unless easy means exist for their quick removal and transport to market.

(h) Any extensive development of fruit and vegetable production in this area and elsewhere in the country, should be accompanied by the establishment of a first-class fruit preservation industry which will absorb fruit of quality unfitted for the fresh fruit market, and provide an alternative method of disposal should the fresh fruit market fail at any time.

93. Another small possibility in irrigated farming in the Jordan Valley is considered locally to be the "Zor". This is a low-lying shelf of land only a few hundred yards wide along the banks of the Jordan. At present it is covered with scrub and is subject to flood. Before it becomes available it will require scrub-clearing, levelling, protection from floods and erosion and irrigation by pumping from the river. The area is small - the total area owned by Government is stated to be about 1,300 acres only. In a country with greater irrigation facilities and possibilities the considerable expense involved in developing such a small area might not normally be considered worth-while. Circumstances alter cases, however, and in Transjordan where already there is an hunger for cultivated land and where at present this situation is very greatly aggravated by refugees, the need may justify the means.

Qasr el Azraq

94. The only other area in which the development of irrigated farming on a concentrated area of any considerable magnitude is considered to be a possibility is the Azraq in the desert East of Amman. This project has been discussed in a separate part of this note.

Sub-Surface Supplies

95. Of the possibilities of the development of agriculture by irrigation from sub-surface supplies, and on the basis of data provided by the sinking of many bores whose sites were chosen so as to cover every favourable region, Mr. Ionides says "The results show conclusively that wells can provide nothing more than an insignificant aggregate of water, very useful where it exists, but negligible in its total effect". It is of interest to observe, however, that elsewhere he says in this connection that the Ghor el Kabid and the Ghor Nimein conditions are specially favourable. These areas lie near the Wadi Shaeb which is in the southern end of the Jordan Valley where a large area of land, at present producing only unused grass, awaits development. Borings in this land indicated that the water

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table is met at 25 - 50 feet from ground surface.

Grazing Ground Supplies

96. Finally, connected with the development of water supplies, but not with crop production under irrigation, a project is contemplated for the provision of drinking water for livestock in the grazing areas of Transjordan. Over very large stretches of the country grass develops annually to a greater or lesser degree during the rainfall in the winter months. At present it cannot be utilised adequately through the entire absence over long distances of natural springs or any other sources of drinking water for livestock. Grazing has, therefore, to be confined to areas within distances of water accessible to the animals. Although rainfall is scanty over much of the grazing area run-off does occur in depressions during the rainy season. It is proposed to excavate ordinary earthen tanks or reservoirs in the grazing areas in the expectation that they will impound run-off rainfall and so, by providing drinking water, will prolong the grazing season in areas already grazed and extend grazing to areas which at present are too remote from water supplies.

97. As at present contemplated, about 50 such reservoirs will be constructed over a period of three years. They will be scattered over the grazing country East and North. The experience of the first year should indicate the true value of such a provision. If drinking water can be collected and held up in these reservoirs for a reasonable period the project should be of great advantage to the livestock industry in the country. Experience in the Sudan, where the excavation of hafirs is a feature of development operations, should be valuable in relation to machinery required, costs and results. This information is being obtained and supplied to Transjordan.

V

THE AGRICULTURAL DEPARTMENT

98. The Agricultural Department of Transjordan includes in its administration agriculture, including horticulture, and veterinary activities. It does not cover forests or irrigation, both of which fall under the Department of Lands.

A. Finances

99. The budget estimates of expenditure for the current year and for last year are given below. For purposes of comparison the provision made for other benificent departments is also given.

	1948 - 1949 Estimates L.P.	Percentage of total		1949 - 1950 Estimates L.P.	Percentage of total	
Agriculture	33,469	1.44		34,940	1.49)	
Agriculture Extraordinary				30,342	1.29)	2.78
Public Health	38,255	1.65		54,854	2.34)	
Public Health Extraordinary				8,000	.34)	2.68
Education	52,828	2.28		60,071	2.56	
Public Works	107,810	4.65)		119,950	5.12)	
Public Works Extraordinary	163,096	7.04)	11.69	259,100	11.05)	16.17
Lands	86,582	3.73)		75,044	3.20)	
Lands Extraordinary	31,325	1.35)	5.08	151,922	6.48)	9.68
Total budget for Transjordan	2,316,366	100		2,344,402	100	

100. Transjordan is essentially an agricultural country. Approximately 85% of its population are engaged in agricultural activities. Yet it will be observed that the budget provision made for expenditure on agriculture in 1948 - 49 represented only 1,55% of the provision for the Kingdom as a whole. This proportion has been almost doubled in the 1949 - 50 budget through the provision of Extraordinary Expenditure intended to cover the following principal items :-

(a) L.P. 6,000 for starting an Agricultural School at Jebaiha. The details do not appear to have been worked out yet but there is an idea that an elementary course of two years might be given to boys of VI form education and that it should not qualify for Government service.

(b) L.P. 10,400 for the purchase of tractors, combines and other machinery as a first step in setting up a hire-contract cultivation service for cultivators.

(c) L.P. 10,000 for the purchase from outside of new American vine stock and for its subsequent multiplication for distribution for the control of the disease Phylloxera of grape vines.

(d) L.P. 2,000 for the procurement of date palm suckers from outside countries.

Comments on these items are made elsewhere in these notes in connection with the subjects to which they relate.

B. Activities

101. On the agricultural side the Departments main activities are concerned with the running of a few departmental stations, whose functions and work are described later, and with extension work activities. Selected seeds of some crops are produced and distributed: fruit nursery plants are raised and sold in considerable numbers: advice is given to cultivators on improved methods of crop husbandry and assistance is rendered in the control of crop pests and diseases. No laboratory research is undertaken, nor is any scientific staff employed for research: direct education by set courses forms no part of the Department's responsibilities.

The veterinary staff concerns itself with :-

(a) the control of contagious diseases,

(b) inspection of abattoirs and meat,

(c) inspection of imported and exported livestock and of livestock products and the collection of taxes on them,

(d) the treatment of Army horses.

102. The principal diseases of livestock are anthrax, sheep pox and pyroplasmosis. Minor and occasional diseases are mange, glanders and foot and mouth disease. The staff tours the country for the examination of livestock and the detection of diseases and inoculates animals where necessary. It is understood that the required vaccines are obtained from Iraq. Inoculation against certain diseases is not compulsory all over Transjordan, as it is in some other countries in this area.

103. The veterinary staff consists of a Chief Veterinary Officer who is located at Amman, 3 District Veterinary Officers, posted at Salt, Kerak and Irbid respectively, and 5 Cattle Inspectors at Salt, Irbid (2), Maan and Kerak.

104. There are no veterinary hospitals in the country and only one veterinary dispensary - at Amman.

105. No stud bulls are kept and no livestock improvement work is done.

C. Staff

106. Headquarters The headquarters staff at Amman consists of :-

(a) The Director of Agriculture.
The present Director is Nassouh Bey Taher.
He received his technical education in France.

(b) Two Assistant Directors of Agriculture.
1. Abbas Bey Abu Risha, who studied at the Agricultural School, Selemiyeh, in Syria.
2. Michael Haddad, whose technical education was obtained at Columbia, Cornell and Texas Universities in the U.S.A.

Education Direct agricultural education is not a function of the Department at present and no staff exists for this line of activity.

Research No staff is employed for research in crop or animal husbandry.

Extension Work Extension staff is as follows :-

Postings of District Agricultural Officers	Postings of Junior Agricultural Officers	
One at Irbid	Irbid	2 + 1 Plant Protection Officer
	Ajlun	1
	Jerash	1
One at Amman	Salt	1
	Madaba	1
	Amman	2
One at Kerak	Kerak	1
	Tafila	1
	Maan	1

Training of extension and farm staff.

(a) **Senior District Agricultural Officers**

D.A.O. Irbid - studied at Grignon, near Paris.
D.A.O. Amman - vacant. Duties undertaken by Assistant Director, Michael Haddad.
D.A.O. Kerak - studied at the Khadoorie Agricultural School at Tulkarm (Palestine) and spent one year in Egypt on plant protection studies.

(b) **Junior Agricultural Officers**

Irbid - 1 studied at the Agricultural School, Salemiyeh (Syria), 2 at the Agricultural School, Tulkarm (Palestine) and 1 received no technical education.

Amman - 1 studied at a former agricultural school in Lebanon, 2 at Tulkarm and 1 is without technical qualifications.

Kerak - 2 studied at Tulkarm and 1 at Talabaya Farm School, Lebanon.

(c) **Staff of Agricultural Stations and Nurseries**

All 5 assistants at the 4 departmental stations and nurseries were trained at Tulkarm.

D. Facilities

107. 1. **Research Laboratories**

As already stated, the Transjordan Government employs no special staff for research into the improvement of either crop or animal husbandry and no laboratories exist.

108. 2. Experimental Stations, Seed Farms and Fruit Nurseries.

The Agricultural Department has six stations, each of which fulfils one or more of these functions. They are located throughout the length of the Kingdom from the extreme North within a few kilometres of the River Yarmouk, to Aqaba on the southern frontier. They are considered here in the order in which they occur from North to South.

109. (a) The Baqura Nursery

This nursery is located South of Adasiya and not far from the irrigation headworks of the Wadi el Arab from which it draws its irrigation supplies. Its area is 150 donums (37½ acres). The site is more than 700 feet below sea level: the climate is sub-tropical.

110. It was started in 1932 as a citrus nursery for the production and distribution of citrus nursery plants for the Jordan Valley, and also to propagate date palms. It is said that little was done, however, in the citrus connection and that interest was lost in the project due to the low returns obtained from citrus fruit at that time. Consequently, other fruits were taken up. Jordan Valley citrus fruit is considered to be superior in flavour to the Jaffa product and is at least a month earlier in ripening. It is not, however, a good transporter: the skin appears to be too delicate.

111. Owing to lack of funds this nursery was handed over for maintenance purposes to the Department of Lands about 1942 but it was resumed in 1944.

112. 8 donums (2 acres) are under citrus fruits - lemons, oranges, grapefruit and pomelos.

113. There are about 500 date palms but it has not so far been possible to fully plant up the area originally intended for this fruit. It may be possible to plant here some of the suckers which are expected to be received shortly from Saudi Arabia. Meantime suckers are being produced from the existing date palms by encasing the offshoots at the base of the palms in wooden boxes packed with earth. When these shoots have struck roots they will be separated off from the parent trees and planted out.

114. Olive trees line both sides of the central road. Apples, pears, plums, peaches, pomegranates and figs also are grown and nursery plants of these fruits are being raised for sale.

115. A banana plot has been planted for experimental purposes. A row of castor plants is doing well.

116. American grape vines were planted four years ago for the production of mother stock to combat the disease Phylloxera which is doing great damage to the Transjordan grape crop. Distribution of stock should begin this year and in future the nursery should be in a position to issue some thousands of resistant stock annually. Much greater quantities of such stock are needed urgently, however, if the grape crop is to be saved from extinction by Phylloxera. Immediate needs are placed at 100,000 American stock but so far they seem to have proved unobtainable. The present mother stock was got from Palestine. It is believed that Cyprus has the desired varieties of resistant stock but that after filling its own present needs, it is unable to contribute substantially to the needs of this country.

117. Phylloxera resistant stocks are believed to be available from the following two firms, the names of whose Beirut representatives have been added. It is suggested that they be contacted :-

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1. Maison Gendre, Quissac (Gard), France.
Agents for Syria and Lebanon: Fuad Najjar,
Place de l'Etoile, Beirut.

2. Pepiniere Richter, Montpellier, Heraut, France.
Agents Saade Freres,
Comptoir Agricole,
P.O. Box 182, Beirut.

118. The general condition of this nursery is not good and much hard work must be put into it before it is of a standard comparable to that of some of the other departmental nurseries.

119. (b) Ruseifa Nursery

This nursery is situated about 15 kilometres outside Amman on the road to Mafraq. It was established about 16 years ago. Its area is 15 acres and it is irrigated from a stream.

120. Part of the area is devoted to trials of different varieties of apples, pears, plums, peaches, quinces, and apricots. The best of these varieties will be used subsequently as budwood for nursery work.

121. The stocks for apples, plums, pears, peaches and cherries were obtained from East Malling in England. They arrived in excellent condition by sea. The full requirements of Transjordan could not be supplied and steps are, therefore, being taken to multiply up the material which has been obtained.

122. Nursery plants being produced cover a wide range of fruits which include apples, pears, plums, apricots, olives, figs, pomegranates and almonds.

123. About 10,000 nursery plants are said to have been issued this year. The demand is great and cannot be met on the present scale of departmental production. Accordingly, this line of activity is being expanded. Applesand pears are in greatest demand.

124. For budded plants a nominal price of 25 mills (6d.) per plant is charged and for non-budded plants 15 mills (3½d.).

125. This is one of the best laid out and most attractive nurseries in the Middle East. The condition of all fruit trees and nursery plants is exceptionally good, clean and healthy. One defect is noticeable. The leaves of several fruit trees and many nursery plants are of a pale yellow sickly appearance, indicating inadequate supplies of one of the minor elements of plant food, possibly iron. The nature of the deficiency should be determined by experiment and should be remedied as quickly as possible.

126. (c) The Jebaiha Experimental Farm

This farm was opened 15 years ago. It is 150 acres in area and is situated on the Amman - Palestine road, 10 kilometres from Amman.

127. The average annual rainfall is about 500 mms. (20"). It fluctuates widely, however, for whereas in 1947 it was only 267 mms. (10¾"), in 1949 it was 637 mms. (25½").

128. The land is entirely rainfed. A small tube well provides drinking supplies only. The whole area is divided into blocks each of which is surrounded by rows of tall Cypress trees for windbreaks. Some hilly land with shallow soil and rocks has been planted under Aleppo pines and Cypress.

129. On the cropped area a three years' rotation is practised - cereals - legumes - summer vegetables.

Wheat

130. Wheat selection is done from individual ears. The selected grain is multiplied up on the farm for one year and then further multiplied on the lands of private cultivators, prior to general issue. 1,000 tons of selected seed were issued in 1946; in 1947 no issue was possible owing to the failure of the rains: in 1948 200 tons were distributed. A local selection, known as F8, is said to be the principal wheat.

131. A complete fertiliser mixture of 8 kilos sulphate of ammonia, 10 kilos superphosphate and 12 kilos potash per donum, is being tried in duplicate plots for the first time on a number of different wheat varieties. The quantities are apparently arbitrary. There have been no previous trials and it is not known whether in fact the soil or wheat crop requires or repays the application of all the three elements, N. P. and K. The experiment has not been well designed and the result is not likely to produce information of much value. Fertiliser experiments on rainfed cereals require to be carefully thought out for elsewhere under the rainfall conditions in the East fertilisers often give an uneconomic return when applied to cereal crops.

132. Many varieties of wheat from Holland are under trial. They all are late in maturing and seem unlikely to be suitable for local conditions.

133. An experiment to endeavour to induce drought resistance in wheat by pre-soaking of the seed in sodium chloride and potassium nitrite has been laid down.

Potatoes

134. This crop appears to have been first introduced here during the last war, when the Army needed supplies and assisted in procuring the seed. 14 varieties, all from Holland, are being tried under rainfed conditions for the first time. They have been planted on the flat in lines one metre apart - a distance which is excessive in potato-growing countries. So far the plants look healthy and free of disease.

135. Tomatoes were being planted under dry farming conditions. The only irrigation they receive is a tin of water per plant immediately on being transplanted. Cucumbers are being similarly grown. Lentils constitute a crop in the rotation.

Fruit

136. Most of the farm is devoted to fruit growing. The apples, pears, plums, etc. which were planted originally have done well and now are used for budwood.

137. Within the last two years an additional 50 donums (12½ acres) of land have been planted to fruit for experimental purposes. They include apples (44 varieties), pears, plums, peaches, cherries, pistachios, olives, grapes (16), figs (36), collected from all over the world. The layout of the orchard is good; the plants are clean and healthy and the cultivation good. Successful varieties will be used in course of time as budwood for nursery work for the public.

138. If adequate records of the growth and performance of so many fruits and so many varieties of each fruit are to be kept, the present subordinate staff on the farm will require to be suitably increased. No nursery plants are produced at this farm.

Poultry

140. White Leghorns, Australorps, Wyandottes, Light Sussex, Plymouth Rocks, and Fayyums (Egyptian) are kept. Pens and houses are good. Laying hens are trapnested and records are kept of each individual hen. Eggs are sold to the public for hatching at 1 piastre (2.4 pence) each: month-old chickens are sold at 4 piastres (9.6 pence) each. Hatching is done in incubators and lamp-heated foster-mothers are used.

141. A Poultry School was started this year to train young men desirous of taking up poultry keeping. The training period is 6 months. There are 5 students. They do all the daily work of the poultry section and each receives a monthly wage of L.P.5. They are provided with free dormitory accommodation but they feed themselves.

Cultivation

142. Farm cultivation is done by mules and not by tractor. Apart from a cultivator and a self-delivery reaping machine, few modern farm implements appear to be used.

General

143. This is an attractive farm, and it is well situated in the public eye. The steep land has been stone-terraced and planted to vines. Grape vines on the farm are not free of Phylloxera. The fruit varieties should produce most useful information in due time. The field crops on the experimental side are less satisfactory. It is obvious that a trained agronomist is needed here. In view of the importance of fruit and vegetables to the country, its special suitability to produce them and the considerable amount of varietal comparisons that is being undertaken, there is ample justification for the appointment of a fruit and vegetable specialist also.

144. (d) El Qasr Seed Farm

This farm was opened only a few months ago. The area is 600 donums (150 acres). The land was purchased from a large landowner at L.P. 10 a donum (£40 an acre).

145. The farm is situated on the main Amman to Kerak road between El Qasr and Rabba, 25 kilometres from Kerak, though the road itself is bad. A wire fence is being erected round the farm at present.

146. The locality is poor agriculturally, but the land of this farm seems good. Although, owing to receiving late possession of the land, the present wheat crop was not sown till the extraordinarily late date of 27th March, the crop is quite good, but the straw short.

147. Cultivation was done by tractor. The Department has two tractors in this area, a McCormick Deering W.9 wheel-type and a Caterpillar track.

148. This farm is intended for the production of improved seeds. Selected seeds from the Jebaiha Experimental Farm will be multiplied

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here prior to distribution to cultivators. Trials are to be made of such fruits, olives, grape vines, etc., as are likely to succeed under the dry farming conditions of this tract. The farm will be a valuable departmental asset in this region.

149. (e) Mazar Experimental Farm

This is also a new farm, opened only in very recent months. It is situated about 14 kilometres South of Kerak on the main road. The elevation is about 3,500 feet above sea level. The area is 420 donums (105 acres) of which about a quarter are under forest. The farm is to combine experimental work on fruit with seed production.

150. First ploughing has been done by tractor. The usual 3 - years rotation, cereals - legumes - summer crops, will be practised on the cropped area.

151. The rainfall in this area was 465 mms. (18") in 1947 - 8 and 377 mms. (15") in 1948 - 9. It is received between November and April, as elsewhere in the country.

152. Several varieties of wheat and barley are being tried. A-lentil and simsim also find places. The wheats include 7 India Pusa varieties. It is suggested that three Punjab varieties, Pb 8A, C518 and C591, be obtained and included in the trials.

Fruit

153. There are indications that several varieties of fruit may succeed under the conditions obtaining in this area. A dozen or more years ago a school garden of a few donums was planted by the Agricultural Department with apricots, quince, apples, peaches and mulberries. The trees have made good growth but fruit is scarce on some of them. A strong S.W. wind hits the area and causes flower shedding. Fruit trees planted on this farm will need adequate protection by wind breaks. Given such protection, the school garden results show that they will grow here under dry farming conditions.

154. Already a large area has been planted under a very large number of varieties of fruit. The figures quoted were apples (42 varieties), pears (25) plums (61), peaches (2), cherries (3), figs (8), grapes (16), apricots (2), almonds (2), walnuts (4).

155. This farm should provide most valuable information as to the fruits which can succeed under rainfed conditions in this area. Later the successful trees will be a useful source of budwood for the production of fruit nursery plants for distribution in the tract.

156. (f) Aqaba Experimental Station

This farm is located within a few hundred yards of the sea at the top of the Gulf of Aqaba. It was opened in 1947. Its area is 500 donums (125 acres). The average annual rainfall here during 10 years is only 18 mms. (.7").

157. The primary object in establishing this farm was to provide facilities for determining the possibilities of date palms and the best varieties to grow. Date palms already grow in small numbers under irrigation around wells in the neighbourhood.

158. Already about 25 donums (6¼ acres) of date palms have been planted and the station superintendent is at present in Saudi-Arabia for the purpose of procuring more date palm suckers. An area has also just been planted under wild grape vine cuttings with the idea of producing material for stocks on which to bud good grape varieties.

/Wild.....

Wild vines are said to carry considerable resistance, though not immunity, to Phylloxera.

159. Along the central road a double row of casuarina trees has been planted at about 6 feet distance between trees. They have made remarkable growth, in both height and thickness, in the short time since they were planted and it is obvious that under irrigation they will grow quickly and successfully here.

160. Irrigation is provided for the farm by means of wells and pumps. In the low-lying part of the farm 4 open wells have been sunk to a depth of 3 - 4 metres. These wells are linked to a central well or sump from which the water is pumped by two Ruston 16 H.P. engines into a reservoir tower on the high ground. From this tower the water is distributed through pipes to different points on the station. At these points valves are opened and the water runs finally into earth distribution channels. The soil is very light and percolation losses must be heavy. If the farm develops it may be found economical of water and money to build masonry channels through the lines of trees.

161. The two Ruston engines pump the sump dry in 3 hours. Pumping then ceases for 6 hours till the sump refills. The volume pumped in 3 hours is said to be about 100 c. metres.

162. Some lines of castor plants have been planted along the shelter "chappars" (screens) which have been erected round the nursery area. On the sheltered side where they are protected from strong winds the plants have grown well and are very healthy. On the windward side growth has been retarded very considerably.

163. If the object of this station is to be attained action in two directions appears unavoidable. These are the provision of adequate shelter belts and the fixation of the sandy soil in and around the farm. Strong winds are a constant feature of this place and blowing sand smothers everything. The trees must have very adequate shelter if they are to survive, and equally some binding agency must be found for fixing the sand.

164. Conditions here in respect of wind and sand appear to be so adverse that it is open to doubt whether the farm will succeed in its purpose, except at great cost. If the idea is merely to grow dates in Transjordan, or even to experiment on best varieties, it is possible that more hospitable conditions and suitable locations might be found in such places as the Azraq depression or the horticultural station at Jericho, where date palms already thrive.

VI

AGRICULTURAL EDUCATION

165. Except in so far as agriculture and nature study form part of the curriculum in certain classes of rural primary schools and secondary schools, there is at present no provision for imparting an agricultural education of any standard within Transjordan itself. There exists no University, College or School in which courses in agriculture are given. For the technical training of its staff, whether subordinate or superior, the Agricultural Department relies on outside institutions

Higher Education

166. University Standard. Provision to the extent of L.P.2,500 is made in the current year's budget for the purpose of sending for study abroad 5 or 6 students for full courses of 3 - 4 years leading to degrees of British or American Universities. It is understood that the subjects selected for the students to be sent in September 1949 will probably be Agronomy, Horticulture, Dairying, Botany, Agricultural Engineering and Meteorology. (The trainee in the last of these subjects is intended for a Department other than Agriculture). Agronomy, horticulture and economic botany are important aspects of agricultural improvement and development in Transjordan and the choice of these subjects for the first batch of trainees is appropriate. Dairying and agricultural machinery are of less immediate importance than Veterinary Science and Soil Chemistry and these two subjects could, with advantage, be substituted for them in this year's group.

167. Hopes are entertained for 1950 of sending :-

(a) five more students to take degree courses in other specialised lines,

(b) some existing departmental officers for one year's training in different subjects, e.g. horticulture at East Malling.

168. These proposals are sound and in time will bear fruit, but almost five years will elapse before the first trained nationals return on completion of their studies. Even then they will be without practical experience and unqualified to take command of research sections in their specific subjects. If, therefore, a beginning in the improvement and development of the agriculture of Transjordan has to await action by them, progress will be retarded for some years to come. In similar circumstances, pending the training of their own nationals and their subsequent acquisition of the necessary experience to qualify them to assume full responsibility in their various fields, other eastern countries have found it necessary to engage foreign specialists on contract for a number of years. It is suggested that Transjordan should take similar action in the case of a few key men. By so doing, progress in development could begin immediately and would be well established on the return of the local men from foreign study. The latter should work for a year or two with the foreign specialists who have inaugurated the work and would then replace them.

169. Certificate Standard. Most of the present subordinates in the Agricultural Department received their technical education at the Kadoorie Agricultural School, Tulkarm, Palestine, which is discussed in another section of these notes. A good training centre is needed for future subordinate staff for the Agricultural Department and for providing short specialised courses of different kinds for young men actually engaged in farming. Financial provision has been made in

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this year's budget for starting an Agricultural School at Jebaiha. If, however, Arab Palestine continues to be absorbed in Transjordan, it would be wasteful not to make full use of the good facilities already provided at Tulkarm and it would seem preferable to utilise the Khadoorie Agricultural School which should be capable of providing all the needs of Transjordan.

Agriculture in Primary and Secondary Schools

170. Agriculture forms a subject in the syllabus of the last five classes (3rd to 7th) in rural primary schools and of the first two classes of the four years' course in secondary schools. At present there are 80 (soon to be increased to 130) rural primary schools in Transjordan: 34 of them have school gardens.

171. Interest in the provision of such gardens seems to have first arisen about 15 years ago through the enthusiasm of the then High Commissioner for Palestine and Transjordan. Owing generally to lack of adequate funds but in some cases to the local unsuitability of the sites of schools for gardens, it has not been possible to provide more schools with gardens. It is the policy of the Ministry of Education, however, to increase the present number when funds permit.

172. Several school gardens were visited in the course of a tour of Transjordan. Their success is variable: some leave room for much improvement: some are almost models of what a garden should be. The suggestion was advanced that the poorly maintained gardens are generally attached to schools which have only one teacher and that owing to his many duties he cannot devote sufficient time to the school garden, whilst the most successful gardens are those attached to schools having two or more teachers.

173. In most school gardens emphasis is put on fruit growing and in each a considerable variety of fruits suited to the locality is grown. In some cases also forest trees such as Cypress, Aleppo pine and Casuarina have been planted. Vegetables are grown and in one instance a cereal crop. It was of interest to note that this crop was better than the average crop of the surrounding cultivators. Outside labour appears to be obtained for ploughing the land. The schoolboys plant the vegetables and spray, prune and take general care of the fruit trees. The area of each school garden appears to be 2 - 3 acres.

174. The syllabus in agriculture is very ambitious: the subject headings in themselves constitute a formidable list and cover most aspects of crop and animal husbandry. Since the timetable of the classes provides in some cases only one, and in the remainder only two periods weekly for instruction in agriculture, it seems doubtful whether the extent of the knowledge which can be conveyedin the time available is very great. More discrimination in the syllabus might prove profitable in these circumstances, even whilst accepting that for boys of that age instruction in this subject must be elementary.

175. The Ministry of Education, Transjordan, under which these schools function, is not in favour of continuing the inclusion of agriculture in the syllabus of secondary schools and contemplates its elimination. These schools are usually located in urban centres. It can be agreed that it is more important to concentrate on rural primary schools, since in them the greatest number of boys likely to benefit subsequently from this specialised subject will acquire a knowledge of it.

176. There is, however, another aspect to the question. Secondary schools appear to be the training ground for teachers of rural primary schools, and such future teachers, if they are to be fitted to convey instruction in agriculture to their pupils, must themselves study agriculture. Two alternatives exist in this connection. Either agriculture should be a full-fledged subject in the curriculum of the Secondary School, as it is in that of the Teachers' Training College in Cyprus, or future teachers should be required to undergo a special course of one year's training in agriculture at a suitable institution, such as the Khadoorie Agricultural School, Tulkarm, Palestine. The latter procedure has many advantages, since a large proportion of the students of secondary schools may make little use of their knowledge in their ultimate professions.

177. At present those who teach agriculture in rural primary schools appear to fall into three categories :-

(a) Teachers who have done a training course of one year's duration at the Khadoorie Agricultural School.

(b) Teachers of general subjects whose agricultural training consists of one or, in some cases, two summer courses in agriculture at a centre in Lebanon.

(c) Teachers without agricultural training who depend for guidance on the Agricultural Inspector of School Gardens in the Ministry.

178. At present the Agricultural Department gives no technical guidance or advice in the management and working of school gardens. The Department of Education itself has only one Agricultural Inspector, who was trained originally at Salamiyeh in Syria.

179. There would seem to be advantages in the association of the staff of the Department of Agriculture with the education authorities. Members of the agricultural extension staff constantly pass these school gardens when travelling around the country. To visit them when so doing would involve no expense and little inconvenience. At the same time their greater technical knowledge would be of advantage to the schoolmaster or to his agriculture teacher in guiding him, advising on and even demonstrating treatments and methods and in obtaining supplies of the best seeds, plants and other necessary materials. The suggestion is made that the Ministry of Education might consider the advisability of arranging with the Ministry of Agriculture that District Agricultural Officers in the course of their ordinary tours on departmental duty should visit schools which possess school gardens and should give advice and guidance in the management and running of these gardens and help where necessary in securing supplies. The impression was gained that such co-operation might be welcomed by the former Ministry.

VII

ARAB PALESTINE

180. The territory in that part of western Palestine which is now associated with Transjordan consists of a strip of country whose frontier lies just outside Jenin in the North, is bounded by the railway line on the western outskirt of Tulkarm, passes through Jerusalem and ends just South of Hebron. This area includes the towns of Jenin, Tulkarm, Nablus, Ramallah, part of Jerusalem, Bethlehem, and Hebron.

181. Agriculturally this stretch of country is probably amongst the poorest land in former Palestine. From North to South it consists of a succession of hills. Some of them are so eroded through the ages that they are now only bare rocks: others carry soil only in patches and it is so shallow that it is a matter for wonder that it is capable of producing cereal crops even of the low standard which it carries at present. Agriculture has to depend on rainfall. Except in occasional small areas and in gardens there is generally no irrigated farming.

182. There are bright spots, however, to this gloomy picture. Occasionally flat areas, most of them of no great size individually, occur in the valleys and usually they are rich and fertile: some hills, thickly planted with olives or carrying a fine stand of grape vines, afford practical proof and demonstration of what this poor soil can really produce when it is properly utilised: contour terracing has reached a fine art in many areas.

183. One's main impression is that the general standard of cultivation stands at an higher level than one generally associates with most Middle East cultivators. Obviously those responsible for this satisfactory feature know from hard experience that it is only by such means and such exertions that a living can be got from the soil under the hard conditions which maintain throughout this area.

The North

184. From the Allenby Bridge over the River Jordan to Jerusalem - a distance of approximately 30 miles - the country makes very little contribution to agricultural production, either crop or livestock. A stretch of sloping land on both sides of the road on rising ground from the Jordan to Jericho might be capable of agricultural use (though the soil appears to be alkaline) if it could be irrigated, but the rainfall at this point is too low for crop production. The possibility of irrigating 20,000 donums (5,000 acres) of this land by pumping water from the Jordan is being suggested at present in connection with refugee settlement. Such irrigation would be likely to prove very expensive for the lift from the river is high and the lead a matter of some kilometres. The proposal would require a survey from the engineering and soil aspects before any final decision could be made.

185. Around Jericho fruit and vegetables are being grown under irrigation. Here too there is an excellent departmental horticultural station which will be discussed later. Thereafter, all the way from Jericho to Jerusalem, the country consists of absolutely barren hills. They are not rocky but they produce neither crops nor grass. The rainfall is totally inadequate to sustain plant life.

186. Between Jerusalem and Ramallah the country is generally bare and rocky and the soil thin. Cereal crops are grown, however, everywhere there exists a patch of soil of sufficient depth to cover the seed. The resulting crop is light. Scattered olive trees grow on the hills and vines are found in/few places. All are rainfed. The gardens in and around Ramallah town grow olives, figs, apricots and almonds in considerable quantities under irrigation.

187. At first the country between Ramallah and Nablus is very rocky and the soil thin and heavy. Cereals occupy every square yard of available soil. Wheat and barley seem to occur in the ratio of 2 to 1. Thereafter vines grow in considerable quantities. The cereal crops are light though the annual rainfall here is said to be 24" to 32". The season this year has been exceptionally cold and this soil cannot bear too much rain. This area seems better suited to fruits than to ordinary field crops. Olives, vines and figs do best, all under dry-farming conditions.

188. A large olive-growing area is followed by well-terraced hills growing vines and cereals. These give place later to vine-growing country, where Phylloxera is said to be prevalent, and then to olives and a good deal of figs. Chickpeas and kersenneh occupy the valleys. Beyond Hawwara village the country is cereal up to Nablus where there are good crops in the valley approaching the town.

189. The 22 miles of country which separate Nablus from Tulkarm give a similar variety of conditions and crops. The gardens in Nablus are full of fig, olive, pomegranate and other fruit trees. Near the town every square yard of the rocky hills seems to carry a cereal crop. A considerable area is planted to summer vegetables in the lower lying land. At Arabta village there is a large area of fruit: the locality is said to be famous for its stone fruit. The Mediterranean Fruit Fly is troublesome here. Good cucumber and melon crops are also plentiful. Some excellent hill terracing occurs in this area. The former Palestine Government encouraged it by giving prizes for the best work: for Nablus sub-district alone the annual provision in this connection was said to have been L.P. 1,000 and an individual prize amounted to as much as L P.50.

190. The direct road from Tulkarm to Jenin is blocked as the present frontier crosses it.

191. Village Samaria grows a large area of olives and other fruits. Sorghum appears to be a popular summer crop. The country around is hilly and rocky but the cereal crops are good.

192. The country around village Bunga is olive-growing. It is said that 50% of all the olives grown in Palestine are produced in Samaria district.

193. Sileb el Dahr village presents a wonderful sight with its hillsides of hundreds of acres of fruit- olives, apples, pears, plums, peaches, apricots, figs, etc. Rivalling it in this respect is the next village, Fandaqmieh. Then follows a large area of excellent cereal crops, large olive plantations and summer Sorghum. In places so much wheat is grown that little or no fallow land seems to remain for next year's cereals and the suspicion is raised that wheat may follow wheat annually in some of this area. This picture of prosperity is then replaced by grim bare hills with no soil and no crops, except in the valley approaching Jenin.

194. Olives grow on the hills around Jenin. Beyond the town to the North there is a flat plain covered with cereal crops up to the frontier about a mile distant. On this plain there is a departmental seed farm.

195. Features of the agriculture of the country between Jenin and Nablus are the good cereal crops in the valleys; the olive-covered hills around the village of Qabatia; filler trees of almonds growing amongst young olives; good cultivation beneath the young olive trees and also on fallow land which is kept free of weeds; the marvellous sight provided by Zababdeh village where all the adjoining hills are thickly planted with olives; the large area of excellent wheat near Aqaba village with the olive-covered adjoining hills; the poorer country, ending in rough mountainous or rocky hills with sparse cultivation, on approaching Nablus.

The South

196. The direct road of only four miles between Jerusalem and Bethlehem is blocked and the present route lies along a non-asphalted road of 12 miles over very steep hills. The country all the way is very poor and treeless: such cereals as are grown will produce a light yield. The hills around Bethlehem carry fruit trees, mostly olives, but also figs and apricots. A feature of the hilly region on the way to Hebron is its stone terracing. After passing through rocky bare hills a large vine-growing country is met. Except for a few fig trees, there is nothing to be seen anywhere but vines.

197. The Ain Arroub Horticultural Station of the Department of Agriculture is situated in this part of Palestine. Reference to it is made elsewhere in these notes.

198. A light wheat crop on bare hills is the general impression created by the area approaching Hebron. To the West of Hebron in a rainfall region of 20 - 24 inches at Wadi el Quf, there is a forest nursery and a small forest area which was planted about 25 years ago.

The Agricultural Department

Staff

199. The staff at present working in Arab Palestine consists of :-

(a) One Agricultural Officer who is a graduate of Kansas University where he studied during 1939 - 45. He was employed subsequently from 1945 to 1948 by the Palestine Government. At present he is in charge of all departmental agriculture, veterinary and forest work in this territory.

(b) 3 Agricultural Inspectors for Jenin, Ramallah and Bethlehem. They were trained at Tulkarm.

(c) 4 Superintendents for the four agricultural and horticultural stations in this area.

(d) 1 Veterinary Officer. He is a graduate of Cairo University and takes charge of all veterinary activities.

(e) A number of Stock Inspectors, who tour the country looking for disease outbreaks and treat minor ailments of livestock. They had no initial veterinary training but learnt by experience.

(f) 1 Forest Inspector.

(g) 20 Forest Guards.

200. The agricultural staff visit the villages, conduct demonstrations, give advice and collect agricultural statistics.

201. The veterinary staff are concerned only with disease control. In normal times they inoculate livestock against anthrax which is the main disease. There is no rinderpest. They stated that their work is suffering from lack of vaccines and medicines. At present there is no budget provision for these requirements and services.

202. The work of the forest staff consists of protecting forests from destruction, controlling tree cutting and issuing licences for charcoal burning. It is calculated that out of a total of 855,000 donums (214,000 acres) of forests in former Palestine there now remain in Arab Palestine 267,500 donums (67,000 acres), of which 20,500 donums (5,000 acres) are closed forest. The area of good timber is probably not more than 3,000 donums (750 acres)

203. Additional staff is needed for the four agricultural and horticultural stations, plant protection measures, and other activities. Under the former Palestinian regime the Extension Service consisted of an Agricultural Officer (a University graduate) for each district. Under each officer there were the Agricultural Inspectors, 1 Poultry Inspector, 1 Olive Inspector, and the Superintendents of the Agricultural and Horticultural stations. At present most of these subordinates are lacking.

204. The whole work of the Department is suffering at present from lack of adequate budget provision for the discharge of its functions and duties, and also because of the uncertainty of the present staff as regards their future.

Agricultural Stations

205. In the Palestine territory now under Transjordan there are four agricultural or horticultural stations which constitute valuable assets for future departmental activities.

(a) Horticultural Station, Nablus

206. Established about 20 years ago. Area 100 donums (25 acres). On the termination of the British Mandate in Palestine this station was handed over to the local municipality for maintenance. The Iraqi Army occupied this station from May 1948 till January 1949 when it was taken over by the Agricultural Department. It suffered some damage in its occupation. In the centre of the nursery area the Iraqi Army has placed a neatly laid-out and walled-in cemetery for Iraqis killed in the Palestine war. The greatest loss was that of the station records. There is a large area of olives, figs, grapes, quince, pears, apples, pecans and there are several varieties of each of these fruits. There now exists no record of the earlier performances of these fruits nor even an identification record of the several varieties.

207. In addition to the area under fruits there is a small nursery area of olives and apples. Some vegetables are being grown under irrigation but all trees and other field crops - mainly wheat and chickpeas - are being grown under dry-farming conditions.

208. The station was well planned originally and has shelter belts of tall Cypress trees around each plot. It is suffering greatly at present from lack of adequate financial provision for maintenance. The funds allotted have been entirely spent; no labour except two

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workers can be employed; there were 4 mules for cultivation of the station but 3 had to be sold for want of funds to feed them. Consequently, the condition of the station is not good and is deteriorating further.

(b) Beit Qad Seed Farm

209. This farm lies 3 miles N E. of Jenin within a mile of the present Arab-Israeli frontier. Its area is 2,100 donums (525 acres). Formerly seeds selected and improved at the Acre Experimental Station were sent to this farm for multiplication, prior to being issued to cultivators.

210. The land is good, all culturable and rainfed. Cultivation was mechanised - by tractor and combine. At present the farm is carrying an excellent crop of cereals.

211. The farm has been rented out for a year to surrounding villages who are employing refugees to cultivate it on a share-cropping basis: the lessees take 25% of the grain and the refugee cultivators 75% of the grain and all the straw.

212. This farm will be a useful departmental asset in future agricultural improvements and developments in this territory.

(c) Ain Arroub Horticultural Station

213. This station is situated about midway between Bethlehem and Hebron. Its soil in the hilly land is thin and stoney but better in the valley. On the former fruits and vegetables are grown: on the latter cereals. The area is 300 donums (75 acres), of which one-third is under fruits and two-thirds under field crops. There is no irrigation. The normal annual rainfall is 400 - 600 mms. (16 - 24 inches); this year it was 690 mms. (27½ inches).

214. The station was established in 1937 to determine the possibilities of different fruits and different varieties of these fruits in this part of the country and also as a demonstration of correct horticultural procedure and practice. It is well laid out and well kept. Its better condition than the other stations is due to its having been run by the Egyptians until the end of last March. The original Palestinian staff continued to work it and they were paid 75% of their former Palestine salaries by the Egyptians.

215. In the cropped area a three years' rotation is practised - cereals, summer vegetables and dura, legumes. It is of interest to observe that the order of the crops in the second and third years, viz. summer vegetables and legumes, is the reverse of that practised in Transjordan. 2 mules are kept for cultivation purposes.

216. Amongst the fruits and varieties of fruit under trial at this station are apples (10 varieties), pears (10), almonds (4), plums (6), apricots and peaches (8), quince and cherries (1), figs (4), grapes (4), olives (3). Forest trees occupy 18 donums (4½ acres).

217. Powdery mildew and downy mildew (oidium) on grapes are the principal diseases. There is no Phylloxera either at the station or on surrounding vines outside. The Mediterranean fruit fly, the pomegranate moth, the woolly aphis and the codling moth are the chief insect pests.

218. The present Station Superintendent was trained at Tulkarm. He was in the plant protection service of the Palestine Agricultural Department for seven years.

219. As in the case of the other stations, the immediate need is financial. Since the station was taken over on 1st April, the staff has received no salaries, nor is there any budget for the running of the station. The various members of the staff are carrying on in the hope of being paid in due course and of being retained in future.

(d) Jericho Horticultural Station

220. This is an old station, established long ago, before the days of the British Mandate and extended later on. It is located at the eastern end of Jericho town. Its elevation may be below sea level. The climate is tropical and the station is entirely irrigated.

221. When the Mandate ended the station was handed over to the Municipality; its Superintendent, who was trained in Trinidad, was discharged or left and it was leased to a local man for two years at L.P. 550 a year. About one year of that lease has expired.

222. The station contains a very valuable collection of varieties of fruits which include olives, bananas, vines, pomegranates, papaya, citrus, date palms and loquats. It is understood that the performance records of these fruits are with the municipality. The material available in this station should be a very great asset in the propagation and distribution of the best varieties of so many fruits for the expansion of fruit growing in the territories of both Arab Palestine and Transjordan and no effort should be spared to maintain it safely till it is used for this purpose. It can be one of the most important stations in the whole country.

223. The present lessee is interested only in what he can make out of the fruit. He makes no attempt to keep the station in proper condition. Inter-cultivation is not done; weeds grow profusely; part of the wire fence along the main road has been broken down and the public sit inside the orchard; they also use it as a latrine; refugees too are located in one corner. Under such conditions the station must deteriorate rapidly and some valuable varieties of fruit may suffer seriously, if they are not lost altogether.

224. It is important, in these circumstances, that the station should be brought back under direct departmental supervision and management, even though this will mean cancellation of the lease and the possible payment of compensation. The material in the orchard is of too great potential value in the extension of fruit growing to risk its being lost or damaged through the present arrangement. Possibly also it may prove more satisfactory for date palm growing than the Aqaba station.

The Khadoorie Agricultural School, Tulkarm.

225. This school was one of two which were established about 1930 through a donation of Sir Eric Khadoorie of Hong Kong, in order to provide for agricultural education in Palestine. It was intended for Arabs. The second, at Mount Tabor, was for Jews. Originally the school was under the Department of Agriculture but it passed to the Department of Education of Palestine some years ago.

226. The area of the school farm till recently was 500 - 600 donums (125 - 150 acres) but under the Rhodes Agreement of April, 1949, about 200 donums (50 acres) passed over into Jewish territory. Unfortunately the area which was thus lost was good, flat, agricultural land. Fortunately, however, the buildings and orchards which were

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on the school side of the railway line now forming the boundary with Israel, survived. The remaining area is now no more than 300 - 400 donums (75 - 100 acres). It may prove sufficient for instructional and other purposes if, as is hoped, the school may resume the functions for which it was established.

Duration of Course

227. Initially the school gave a 2 years' course but some years ago the duration was increased to 3 years.

Standard of Admission

228. Students qualified for admission if they had completed two of the four years of secondary school education, i.e. they must have had a total of 9 years education - 7 years primary and 2 years secondary. This standard is still two years short of matriculation. The age is 14 - 15 years.

Fees

229. For local students L.P. 24 a year were charged. This sum covered tuition, accommodation and food. The fee for students of outside countries was L.P. 60 per annum.

230. The school admitted Transjordan students in addition to Palestinians. It had no objection to the admission of nationals of other countries, but apparently there was no demand.

Capacity

231. The School can accommodate 70 students, i.e. about 25 can be admitted annually.

Instruction

232. Teaching was done in Arabic but English was taught as one of the subjects and students could use scientific books and literature published in English.

233. The usual sciences applied to agriculture are said to have been taught: poultry keeping, veterinary sciences and land terracing were included.

234. About 50% of the students' time was spent on agriculture in the first year: less time was devoted to this aspect in the two subsequent years.

235. All the teachers, save one, were trained in Universities in the U.S.A. The present Principal of the school is a graduate of Texas.

Facilities

236. There are good school buildings and well equipped and fitted laboratories. The farmyard buildings are excellent: modern stables, cowsheds and accessory rooms have been built on English principles: a good cattle food preparation room adjoining the cowshed is equipped with power fodder-cutter, power root-cutter, power grain-crusher: a silo tower discharges its contents directly into this room: there is a well equipped dairy with churns, cream separators, a milk cooler and cheese-making equipment.

237. A few Friesian and Kerry cows are kept in addition to animals of local breed. There were 100 sheep and several hundred poultry, but all had to be sold because of lack of financial provision to maintain them.

238. A small area of land is devoted to various kinds of fruit trees and a nursery on which the work is being done at present by students from the local secondary school. It produces nursery plants for sale to the public.

239. The farm equipment includes an International tractor of the track type. Apart from farm cultivation it performs other services at present, such as pumping water from a tube well which provides irrigation for the farm. At present the land is weedy, neglected and ill cared for, and presumably it must remain in this condition till funds are made available to maintain it otherwise.

240. Since mid-May more than a year ago, when the British Mandate ceased, the position of the school has been left in the air. Classes have been discontinued. So far no financial provision has been made and it was gathered that such activities as are being carried on are being financed by utilising the income derived from the sale of produce. It appeared also that the staff are not receiving any salary and that they are hanging on in the hope of continued employment when a final settlement is made.

241. It is understood that the Principal has proposed that budget provision for the expenditure of the school should be for the present L.P. 15,000 a year, plus a sum equal to the income from the school and farm. Its former Palestine budget was L.P. 26,000 per annum. No decision in this connection appears to have been taken yet.

242. Meantime a sum of money has been provided in the current year's budget of Extraordinary Expenditure of the Agricultural Department, Transjordan, to start agricultural classes at Jabeiha. Before such classes can be commenced expenditure on the necessary basic facilities and equipment must be incurred and teachers must be provided. These facilities already exist at Tulkarm and to a degree also which the funds provided for the Jabeiha school will be totally unable to repeat. Even if adequate funds are made available, it seems wasteful and unnecessary to duplicate the existing adequate facilities for imparting an agricultural education in a small country like Transjordan.

243. Tulkarm is a good school, well-equipped and staffed with well-qualified teachers. It appears to have given a sound agricultural education of certificate standard in past years. It has been hitherto the technical training ground for subordinate staff for the Transjordan Agricultural Department. It stands ready for further use at little or no capital expenditure. In all these circumstances, if Arab Palestine, as at present constituted, is absorbed in Transjordan permanently, it is considered very strongly that it should be the main centre of agricultural education in the joint territories, and that the proposal to set up a school at Jabeiha should be held in abeyance.

Refugee Settlement in Arab Palestine

244. There exists in Jerusalem an Arab Society possessing funds which it is willing to spend in the settlement of refugees, if suitable conditions can be found. The prime mover in this connection is Musa Bey Alami, a former senior official in Palestine.

245. As stated earlier, there lies to the North and South of the road from Allenby Bridge to Jericho an area of undeveloped land, but incapable of development unless under irrigation. Musa Bey Alami places the area at 10,000 donums (2,500 acres). In addition there is an area which lies further North and which he places at 50,000 donums (12,500 acres). All this land is believed to be State-owned.

246. Musa Bey Alami's scheme is to develop these two areas of about 17,500 acres by pumping water from the River Jordan and by adopting power cultivation to some extent but not entirely. He would divide the area into holdings of 35 donums (8¾ acres) each. On this basis it would provide for the settlement of 2,000 refugee families, totalling 10,000 souls.

247. It is understood that application to utilise these lands for this purpose has been made to the Government of Transjordan which so far has been unable to grant or refuse the request, in the absence of a permanent settlement of the Palestine question.

248. Meantime Musa Bey Alami proposes to proceed with a preliminary investigation of the project. Technical examination is necessary from two angles. These concern the feasibility and economics of the scheme from an engineering point of view and the quality of the soil. In at least the case of the lower area, viz. that adjoining the Jericho road, there is a considerable difference in elevation between the river and the area in question, and not only will the pumping lift be high but the lead needed to carry the water to the land will involve some kilometres. The provision of an irrigation supply is likely, therefore, to be costly. There is evidence too, that the soil in this area may be alkaline. A survey and examination will be necessary to determine the suitability of the soil for crop production either without or after alkali reclamation. If reclamation by leaching should be necessary, the feasibility of providing sufficient irrigation for the purpose will require consideration.

249. If it should prove feasible and economically within reason this project seems to constitute the main possibility of settling refugees on undeveloped land in Arab Palestine. There is already a scarcity of cultivated land for the existing population in this area. If it is to maintain and provide for greater numbers it will probably be necessary to bring about a considerable reorientation in the agricultural economy of the region by reducing the area under cereals and by devoting land, which clearly must continue to give a small return from such crops, to the cultivation of olives and other fruits for which it is better suited.

250. A possible point in favour of Musa Bey Alami's scheme is that, whilst the expense of developing and cultivating the area may be high, it may, nevertheless, not be entirely uneconomical, unless the cost of the provision of an irrigation supply should prove to be entirely prohibitive or the soil quite unsuitable, since, on the evidence of the success of the horticultural station at Jericho, only a few kilometres distant, the area is likely to be suitable for the growing of various fruits, and possibly also other intensive and highly paying crops. It is being assumed too, that there would be no objection on the part of others to the use of the water of the Jordan at this point for this purpose, and that the possible future

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use of the waters of the Jordan for the irrigation of the Jordan Valley generally, such as has been envisaged by Ionides, would not leave this area high and dry again at some distant date.

251. From all these angles it is obvious that so many unknown quantities are involved that no final conclusion regarding this project is possible at this stage.

VIII

SUMMARY OF PRINCIPAL VIEWS AND RECOMMENDATIONS

Agricultural Statistics

252. Transjordan, like most other Middle East countries, needs to put its agricultural statistics on a more reliable basis than at present. Possibly statistics connected with other departments of Government require a similar overhaul. The Statistical Adviser to the British Middle East Office has already prepared detailed plans for improving the statistical organisation of all departments of the Government of Iraq and Iran and these are being put into execution. He will shortly undertake the preparation of plans in the same connection for Syria and Lebanon. It is suggested that Transjordan should utilise his services to put all their statistics on a sound footing.

Agricultural Industries

253. These industries are restricted at present to small-scale manufacture of tobacco, wines and spirits. If present agricultural policy and practice in the Jordan Valley are reorientated, so as to make the best use of irrigation supplies, tobacco may become a profitable crop in that area. Increased production will lead presumably to greater manufacture.

254. A considerable expansion can take place in the output of wines and spirits if :-

(a) the ravages of Phylloxera are adequately combatted and counteracted by an all-out drive for the production and distribution of resistant vine stock,

(b) large areas of land at present producing very indifferent cereal crops and well-suited to grape-growing, are planted under vines.

255. An olive oil crushing industry of appreciable dimensions can be developed in time if large areas of land, particularly in the North, now giving a poor return from cereal growing, are devoted to the much more profitable use of olive production. Some areas in the northern region of Arab Palestine afford admirable examples of the target at which to aim.

256. Any development programme for Transjordan should include a great expansion of fruit growing. Conditions are suitable for the production of a large number of fruits. To obtain the maximum returns from fruit growing, the establishment of a sound fruit preservation industry is essential. It will not only prepare canned and dried products from first class produce but will convert into jams, jellies, juices, squashes, etc. etc. produce not up to standard for the fresh fruit market. It will also act as a safety valve and outlet for the disposal of fresh fruit in case of difficulties in marketing.

The Agricultural Department

257. The functions and scope of the activities of the Department are too limited, if progress in agricultural development is to be made

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within a reasonable period of time. Expansion requires men, facilities and materials. Without adequate financial provision these requirements cannot be provided.

Finance

258. For a country so essentially agricultural as Transjordan, in which 85% of the population is engaged in agricultural activities and which has no other major industry, an ordinary annual expenditure which represents less than 1.5% of the total budget expenditure of the Kingdom is disproportionate and inadequate if real progress is to be made. Even with the addition of the extraordinary expenditure this year the provision is still low. The funds provided for agriculture in 1947 in the adjoining country of Syria represent 4.44% of the country's total budget estimates. The latter figures include forestry, which the Transjordan figures omit.

259. Transjordan should draw up a five-year programme of agricultural development. It should assign priorities in regard to agreed lines and should arrange for their finance according to an approved schedule.

Staff

260. One of the greatest needs is senior staff for research purposes. Research is indispensible to improvement. It alone can point the way to sound development. The barest minimum requirements are :-

(a) An agronomist for field experimentation on improved methods of crop husbandry.

(b) An horticulturist to deal with fruits and vegetables, in view of the importance of their development to the future prosperity of the country.

(c) An economic botanist for the improvement of existing crops by breeding and selection and for the introduction of new crops.

(d) A soil chemist.

261. The policy of sending abroad at State expense selected nationals to study the sciences applied to agriculture is sound and should be implemented with all speed. All such trainees should be under contract to serve the Government for a specified number of years on their return. It is important that they be employed in the sciences for which they have been trained. Too often it happens in Middle East countries that the services of local men similarly trained are utilised in departments of the Administration where their specialised knowledge is of no particular use and is wasted.

262. Full development and improvement cannot take place in a number of directions until research has pointed the way. If action to begin such research is left to await the return of the nationals sent abroad for study, progress will be delayed for 5 years. At least the first three posts suggested in paragraph 5 should be created now and filled by the early recruitment of suitably qualified and experienced foreign specialists on contract for 5 years. During this period these officers will start work in their respective spheres on sound lines. They will be replaced in due course by the local men after the latter have gained sufficient experience on their return.

263. If suitably qualified and experienced staff of the former Palestine Agricultural Department are available, either for research

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or for district extension work, every effort should be made to secure the services of a number of them.

Facilities

264. The appointment of research staff implies the provision of suitable and adequate facilities for their work. The chief requirement in this connection is research laboratories and very early action is necessary to build, fit and equip such accommodation.

265. On the field side provision, particularly for the horticultural officer, is more satisfactory. Already a very solid foundation has been laid. The existing field stations cover a variety of climatic and soil conditions in the country and should provide adequate information as to possibilities of fruit growing, both irrigated and rainfed, under those conditions.

266. Facilities for agronomic experiments are more limited and when intensive investigations embracing the many aspects of crop production are undertaken additional land in representative tracts and covering different conditions will be needed. The economic botanist also will require land at his disposal. The Jabeiha, El Qasr and Mazar farms will meet part of these needs.

267. Requirements of the extension staff include adequate equipment for demonstration purposes and suitable transport arrangements to enable them to reach all inhabited parts of the country.

Agricultural education

268. Since the needs of Transjordan for agricultural education of University standard are too small to warrant making provision to meet them locally, the policy of sending selected students for foreign study of this nature should be continued.

269. The specialised training required in subordinate staff can be adequately provided at the Khadoorie Agricultural School, Tulkarm, if the part of Arab Palestine now attached to Transjordan remains absorbed in it. It would be wasteful to provide another centre in Transjordan itself so long as the Tulkarm facilities are available.

270. Tulkarm should also cater for short courses of instruction which may be required by the public in specialised aspects of agriculture and animal husbandry.

271. If the present Arab-Israeli boundary at Tulkarm becomes permanent, it may be necessary to provide the school with additional arable land in replacement of the area which it has lost through the fixation of the boundary on its present site.

Agriculture in rural primary schools

272. The provision of school gardens for all rural primary schools should be accelerated. Practical demonstration is an essential aspect of the teaching of agriculture and nature study in these schools, and for it such gardens are needed.

273. All teachers of agriculture and nature study should themselves have made an adequate study of these subjects. The best arrangement probably will be to institute a special one year's teachers training course for the purpose at Tulkarm.

274. It is likely to prove advantageous and helpful to agricultural

/teachers....

teachers in rural primary schools if the local District Agricultural Officer, when on tour in the neighbourhood, should visit schools which possess gardens, to give advice and guidance in their management and, if necessary, to assist in the procurement of such materials as may be required.

Crop Husbandry

275. Some improvements in agricultural practices can be suggested immediately: others will depend on the results of research which must first be carried out.

276. Over many parts of the country production suffers through inadequate cultivation and the presence of an excess of harmful weeds. The indigenous plough is ill-suited to good cultivation on weedy soil. A simple but much superior implement is a miniature mouldboard plough which is used in some Eastern countries and is known as the "Meston" plough. Its iron parts are manufactured by the British firm of Ransomes, Sims and Jefferies, and cost only a few shillings: the pole which attaches the plough to the animals is made and fitted locally. It is suggested that a few Meston ploughs be obtained and that their advantages in this connection be tried out. Heavier ploughs of the same type also are available for stronger animals.

277. Better use of irrigation supplies, where they exist, can be made in several directions: e.g. by

(a) the prevention of waste,

(b) the avoidance of the use of excessive quantities,

(c) the spread of supplies over larger areas,

(d) the concentration of irrigation on the production of intensive and highly-paying field, fruit and vegetable crops, and the relegation of cereals to which irrigation is now applied, to rainfed lands.

278. Chemical fertilisers find little place in agricultural practice at present. There is insufficient knowledge either of the economics of their use or of the individual fertilisers or combinations of fertilisers best suited to individual orchard and field crops under Transjordan conditions or of the optimum quantities to apply. Possibly the scope of fertilisers and the extent of the economic increase which their use can effect under the low rainfall conditions which prevail over much of the country may be very restricted, but the whole subject needs full investigation by a qualified agronomist.

279. Information is needed on a variety of other matters such as crop rotations, seed rates, sowing on the flat or on ridges, the optimum spacing between rows, etc. etc. All these await attention by the agronomist.

280. On the botanical side improvement of existing crops in regard to yield and quality is needed. Breeding and selection by a qualified botanist are called for. A very important requirement, in view of the low rainfall, is resistance of crops to drought and any improvement that can be introduced in this connection will be of the utmost value.

281. The suitability of local conditions for crops not at present grown requires examination. Some members of the Rape family, such as Sarson or Indian Colza (Brassica Campestris) and Rocket or

/Taramira.....

Taramira (Eruca Sativa), flourish under dry-farming conditions in countries further East, and might be suitable as a winter oil seed crop in the areas of lower rainfall: castor appears to do well at the Baqura nursery and might suitably be planted on the borders of fields in the valleys and elsewhere. Once it is well established in the ground this plant does not usually require irrigation in other eastern countries with low rainfall. Sugarcane should suit conditions in the Jordan Valley but whether the area which could be grown, in view of the amount of irrigation which this crop requires, and the extent of the land and irrigation available, would make the crop worthwhile would need consideration.

282. An all-out effort should be made to convert the Jordan Valley from a cereal-producing area into a region which specialises in highly-paying fruits, vegetables and other intensive crops such as tobacco and sugarcane, in so far as the irrigation supply will permit. If and when the major project for the irrigation of the valley by the waters of the Jordan and Yarmouk should materialise, the conversion should become absolute.

283. For the full development of the Jordan Valley the provision of an all-weather road through it is an essential.

284. There are many areas in the country where soil and other conditions are better suited to fruit growing than to the cereal production which is their main feature at present. In the North, a large expansion of fruit growing, particularly olives, should take place. Elsewhere, too, wherever conditions are known to be favourable, fruit growing should be expanded.

285. Parts of the country are well suited to grape production and a considerable increase in the area under vines is desirable, provided adequate steps are first taken to control Phylloxera. It is essential to bring this disease under control if grape production is to assume the role in agricultural production which local conditions warrant.

286. The production of citrus fruits at present is negligible. It was stated that this situation is not altogether fortuitous, as it was not desired to compete with Palestine. That consideration may no longer hold good and, in any case, it seems desirable to take advantage of the early climate of the Jordan Valley by extending citrus and banana cultivation in it.

287. The possibility of growing date palms in the Azraq area seems worth investigation.

288. If the large expansion in fruit growing, which seems likely to be an important aspect of agricultural development, is to become a reality, great numbers of fruit nursery plants will be required. It is important that only the best varieties should be planted, and cultivators must look to the Agricultural Department for supplies. It is said that the departmental nurseries cannot meet even the present demand, and it is obvious that nursery plant production must be greatly increased. There would be little point in undertaking an all-out campaign to induce cultivators to change over from a cereal to a fruit-growing economy unless the necessary supplies, materials and services were available.

289. The department should also increase considerably the quantities of improved seeds which it grows and issues, particularly when the economic botanist is appointed and produces them. In this connection the present system whereby the Department issues such

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seed to cultivators on the basis of payment in kind at harvest time, requires careful watching. Experience of a similar system elsewhere showed that, due to inadequate precautions by the cultivator, the seed which he supplied in repayment was often quite unsuitable for further issue.

290. The Sherah is an inhospitable tract of country. Cereal growing, even supported by a measure of livestock keeping, would seem to offer a precarious existence. It is desirable to ascertain by trial whether it is possible to establish successfully any kinds of fruit on the high land under rainfed conditions. (In the lower valleys of this region various fruits grow successfully under irrigation).

291. The proposed water tanks in the grazing areas as sources of drinking water for livestock should be a boon, provided they catch and hold an appreciable volume of run-off rain water for a reasonable time.

292. Enquiries will be instituted as to the possibilities of improving the quality of the grass in some of the main grazing areas, with a view to making practical trials if there is any prospect of success under the climatic conditions which maintain.

293. Emphasis was laid in many parts of the country on the absolute need of adequate measures to protect agricultural and horticultural produce in the field from the depredations of nomads and the losses which occur through the scant respect for private property, particularly when the product is new or scarce in the region. This, of course, is a matter for the civil administration.

Refugees

294. Transjordan does not offer ready-made facilities on a scale of any magnitude for the rapid settlement of refugees.

295. It has been rightly concluded by the local authorities that unoccupied land for rainfed cultivation exists nowhere but in the Sherah, an unattractive stretch of country with a precarious rainfall, capable of producing on present limited showing only the poorest cereal crops, but hitherto inadequately explored agriculturally.

296. These authorities have also rightly summed up the only possibilities of settlement under irrigated farming, With the exception of the Azraq depression facilities are confined to the Jordan Valley. Here the only short term facilities lie in the possible development of the "Zor", a long narrow strip of land adjoining the river, but requiring scrub-clearing, levelling, protection from floods and irrigation by pumping from the river, before it is capable of use. According to present estimates the cost of development would be roughly L.P. 93,000 the area finally provided only 1,300 acres and it would suffice for the settlement of just over 1,000 souls.

297. In regard to the Azraq depression, irrigation, drainage and soil conditions require examination and appraisal before its possibilities for agricultural development can be determined. If these conditions prove to be favourable the capacity for absorbing refugees has been estimated provisionally by local authorities at 10,000 persons.

298. On a long-term basis the Jordan Valley alone holds out possibilities of agricultural settlement in Transjordan under

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irrigation on an appreciable scale but the obstacles to be surmounted are such that it would be unsafe at present to base great expectations on the project. The chief of these obstacles are :-

(a) The construction of a major irrigation project of which the inclusive cost is thought likely to exceed L.P. 13 millions.

(b) A settlement with Palestine and other adjoining countries as to the distribution of the waters of the rivers Jordan and Yarmouk.

(c) The expropriation by Government of present owners of the land in the Jordan Valley and the redistribution of the area on a small-holding basis of 25 donums each (6¼ acres) between present owners and new settlers.

299. If and when all these difficulties are surmounted and the construction has been completed, the total irrigated land, inclusive of that supplied by the Wadis to the East, will be 300,000 donums, capable of provising for 10,000 families, or 50,000 persons, according to the estimates of Mr. Ionides. Some of this number would consist of cultivators already on the spot, thus reducing the number of new settlers, but possibly this loss would be made good by the additional settlers who would be required to perform subsidiary services and functions in the Colony.

300. The only remaining possibility in this region would appear to be associated with the large area now devoted mainly to grass in the Ghor el Kabid and Ghor Nimein in the neighbourhood of the Wadi Shaeb. Ionides' report that sub-surface water conditions are favourable suggests the development of this area by tube-well irrigation, if the land can be made available for the purpose.

301. All cultivable land in the dry-farming regions of Arab Palestine appears to the outsider to be so entirely cultivated at present that there can be few possibilities of finding unoccupied cultivable land for additional settlers. Whether this country can contribute at all to refugee resettlement on the land seems doubtful and possibilities appear to lie only in Musa Bey Alimi's project to irrigate certain undeveloped areas by pumping from the River Jordan. As observed elsewhere, this scheme requires technical examination from the engineering and soil aspects before any authoritative opinion is possible. Looked at superficially, in the absence of these surveys, the impression is formed that the provision of an adequate irrigation supply to this land will be difficult and expensive.

Arab Palestine

302. The chief matters requiring early attention in this area are :-

(a) the provision of finances to enable the staff which is still functioning to carry on essential work, even if it should be on no more than a care and maintenance basis;

(b) a decision as to the future of the staff;

(c) the resumption by the Khadoorie Agricultural School, Tulkarm, of the functions for which it was established and the provision of funds to enable it to perform those functions.

(d) the resumption of Jericho Horticultural Station under the direct control and management of the Agricultural Department.

303. Agricultural development in this country appears to lie largely in the substitution of fruit-growing - olives, grapes, etc. - on a considerable scale, for cereal growing on land which is obviously marginal for ordinary crop production. What has already been accomplished in this connection on the hills in several villages in the North affords ample proof of the soundness of such a policy. It is felt that it is only by such means that much of the poor land in this territory can support a larger population, or even provide a reasonable livelihood for those already depending on it for existence.

H.R. STEWART

20th June, 1949.