WATER USE SEMINAR, DAMASCUS: REPORT OF THE FAO/UNDP REGIONAL SEMINAR ON EFFECTIVE USE OF IRRIGATION WATER AT FARM LEVEL. DAMASCUS, SYRIA, 7-13 DECEMBER 1971

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1.2 WATER USE IN IRRIGATION PROJECTS IN THE SYRIAN ARAB REPUBLIC BY DR. NOUREDDINE RIFAI

1. Introduction

Syria is a country which depends basically on agriculture and irrigation. It is situated in an arid or semi-arid zone and the water resources are relatively limited. With large areas of arable and irrigable lands, 70 per cent of the population depend on agriculture and agricultural industries for their living. Consequently, it is of paramount importance for the country to take notice of the development of land and water use practices and of better utilization of available water resources for irrigation from both the technical and economical points of view. Our country has followed very closely the technical development of such water use and has, consequently, constructed dams to store water, lined distributing canals with concrete to minimize seepage, and established experimental farms to find the best way of using water for irrigation, the best rotations and the optimum consumptive use.

2. Soils in Syria

The total area of the Syrian Arab Republic is 18.5 million ha, with a wide variety of soils. There are the Red Soils, well known in the Mediterranean Region, the Grumosols, the Cinnamonic, the Gypsiferous, the Alluvial, the Hydromorphic and the desert soils. The following table shows the area of land classified according to main soil groups.

Table 1: Area of Land by Main Soil Group

Soil Group	Area (in 1 000 ha)
Red Mediterranean	850
Grumosols	2 218
Cinnamonic	4 781
Gypsiferous	5 528
Alluvial	531
Hydromorphic	366
Desert	4 244
Total	18 518

Out of this total area, 7 million ha are arable and irrigable. However, only about 3 million ha are tilled under dry farming and 600 000 ha under irrigated farming.

3. Precipitation in Syria

In spite of its yearly fluctuation, precipitation forms an important basis of agricultural production in the country. Dry farming is mostly situated in regions where rainfall exceeds 350 mm per annum.

Table 2: Precipitation in Some of the Principal Meteorological Stations in 1969

Station	Total yearly precipitation mm	Number of days with		
		Rain	Snow	Hail
Damascous	294.8	60	1	0
Nabek	120.0	42	5	0
Palmyra	137.2	50	0	0
Tanef	111.7	39	0	0
Hama	383.8	91	0	1
Safita	1 133.8	98	0	5
Latakia	1 080.0	96	0	0
Aleppo	359.8	101	1	0
Al-Raqqa	412.1	85	0	1
Tal-Abiad	430.3	94	0	1
Kamishli	673.2	94	1	2
Al-Hasakeh	474.2	76	0	0
Deir-Ez-Zor	222.1	70	0	0
Abu Kamal	161.9	66	0	0
Al-Sweida	434.7	74	3	4

Table No. 3 gives some of the basic data influencing crop growth, particularly in dry-farming areas; table No. 4 gives temperature data.

Table 3: Hours of Sunshine, Average Daily Evaporation and Relative Humidity in Some of the Principal Meteorological Stations in Syria in 1969

Station	Hours of Sunshine	Average Daily Evaporation mm	Relative Humidity (Average) %
Damascus	3 083.4	5.8	58
Nabek	-	6.6	57
Palmyra	3 021.6	8.2	52
Tanef	-	10.4	47
Hama	2 914.9	5.6	67
Safita	-	3.3	69
Latakia	2 824.0	-	67
Aleppo	2 850.6	5.3	63
Raqqa	2 946.5	6.0	58
Kamishli	2 761.6	7.5	53
Hasakeh	2 830.1	5.1	58
Deir-Ez-Zor	3 022.9	6.3	52
Abu Kamal	-	8.3	47
Al-Sweida	-	4.0	60

Table 4: Yearly Temperature in the Principal Meteorological Stations in 1969

Station	Yearly Temperature in C°			Absolute Max.	Day	Month	Absolute Min.	Day	Month
	Average	Av.Max.	Av.Min.						
Damascus	17.6	24.3	10.2	39.8	26	Aug.		29	Jan.
								14	Feb.
Nabek	13.0	19.3	7.0	34.6	25	Aug.	-5.6	30	Jan.
Palmyra	18.9	25.6	12.6	41.4	4	June	-0.5	22	Dec.
Tanef	18.0	25.2	10.7	41.1	26	Aug.	-2.3	2	Feb.
Hama	18.0	24.7	11.7	42.2	1	Sept.	-0.4	30	Jan.
Safita	18.0	22.4	14.5	40.8	3	June	2.4	29/30	Jan.
Latakia	18.9	23.4	16.6	36.8	1	June	3.0	30	Jan.
Aleppo	17.3	23.6	11.3	40.8	12	July	-0.9	30	Jan.
Raqqa	18.5	25.7	11.6	42.5	12	July	-2.3	15	Dec.
Tal-Abiad	17.2	24.6	9.7	42.0	19	Aug.	-3.0	15	Dec./Feb.
Kamishli	18.7	24.6	12.4	43.6	20	Aug.	0.7	8	Jan.
Hasakeh	18.1	25.2	11.3	42.6	19/20	Aug.	-3.6	15	Dec.
Deir-Ez-Zor	19.5	26.3	13.1	42.4	5	June	-1.6	15	Dec.
Abu Kamal	20.3	27.7	12.9	43.4	27	June	-1.3	15	Dec.
Sweida	16.1	22.2	10.5	37.8	31	Aug.	-4.0	30	Jan.
					4	Sept.			

4. Water Resources in Syria

The Syrian water resources are:

(A) rainfall in late autumn, winter and early spring;
(B) permanently flowing rivers;
(C) intermittently flowing rivers;
(D) ground water (wells, springs, etc.).

(A) Most of the rain falls in the coastal region and on the narrow strips of land extending from Damascus to Homs, Hama and Aleppo, and near the Turkish frontier. A major part of the rain is lost in the interior of the country through evaporation, and in the coastal region through floods that run into the sea. A small part goes into raising the soil moisture in the dry farming areas, while the rest infiltrates into the earth, feeding the wells and the springs. The following table shows the distribution of rainfall in a moderately rainy year.

Table 5-A: Precipitation in Syria (Average year)

Area of land receiving the precipitation in km^2	Per cent ratio to total area of the country	Total annual precipitation in mm
9 250	5 %	over 1 000 mm water
37 000	20 %	500 -1 000 mm water
46 000	25 %	250 - 500 mm water
74 000	40 %	100 - 250 mm water
18 500	10 %	less than 100 mm water
Total 50 000 million m^3 of water		

Over 60 small earth dams have been constructed on the course of several flood streams. The volume of these dams is only a few millions of cubic meters of water because of the excessive evaporation, particularly in the internal parts of the country. For example, the annual evaporation at Tabqa reaches 2 500 mm of water, while the average rainfall is not more than 180 mm per annum.

(B) The permanently flowing rivers in Syria are, with the exception of the Euphrates, relatively small, with a total outflow not exceeding 6 000 million m3 per year.

The average annual outflow at the Turkish-Syrian frontier of the Euphrates River has been estimated at 28 000 million m^3. The following table gives the annual outflow and the lengths of the rivers of Syria.

Table 5-B: Permanently Flowing Rivers in Syria

Name	Annual outflow millions m^3	Length within the Syrian Territory (km)
Euphrates	28 000	675
Khabour	1 800	460
Orontes	1 500	325
Yarmouk	450	47
Barada	400	71
Senn	360	6
El-Kebeer S	250	50
Efrine	250	85
Balikh	200	105
El-Kebeer N	150	56
El-Sajour	100	48
Al-A'waj	80	66
El-Sawert	70	-
Banias	65	2
KouWeik	35	10
Syberani	20	28
Total (excluding Euphrates) 585 million m^3 of water per annum		

(C-D) It is estimated that the annual water output of the intermittently flowing rivers and of the underground water resources does not exceed 1 000 million m^3, most of which is used for drinking purposes, for watering cattle, for industry and for irrigating a few scattered areas of land.

5. Population in Syria

The population of Syria increases at the rate of 2.5 % annually. The emigration of the rural population to large cities increases in the dry years. In 1945 the population was less than 3 million. At present it exceeds 6 million, centered mostly in Damascus, Aleppo and the coastal region and in other large cities. The following table shows the growth of the population over the last 25 years.

Table 6: The Growth of Population in Syria

Year	Population (in millions)
1943	2.86
1944	2.90
1945	2.95
1946	3.01
1947	3.04
1948	3.09
1949	3.18
1950	3.25
1951	3.33
1952	3.43
1953	3.66
1954	3.81
1955	3.91
1956	4.02
1957	4.15
1958	4.42
1959	4.66
1960	4.84
1961	4.97
1962	5.18
1963	5.31
1964	5.47
1965	5.63
1966	5.76
1967	5.80
1968	6.24

6. Irrigation Projects in Syria

A big number of small irrigation projects exist in the country near large water courses. Two big projects are the Euphrates Project and the Ghab Project on the Orontes. There is also the Irrigation Project of Homs-Hama extending between the two cities along the Orontes. The following table presents the irrigated areas in all these Projects and those under study and/or implementation.

Table 7: Irrigation Projects in Syria

Project	Present irrigated area (1 000 ha)	Area under study and execution (1 000 ha)
Euphrates	250 (mostly by pumping)	640
Khabour	70 " " "	130
Balikh	15	0
Sajoure	5	0
Jaghjagh	3	0
Ghab-Tar-El-Al-Asharneh	70	0
Homs-Hama	22	0
Upper Orontes	0	15
Ifrine	1	0
El-Senn	9	0
Nahr El-Kebir N	0	3
Nahr El-Kebir S	2	13
Yarmouk	7	0
Ghouta (Barada and Awaj)	15	0
El-Rouje	3.5	0
KouWeik	16	0
Sheikh Meskine	0.35	0

The areas under cultivation for the major crops, the annual agricultural production and the production per hectare are indicated in table 8-A.

In view of the importance of cotton in irrigated farming, Table 8-B shows areas cultivated with cotton, the annual production and the unit production.

The statistical tables, taken from the abstracts issued by the State Planning Commission, give a picture of the land, the water and agricultural production in Syria. It will be noticed that the share of irrigated land in the country is very nearly 1/10 ha per head, 1/3 ha being dry farming land. It will also be seen that the area of irrigated land has not increased much during the last few years while a decrease in the dry farmed area is evident. Therefore, it has become essential to speed up the construction of the Euphrates Dam and to set up experimental farms in the Euphrates and Ghab areas in order to improve land and water use, to increase irrigation efficiency in the field, to study irrigation practices and to determine water requirements in the light of proposed rotations.

7. Land and Water Use Experimental Farms in Syria

Two stations have been set up for field experiments in the Ghab Project, one at Ein El-Naour, the other at Kerim. The soils of these farms are of the silty clay loam type with a high percentage of organic matter, and the water table is high. Studies have been carried out on the following points:

(A) Determination of water requirements, data and frequency of irrigations by means of empirical formulae using meteorological data, such as those of Penman and of Blaney and Criddle, after calculation of the coefficients for the various stages of growth of some crops.

The moisture contents of the soils, before irrigation, and the effect of rainfall and of groundwater were taken into consideration. The studies were carried out mainly on the following major crops: cotton, spring beets, autumn beet, alfalfa, sorghum, maize and potatoes.

(B) Study of irrigation efficiency at the farm level, including the following:

(i) Soil permeability.
(ii) Method of irrigation (furrows or basin).
(iii) Dimensions of the units irrigated.
(iv) Rate of flow of water.
(v) Land levelling and land preparation.
(vi) Depth of water table.
(vii) Frequency of irrigation.
(viii) Skill and attention of the irrigator.

It was observed that irrigation efficiency varied from 50 to 60 % and that irrigation by basin was preferred to that by furrows. It was found that irrigation by sprinklers cannot be applied in the Ghab Area.

Table 9 summarizes the results that have been obtained at the experimental farms in Ghab and in Tar-El-Ala-Asharneh.

Table 8-A: Areas, Production and Unit Production of Cultivated Lands in Syria from 1963 to 1969 (Major Crops only)

Year	Cereals Dry farming			Major Industrial Crops Mostly irrigated			Pulses Mostly irrigated			Vegetables irrigated		
	Area 1 000 ha	Prod. 1 000 t	Unit/Prod. tons/ha	Area 1 000 ha	Prod. 1 000 t	Unit/Prod. tons/ha	Area 1 000 ha	Prod. 1 000 t	Unit/Prod. tons/ha	Area 1 000 ha	Prod. 1 000 t	Unit/Prod. tons/ha
1963	2 432	2 034	0.8	305	505	1.7	177	127	0.7	34	240	7.1
1964	2 299	1 791	0.8	319	662	2.1	210	194	0.9	30	240	7.5
1965	1 951	1 388	0.9	318	664	2.1	247	187	0.8	27	223	8.2
1966	1 226	787	0.6	285	581	2.0	152	74	0.5	34	209	6.1
1967	1 895	1 691	0.9	269	501	1.9	194	208	1.1	29	251	8.7
1968	1 575	1 167	0.7	320	578	1.8	208	127	0.6	29	287	9.9
1969	1 881	1 664	0.9	326	587	1.8	234	221	0.9	28	280	10.4

Table 8-B: Cultivated Area and Production of Unginned Cotton

Year	Cultivated Areas			Production			Unit Production	
	Total	Irrigated	Dry Farming	Total	Irrigated	Dry Farming	Irrigated	Dry Farming
1961	249	203	64	325	309	16	1.5	0 3
1962	302	229	73	404	377	27	1.6	0.4
1963	292	222	70	410	379	31	1.7	0.4
1964	287	221	66	470	440	30	2.0	0.5
1965	288	232	56	476	453	23	2.0	0.4
1966	255	226	29	375	369	6	1.6	0.2
1967	239	197	42	329	316	13	1.6	0.3
1968	288	228	60	394	372	22	1.6	0.4
1969	299	236	63	382	364	18	1.5	0.3

Unit of Area: 1 000 hectares; Unit of Production: 1 000 tons/hectare; Unit of Unit Production: tons/ha.

Table 9

Field and Gross Irrigation Requirements for Different Crops and Soils in Ghab and Asharneh - Tar El Ala

	No.	Field Irrigation Requirements				Gross Irrigation Requirements			
						20% added for losses		10 % added for losses	
		Irrigation Season	Rate m^3/ha	Total m^3/ha	Peak Flow Rate l/sec	Total m^3/ha	Peak Flow Rate l/sec	Total m^3/ha	Peak Flow Rate l/sec
A. GHAB CLAYS									
1. Cotton	5	End May - Mid August	1 200	6 000	0.82	7 200	0.98	6 600	0.90
2. Spring beet	5	2nd half May	1 200	6 000	0.77	7 200	0.92	6 600	0.85
		- mid August	1 000	5 000	0.64	6 000	0.77	5 500	0.70
3. Autumn beet	2	Mid May - Mid June	1 200	2 400	0.70	2 880	0.84	2 640	0.77
4. Alfalfa	7	Mid May - End August	1 200	8 400	0.67	9 080	0.80	8 820	0.73
5. Sorghum and Sudan Grass for forage	4	Mid June - End August	1 400	5 600	0.77	6 720	0.92	6 160	0.85
6. Maize for grain or forage	5	End June -	1 200	6 000	0.99	7 200	1.19	6 600	1.09
		Early September	1 000	5 000	0.82	6 000	0.98	5 500	0.90
7. Sorghum for grain or forage	4	End June -	1 200	6 000	0.99	7 200	1.19	6 600	1.09
		Early September	1 000	5 000	0.82	6 000	0.98	5 500	0.90
8. Onions	8	Mid May - Early August	750	6 000	0.87	7 200	1.02	6 600	0.94
9. Green beans	2	Mid May - Mid September	1 200	2 400	-	2 880	-	2 640	-
B. SILTY CLAYLOAMS									
1. Cotton	5	End May -	1 400	7 000	0.90	8 400	1.08	7 700	0.99
		Mid August	1 200	6 000	0.77	7 200	0.92	6 600	0.85
2. Spring beet	4	Early June -	1 400	5 600	0.77	6 720	0.92	6 160	0.85
		Mid August	1 200	4 800	0.66	5 760	0.80	5 280	0.73

Field and Gross Irrigation Requirements for Different Crops and Soils in Ghab and Asharneh - Tar El Ala (Continued)

	No.	Field Irrigation Requirements				Gross Irrigation Requirements			
						20% added for losses		10% added for losses	
		Irrigation Season	Rate m^3/ha	Total m^3/ha	Peak Flow Rate l/sec	Total m^3/ha	Peak Flow Rate l/sec	Total m^3/ha	Peak Flow Rate l/sec
3. Autumn beet	2	Mid May - Mid June	1 400	2 800	0.81	3 360	0.97	3 080	0.89
4. Alfalfa	6	Mid May - Mid September	1 400	8 400	0.67	10 080	0.80	9 240	0.73
5. Sorghum and Sudan Grass for forage	4	Mid June - End August	1 400	5 600	0.77	6 720	0.92	6 160	0.85
6. Sorghum and Maize	4	End June - Mid September	1 400	5 600	0.77	6 720	0.92	6 160	0.85
7. Potatoes	3	Mid May - Mid June	1 200	3 600	0.99	4 320	1.19	5 960	1.09
8. Green beans	2	Mid August - Mid September	1 200	2 400	-	2 880	-	2 640	-
9. Tomatoes	6	Mid May - Early August	1 000	6 000	0.85	7 200	1.02	6 600	0.94
10. Onions	8	Mid May - Early August	750	6 000	0.87	7 200	1.02	6 600	0.94
C. PEATY AND SANDY LOAMS									
1. Cotton	5	End May -	1 500	7 500	0.96	9 000	1.15	8 250	1.06
		Late August	1 400	7 000	0.90	8 400	1.08	7 700	0.99
2. Spring beet	4	Late May -	1 500	6 000	0.82	7 200	0.98	6 600	0.90
		Mid August	1 400	5 600	0.77	6 720	0.92	6 160	0.85
3. Autumn beet	2	Mid May - Mid June	1 500	3 000	0.87	3 600	1.04	3 300	0.96
4. Alfalfa	6	Mid May - Mid September	1 500	9 000	0.70	10 800	0.84	9 900	0.77
5. Sorghum and Sudan Grass for forage	4	Mid June - End August	1 500	6 000	0.83	7 200	1.00	6 600	0.91

Field and Gross Irrigation Requirements for Different Crops and Soils in Ghab and Asharneh - Tar El Ala (Continued)

	No.	Field Irrigation Requirements				Gross Irrigation Requirements			
						20% added for losses		10% added for losses	
		Irrigation Season	Rate m^3/ha	Total m^3/ha	Peak Flow Rate l/sec	Total m^3/ha	Peak Flow Rate l/sec	Total m^3/ha	Peak Flow Rate l/sec
6. Sorghum and Maize for grain and forage	4	End June - Mid September	1 500	6 000	0.83	7 200	1.00	6 600	0.91
7. Potatoes	3	Mid May - Mid June	1 400	4 200	1.15	5 040	1.38	4 620	1.26
8. Peanuts	4	Mid June - Late August	1 500	6 000	0.83	7 200	1.00	6 600	0.91
9. Green Beans	2	Mid August - Mid September	1 400	2 800	-	3 360	-	3 080	-
D. ASHARNEH - TAR EL ALA RED SOILS									
1. Cotton	7	Mid May - End August	800	8 000	0.99	NOT APPLICABLE		8 800	1.09
2. Spring beet	7	Mid May - Late August	800	6 600	0.83	"	"	7 200	0.91
3. Autumn beet	3	Early May	1 200	3 600	0.66	"	"	3 960	0.73
	4	End April - Mid June	900	3 600	0.75	"	"	3 960	0.83
4. Alfalfa	7	Early May - End August	1 200	8 400	0.66	"	"	9 240	0.73
5. Sorghum and Sudan Grass for forage	7	End May - End August	1 200	8 400	0.99	"	"	9 240	1.09
	6		1 400	8 400	0.77	"	"	9 240	0.85
6. Maize for Grain or Silage	5	End June - Early Sept.	1 200	6 000	0.99	"	"	6 600	1.09
7. Sorghum for Grain or silage	4	End June	1 400	5 600	0.77	"	"	6 160	0.85
8. Potatoes	4	End April - Mid June	1 000	4 000	0.83	"	"	4 400	0.91
9. Spring Beans	3	Mid August - Mid September	800 - 1 000	2 600	-	"	"	2 860	-
10. Tomatoes	7	Early May - Mid August	1 000	7 000	0.83	"	"	7 700	0.91
	10	Mid August	750	7 500	0.87	"	"	8 250	0.96
11. Onions	8	Early May - Early August	750	6 000	6.87	"	"	6 600	0.96

Three experimental farms have been set up in the Euphrates Project. One is in the upper land of the Balikh Basin in the Euphrates Valley, called the Ballaneh Experimental Farm. The second is situated in the alluvial land with sandy soils, extending along the course of the river (Zor Lands). This is the Kourbatiyeh Farm. The third has been set up in alkali-affected land with high salt content. It is called the Khatouniyeh Farm. In addition, there is an agricultural experimental station at Raqqa.

Most of the experiments have been done on cotton with a few on alfalfa. The studies aimed at:

(a) Determination of water requirements of cotton by means of the Penman and the Blaney and Criddle formulae, after calculation of coefficients relative to the crop.

(b) Study of the effect of the increase and the decrease in irrigation water by 20, 40 and 60 % of requirements, as determined by the Blaney and Criddle formula of unit production.

(c) Study of the infiltration rate of soils and determination of method of irrigation by furrow, basin and sprinklers.

(d) Determination of irrigation efficiency at field level.

(e) Determination of most suitable rotations, and of dates and frequencies of irrigation.

(f) Study of the quality of irrigation water.

(g) Experiments in leaching salt-affected soils and the maintenance of the cation equilibrium in the soil.

These studies were started in 1965 at the Ballaneh Experimental Farm, with silt loam soils covering 65 hectares. They are also being carried out at the Kourbatiyeh farm in clay loam soils with a fair amount of salinity and a moderate exchangeable sodium percentage.

Experiments are also being carried out at Khatouniyeh farm, where the soils are alkaline and saline. In particular, leaching experiments are being tried to reduce the sodium adsorption ratio to an acceptable level ($\backsim$ 5).

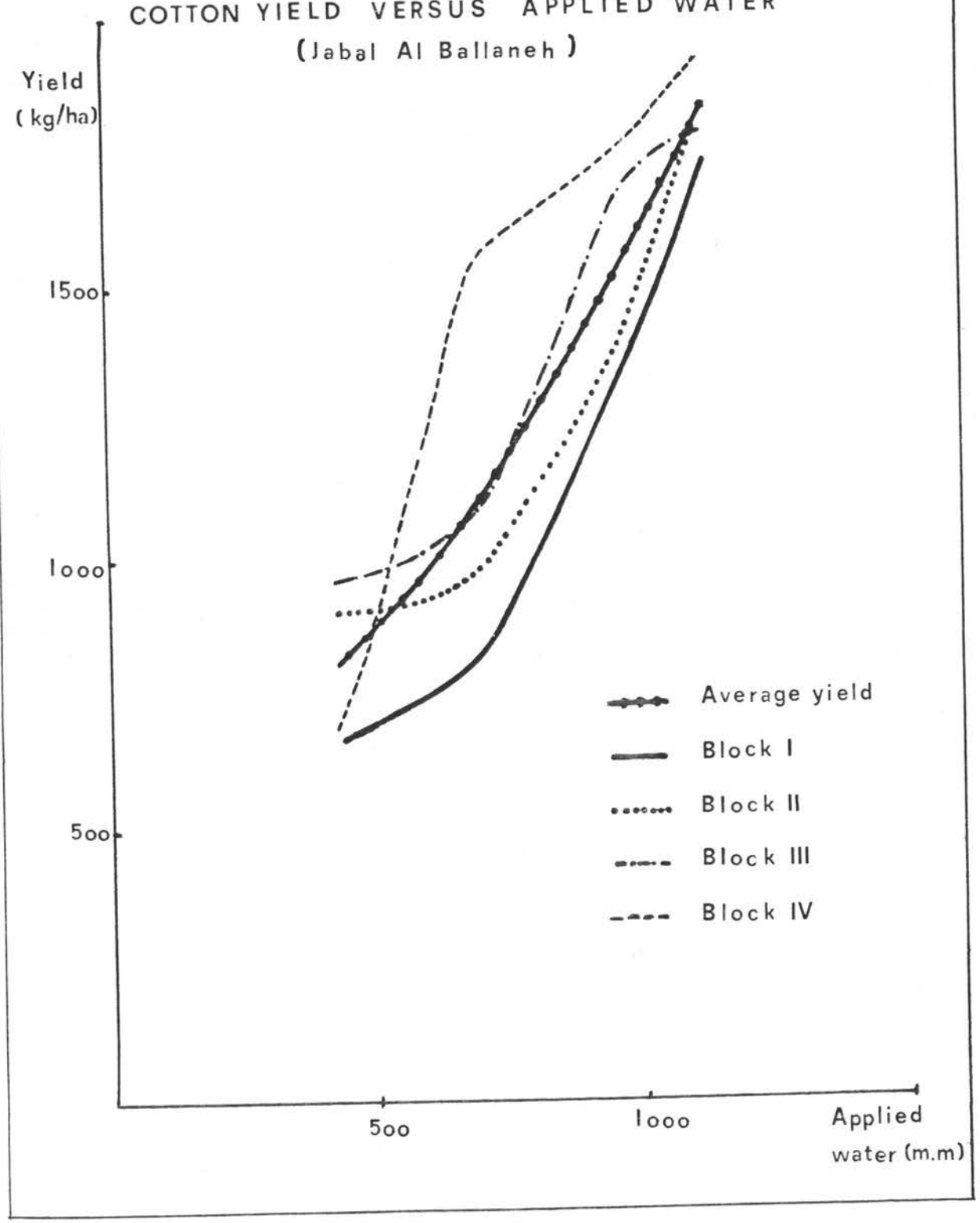
No effect has been noticed in the use of phosphatic and potassic fertilizers but the use of nitrogen fertilizers has increased the yield and reduced water requirements.

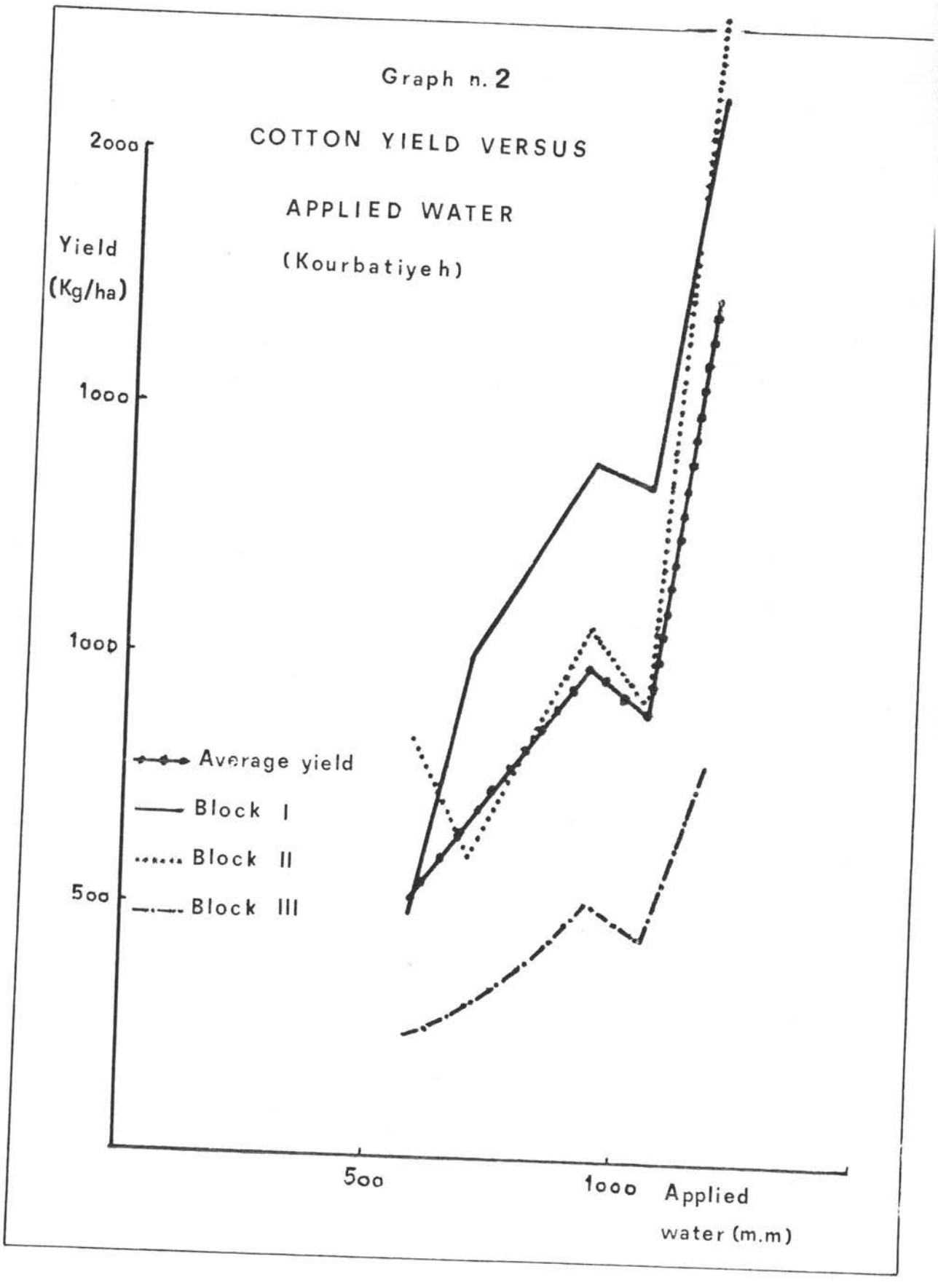
Graph No. 1 shows results of an experiment on cotton carried out in 1966 at Ballaneh Farm; Graph No. 2 gives the results of a similar experiment carried out at Kourbatiyeh Farm in the same year.

8. Water Use in Syria

Although experiments in land and water use in Syria started only seven years ago, the harsh experience of the Syrian farmer, particularly in dry years, has made him quick to appreciate the value of the water diverted to his fields for a few hours every week and he is doing his best to obtain the maximum efficiency in its use.

Graph n. I


COTTON YIELD VERSUS APPLIED WATER
(Jabal Al Ballaneh)
Yield
(kg/ha)
1500
1000
500
500
1000
Applied
water (m.m)
Average yield
Block I
Block II
Block III
Block IV


Graph n. 2
COTTON YIELD VERSUS
APPLIED WATER
(Kourbatiyeh)
Yield
(Kg/ha)
2000
1000
500
Average yield
Block I
Block II
Block III
500
1000
Applied
water (m.m)

The water duty in most irrigation projects in Syria does not exceed 0.5 l/ha/sec. It is only 0.25 l/ha/sec. in Homs-Hama project, an area of 22 000 ha. In the Euphrates Project it is estimated that the figure will be about 1.37 l/ha/sec.

Syria has developed most of its available water resources (with the exception of her share in the Euphrates waters). In order to develop the irrigated land and to increase crop yields two courses of action have to be taken: the first is to reclaim and develop the arable land in the Euphrates Basin and make use of Syria's share of the Euphrates waters; the other is to improve present irrigation and water use practices.

The main problems concerning the effective use of water in Syria call for:

1. Study of the hydrological basins and estimation of the average yearly yield of water from surface or ground sources.

2. Survey and classification of the arable land in Syria in order to assess the properties of the soils, and to determine moisture characteristics and depth of the root zone.

3. Study of ways to reduce water losses due to evaporation from free water surfaces or to seepage.

4. Increase in the irrigation efficiency at the farm level.

5. Determination of the most economic use of water for selected rotations.

6. Study of the effect of depth of the water table on water requirements, and on depth of the root zone, and determination of the most suitable method for drainage.

7. Study of various methods of irrigation, taking into consideration the land slope, soil infiltration rate, and quantity of water that can be provided to the field at each irrigation.

8. Study of the suitability of available water for irrigation.

9. Increase in the number of agro-meteorological stations in order to gather sufficient data for the determination of water requirements (Penman formula).

10. Instruction of farmers on the value of making best use of water in the field.

No doubt the solution of these problems demands a well planned programme, the allocation of sufficient funds and the training of specialists and technicians.

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