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**THE EAST GHOR CANAL PROJECT**

**BY**

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## ABSTRACT

Jordan has had to import food worth tens of millions of Jordan Dinars in the past two decades. This has been a heavy drain on the country's limited resources. Due to the country's rapidly growing population and the meager and fluctuating rainfall, the need for extending irrigation facilities to new areas to step up food production and exports is paramount.

The optimum utilization of the limited water resources in the country had been accorded the highest priority in the Jordanian government plans for economic development. Studies have shown that the capital output ratio in agricultural projects is lower than in others such as industry, mining or constructions. Hence, projects relating to the development of irrigation are playing a vital role in raising the production per capita and, consequently, the standard of living in Jordan.

The East Ghor Canal Project is a manifestation of the Jordanian government development policy. It has been executed on three stages over a period of almost nine years. It is placed under the charge of one administrative unit named the East Ghor Canal Authority. This administrative setup is responsible for carrying out the various activities pertaining to the East Ghor Canal Project.

In organizing for agricultural development, farmers are encouraged to behave in a manner that will result in their producing more agricultural products. They are expected to do so only if it is in conformity with their values, goals and needs. If such a project is meant to serve other ends, such as politics or settlement, then its chances of success are greatly reduced.

Standard recommendations for a wide area of agricultural land are seldom if ever justified. Instead, the essence of maximizing agricultural output is to find the best use for individual plots, modifying each in such ways as are necessary and economically feasible to

increase the quantity and improve the quality of the product — thus maximizing the value of the product in monetary terms.

The purpose of this thesis is to study and analyze the relative position of the East Ghor Canal Project in the Jordanian economy. Thus, Chapter I gives a survey of the Jordanian economy. Chapter II analyzes the importance of the agricultural sector to the economy of the country. Chapter III contains a comprehensive survey of all important schemes which have been proposed to utilize the waters of the Jordan Valley watershed. Chapter IV introduces and gives a detailed description of the East Ghor Canal Project. Finally, Chapter V assesses and analyzes the contribution of the East Ghor Canal Project to the Jordanian economy. It gives an account of the agro-economic implications and depicts the trend of agricultural production and income in the East Ghor Canal Project Area.

Muhammad A. Malallah

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## INTRODUCTION

The Jordan Valley divides the Hashemite Kingdom of Jordan into two parts: the Eastern Bank, previously known as Amirate of Transjordan or simply Transjordan, and the Western Bank which is the part of Palestine adjacent to Jordan which was retained by the Arabs after the Arab-Israeli conflict of 1948. Thus the Hashemite Kingdom of Jordan finally emerged, as a political entity, in its present form, in April 24, 1950 when these two banks were officially united.<sup>1</sup>

## LOCATION AND TOPOGRAPHY

Jordan is located in the heart of the Middle East with an area of 94740 square kilometers.<sup>2</sup> It is

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<sup>1</sup>Burhan Dajani, Lectures on Economic Development of Jordan (Cairo: Institute of High Arabic Studies, 1957), p. 8.

<sup>2</sup>Ministry of Information, The Economy of Jordan, Its Volume and Progress (Amman: Ministry of Information Press, 1966), p. 7.

bounded on the north by the Syrian Arab Republic and the Yarmuk River; on the east by the Iraqi Republic and the Kingdom of Saudi Arabia; on the south, by the Kingdom of Saudi Arabia and Aqaba Gulf; and on the west by the truce line with Israel and the Jordan River.<sup>3</sup>

Geographically, and from east to west, Jordan can be divided into four distinct zones: the desert, the eastern plateau, the great rift or the Ghor, and the western plateau.<sup>4</sup> The desert alone covers approximately 80 thousand square kilometers or 83.5 percent of the total area of Jordan. It extends over the east and receives an annual rainfall of less than 200 mm.<sup>5</sup> The eastern and western plateaus overlook the Jordan Valley. They are generally similar except that the western plateau is lower, receives more rain and is more densely populated.

Finally, the great rift is undoubtedly the dominant topographic feature in the country. It extends some 105 kilometers in length and varies between 5 - 22

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<sup>3</sup>Burhan Dajani, op. cit., p. 10.

<sup>4</sup>Ibid.

<sup>5</sup>Ibid., p. 11.

kilometers in width.<sup>6</sup> However, it can be divided into three parts: the Jordan River including its principal tributary the Yarmuk (aspects of which constitute the essence of this work), the Dead Sea and Wadi Araba.

#### POPULATION AND LABOR FORCE

When the two banks of the River Jordan were united in 1950, the total population was approximately a little over one million. In 1952, a housing and population census was conducted which revealed that Jordan's total population was 1,329 thousand.<sup>7</sup> Since then the population has been growing rapidly at an estimated average rate of roughly 3.35 percent (see Table 1). This exceptionally high natural rate of population growth has not been matched by a commensurate expansion of cultivated area. Consequently, human pressure on cultivated land has increased considerably. The manland ratio in 1952 was found to be 1.27 persons per planted hectare which renders

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<sup>6</sup>George Harris, Jordan, Its People, Its Society, Its Culture (New Haven: Hraf Press, 1958), p. 19.

<sup>7</sup>Department of Statistics, Annual Statistical Yearbook, 1953 (Jerusalem: Greek Convent Press, 1954), p. 1.

Jordan one of the most densely populated of the agrarian societies.<sup>8</sup>

TABLE I  
POPULATION GROWTH IN JORDAN  
1952 - 1964

End of year <sup>a</sup>	Population <sup>a</sup>	Births		Deaths		Net Natural Increase <sup>b</sup> Per 1000
		Number <sup>a</sup>	Rate Per 1000 <sup>b</sup>	Number <sup>a</sup>	Rate Per 1000 <sup>b</sup>	
1952	1329174	46146	34.7	14948	11.2	23.5
1954	1402627	53170	37.9	14402	10.3	27.6
1956	1490509	55374	37.1	12315	8.3	28.8
1958	1606746	69594	43.3	11640	7.3	36.0
1960	1724868	78520	45.5	11965	6.9	38.6
1962	1787646	86397	48.3	12133	6.8	41.5
1964	1935440	86327	44.6	11380	5.9	38.7

Source:

(a) Department of Statistics, Annual Statistical Yearbooks 1952, 1954, 1956, 1960, 1962 and 1964 (Amman: Department of Statistics).

(b) Computed by the writer.

The reported rate of growth was actually verified by the 1961 census of population which reported a total population

<sup>8</sup>UNRWA Bulletin No. 11, Inventory of Major Economic Development Programmes and Projects in the Middle East (Beirut: UNRWA, 1954), p. 97.

of 1,706,226,<sup>9</sup> of which 50.85 percent were males and 49.15 percent were females as shown in Table 2.

TABLE 2  
AGE AND SEX DISTRIBUTION OF POPULATION  
1961 CENSUS

Age Distribution Years	Males	Females	Total	Per Centage of Total Population
Less than 15	408744	365772	774516	45.40
15 - 64	419990	435673	855663	50.10
65 and above	<u>38863</u>	<u>37184</u>	<u>76047</u>	<u>4.50</u>
Total	<u>867597</u>	<u>838629</u>	<u>1706226</u>	<u>100.00</u>

Source:  
Compiled from Appendix I.

As for the age distribution, it was found that 45.40 percent of the population were below fifteen years of age and only 4.50 percent were above 65 years old. The remaining 50.10 percent were between 15 and 64 years old.

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<sup>9</sup>See Appendix I.

As for the geographical distribution of the population, it was found, at the end of 1961, that 51.8 percent of the population lived in the west Bank, 41.4 percent lived in the east Bank, 3.7 percent were abroad and the remaining 3.1 percent were nomads, virtually all dwelling in the desert. This can be seen in Table 3.

TABLE 3  
GEOGRAPHIC DISTRIBUTION OF POPULATION  
AS OF END OF 1961

Area	Population	Percent of Total
West Bank	888276	51.8
East Bank	709314	41.4
Nomads	52929	3.1
Jordanians Abroad	<u>62863</u>	<u>3.7</u>
Total	1713382	100.0

Source:  
Compiled from Appendix II.

With the exception of the nomadic tribesmen, population concentration is in that part of Jordan to the west of the Hejaz railway which runs from Damascus through Amman and

terminates to the South of Ma'an. This railway roughly forms the borderline between the desert to the east and the eastern uplands to the west. Paralleling the rainfall pattern, the concentration of population is higher to the north and west. Hence, rainfall has been the determining factor on the geographical distribution of labor force and employment.

As for the working population, estimates indicate that the labor force has increased from 421 thousand persons in 1961 to 537 thousand persons in 1966 (see Table 4).

On this basis, the average rate of growth of the labor force is 3.5 percent annually, which is virtually equivalent to the rate of population growth. Such equality in growth rates apparently follows directly from the procedure adopted in estimating the size of the labor force.

The sectoral distribution of employment and the relative share of the various sectors in the Gross Domestic product will be discussed below.



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TABLE 4

ESTIMATES OF LABOR FORCE IN JORDAN FOR 1961 AND 1966  
(per Thousand Persons)

Year	Population	Population Between 15 and 65	Labor Force <sup>1</sup>	
			In Percentage	In Number
1961: (a)				
Male	867	420	95	399
Female	<u>838</u>	<u>436</u>	<u>5</u>	<u>22</u>
Total	<u>1706</u>	<u>813</u>	<u>100</u>	<u>421</u>
1966: (b)				
Male	1176	538	95	511
Female	<u>1137</u>	<u>532</u>	<u>5</u>	<u>26</u>
Total	<u>2313</u>	<u>1070</u>	<u>100</u>	<u>537</u>

Source:

(a) Department of Statistics, Annual Statistical Yearbook 1964 (Amman: Department of Statistics Press), p. 2.

(b) Forecast by the writer following IBRD estimate for 1955 and reported in The Economic Development of Jordan (Baltimore: The John Hopkins Press, 1957), p. 441.

(1) In estimating Jordan's Labor Force, the following assumptions were made:

(a) Five percent of males between 15 and 65 years old were excluded to allow for students and invalids.

(b) Only 5 percent of women between 15 and 65 years old were capable and willing to engage in paid non-agricultural employment.

(c) Women in agriculture were excluded.

BASIC FEATURES OF THE ECONOMY OF JORDAN

Available data indicate that Jordan has achieved, during the past few years, a rapid economic growth. Gross Domestic Product rose from J.D. 89.44 million in 1960 to J.D. 110.87 million in 1961; it dropped to J.D. 108.62 million in 1962, then it rose again to J.D. 117.67 million in 1963 and reached an all-time peak of J.D. 135.52 million in 1964. In other words, Gross Domestic Product has risen over the period 1960-1964 by fifty two percent.<sup>10</sup> As a result, per capita income has risen, over the same period from a low level of J.D. 51.87 in 1960 to J.D. 70.30 in 1964, or by 35 percent (see Table 5).

TABLE 5  
PER CAPITA INCOME AND INDEX FOR 1960 AND 1964

Item	1960	1964
Gross Domestic Product (in Million J.D.) . . . . . (a)	89.44	135.52
Population (in Thousand persons) . . (b)	17.24	19.35
Per Capita Index	51.87 100	70.03 135

Source: (a) Compiled from Appendix III.  
(b) Department of Statistics, Annual Statistical Yearbooks 1960, 1964 (Amman: Department of Statistics Press).

<sup>10</sup>See Appendix III.

Sectoral Distribution of Income and Employment.

An examination of the structure of Gross Domestic Product between the various economic sectors for the period 1960 - 1964, reveals that agriculture and trade were the leading sectors. Agriculture contributed J.D. 14.62 million in 1960 and J.D. 34.14 million in 1964. Percentage-wise, this sector accounted for 16.4 percent in 1960 and 25.3 percent of the total Gross Domestic Product in 1964. Trade, however, contributed J.D. 19.57 and J.D. 28.01 million in 1960 and 1964 respectively. In other words, this sector generated 21.9 and 20.7 percent of total Gross Domestic Product in the same two years under consideration.<sup>11</sup>

A secondary role was played by the public sector which includes public administration and defence. The income it generated during the years under consideration constituted 17.6 and 14.5 percent of total Gross Domestic Product. An even smaller role was played by industry.<sup>12</sup> Its contribution in 1960 and 1964 rose from 12.7 to 13.2 percent. This rise indicates the tendency for its relative

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<sup>11</sup>See Appendix IV.

<sup>12</sup>Industry here includes manufacturing, construction and quarrying.

share in the Gross Domestic Product to grow.

Transport, Services, rents of real estate and banking came next, contributing 12.4, 9.2, 8.0, and 1.0 percent respectively in 1960 and 8.9, 8.3, 7.3 and 1.1 percent respectively in 1964. However, in order to clearly show the significance of these figures they are considered against labor force sectoral distribution.<sup>13</sup>

The sectoral distribution of employment reveals that agriculture came first among all the sectors of the economy in terms of employment. According to 1961 census of population some 138 thousand or 35.3 percent of the labor force were employed in agriculture. Industry ranked next with some 82 thousand or 21.1 percent of the total labor force. Services employed 13.7 percent whereas trade provided employment for 8.0 percent and finally transport, communication and warehousing employed only 3.1 percent of the total labor force.<sup>14</sup>

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<sup>13</sup>At this point the following reservation is in order. Gross Domestic Product data are available for the period 1960-1964, whereas reliable data pertaining to sectoral distribution of labor force are available only for 1961.

<sup>14</sup>See Appendix V.

TABLE 6

SUMMARY OF SECTORAL DISTRIBUTION OF EMPLOYMENT FOR  
1961 AND GROSS DOMESTIC PRODUCT FOR 1960  
AND 1964 IN PERCENTAGE OF TOTAL

Sector	In Percentages of Total		
	Employment <sup>a</sup> 1961	Gross Domestic Product <sup>b</sup>	
		1960	1964
Agriculture	35.3	16.4	25.3
Industry	21.1	12.7	13.2
Trade	8.0	21.9	20.7
Services	16.8	30.6	25.6
Electricity and Water Supply	0.4	0.8	0.7
Public Administration and Defence	-	17.6	14.5
Others	18.4	-	-
<b>Total</b>	<u>100</u>	<u>100</u>	<u>100</u>

Source:

- (a) Compiled from Appendix V.
- (b) Compiled from Appendix IV.

These figures reflect a significant measure of uneven distribution of income. For example, although agriculture provided employment for 35.3 percent of total

labor force, on the average only 20.8 percent of Gross Domestic Product was generated by this sector (See Table 6). Trade, on the other hand, employed 8.0 percent of total labor force and generated on the average 21.3 percent of Gross Domestic Product. Finally services provided employment for 16.8 percent of the labor force and contributed on the average, 28.1 percent of total Gross Domestic Product.

The first phenomenon, namely agricultural income in relation to employment, shows that the Jordanian economy fits the description of underdeveloped. Whereas, the second phenomenon, namely the income generated in trade and services as compared with employment therein, reveals maldistribution of the Gross Domestic Product. Hence, given the promising potentialities of agriculture in the country,<sup>15</sup> these phenomena signal the urgent need for developing the agricultural sector. Other indications of this need can be found later in this paper.<sup>16</sup>

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<sup>15</sup>Burhan Dajani, op. cit., p. 19 and pp. 63 - 65, and IBRD, The Economic Development of Jordan (Baltimore: Johns Hopkins Press, 1957), p. 13 and pp. 80 - 85.

<sup>16</sup>See Chapter II, pp. 44-46.

The Public Budget.

The following paragraphs focus on the Public Budget over the period 1961 through 1964 for which data could be obtained. In general, the overall budget has been growing steadily. In aggregates, total government receipts have risen from J.D. 33.5 million in 1961 to J.D. 45.7 million in 1964. On the other hand, total government expenditures during the same period also increased from J.D. 32.9 million in 1961 to J.D. 43.6 million in 1964. Thus except for 1963 for which a deficit of three million Jordan Dinars was reported, the years 1961, 1962 and 1964 witnessed surpluses of J.D. 0.6, 1.3 and 2.1 million respectively (see Table 7).

TABLE 7  
SUMMARY OF TOTAL GOVERNMENT RECEIPTS AND  
EXPENDITURES FOR 1961 - 1964  
(in million J.Ds.)

Item	1961	1962	1963	1964
Receipts. . . . . (a)	33.5	38.8	36.3	45.7
Expenditures. . . . . (b)	<u>32.9</u>	<u>37.5</u>	<u>39.3</u>	<u>43.6</u>
Surplus or (Deficit)	<u>0.6</u>	<u>1.3</u>	<u>(3.0)</u>	<u>2.1</u>

Source:

(a) Compiled from Appendix VI.

(b) Compiled from Appendix VII.



The expenditures of the government have been financed by two principal sources: domestic revenues and foreign support.

Domestic revenues comprised, on the average, 49.9 percent of total revenues collected by the Jordanian government throughout the period 1961 - 1964. They ranged between J.D. 14.6 million in 1961 and J.D. 23.8 million in 1964. After 1961 they rose sharply to J.D. 21.1 million because of extraordinary pipeline transit payment, then dropped slightly to J.D. 19.3 million in 1963 (see Table 8). It is important to note that the ratio of domestic revenues to total revenues has been rising.

The subdivision of the revenues from domestic sources shows that indirect taxes<sup>17</sup> accounted for a greater percentage than any other single item in the domestic revenues. However, their share showed falling tendency. In 1964, they formed 58.5 percent of total domestic revenues down from 61.1 percent in 1961. This tendency indicates

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<sup>17</sup> Indirect taxes include customs and excise, licences and fees.

TABLE 8  
 RATIO OF DOMESTIC REVENUES AND FOREIGN SUPPORT TO  
 TOTAL REVENUES FOR 1961 - 1964  
 (in Million J.Ds.)

Item	1961		1962		1963		1964		Average <sup>b</sup> 1961-1964
	Amount <sup>a</sup>	percent of total <sup>b</sup>	Amount <sup>a</sup>	percent of total <sup>b</sup>	Amount <sup>a</sup>	percent of total <sup>b</sup>	Amount <sup>a</sup>	percent of total <sup>b</sup>	
Domestic Revenues	14.6	43.6	21.1	54.4	19.3	53.2	23.8	52.1	49.9
Foreign Support	18.9	56.5	17.7	45.6	17.0	46.8	21.9	47.9	50.1
Total Revenues	<u>33.5</u>	<u>100</u>	<u>38.8</u>	<u>100</u>	<u>36.3</u>	<u>100</u>	<u>45.7</u>	<u>100</u>	<u>100</u>

Source: (a) Compiled from Appendix VI.  
 (b) Computed by the writer.

the growing role of domestic direct revenues. Among the latter, direct income tax accounted for not more than 15 percent.<sup>18</sup>

The total revenues for 1964 came up to J.D. 45.7 million.<sup>19</sup> Direct taxes accounted for 7.7 percent of total revenues, whereas the ratio of indirect taxes to total revenues was 27.1 percent, or more than one fourth of total revenues.

The other source of financing government expenditures has been Foreign Support to the budget. Foreign financial aid accounted for some fifty percent of total revenues accruing to the government throughout the period 1961 - 1964. It ranged between J.D. 17.0 million in 1963 and J.D. 21.9 million in 1964 as can be seen in Table 8, the major contributor throughout the period being the United States government. The bulk of the American aid to Jordan was paid to the government, among other things, for the purpose of financing its military and civilian expenditures.<sup>20</sup>

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<sup>18</sup> See Appendix VI.

<sup>19</sup> Ibid.

<sup>20</sup> A detailed subdivision of foreign support by source and amount can be seen in The Economy of Jordan, Its Volume and Progress (Ministry of Information Press, 1966), pp. 53-59.

The subdivision of the revenues from foreign sources shows that budget grants constituted the major source of foreign aid. They accounted for greater percentage than any other single item in the foreign support. However, their share has also been falling, since, in 1964, they accounted for 62.4 percent of total foreign support as against 86.8 percent in 1961. However, grants have been gradually substituted by loans. Budget loans appeared for the first time in 1964 budget, when Kuwait lent the Jordanian government five million Jordan Dinars at four percent interest rate for ten years, repayable as from the beginning of 1970.<sup>21</sup> Development loans assumed increasing importance over the period under review, and their ratio ranged between a low 2.6 percent in 1961 and a high 11.5 percent in 1962. However, their share amounted to 7 and 9 percent in 1963 and 1964 respectively.<sup>22</sup>

On the expenditure side of the budget, two important tendencies can be noticed. First, the bulk of the recurring expenditures has been absorbed by defence, army and public security. As shown in Table 9, total recurring

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<sup>21</sup>Ibid., p. 55.

<sup>22</sup>See Appendix VI.

expenditures have increased from J.D. 28.2 million to J.D. 34.5 million over the period 1961 - 1964; so did defence and public security expenditures which increased from J.D. 18.7 million to J.D. 21.0 million over the same period. Second, there was a steady increase in the funds that have been channelled into development projects. In 1961, J.D. 4.7 million were spent for development; the amount of development expenditure virtually doubled in 1964.

These development funds were actually administered partly by the United Nations Operation Mission, and partly by the Development Board. These authorities undertook special projects which were deemed essential for the growth of the economy, such as the construction of the Aqaba Port, the Desert Highway and the East Ghor Canal. Approximately J.D. 27.6 million have been spent on such development projects throughout the period 1961 - 1964.

Apart from the above-mentioned avenues, all other expenditures were of a current nature and ranged between J.D. 9.5 million in 1961 and J.D. 13.5 million in 1964 (see Table 9). However, the subdivision of these items shows that education came first among all civilian expenditures, communication and public works ranked second,

followed by social affairs and health and finally current expenditures on agriculture and irrigation.<sup>23</sup>

TABLE 9

SUMMARY OF GOVERNMENT EXPENDITURES FOR 1961 - 1964

(in Million J.Ds.)

Item	1961	1962	1963	1964
Defence, Army & Public Security	18.7	19.1	21.0	21.0
All Other Recurring Expenditures	9.5	10.9	12.2	13.5
Development Expenditures	<u>4.7</u>	<u>7.5</u>	<u>6.1</u>	<u>9.1</u>
Total Expenditures	<u>32.9</u>	<u>37.5</u>	<u>39.3</u>	<u>43.6</u>

Source:

Compiled from Appendix VII.

If the overall government fiscal operations are viewed in their entirety, namely expenditures in relation to revenues, two striking features can be noticed. First, even recurring expenditures alone could not be financed by domestic revenues. In other words, Jordan government has not yet become self-supporting. This can be seen in Table 10.

<sup>23</sup>See Appendix VII.

TABLE 10  
GOVERNMENT FISCAL OPERATIONS FOR  
1960 - 1964  
(in Million J.Ds.)

Item	1961	1962	1963	1964
Total Revenues. . . . . (a)	33.5	38.8	36.3	45.7
Domestic	14.6	21.1	19.3	23.8
Foreign	18.9	17.7	17.0	21.9
Total Expenditures. . . . . (b)	32.9	37.5	39.3	43.6
Recurring	28.2	30.0	33.2	34.5
Development	4.7	7.5	6.1	9.1
Surplus or (Deficit)	0.6	1.3	(3.0)	2.1

Source:

(a) Compiled from Appendix VI.

(b) Compiled from Appendix VII.

The second striking feature which helps to mitigate the effects of the first is the tendency of development expenditures to vary directly with foreign grants and loans. It might have been well the case that forecasted development expenditures were based on anticipated grants and loans. However, probably because of the increasing development expenditures, the gap between domestic revenues

and recurring government expenditures is narrowing down. In 1961, domestic revenues financed 51.8 percent only of recurring expenditures, whereas in 1964 their share rose to 67.0 percent of recurring expenditures. In general, the public budget reported overall surpluses throughout the period 1961-1964, with the exception of 1963.

Balance of Payments.

Over the period 1963 - 1965, for which data could be obtained, the overall balance of payments showed a deficit in the first year of J.D. 7.58 million and surpluses of 11.11 and 4.33 million Jordan Dinars were reported for 1964 and 1965 respectively.<sup>24</sup>

Although the general picture of the overall balance of payments is continuously changing, yet the dominant feature is the chronic and substantial deficit in the balance of trade. This trade deficit had increased remarkably in the fifties and early sixties. It reached an all-time peak of J.D. 47.07 million in 1963,<sup>25</sup> but dropped

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<sup>24</sup> See Appendix VIII.

<sup>25</sup> The deficit in 1953 was J.D. 13.76 million; in 1959 it steadily rose to J.D. 32.00 million.



to J.D. 40.65 million in 1964 and rose again to J.D. 45.86 million in 1965.

However, a breakdown of the components of the balance of trade would reveal that this tendency was tapered off in the mid-sixties. For instance, merchandise imports which amounted to J.D. 53.63 million in 1963, dropped to J.D. 49.38 million in 1964, then rose again to J.D. 55.77 million. The increase throughout the three year period was less than four percent. On the other hand, exports rose steadily between 1963 and 1965 inclusive. Total exports, including reexports, increased from J.D. 6.56 million in 1963 to J.D. 8.73 million in 1964 and to J.D. 9.91 million in 1965. The increase over the period amounted to more than fifty percent. Thus, there has been a tendency for the trade deficit to decrease. Moreover, although the ratio of exports to imports is very low, yet the trend is apparently favourable.

An even clearer picture can be seen from an examination of the composition of foreign trade. Table 11 shows the ratio of exports to imports over the period 1960 - 1964. The ratio has risen from 8.1 in the beginning of the period under review to 13.1 in 1964. This improvement

was mainly due to the increase in agricultural production over the period 1960 through 1964 as will be shown in the next chapter.

TABLE 11  
RATIO OF EXPORTS TO IMPORTS FOR 1960 - 1964

	1960	1961	1962	1963	1964
Exports (in Thousand J.Ds.) . . . . (a)	3481	4252	4929	5523	7012
Imports (in Thousand J.Ds.) . . . . (a)	<u>42935</u>	<u>41910</u>	<u>45629</u>	<u>50927</u>	<u>53464</u>
Ratio of Exports to Imports . . . (b)	8.1	10.1	10.8	10.8	13.1

Source:

- (a) Compiled from Appendix IX.
- (b) Computed by the writer.

ECONOMIC ACHIEVEMENTS, PLANNING AND PROSPECTS

Given the economic and political conditions, Jordan could achieve, in the past few years, a relatively high rate of economic growth. Official estimates indicate

that Gross Domestic Product has grown from J.D. 89.44 million in 1960 to J.D. 135.52 million in 1964. In other words, Gross Domestic Product has increased by fifty per cent over a period of five years.

Broadly speaking, two reasons have contributed to this high rate of economic growth. First, remittances from nationals working in the oil producing countries, especially in the Gulf Area. No official data are given of the total inflow through this channel. However, the amount is thought to be considerable. The second reason contributing to the relatively high rate of economic growth is sound economic planning. The government of Jordan produced a Five Year Program for Economic Development 1963 - 1967, which was revised "as a result of reductions in the level of budget support, particularly that received from the United States."<sup>26</sup> Thus, another Seven Year Program covering the period 1964 through 1970 was worked out. These programs actually focus attention on the economic problems of the country, try to solve these problems and

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<sup>26</sup> Development Board, The Seven Year Program for Economic Development of Jordan 1962 - 1967 (Amman: The Commercial Press, 1966), p. 1.

anticipate the prospects as well as the path of development to which the economy is committed.

The Five Year Program For Economic Development 1962-1967.

The total amount of development funds required for the implementation of the 1962 - 1967 program stood approximately at J.D. 127.32 million.<sup>27</sup>

The program had three main objectives in the following order of priority:

1. Expanding Gross Domestic Product
2. Reducing unemployment
3. Improving Balance of Trade.<sup>28</sup>

To attain these objectives, the program particularly emphasized developing agriculture and water resources. These were expected to receive J.D. 40.34 million or 31.7 percent of the total estimated capital expenditures. The share of agriculture, exclusive of water resources, was approximately J.D. 13 million; that of forestry was one

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<sup>27</sup>Development Board, The Five Year Program for Economic Development 1962-1967 (Amman: Development Board, 1961), p. 19.

<sup>28</sup>Development Board, Ibid., pp. 15 - 16.

million; and that of other sectors, including fisheries, roughly three millions. Water development was expected to absorb J.D. 23 million or 57 percent of the total (see Table 12).

TABLE 12  
SUMMARY OF THE AGRICULTURAL SCHEME - FIVE YEAR PROGRAM  
1962 - 1967  
(in million J.Ds.)

	Amount	Percent of Total
Agriculture	13	32
Forestry	1	3
Fisheries & Others	3	8
Water	<u>23</u>	<u>57</u>
TOTAL	40	100

Source:

Development Board, The Five Year Program For Economic Development, 1962 - 1967 (Amman: Development Board, 1961), compiled from Table 23-2A, p. 361.

Of the total capital expenditures of J.D. 127 million, roughly J.D. 21 million were to be provided from the increased domestic revenues of the government;

J.D. 47 million from the private sector; and J.D. 59 million from loans and grants from foreign governments. The Five Year Program had to be reconsidered because it was found that foreign loans and grants were not forthcoming. As a result, the present "Seven Year Program for Economic Development 1964 - 1970" was worked out.

The Seven Year Program for Economic Development  
1964 - 1970.

The present Seven Year Program (1964 - 1970) does not indicate abandonment of the previous Five Year Program, but does reflect a substantial rearrangement of the priorities of its goals in response to changing economic conditions and financial availabilities.<sup>29</sup> The plan is expected to be financed through the cooperation of the parties concerned. As Table 13 shows, the private sector is expected to contribute J.D. 107 million or 39 percent. The public sector is planning to contribute some J.D. 32 million or 12 percent. Of the latter, 10 percent will be available as a result of the anticipated

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<sup>29</sup> Development Board, The Seven Year Program for Economic Development of Jordan 1964 - 1970 (Jerusalem: The Commercial Press, 1966), p. 1.

increase of the government revenues relative to expenditures, whereas the remaining two percent will be covered through deficit financing. It is envisaged that Foreign Grants and Loans contribute J.D. 136 million or 49 percent. Noticeable, however, is the larger share of Foreign Loans when compared with Development Grants and Economic Assistance.

TABLE 13  
SOURCES OF FINANCING THE SEVEN YEAR PROGRAM  
OF ECONOMIC DEVELOPMENT 1964 - 1970  
(in Million J.Ds.)

Source	Amount	Percent of Total
Private Savings	107	39
Development Grants & Economic Assistance	36	13
Foreign Loans	100	36
Increase of Revenues over Expenses	<u>27</u>	<u>10</u>
	270	98
Deficit (to be financed by a Public Debt.)	<u>5</u>	<u>2</u>
TOTAL	<u>275</u>	<u>100</u>

Source:

The Central Bank of Jordan, Quarterly Bulletin Number One (Amman: The Modern Press, 1966), p. 22.

The primary goal of this plan is to move Jordan as soon as possible, towards economic self-sufficiency.<sup>30</sup>

Jordan, at present, suffers from three economic problems which normally plague any underdeveloped, over-populated country: a large deficit in the balance of trade, a low level of gross domestic product per head and a huge reservoir of idle human resources.

Therefore, to attain economic self-sufficiency three specific goals have been adopted by the government of Jordan in the following order of priority:

1. "Major reduction in the external balance of trade deficit and such reduction in dependence upon budget support as Jordan may be able to sustain.
2. An increase in per capita income at as rapid a rate as possible, consistent with Goal One, and
3. A reduction in the level of unemployment."<sup>31</sup>

To implement this program, production targets have been established for each sector in such a way as to comply with the broad goals of the program. Those targets are realizable only if the specific schemes are carried out. These schemes are divided sectorially and grouped together to form a comprehensive, integrated economic plan.

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<sup>30</sup>Development Board, op. cit., p. 45.

<sup>31</sup>Ibid., p. 5.



## CHAPTER II

### THE AGRICULTURAL SECTOR

Though agriculture dominates Jordan's economy, the cultivable land is small as compared with the total area of the country. The desert covers some 83.5 percent of the total area of Jordan, receiving an annual average rainfall of less than 200mm., which is the minimum amount of rainfall necessary for agriculture. The remaining 16.5 percent of land generally receives more than that bare minimum, but not all of it could be brought under cultivation. This is so partly because of the topographic feature of the plateaus, which are notable for their steep, rocky hills.

However, "a striking feature of Jordanian agriculture is the cultivation of every area, however small, with soil and water enough to give hope that a crop may result."<sup>1</sup> The arable land was estimated at

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<sup>1</sup>IBRD, The Economic Development of Jordan (Baltimore: Johns Hopkins Press, 1957), p. 78.

thirteen million dunums in 1964<sup>2</sup> of which 20.9 percent was not cultivated at all because of water shortage; 30.1 percent was left fallow and the remaining 49 percent was cultivated (see Table 14). Out of the actually cultivated area 11.8 percent was irrigated and 88.2 percent was rainfed. However, the total cultivated land comprised 6.5 percent of the total area of Jordan.

TABLE 14  
AGRICULTURAL LAND DISTRIBUTION BY TYPE  
OF FARMING IN 1964

	Area in Thousand Dunums	Percentage of Total
Irrigated	759	5.8
Rainfed	5616	43.2
Fallow	3909	30.1
Not Cultivated	<u>2716</u>	<u>20.9</u>
TOTAL	13000	100

Source:

Ministry of Information, The Jordanian Economy, Its Volume and Progress (Amman: Ministry of Information, 1966), p. 19.

<sup>2</sup>Ministry of Information, The Agricultural Sector (Amman: Ministry of Information, 1965), p. 5.

The cultivated land is mostly planted with cereals, vegetables and fruits. Most of Jordan's agriculture is carried out on land the productivity of which depends not only on the amount of rainfall, but also on its distribution and timing, so that a considerable fluctuation in agricultural output from one year to another is not unusual.<sup>3</sup>

#### AGRICULTURAL PRODUCTION 1960 - 1964

Agricultural output fluctuates widely from year to year, depending chiefly on rainfall and other seasonal factors. Throughout the period 1960 - 1964 output of cereals, vegetables and fruits varied from 571.2 thousand tons in 1960 to 1320.8 thousand tons in 1964 as shown in Table 15. To illustrate the order of magnitude of the possible variation, the 1964 production was 231 percent of that of 1960.

Against this fact, a look at the rainfall cycle shows that 1960 was relatively a bad year. Table 16 shows

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<sup>3</sup>Central Bank of Jordan, First Annual Report (Amman: Modern Press, 1965), p. 13.

TABLE 15  
VOLUME OF AGRICULTURAL OUTPUT 1960 - 1964  
(in Thousand Tons)

Product	1960	1961	1962	1963	1964
Cereals	68.8	228.4	181.5	116.6	449.2
Vegetables	393.6	532.9	494.5	537.5	611.7
Fruits	<u>103.8</u>	<u>261.7</u>	<u>165.4</u>	<u>183.0</u>	<u>259.9</u>
Total	<u>571.2</u>	<u>1023.0</u>	<u>841.4</u>	<u>837.1</u>	<u>1320.8</u>
Index	100	179	147	146	231

Source:

Compiled from Appendix X.

that average rainfall in Jordan in 1960 was 170mm. and the total output of cereals, vegetables and fruits in that year amounted to 571.2 thousand tons. In contrast, the corresponding figures for 1964, which was a good year, were 461mm. of rainfall and 1320.8 thousand tons of output. During that period, agricultural production cycle followed the irregular variations of the rainfall cycle (see chart 1).

PRODUCTION AND RAINFALL CYCLES  
1960 - 1964

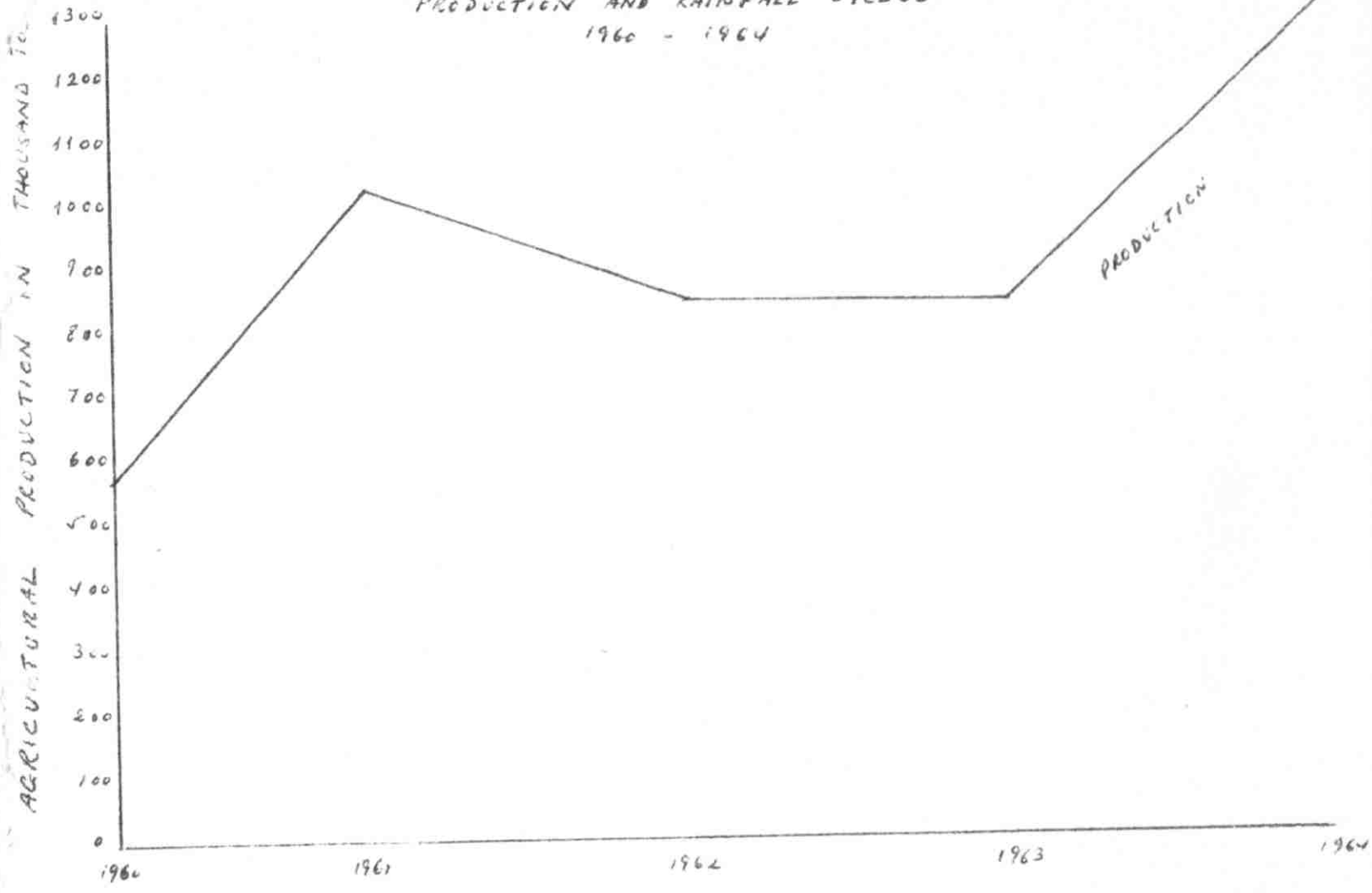


TABLE 16  
AVERAGE RAINFALL IN JORDAN AND INDEX 1960 - 1964  
(in mm.)

Year	Average Rainfall	Index 1960 = 100
1960	170	100
1961	320	188
1962	340	200
1963	232	136
1964	461	271

Source:

Compiled from Appendix XII.

The main field products in Jordan are wheat and barley which are grown as rainfed winter crops. Due to unstable rain conditions, poor and sometimes primitive methods of cultivation, the production of these crops fluctuates widely. For instance, the yield of barley per dunum fluctuated between 17.8 and 106.3kgs, and that of wheat varied between 17.4 and 99.3kgs. during the period 1960-1964.

Similarly, productivity of fruits witnessed sharp changes. The yield per dunum of bananas varied between 960 and 1849.5kgs.; and that of apples and pears between 107.7 and 288.0kgs. over the same period.<sup>4</sup>

In contrast, vegetables production seemed to follow a steady upward trend during 1960-1964, except for the year 1962. However, total vegetable production expanded from 398.6 thousand tons in 1960 to 611.7 thousand tons in 1964. This increase in vegetable production was mainly due to the expansion of irrigated land especially in the Jordan Valley upon the completion of the major portion of the "East Ghor Canal Project", which added some 120 thousand dunums of irrigated land. (See Chapter IV for a full description of the project).

Other products of the agricultural sector, namely forestry and livestock, had manifestly been less subject to climatic fluctuations.<sup>5</sup> Table 17 shows forest products of fire wood, charcoal and wood.

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<sup>4</sup>See Appendix XI.

<sup>5</sup>Of course, short-run or monetary effects are discarded here. However, climatic conditions certainly have their effects on forestry in the long-run.

TABLE 17  
FOREST PRODUCTION  
1960-1964

Product	1960	1961	1962	1963	1964
Fire Wood (in thousand tons)	10.6	12.9	33.1	8.6	8.7
Charcoal (in thousand tons)	2.4	0.9	3.3	0.2	0.8
Wood (in cubic meters)	1712	1368	1383	2882	5695

Source:

Department of Statistics, Annual Statistical Yearbook 1964 (Amman: Department of Statistics Press), p. 128.

The first two products exhibited no direct or indirect relation to the variation in rainfall. The third, namely wood, had apparently been subject to climatic changes since production in the "bad year" was 1712 cu.m., whereas it reached 5695 cu.m. in the "good year". This increase in wood product, however, can partly be explained as "reaping the fruits" of a long run policy of afforestation expansion.<sup>6</sup>

The third major kind of agricultural products is livestock. Livestock censuses for the period 1960-1964,

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<sup>6</sup>The number of seedlings planted over the period 1960-1964 was as follows: 240.5, 589.8, 582.8, 761.8 and 1096.5 respectively.



which are reported in Table 18 show no apparent direct or indirect relationship of the number of livestock to rainfall. The principal kinds, in the order of their number, are sheep, goats, cattle and camels.

TABLE 18  
LIVESTOCK STATISTICS 1960 - 1964  
(in thousand heads)

Kind of Livestock	1960	1961	1962	1963	1964
Sheep	608.9	528.0	701.8	741.3	802.6
Goats	513.3	450.9	537.1	564.6	650.5
Cattle	61.7	44.9	59.9	61.1	65.0
Camels	20.5	19.5	12.4	12.8	19.2

Source: Department of Statistics. Annual Statistical Yearbook 1964 (Amman: Department of Statistics Press), p. 129.

Finally, tobacco, poultry and game, honey and fish constitute a minor portion of total agricultural production. In terms of value, the four products just mentioned contributed 1.30 and 2.52 million Jordanian Dinars to the agricultural income in the years 1960 and 1964 respectively. The

corresponding figures for the total agricultural income for the same two years were 18.34 and 37.86 million Jordanian Dinars respectively. In percentage, the four items constitute 7.09 percent and 6.66 percent of the total agricultural income.<sup>7</sup>

The distribution of the total agricultural income between the principal agricultural products is shown in Table 19. The value of crop products was J.D. 10.75 million in 1960. It rose (more than doubled) in 1961, then declined

TABLE 19  
SUMMARY OF AGRICULTURAL INCOME 1960 - 1964  
(in million J.Ds.)

Product	1960	1961	1962	1963	1964
Crops	10.75	13.07	15.24	16.12	27.90
Forestry	0.20	0.20	0.16	0.14	0.13
Livestock	<u>7.39</u>	<u>6.44</u>	<u>8.69</u>	<u>9.11</u>	<u>9.83</u>
Total	<u>18.34</u>	<u>29.71</u>	<u>24.09</u>	<u>25.37</u>	<u>37.86</u>

Source:  
Compiled from Appendix XIII.

<sup>7</sup>See Appendix XIII.

in 1962 and advanced in 1963. However, it reached its peak of J.D. 27.90 million in 1964, thus constituting alone a little more than 73 percent of total agricultural income. On the other hand, the values of both forestry and livestock products were more or less stable. They constituted 41 percent (1 forestry; 40 livestock) in 1960 and 28 percent (3 forestry; 25 livestock) in 1964 of total agricultural income.

The overall gross value of agricultural production ranged between 18.34 and 37.86 million Jordanian Dinars during 1960-1964. Cereals, vegetables and fruits contributed, on the average, two thirds of total value; whereas livestock and forestry contributed together approximately one third of the output of this sector in terms of value.

#### CONTRIBUTION OF THE AGRICULTURAL SECTOR TO EMPLOYMENT, INCOME AND BALANCE OF TRADE

The most recent available data pertaining to the sectoral distribution of employment in Jordan date as far back as 1961. In that year, approximately 390 thousand people were employed in the various economic sectors of the

country.<sup>8</sup> This total constituted 22.9 percent of the total population.

Agriculture was the most important sector in 1961 in terms of its contribution to employment and to Gross Domestic Product. It absorbed more than one third of the total labor force and produced more than one fifth of Gross Domestic Product. In other words, nearly 138 thousand were employed in agriculture and produced J.D. 25.30 million worth of goods. Percentagewise, while providing employment for 35.3 percent of total labor force, agriculture contributed 22.8 percent of Gross Domestic Product. Its contribution in 1965 was J.D. 34.11 million or 22.6 percent of Gross Domestic Product.<sup>9</sup>

The importance of this sector to the economy in general can even be more clearly seen with respect to its impact on the balance of trade. In 1965, Jordan imported J.D. 56 million worth of goods and exported J.D. 8 million, hence a deficit of approximately J.D. 48 million was incurred.<sup>10</sup>

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<sup>8</sup> See Appendix XIV.

<sup>9</sup> See Appendices XIV and XV.

<sup>10</sup> See Appendix XVI.

An analysis of Jordan's balance of trade will show that agricultural products comprised 60.4 percent of total exports in 1965. The only other item of importance was phosphate which contributed 31.1 percent. The share of all other exports was only 8.5 percent.

Similarly, on the imports side, consumption goods, virtually all of which were basically agricultural products, accounted for 48.3 percent of total imports. Other items under imports included primary and intermediary materials and capital goods which accounted for 25.7 and 17.9 percent respectively. The latter item was composed of machinery and equipment for development projects.

Thus, agricultural products, as a group, accounted for the greater portion of both exports and imports and contributed J.D. 22 million of the trade deficit. In other words, more than 46 percent of the trade deficit was due to agricultural imports. Therefore, correcting the trade deficit has been one of the major objectives of Jordan's development policy as was shown in Chapter I. One way of correcting this trade deficit is by developing the agricultural sector. The following section deals with the agricultural scheme within the Seven Year Plan.

## THE AGRICULTURE SCHEME

As mentioned earlier, the agricultural sector provides employment for more than one third of the labor force, contributes roughly one fourth of the gross domestic product, and produces approximately 60 percent of the commodity exports. Besides, most of the activities of the other sectors of the economy are closely tied up to agriculture. Thus, the agricultural sector forms the base of the existing economic structure of the country.

Agricultural development emerges high on all the priority scales that have so far been suggested, mainly for the following reasons:

1. Agriculture can be the main contributor towards bridging the balance of trade gap. If the cultivable land is brought actually under cultivation, a large portion of the agricultural imports can be locally and economically supplied. On the one hand, livestock, chicken and dairy products can be supplied locally if cheap fodder becomes available as part of a crop rotation in the Jordan valley. On the other hand, present exports of fruits and vegetables can be multiplied several fold with the full exploitation of the irrigable lands.<sup>11</sup>

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<sup>11</sup>It is interesting to note that the climatic conditions in the Jordan valley are conducive to early ripening of fruits and vegetables. With efficient organization, these products can be marketed easily and command high prices, especially in the neighbouring countries.

2. Agricultural income can be increased with a given amount of investment more than in most other fields of development. Table 20 shows that capital output ratio is lower in agricultural projects than in others such as industry, mining or construction.

TABLE 20

CAPITAL OUTPUT RATIO IN SELECTED PROJECTS

Project	Capital Output Ratio
Yarmuk Project	1.2 : 1
Oil Refinery	2 : 1
Jerusalem Hotel	2.3 : 1
Construction	10 : 1

Source:

Development Board, A Series of Seminars on Jordan Agriculture (Amman: The Development Board-mimeographed), p. 59.

3. Agriculture is a labor intensive rather than a capital intensive occupation. Hence, its development can alleviate the employment problem from which the country suffers.
4. Agriculture can contribute substantially towards creating a more balanced economy, particularly reducing the relative importance of phosphate

and potash exports as the main indigenous exchange earners in the future.<sup>12</sup>

However, this sector which ranks so high on the priority list, actually suffers from various problems including: low productivity of land and labor, heavy dependence on precarious rainfall, soil erosion, overgrazing of range lands, lack of planned land-use pattern, lack of adequate long-term capital, ignorance on the part of farmers of modern techniques of production coupled with primitive methods of cultivation and various marketing problems.<sup>13</sup>

Taking the foregoing points into consideration, no wonder that the Seven Year Plan also gave priority to the development of the agricultural sector. Out of the estimated capital expenditure of J.D. 274,851 thousand to be spent over the seven years of the plan, agriculture is assigned J.D. 74,210 thousand or 27 percent of the total.<sup>14</sup> As for financing, the public sector provides J.D. 57,940 thousand and the private sector is expected to contribute

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<sup>12</sup>Development Board, A Series of Seminars on Jordan Agriculture (Amman: Development Board-mimeographed), p. 58-60.

<sup>13</sup>Development Board, The Seven Year Program for Economic Development 1964-1970, op. cit., p. 74.

<sup>14</sup>See Appendix XVIII.



J.D. 16,270 thousand. These amounts comprise 39.8 and 12.6 percent of the public and private contributions respectively.<sup>15</sup>

Further breakdown of the capital expenditure on agriculture shows that projects related to the ministry of agriculture, forestry, veterinary, extension, research, marketing, fishing and private expenditures on agriculture receive no more than one fourth of the estimated gross capital expenditure throughout the seven years of the plan. Equally significant is the fact that projects related to irrigation are expected to receive three fourths of the budgeted expenditure. Of the latter, the Yarmuk Project absorbs the lion's share of more than forty percent of total capital expenditure.

The Seven Year Plan recognizes that the chief means for expanding agricultural production lies in the reclamation of land in the Yarmuk-Jordan Valley. It had been estimated that the overall development of the valley would bring under irrigation more than half a million dunums and would provide living for roughly one hundred fifty thousand persons

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<sup>15</sup>See Appendix XIX.

either on the farms or in other occupations associated with agricultural operations.<sup>16</sup>

The above estimates, however, are derived from one study only. For many years, several studies have been conducted, the next chapter, deals in a chronological order, with the most significant schemes proposed for the utilization of the Yarmuk-Jordan valley.

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<sup>16</sup>Baker & Harza, Yarmuk-Jordan Valley Project. Master Plan Report (Pennsylvania: Baker & Harza Engineering Co., 1955), Vol. VIII, p. 60.

## CHAPTER III

### SCHEMES FOR THE UTILIZATION OF THE RIVER JORDAN

#### THE RIVER JORDAN

The River Jordan and its valley constitute one of the most peculiar natural phenomena of this planet. They have been closely linked with the history of mankind. Despite the small area of the valley and the limited quantity of water that runs through it, as compared with the world's famous rivers, this valley is one of the most important valleys in south west Asia.

The River Jordan begins its course from the south and west slopes of Jabal Sheikh (Mount Hermon). The river is washed white with snow derived from Jabal Sheikh which is covered by snow virtually all year round.<sup>1</sup> The main sources from which the River Jordan draws the major portion of its perennial waters are:

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<sup>1</sup>Nelson Glueck, The River Jordan (Jerusalem: Jerusalem Press, 1945), p. 14.

1. Hasbani which is the northernmost tributary of the River Jordan with a length of twenty four miles<sup>2</sup> and having its origin in Lebanese territory.
2. Baniyas which is the easternmost tributary of the River Jordan with a length of five and a half miles<sup>3</sup> and having its origin in Syrian territory.
3. Leddan which is the shortest but the strongest source of the River Jordan<sup>4</sup> and having its origin in Israeli occupied territory.

These three main sources join together to form one stream --the stream of the River Jordan. The stream of the river flows southward for a distance of fifteen kilometers, then delivers its waters into Lake Tiberias.<sup>5</sup>

The River Jordan emerges from the southern extremity of Lake Tiberias to be joined soon afterwards by its most

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<sup>2</sup>Nelson Glueck, op. cit., p. 30.

<sup>3</sup>Ibid., pp. 17 - 18.

<sup>4</sup>Ibid., p. 29.

<sup>5</sup>The Arab Committee, Conspiracies on the Waters of the River Jordan (Damascus: Arab Unity Press, 1960), p.18.

important tributary — the Yarmuk. Then, it continues its course which is almost due south, in an ever deepening depression, till it reaches the Dead Sea. Located at nearly four hundred meters below sea level, this salty lake is actually the final destination of the waters of the entire Jordan River system.

This system includes several wadis (streams) which feed the river from both banks. The eastern wadis are: Arab, Ziqlab, Abu-Ziad, Jurum, Kufrinji, Rajeb, Zarqa, Nimrin, Kufreen and Rameh. The western wadis are: Fara'a, Due, Auja, Sultan and Qilt. The quantity of water that runs through the river varies from one point in time to another. "During the rainy season the discharge increases, and the flow reaches its peak about the middle of February. Thereafter, the flow begins to subside, being maintained at a high level partly by springs and partly by the gradually melting snow on Mount Hermon."<sup>6</sup> However, the quantity of water that reaches the river annually is as follows:<sup>7</sup>

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<sup>6</sup>M.G. Ionides, Report on the Water Resources of Transjordan and their Development (London: The Crown Agents, 1939), p. 135.

<sup>7</sup>The Arab Committee, op. cit., p. 24.

Hasbani .....	157	Million	Cubic	Meters
Banias .....	157	"	"	"
Leddani .....	258	"	"	"
Yarmuk .....	475	"	"	"
Total Discharge of the River				
North of the Dead Sea .....	1250	Million	Cubic	Meters

It is worth mentioning at this point that "of the four major tributaries of the Jordan River, which between them contribute over 15 percent of the utilisable water in the Jordan Valley, not one is a purely national river. They all constitute waterways of common interest, and any use of their waters is thus subject to agreement between the states concerned."<sup>8</sup>

The length of the valley from the southern end of Lake Tiberias to the northernmost point of the Dead Sea is 250 kilometers, whereas the length of the River Jordan between these two points is 700 kilometers.<sup>9</sup>

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<sup>8</sup> Izzat Tannous, Commentary on Water Development in the Jordan Valley Region (Beirut: The Arab Palestine Office, 1954), p. 17.

<sup>9</sup> The Arab Committee, op. cit., p. 23.

Concerning its width and depth, the River Jordan is about 30-50 meters wide and about 1-3 meters deep.<sup>10</sup> Hence, it is not useful for navigation.

The River Jordan flows in a steep slope and the valley around it is sloping too but not to the same extent. The valley itself is higher than the river stream considerably. Moreover, the valley has another slope. This second slope consists of a slope from the surrounding plateaus down to the stream of the river. The area of this slope, and in both sides consists of three parts. First comes the Ghor; then a desert area called Qattarah, finally comes the Zor. The Ghor borders the hills whereas the Zor surrounds the stream.<sup>11</sup>

The major sphere of development, which can profitably contribute to increased production of which Jordan stands in need, is irrigation. In the Jordan valley, there is little dry-farmed land, and agriculture depends upon irrigation. It is here that the opportunities for rapid economic development are to be found.<sup>12</sup>

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<sup>10</sup>Glueck, op. cit., p. 61.

<sup>11</sup>Ibid., pp. 63-71.

<sup>12</sup>M.G. Ionides, op. cit., pp. 7-10.

Accordingly, long series of proposals and detailed studies had appeared to develop the Jordan valley. Broadly speaking, these studies can be divided into two main groups: First the early schemes, the most important of which is the Ionides Plan of 1939, which was intended to raise the standard of living of the small farmers of the area and to increase the national income of the country. The Lowdermilk-Hays plan is also presented under the early schemes.

Secondly, the recent schemes including Bungar Plan of 1952, the Johnston Plan of 1953, the Israeli Plan of 1954, the Counter Arab Plan of 1954 and the Yarmuk-Jordan Valley Project. Since these later plans were proposed after the Arab-Israeli war of 1948, they embodied political considerations besides their apparent economic aspects. The major features of each of these plans are presented below.

#### EARLY SCHEMES

##### Ionides Plan.

This plan was originally embodied in a "Report on the Water Resources of Transjordan and their Development",



submitted to the government of Transjordan in 1939 by M.G. Ionides, who was then the Director of Development in Transjordan. Later on, however, the said report and the suggestions therein came to be known as "Ionides Plan."

Ionides Plan encompasses three major propositions relative to water resources development in Jordan. Accordingly, the plan can be divided into the following three sections:

1. Irrigation from Tributaries
2. A River Yarmuk Diversion Canal
3. The River Jordan

The first section dealt with the utilization of water for irrigation. It was confined to the Eastern Tributaries of the River Jordan. These are ten streams with an estimated annual water supply of 123 million cubic meters.<sup>13</sup> These streams irrigate an area of 186395 dunums. The land irrigated by these waters is fertile

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<sup>13</sup>M.G. Ionides, op. cit., computed by the writer from Table 41, p. 253.

and the climatic conditions are favourable to the growth of several kinds of crops, including many tropical varieties since winter is warm and frost is very rare.<sup>14</sup>

The system of water control for irrigation purposes from those streams was inadequate and economically wasteful. Each one of these ten streams was divided into two main canals in which water was continuously flowing. The canals were made of crude earth so that a considerable amount of water was absorbed by land during the flow. A second disadvantage to this system was the ease with which a land owner could steal water from these canals. Water was divided among farmers in proportion to the size of land owned, and this division was by no means accurate. Consequently, farmers who did not feel safe as to water rights were discouraged to develop their lands and did not risk the investment of permanent capital.<sup>15</sup>

To remedy this situation and provide proper methods of control, the government should provide means of collecting water on each stream and distributing it

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<sup>14</sup>M.G. Ionides, op. cit., p. 249.

<sup>15</sup>Ibid., p. 254.

to farmers through weirs. Concrete channels might be constructed at the fountains of these streams or throughout the system. Though this alternate plan would be more costly,<sup>16</sup> its implementation would result in utilizing water which otherwise would be wasted, equitable distribution of water, checking thefts of water and, most important, encouraging farmers to invest capital on land due to the effect of security resulting from the definite water right warranted by this scheme.<sup>17</sup>

The second section dealt with diverting the waters of the Yarmuk river and other wadis into a canal running parallel to the River Jordan. The idea here was to construct an eastern canal combining the waters of the Yarmuk River, Wadi Ziqlab, and Wadi el-Arab. The canal was supposed to be 21 kilometers long<sup>18</sup> and a capacity of 2.56 cubic meters per second,<sup>19</sup> or a total of 80,732,160 cubic meters per annum.

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<sup>16</sup>The cost of the alternate scheme is one-third mil per cubic meter as contrasted with one-twentieth of a mil per cubic meter delivered under the previous arrangement. See M.G. Ionides, op. cit., p. 254.

<sup>17</sup>M.G. Ionides, op. cit., pp. 254 - 255.

<sup>18</sup>Ibid., p. 256 and p. 347.

<sup>19</sup>Ibid., p. 256. This quantity is calculated as follows:

Since the proposed canal was earthen, one third of this total was expected to be lost through absorption. Hence, 54 million cubic meters of water per annum was thought to be available for utilization. The annual quantity of water originally utilized from the Yarmuk and the other two streams was estimated at 21 million cubic meters. Therefore, the annual net increase in water supply, due to the implementation of this scheme, was estimated at 33 million cubic meters.<sup>20</sup>

This increase in water supply was expected to increase the irrigated area from 36,320 dunums to 45,360 dunums, an increase of 9,080 dunums or an increase of 25 percent. According to this scheme, each dunum would receive 1200 cubic meters per year.<sup>21</sup>

This scheme was expected to cost £P. 70 thousand and annual maintenance of £P. 5,500. Hence, the cost

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Yarmuk ....	1.76	cubic meters per second.
Ziqlab ....	0.30	" " " "
el-Arab....	0.50	" " " "
	<hr/>	
TOTAL	<u>2.56</u>	cubic meters per second.

<sup>20</sup>Ibid., p. 348 and Table 2 on the same page.

<sup>21</sup>Ibid., p. 256.

per cubic meter newly delivered (of the 33 million cubic meters) was one-seventh a mil.<sup>22</sup>

An alternative to this scheme contemplated the construction of an impervious canal. The area that could be irrigated from this canal was estimated at 117,000 dunums. The unit cost would have been five or six pounds per dunum. Accordingly, a total capital expenditure of £P. 585,000 or £P. 702,000 was required.<sup>23</sup>

The third section dealt with the utilization of the waters of the River Jordan. The River Jordan could be used for intensive irrigation in two ways: a diversion canal and pumping.

As for diversion, a canal could be constructed from the south of the Lake Tiberias, which was supposed to be used as a reservoir, leading to the irrigable areas in the east Ghor. By controlling the level of Lake Tiberias, the flow of this canal could irrigate nearly 300,000 dunums.<sup>24</sup>

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<sup>22</sup>M.G. Ionides, op. cit., p. 256.

<sup>23</sup>Ibid., pp. 255 - 256.

<sup>24</sup>Ibid., p. 257.

If impervious channels were used throughout, then the cost would be in the neighborhood of £P. 9 per dunum, or a total of approximately £P. 2,700,000. On the other hand, if earthen channels were used, then the unit cost would be much less, or about £P. 0.3 or £P. 0.4 per dunum, or a total in the range of £P. 900,000 and £P. 1, 200,000.<sup>25</sup>

A difficulty that met this scheme was the interference of the works of the Palestine Electric Corporation (Rutenberg Concessions) in matters of regulating the level of Lake Tiberias.

As for pumping, it was found that 20,000 dunums of the Zor could be irrigated from the River Jordan by the use of pumps. The cost of such a plan was estimated at one fourth a mil per cubic meter delivered. On the other hand, irrigating the Ghor by pumping would have costed 4.25 mil per cubic meter. This is so because the Ghor is higher and further from the River Jordan than the Zor.<sup>26</sup>

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<sup>25</sup>M.G. Ionides, op. cit., p. 258.

<sup>26</sup>Ibid.

Lowdermilk-Hays Plan.

This plan recommended the establishment of a "Jordan Valley Authority" to undertake the execution of this plan. The original sketch of the Jordan Valley Authority (JVA) appeared in 1944 in Walter C. Lowdermilk's book "Palestine, Land of Promise."

The other person associated with this plan is James B. Hays. He was Project Manager of the TVA, then was appointed as Chief Engineer for the "Commission on Palestine Surveys". He put the final touches of this scheme. Hence, the following description of the scheme is based upon J.B. Hays' 1946 report.

The JVA scheme of irrigation and hydro-electric power development was designed to be carried out in eight stages. It would provide irrigation for at least 2,424 thousand dunums; it would furnish eventually about 660 million Kilowatt hours of hydro-electric energy per year; and it would cost approximately \$250 million.<sup>27</sup>

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<sup>27</sup>James B. Hays, T.V.A. on the Jordan (Washington, D.C.: Public Affairs Press, 1948), p. viii.

The purpose of such large scale scheme was largely political rather than simply economic. "A Jordan Valley Authority . . . would, through full utilization of the Jordan Valley depression and adjoining drainage areas for reclamation and power, in time provide farms, industry and security for more than three million new settlers over and above the 1,800,000 Arabs and Jews already residing in Palestine and Transjordan".<sup>28</sup> Thus, the scheme was intended to show that Palestine can support more people if this scheme were implemented.

The technical aspects of the JVA scheme are based on the following principle. Lands near the source of water supply are irrigated first. Then, as additional water sources are developed or become available, irrigated area would be expanded. Thus, the sweet waters of the Upper Jordan would be diverted into a network of irrigation canals. To compensate the Dead Sea for the loss of these waters, sea waters would be diverted from the Mediterranean, at a point near Haifa, through a tunnel and canal down the Ghor to the Dead Sea,<sup>29</sup>

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<sup>28</sup>James B. Hays, op. cit., p. vi.

<sup>29</sup>Ibid., pp. vi-vii and p. x.



Generally, the JVA would be concerned with power and irrigation. However, its scope can be expanded to include such aspects as water and soil conservation, flood control, reforestation, complete draining of the Huleh swamps and reclamation of the Negev through the damming of flood waters.<sup>30</sup>

The JVA scheme is divided into eight stages. Seven of these stages provide water for irrigation and one (the fourth) for hydro-electric power. The scheme further provided for two additional stages if water from outside Palestine were obtained. The main features of each stage are discussed below.

Stage I was thought to develop, by wells and pumps, underground and spring waters in the coastal plain, inland plains and along the base of the hills next to the coastal and other inland plains. It also provided for building a dam on the Hasbani east of Ibel es-Saki, a power plant at the base of the dam, a short tunnel, a power canal above Tel Hai and a power plant below Tel Hai. This stage was expected to provide 518 million cubic meters which would

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<sup>30</sup>Ibid., p. vii.

irrigate an area of 703,000 dunums. Moreover, it was expected that 90 million kilowatt hours would be made available. Total capital cost of the whole stage was approximately \$29 million and would have required nearly \$4 million for maintenance and operations.<sup>31</sup>

Stage II was supposed to utilize the summer flow of the Upper Jordan including the entire flow of the Hasbani for irrigation of Upper Huleh and Lower Galilee. Two gravity canals would be constructed and Sahl el-Battauf would be used as a reservoir. Approximately 343 million cubic meters would be made available to irrigate 521 thousand dunums. Moreover, an annual output of 10 million kilowatt hours would be produced. The capital cost of this stage would be around \$2 million and an amount of \$27,700 would be required for operations and maintenance.<sup>32</sup>

Stage III differs from the previous two stages. Although it provided for constructing a dam across the Yarmuk, yet it was confined solely to irrigation, and contemplated diverting 50 percent of the waters of the Yarmuk

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<sup>31</sup>James B. Hays, op. cit., pp. 39-46.

<sup>32</sup>Ibid., pp. 47-53.

River to irrigate Tiberias, Yarmuk and Beisan areas. The stream of the Yarmuk River was supposed to be diverted into Lake Tiberias by constructing a dam across the Yarmuk at the point where the river descends from the mountains to the valley. An area of 110 thousand dunums would be irrigated after receiving 125,500,000 cubic meters of water. The capital cost was estimated around \$8 million while maintenance and operation costs would amount to \$583,100 per year.<sup>33</sup>

Stage IV had two-fold purposes. First, it involved diverting from the Mediterranean, into the Dead Sea, an amount of water equal to the amount of water withdrawn from the River Jordan, to replenish the deficiency in the Dead Sea created by the diversion of the River Jordan.<sup>34</sup> Second, the utilization of the difference in elevation between the Mediterranean and the Dead Sea level to generate an annual output of 560 million Kilowatt hours. This stage would require \$43,530,000 as capital cost and \$2,152,100 for maintenance and operations per year.<sup>35</sup>

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<sup>33</sup>James B. Hays, op. cit., pp. 54-60.

<sup>34</sup>The quantity of water needed would be 1250 million cubic meters which is equal to the discharge of the River Jordan south of Allenby Bridge. See Burhan Dajani, op. cit., p. 74.

<sup>35</sup>James B. Hays, Ibid., pp. 61-66.

Stage V proposed the utilization of the winter flow of all streams, wadis and springs of the Upper Jordan for irrigation of lands to the south. It further included the construction of a dam to impound el-Battauf Reservoir. It was expected to recover 207,240 thousand cubic meters of water to irrigate 292 thousand dunums in Affule-Beit Alfa and the Coastal Plain down to Rehovot regions. The capital cost of the stage was estimated at \$32,830,000 and maintenance and operations costs were around \$1,879,000.<sup>36</sup>

Stage VI provided for the reclamation of Huleh Lake and Swamps through drainage. It further provided for irrigating the Huleh Basin region and the Southern Coastal Plain. Drainage would be achieved by widening and deepening the lake outlet, whereas the irrigation aspect of this stage would consist of concrete-lined canals and pipes. The area to be reclaimed was estimated at 293,000 dunums and the quantity of water utilized was estimated at 229,332 thousand cubic meters. However, the capital cost of this stage was \$21,512,000 and maintenance and operation costs stood at \$2,043,800.<sup>37</sup>

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<sup>36</sup>James B. Hays, op. cit., pp. 67 - 70.

<sup>37</sup>Ibid., pp. 71 - 81.

Stage VII dealt with utilizing the wadis draining into the river Jordan from the west<sup>38</sup> to irrigate the Lower Jordan valley especially the Jericho Plain by means of canals and pumps. Approximately 247 million cubic meters could be collected to irrigate 165 thousand dunums. Capital cost required was estimated at \$15,352,000 and cost of maintenance and operations were approximately \$863 thousand.<sup>39</sup>

Finally, Stage VIII provided for storage and recovery of winter flood waters from all the principal wadis draining into the Mediterranean,<sup>40</sup> by means of dams, canals siphons and pumps, to reclaim and irrigate the Negev. It was expected to recover 319,700,000 cubic meters of water which would be used to irrigate 342,000 dunums. The capital cost required to execute this stage was estimated at \$53,882 thousand and an additional \$2,880,700 would be required annually for maintenance and operations.<sup>41</sup>

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<sup>38</sup>For detailed enumeration of these wadis see page 51 of this chapter.

<sup>39</sup>James B. Hays, op. cit., pp. 82-89.

<sup>40</sup>The principal wadis draining into the Mediterranean are the following: Karkara, Qarn, Halazun, Malik, Qishon, Abu Nar, Massin, ez Zeimar, et Tin, Qana, Sarida, Kabir, Sarar, Ajjur, Zeita, Hasi, er Raml and Ghazza.

<sup>41</sup>James B. Hays, Ibid., pp. 90-103.

## RECENT SCHEMES

### Bungar Plan.

This plan was prepared, in 1952, for the Jordanian government by the United States Technical Cooperation Administration under the supervision of Mills E. Bungar, Chief of Water Resources Development, Point Four Mission in Jordan.

The purpose of Bungar Plan was the development of the Jordan Valley without indulging in international negotiations. The plan was so designed as to be easily integrated with succeeding schemes that might utilize Lake Tiberias for storage of the Yarmuk waters.<sup>42</sup>

The plan envisaged the construction of a 130-meter high dam near Maqarin Station to store 500 million cubic meters of the Yarmuk waters. This "discovery of a suitable site for construction of a large storage reservoir on the Yarmuk river is one which could change all previous thinking on the subject of water development in the area."<sup>43</sup>

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<sup>42</sup>Burhan Dajani, op. cit., p. 75.

<sup>43</sup>Izzat Tannous, op. cit., p. 14.

The Yarmuk waters would be channelled, from the dam, in a 30 Kilometer long canal to Adasieyh. At this point a diversion dam would be built to feed the main irrigation canal running along the eastern rim of the Jordan Valley and extending to the northern shores of the Dead Sea. Another canal would be built along the western rim of the valley. This canal would be fed by pumping from a low diversion dam to be constructed on the River Jordan. Alternatively, it might be fed by siphonning water from the eastern canal.<sup>44</sup> This plan further provided for building dams and hydroelectric power stations on the side wadis south of the Yarmuk.<sup>45</sup>

Under this plan, 43500 and 6000 hectares of land would be irrigated in Jordan and Syria respectively.<sup>46</sup> Moreover, 218 million kilowatt hours would annually be generated from the Maqarin and Adasieyh. Total costs of the plan were estimated around \$49 million.<sup>47</sup>

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<sup>44</sup>Raphael Patai, (ed.) Jordan (New Haven: Human Relations Area Files, 1957), p. 126.

<sup>45</sup>Burhan Dajani, op. cit., p. 77.

<sup>46</sup>Raphael Patai, Ibid., p. 126.

<sup>47</sup>United Nations Relief and Works Agency for Palestine Refugees, Bulletin of Economic Development Number 14 (Beirut: U.N.R.W.A., 1956), p. 84.

The importance of this plan stems from the fact that all of the Yarmuk waters could be stored in the Maqarin reservoir without reference to Lake Tiberias, thus avoiding the political complications which storage in the lake would create. Furthermore, this plan "forms the basis of the present suggestions for the large scale utilization of the Yarmuk waters and for the agricultural development in the Jordan Valley."<sup>48</sup>

Jordan and Syria immediately accepted Bungar Plan and signed, in June 1953, an agreement whereby they shared the costs and benefits of the proposed plan. The United Nations Relief and Works Agency (U.N.R.W.A.) was interested in the plan and signed two agreements with the Jordanian government to participate in the financing of the plan.<sup>49</sup> Israel, however, objected because this plan did not recognize its claims of a share of the Yarmuk waters.<sup>50</sup> Consequently, the U.N.R.W.A. and Point Four withdrew their assistance.

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<sup>48</sup>Burhan Dajani, op. cit., p. 75.

<sup>49</sup>Izzat Tannous, Ibid., p. 13.

<sup>50</sup>Edward Rizk, The River Jordan and its Tributaries (Amman: Ministry of Information), p. 24.



"No doubt that political considerations resulting from the Israeli objection to the plan led to the sudden withdrawal of the United States assistance."<sup>51</sup>

After this stage, U.N.R.W.A. requested Charles T. Main Inc., to study all previous plans pertaining to the development of the Jordan Valley, under the auspices of the Tennessee Valley Authority. The result of this study was embodied in a report titled "The Unified Development of the Water Resources of the Jordan Valley Region."

#### Johnston Plan.

Israeli claims to a share of the Yarmuk waters posed political difficulties relative to Bungar Plan. Worse than that was the United States experts' allegation that the plan was impractical and uneconomic. The high hopes raised in Jordan by the suggestion of the scheme, were suddenly frustrated.

In this climate, namely the sudden and poorly justified rejection of Bungar Plan, the "Unified Development of

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<sup>51</sup> Addel-Hafeez Muhammad, The River Jordan and the Diversion Schemes (Amman: Weekly News House, 1964), p. 53.

the Water Resources of the Jordan Valley Region", or the "Main Plan", was proposed. This plan served as basis for the negotiations which ambassador Eric A. Johnston conducted with the Arab states and Israel. Hence, this plan came to be commonly referred to as "Johnston Plan." As a start, it is important to note that this plan "was based upon materials, reports and data made available to Tennessee Valley Authority and was made without field investigations."<sup>52</sup>

The purpose of the plan was to "establish, in general terms, disregarding political boundaries, a broad plan for the effective and efficient use of the water resources of the Jordan Valley emphasizing, first irrigation and, second, the production of hydroelectric power."<sup>53</sup>

The entire plan contemplated the utilization of 1,305 million cubic meters<sup>54</sup> of water. Out of this amount, 879 million cubic meters, or 67 percent of total would be for Jordan and Syria; 426 million cubic meters, or 33 percent,

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<sup>52</sup>Chas. T. Main Inc., The Unified Development of the Water Resources of the Jordan Valley Region (Boston: prepared at the request of the United Nations under the direction of the Tennessee Valley Authority, 1953), p. i.

<sup>53</sup>Ibid., p. 1.

<sup>54</sup>Ibid., p. 53.

for Israel;<sup>55</sup> and none for Lebanon. The water utilized would irrigate 936 thousand dunums<sup>56</sup> of which 520 thousand dunums, or 55 percent of total in Jordan and Syria (Jordan 490,000; Syria 30,000 dunums) and 416 thousand dunums, or 44.5 percent in Israel.<sup>57</sup> The plan provided for the generation of hydroelectric power of 218 million kilowatt hours<sup>58</sup> of which 134 million kilowatt hours, or 61.5 percent, on the Yarmuk in Jordan and 84 million kilowatt hours, or 38.5 percent, on the Hasbani in Israel.<sup>59</sup>

To attain the above mentioned purposes, the Johnston Plan envisaged the construction of the following works:<sup>60</sup>

1. The Hasbani Storage Dam and Power Development Canal. The dam, 90 meters high with a storage capacity of about 165 million cubic meters, would be used for the sole purpose of storing irrigation water. It was meant to be used as a partial regulator of the combined flow of the Banyas, Hasbani and Leddan tributaries.

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<sup>55</sup>Burhan Dajani, op. cit., p. 81.

<sup>56</sup>Chas. T. Main, Ibid., p. 8.

<sup>57</sup>Burhan Dajani, Ibid., p. 81.

<sup>58</sup>Chas. T. Main, Ibid., p. 56 and P. 64.

<sup>59</sup>Burhan Dajani, Ibid., p. 82.

<sup>60</sup>Chas. T. Main, Ibid., pp. 36-40; p. 56 and pp. 61-63.

The Power Canal would carry the water released from the Hasbani reservoir to a point near Tel Hai. Total energy output, per average year, from this canal was estimated at 84 million kilowatt hours.

2. Drainage and Irrigation of Huleh Area. Huleh marshes would be drained for irrigation and raising of crops purposes. To accomplish this, Lake Huleh outlet would be enlarged and drainage canals constructed.

3. The Banyas Dam and Canal. The dam would be for the purpose of diverting Banyas water into an irrigation canal so that Banyas water would be carried to the Galilee Hills area by gravity. The irrigation canal would extend for 120 kilometers to irrigate Huleh, Jezreel Valley and Galilee Hills area. At various points, the canal's capacity would vary from one cubic meter per second to 14 cubic meters per second.

4. The Maqarin Dam and the Yarmuk Power Development. These works on the Yarmuk were initially meant for power development of 134 million kilowatt hours per year. The works encompass the Maqarin Dam, the Adasieyh Power Plant and the Power Canal. The dam would serve as the tailwater

for Adsasieyh Power Plant, a headwater for both the east Ghor irrigation canal and the 32-kilometer long Power canal.

5. East and West Ghor Canals. These canals, and all related headworks, siphons, spillways and outlets, would be constructed for the purpose of irrigation by gravity. The canals would serve the full length of the Ghor, on both sides, to the vacinities of Wadis Kufrinji and Qilt. In conjunction with this, the water surface level of Lake Tiberias would be raised two meters by building a dam on the lake.

6. Control Works and Canals for Flow of Wadis. All facilities required to conduct the perennial flows of the wadis would be constructed in order to control and utilize these waters.

Regarding the flood flows of these wadis, the plan envisaged the recovery of 74 million cubic meters of these flows by constructing such facilities as proved "to be economically feasible by actual field study."

7. Well Supplies. The development of well supplies in the Ghor and Yanveel Valley would be either as a main source or as supplementary to stream flow utilization. However, the

water obtained from this source should be comparable to those from other sources.

The overall plan would be executed in 4 stages<sup>61</sup> over 10 to 15 years.<sup>62</sup> It would cost \$121 million if the height of the Maqarin Dam was 58 meters. An additional \$14 million, and a fifth stage, would be required should the dam be raised to a height of 95 meters. Thus, total cost of the plan would stand at \$135 million.<sup>63</sup>

Starting late 1953, Johnston had visited the Middle East four times, over a period of almost two years. During his first trip, Johnston was informed that any unified development scheme involving Arab participation and consent should be carried forward under neutral or international authority. During this trip, he asked the parties concerned to study his plan and to make suggestions for modifications. He assured the parties concerned that "the United States will give such suggestions utmost considerations as long as they are in line with the principle of a comprehensive, unified

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<sup>61</sup>Chas T. Main, op. cit., p. 12.

<sup>62</sup>Ibid., p. 6.

<sup>63</sup>Burhan Dajani, op. cit., p. 83.

approach to the valley's development... counterproposals based on totally new concepts and calculations to accomplish political ends could not be compatible with this principle."<sup>64</sup>

Before Johnston's second trip to the Middle East in mid 1954, the Arabs and Israel published alternate plans (discussed later in this chapter). On the basis of these plans and the ensuing negotiations, Johnston returned to the Middle East in 1955 with a revised plan. According to this revised plan, water allocations were as follows:<sup>65</sup>

Lebanon.....	35	Million	Cubic	Meters
Syria.....	132	"	"	"
Jordan.....	375	"	"	"
Israel.....	<u>350</u>	"	"	"
Total	<u>892</u>	"	"	"

Thus, the three Arab states would receive some 60 percent, whereas Israel alone would receive almost 40 percent of the total. Israel continued to object with regard to this

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<sup>64</sup>Eric Johnston, Mission to the Middle East (New York: American Friends of the Middle East, 1954), p. 2.

<sup>65</sup>The Arab Committee, op. cit., p. 105.

system of water allocations. It insisted on demanding 550 million cubic meters of water, of which 400 million cubic meters would go to the Negev, and the remaining 150 million cubic meters would be used in the River Jordan watershed. This issue remained a serious point of dispute.<sup>66</sup>

Another point of disagreement was the question of a suitable storage site of the Yarmuk water. To Israel's satisfaction and approval, the original version of "Johnston Plan" recommended the use of Lake Tiberias as a natural storage reservoir of the Yarmuk Water.

The Arabs preferred, on technical, economic, political and religious grounds, to store Yarmuk waters in the Maqarin dam. Naturally, Israel objected to this and fully backed Johnston's suggestion. Israel insisted on channelling Yarmuk waters to Tiberias. This much debated issue was finally resolved. As a result of leakage discovered in Sahl el-Battauf reservoir, Israel needed Lake Tiberias for storage of the Upper Jordan waters. Hence, it was agreed that the bulk of the Yarmuk waters would be stored at Maqarin.<sup>67</sup>

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<sup>66</sup>Omar Ghobashy, The Development of the Jordan River (New York: Arab Information Center, 1961), pp. 27-28.

<sup>67</sup>Ibid., p. 28.



The third issue of disagreement was the Israeli objection to any form of international supervision. Israel regarded a permanent United Nations supervision of the water resources as an unwarranted encroachment on its sovereignty. Johnston eventually failed to convince Israel to accept international supervision. This obstinate stand of the Israelis was the real cause of the failure of Johnston mission.<sup>68</sup>

Several reasons may have contributed to the Israeli rejection of "Johnston Plan." The plan provided for Jordan waters' utilization within Jordan watershed. This would have made impossible the Israeli plans, based on the "Lowdermilk-Hays Plan", to irrigate the coastal plain and the Negev with Jordan waters. Thus, the real reason for Israel's rejection of "Johnston Plan" was made evident when Israel plan of unilateral diversion was revealed. By unilateral action, Israel thought that it could withdraw an amount of Jordan waters commensurate with its objectives and targets.

As for the Arabs, "Johnston Plan" was viewed as having farreaching political implications, which were inseparable from

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<sup>68</sup>Omar Ghobashy, op. cit., p. 28.

its economic and development aspects. The scheme would facilitate a permanent resettlement of the Arab refugees in Arab states. "The execution of the plan will help solving the present problems between the Arabs and the Jews and realizing the objectives of (refugee) settlement."<sup>69</sup> Moreover, the plan necessitated cooperation between the Arabs and Israel. "The execution of Johnston Plan is a remedy to the present problems and a solution to the Arab-Israeli conflict in Palestine."<sup>70</sup> Hence, this plan was conceived as a sabotage against the Arab boycott against Israel. Furthermore, the Arabs rightly thought that the execution of the plan would increase Israel's absorptive capacity which would eventually lead to Israeli expansion by occupying more Arab lands.<sup>71</sup>

The Arabs had sufficient reason to doubt whether the whole plan would have originally been advanced if there were

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<sup>69</sup>A speech delivered by M. La Buisse, Commissioner General of UNRWA, in November 1955 and quoted in The Arab Committee, op. cit., p. 62.

<sup>70</sup>A statement given in a press conference by Dag Hammarskjold, former Secretary General of the United Nations, in October 1955 and quoted in The Arab Committee, Ibid., p. 62.

<sup>71</sup>Issa Nakhleh, The Diversion of Waters from the International Water System of the Jordan Valley by Zionist Authorities in Occupied Palestine is a Violation of International Law and Constitutes an Aggression Against the Arab States (New York: The Arab Higher Committee For Palestine, 1964), p. 29.

no Israel. Those who worked out, urged and offered to finance a large share of the plan, should have some reasons for dismissing the idea of storing the Yarmuk waters in Maqarin, though the difference in cost is minimal.

"It may be noted that the TVA 'office study' recommendations differed very materially from the conclusions of the very detailed field engineering survey of the Baker-Harza firm.... The Baker-Harza Plan concluded that a Maqarin dam El 91m would be economically justified for irrigation purposes, that provision should be made to raise this dam to El 168m for irrigation and power purposes, and that an El 168m dam would cost \$42,160,000 or substantially less than the TVA estimate of \$51,000,000 for a 160 meter dam. The Baker-Harza conclusions regarding the Maqarin dam were substantially along the same lines as the Bungar Plan."<sup>72</sup>

On the other hand, the Technical Committee on Water, established by the Arab League, rejected the idea of storing the Yarmuk waters in Lake Tiberias for economic, technical, political and religious reasons.<sup>73</sup>

Since the Arab states of Jordan, Syria and Lebanon are riparians with regard to the River Jordan, it is unreasonable to expect them to accept a plan that, under the

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<sup>72</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 87.

<sup>73</sup>See pp. 92-93 of this chapter.

guise of "Unified Regional Development", would deprive them of their share in this river. However, the Arabs facilitated Johnston's mission in many ways particularly when they conceded to the final allocations of water. Israel was allotted 44 percent although only 23 percent of the waters of Jordan have their origin in Israel.<sup>74</sup> In spite of this concession, Israel rejected "Johnston Plan" and continued to work on its own plans. Thus, Johnston negotiations were cut off in 1955 without reaching an agreement.

#### Israeli Plans.

Israel's answer in 1954 to "Johnston Plan" was the "Plan for Development of the Water Resources of the Jordan and Litani River Basins." This counterproposal is referred to as the "Cotton Plan", being named for the American engineer John S. Cotton who was then a consultant to Tel-Aviv government.<sup>75</sup>

This Israeli scheme was described as comprehensive. "The plan is not limited to the resources of the hydrographic

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<sup>74</sup>The Arab Cultural Club, The Arabic Culture (Beirut: The Arab Cultural Club, May 1965), Year 8, Vol. V, p. 35.

<sup>75</sup>Edward Rizk, op. cit., p. 31.

basin since hydrographic boundaries have no real engineering meaning - but includes all water resources which can be beneficially integrated into a regional plan."<sup>76</sup> The extra water resources which the foregoing statement contemplates its integration in a regional plan is the Litani which is a purely Lebanese national river. This encroachment on others' property is justified as follows: "...diversion of surplus waters from the Litani would in no way handicap irrigation development in Lebanon, since the major portion of the Litani flow would, unless diverted southward, continue to be wasted into the Mediterranean."<sup>77</sup> Thus, out of the 700 million cubic meters of the Litani annual discharge, the "Cotton Plan" suggested channelling 400 million cubic meters, or 59 percent, to Upper Jordan for Israeli use.<sup>78</sup>

The inclusion of the Litani River waters in a regional plan was actually a unique feature of the Israeli "Cotton Plan."

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<sup>76</sup>A statement issued by Israeli Office of Information, New York in June 1954 and quoted by Edward Rizk, op.cit., p. 31.

<sup>77</sup>Ibid., p. 33. In fact, this is utterly untrue. Lebanon has schemes for the utilization of the Litani waters for irrigating southern Lebanon. Portions of these schemes, such as the Karoon Dam, have been actually executed.

<sup>78</sup>Burhan Dajani, op. cit., p. 93.

The other differentiating features of this plan included the following works:<sup>79</sup> a 93-kilometer long canal to divert the Litani and Jordan headwaters to a reservoir at Sahl el-Battauf. Another 38-kilometer long canal would divert Jordan waters to the same reservoir. From this site, the plan proposed to channel water, by canal and pipe, southwards to the Negev, picking up the flow of the coastal streams along the way.

This plan envisaged the utilization of 2245 million cubic meters of which 1290 million cubic meters or 42 percent was allocated to Israel.<sup>80</sup> Manifestly, this quantity is more than River Jordan total discharge above the Dead Sea of 1250 million meters. The area irrigated would be 1790 thousand dunums.<sup>81</sup> It would generate 266500 kilowatt hours and would cost \$461 million.<sup>82</sup>

Israel plotted this "Cotton Plan", in 1954, as a counterproposal to "Johnston Plan" simply to intrigue the ambassador's mission. Johnston, on the one hand, was unable to agree to Israel's demands. Israel, on the other hand,

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<sup>79</sup>The Arab Committee, op. cit., pp. 78-83.

<sup>80</sup>Edward Rizk, op. cit., p. 32.

<sup>81</sup>Ibid.

<sup>82</sup>The Arab Committee, Ibid., pp. 77-78.

continued to execute its previously designed the "Seven Year Plan."

The Seven Year Plan.

This Israeli plan was formulated in 1953 by the Ministry of Finance.<sup>83</sup> It aimed at more than doubling of Israel's water supply to increase the irrigated land three-folds. The objective of the plan "was to increase ... agricultural production which then supplied only one-half of Israel's total food and feed requirements to a point by 1959-1960 it could furnish three-fourths of total requirements for an estimated population of two million persons."<sup>84</sup> This was meant to reduce the Israeli balance of trade deficit.<sup>85</sup>

This plan contemplated the use of 1730 million cubic meters of water of which 1300 million cubic meters would be utilized to irrigate 1,854,000 dunums and the balance would be channelled for domestic and industrial uses. The extra quantity of water needed for the final implementation of

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<sup>83</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 95.

<sup>84</sup>Ibid.

<sup>85</sup>Burhan Dajani, op. cit., p. 90.

this plan, totalling 920 million cubic meters, would be captured from various sources: local, regional and River Jordan.<sup>86</sup>

The key feature of this plan, as well as all other Israeli plans, is the diversion of the River Jordan water at Banat Yaqub bridge to the Negev. However, Israel was rightly prevented from using this point as its takeoff site. This was due to the fact that this site lies within the demilitarized zone between Syria and Israel. In 1953, Syria declared that, under the terms of the Armistice, the area should remain under the authority of the United Nations Israel-Syrian Mixed Armistice Commission. Syria had shown that Israel had no right to alter any feature that might affect existing property rights. Surprisingly enough, Israel was enjoined by the Security Council to stop diversion.<sup>87</sup>

In light of this, and due to the fact that the Syrians were strategically controlling that site, Israel found itself obliged to modify its plan. Hence, the takeoff site was moved to the northwest side of Lake Tiberias.<sup>88</sup>

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<sup>86</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 96.

<sup>87</sup>The Arab Committee, op. cit., pp. 84-87.

<sup>88</sup>It is expected that Israel would fall back on its original plan for diverting the Jordan River waters at Banat Yaqub bridge after its occupation of the Syrian Plateau during the Battle of June 5, 1967.



From this point at the Lake, the waters would be pumped westward to Sahl el Battauf reservoir. "From Sahl Battauf, the Main Conduit, a cement pipe of 108 inch diameter, would lead southward for 142 kilometers to Fluja and thence through 66 inch pipelines to the Negev. The Main Conduit and its reservoirs would be linked with the Kishon project, the Yarkon project and other local projects to make a national system storing water in surplus areas for use in deficit areas."<sup>89</sup>

It is important to note that Professor H.H. Hayman of Tekhnion in Haifa, pointed out that technically the entire plan for diverting water from the north to the southern Negev is wasteful. Water losses from evaporation in the southern Negev are three to four time those in the north. Professor Hayman implied that the idea of moving water to southern Negev for agricultural purposes is based on political decisions that ignore technical realities.<sup>90</sup>

Other salient features of the Seven Year Plan include drainage and reclamation of Huleh marches, irrigation of

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<sup>89</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 97.

<sup>90</sup>A speech delivered by Engineer Adnan Abdel Raheem in Amman, on February 18, 1967.

Beisan Valley and irrigation of Galilee Plateau.<sup>91</sup> The overall cost of the irrigation schemes in the Seven Year Plan was estimated at \$287 million.<sup>92</sup>

This "Seven Year Plan" was substituted for in 1956 by a larger scheme named the "Ten Year Plan." The latter, which is an expansion of the former, also follows the Lowdermilk-Hays' basic proposals.<sup>93</sup> It contemplated the doubling of the water supply by 1966 to support some three million people. It provided for increasing water supply to 1800 million cubic meters of which 1500 million cubic meters would be used to irrigate three million dunums.<sup>94</sup>

Like its 1953 predecessor, this Ten Year Plan encompasses the Jordan-Negev diversion, and the completion of Huleh, Beisan and Galilee projects. However, certain modifications had to be introduced. Due to leakage discovered in the Sahl el-Battauf reservoir, this plan provided for more storage at Lake Tiberias for ultimate Israeli use. It also envisaged diverting 500 million cubic meters annually

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<sup>91</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 97.

<sup>92</sup>Ibid., pp. 97-98.

<sup>93</sup>Edward Rizk, op. cit., p. 39.

<sup>94</sup>UNRWA Economic Bulletin No. 14, Ibid., pp. 95-96.

from River Jordan at Banat Yaqub bridge as contrasted with the 340 million cubic meters in the Seven Year Plan. It also included the diversion of 30 million cubic meters of saline water, from the surroundings of Lake Tiberias, downstream the River Jordan.<sup>95</sup>

It is evident that Israel intentions involve the diversion of all of the River Jordan waters and an additional 100 million cubic meters of the Yarmuk River water for its own use. However, as an UNRWA report reminds:

"Other countries with riparian interests in the Jordan waters are Lebanon, Syria and Jordan. The headwaters of the Jordan are the Hasbani River rising in Lebanon, the Banias and Dan Rivers rising in Syria and the Yarmuk River which rises and flows entirely through Arab countries (Syria and Jordan) except the last 10 Km of the north bank bordering Israel. The east bank of the Jordan River below Tiberias is entirely Jordanian; about one-third of the west bank is Israeli and two thirds Jordanian."<sup>96</sup>

Thus, Israeli plans to divert River Jordan waters are basically illegal and cut across the Arab plans which were designed to make the Jordan Valley more fertile.

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<sup>95</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 99.

<sup>96</sup>Ibid., p. 100.

The Arab Plan.

In response to Johnston proposals, the Arab League, in turn, moved to set up a Technical Committee on Water. This committee formulated in March 1954 the "Arab Plan for Development of the Water Resources in the Jordan Valley." This was the first all-Arab regional water plan. Although it was revised few months later, this plan remained the basic document from which the Arab governments continued discussions with Eric Johnston.

The major premise of the Arab Plan, which distinguished it from the other regional plans, was that it considered as "practically impossible to propose a plan for the development of the water resources in the valley of the Jordan River and its tributaries on the basis of disregarding the political boundaries between countries falling in the valleys of these rivers."<sup>97</sup> Then the syllogism elaborating this major premise goes as follows: "any regional plan for the utilization of the waters of the Jordan watershed, must take into consideration the existing boundaries between the countries. Thus providing irrigation to all arable lands

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<sup>97</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 91.

actually around the sources and within the basins of these rivers inside the boundaries of each country, and enabling the latter to benefit from available hydroelectric power."<sup>98</sup>

On the basis of this logic, the Arab Plan contained four derivative schemes as follows:<sup>99</sup>

- I. Utilization of the Yarmuk River water for the purpose of irrigation and production of hydroelectric power.
- II. Utilization of waters of the River Jordan and its tributaries, north of Lake Tiberias, for the purpose of irrigation and production of hydroelectric power.
- III. Utilization of waters of the River Jordan and its tributaries, south of Lake Tiberias, for the purpose of irrigation.
- IV. Utilization of waters of wadis and wells.

The Arab Plan envisaged the utilization of 1429 million cubic meters of waters from the Jordan watershed,<sup>100</sup> of which 1142 million cubic meters were allocated to the Arab states to irrigate 644 thousand dunums and 287 million cubic meters to Israel to irrigate 234 thousand dunums.<sup>101</sup>

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<sup>98</sup>Burhan Dajani, op. cit., p. 85.

<sup>99</sup>The Arab Committee, op. cit., pp. 92-100.

<sup>100</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 91.

<sup>101</sup>Burhan Dajani, Ibid., pp. 88-89. The Arab Plan did not specify the cost and duration required for its completion.

Technically, the Arab Plan was carefully formulated. Its basic features were as follows:

- I. Utilization of the Yarmuk River water for the purpose of irrigation and production of hydroelectric power:

This plan provided for a high dam to be built on the Upper Yarmuk, at Magarin or Wadi Khalid, to store 400 million cubic meters. Furthermore, hydroelectric power would be generated from the power canal extending from the storage site to Adasieyh. A diversion dam at Adasieyh would be required to divert 270 million cubic meters southward into the East Ghor Canal; and 60 million cubic meters for storage in Lake Tiberias.<sup>102</sup> Thus, the Arab Plan agreed to the use of Lake Tiberias as a storage site for surplus waters but not as the main storage facility mainly for the following reasons:

- (i) "This Lake and its shores fall in Israel. Accordingly its use as a main reservoir for the Yarmuk River renders the stored water, which is intended for the benefit of Trans-Jordan, at the mercy of Israel;
- (ii) The salinity of the Yarmuk water is 88 parts per million as compared with

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<sup>102</sup>UNRWA Economic Bulletin No. 14, op. cit., pp. 92-93.

Tiberias water of 300 parts per million. Storage of Yarmuk water in Tiberias would result in higher salinity for the waters withdrawn from Tiberias for Jordanian use than if Jordan used Yarmuk waters directly;

- (iii) Evaporation of Lake Tiberias, which is broad and shallow, is greater than at Magarin which is narrow and deep. The TVA (Johnston) Plan estimated present evaporation at Tiberias at 300 million cubic meters... The Arabs plan estimated, after a field reconnaissance that storage in the proposed Magarin reservoir would not exceed 15 million cubic meters annually.
- (iv) TVA storage in Tiberias will cause the water level in the Lake to be raised about 2 meters, which will certainly affect the Holy features scattered all over the shores of this Lake."<sup>103</sup>

A further reason advanced along these lines runs as follows: An examination of the Yarmuk discharge, over 20 years, had shown that, should the waters of this river be stored in Lake Tiberias, then the excess water that could not be stored, on the basis of total storage capacity of 830 million cubic meters, would be lost. On the average, 150 million cubic meters would be thus lost three times over 20 years.<sup>104</sup>

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<sup>103</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 93.

<sup>104</sup>Burhan Dajani, op. cit., p. 86.

To irrigate the potentially fertile lands in the Ghor, this plan provided for the construction of an East Ghor canal. This canal would be fed either from Adasieyh diversion dam or from Lake Tiberias. It would extend along the eastern rim of the Jordan Valley almost to the Dead Sea. This canal would feed, through a siphon across the River Jordan, a West Ghor canal. The latter would extend from a point shortly below the Jordan-Israeli boarder to Jericho.<sup>105</sup>

Syria would receive 80 million cubic meters from the Maqarin dam to irrigate 68 thousand dunums in Mzereib and Tel Shihab region. Another 10 million cubic meters would be utilized to irrigate the Syrian side of the Yarmuk Valley.<sup>106</sup>

II. Utilization of waters of the River Jordan and its tributaries, north of Lake Tiberias, for the purpose of irrigation and production of hydroelectric power:

The Arab Plan provided for the construction of a dam on the Hasbani in Lebanon and a power plant downstream at el Ghajar village. The capacity of the dam was supposed to be

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<sup>105</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 93.

<sup>106</sup>The Arab Committee, op. cit., p. 95.



35 million cubic meters;<sup>107</sup> and that of the power plant was 120 thousand kilowatt hours.<sup>108</sup>

On Baniyas, an irrigation canal would be constructed. It would furnish 20 million cubic meters to Syria, then extend westward, cross the River Jordan and deliver 96 million cubic meters of water to Israel.<sup>109</sup>

Syria would draw on the River Jordan to irrigate the Botaiha region. The quantity of water needed for this purpose was estimated at 22 million cubic meters.<sup>110</sup>

III. Utilization of waters of the River Jordan and its tributaries, south of Lake Tiberias for the purpose of irrigation:

The plan provided for constructing the Beisan canal to irrigate the West Ghor in Israel. It was supposed to draw 41 million cubic meters from Lake Tiberias to irrigate 78 thousand dunums in the West Ghor. In addition, 45 million cubic meters would be drawn to irrigate the Yarmuk Triangle.<sup>111</sup>

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<sup>107</sup>The Arab Committee, op. cit., p. 96.

<sup>108</sup>UNRWA Economic Bulletin, op. cit., p. 96.

<sup>109</sup>Ibid.

<sup>110</sup>Ibid.

<sup>111</sup>Ibid.

IV. Utilization of waters of Wadis and Wells:

The Arab Plan further provided for the utilization of Wells, perennial supply and flood flows of the Wadis. With this respect, the plan estimated the quantity of water actually utilized at 268 million cubic meters. Wells were estimated to furnish additional 40 million cubic meters; and flood flows of the Wadis approximately 74 million cubic meters.<sup>112</sup>

Thus, the Arab Plan recognized the different political entities on the River Jordan watershed. The final allocation of waters to the four riparians, as well as the areas irrigated in the respective states are presented in Table 21.

Upon the Israeli rejection of this plan and the ultimate failure of Johnston's mission, the Arab League Technical Committee introduced certain modifications on the Arab Plan. The new scheme did away with the mutual development of the River Jordan with Israel. The revised plan was promulgated on October 10, 1955 and it called for<sup>113</sup>

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<sup>112</sup>The Arab Committee, op. cit., pp. 100-101.

<sup>113</sup>UNRWA Economic Bulletin No. 14, op.cit.,p. 95.

TABLE 21

WATER ALLOCATION AND AREA IRRIGATED UNDER  
THE ARAB PLAN

Unit	Arab States			Total for Arab States		Israel	
	Jordan	Syria	Lebanon	Quantity	Percentage	Quantity	Percentage
Water Area Irrigated	Million Cubic Meters	975	132	35	1142	287	20.1
	Thousand Dunums	490	119	35	644	234	26.7

Source:

Burhan Dajani, Lectures on Economic Development of Jordan (Cairo: Institute of High Arabic Studies, 1957), p. 89.  
(a) Compiled and computed by the writer.

"the construction of a canal from the Hasbani River in Lebanon to the Baniyas River in Syria (entirely in Lebanese and Syrian territory without touching Israel). This canal, after serving local Lebanese and Syrian needs, would convey Hasbani and Baniyas water southward across the Hauran (entirely in Syria) to the Yarmuk River at Wadi Khalid, a few Km. downstream from Maqarin. Large dams would be constructed at Maqarin, to store upper Yarmuk waters, and at Wadi Khalid to store excess Yarmuk waters plus any waters remaining from the Hasbani and Baniyas Rivers after serving irrigation needs along the way. Waters from the Maqarin and Wadi Khalid reservoirs would flow down the Yarmuk River to a diversion dam at Mukheibe (a few Km. above Adasiya) where both banks are Arab. From Mukheibe the water would be conveyed to the east Ghor Canal for irrigation southward to Jericho as proposed in the Original Arabs Plan of March 1954 as revised. The cost of such a project would be very substantial and steps have not yet been taken to obtain the necessary capital to carry it out."

#### THE YARMUK-JORDAN VALLEY PLAN

The origin of this plan is an engineering study carried out, at the request of the Jordanian government, by Michael Baker, Jr., Inc., of Rochester, Pennsylvania, and Harza Engineering Co., of Chicago, Illinois, for the purpose of providing a blueprint for the execution of Bungar Plan. This study comprised a complete soil and

hydrology survey of Jordan. It costed \$ 2,481,031 and was submitted to the Jordanian government on July 15, 1955.<sup>114</sup>

This plan contemplated the utilization of the Yarmuk and River Jordan waters for irrigation and hydro-electric power development. Its basic premise was that "increased agricultural production is the key to the development in the Valley. . . Therefore, irrigation needs come first and electric power second."<sup>115</sup> It provided for major storage on the Yarmuk at Maqarin, principally for irrigation but also for power development purposes; minor storage in Lake Tiberias; a diversion dam at Adasieyh; East and West Ghor irrigation canals and six power plants on both the Yarmuk and the East Ghor canal. These basic features can briefly be explained as follows:

1. Maqarin Dam:<sup>116</sup> the plan recommended the construction of a 68 meter high dam at Maqarin. It would store

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<sup>114</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 100.

<sup>115</sup>Ibid., p. 101.

<sup>116</sup>Another dam site at Wadi Khalid was investigated. It was found equally suitable for irrigation but unworkable for power development. See Baker & Harza, Yarmouk Jordan Valley Project, Master Plan Report (Pennsylvania: 1955), Vol. I, p. 57.

47 million cubic meters of Yarmuk waters which would be utilized solely for irrigation. The plan provided for raising its height to 145 meters with a storage capacity of 460 million cubic meters. This high dam would be utilized for irrigation purposes and would allow the maximum generation possible of hydroelectric power.<sup>117</sup>

2. Adasieyh Diversion Dam: this diversion dam was supposed to conduct the Yarmuk waters partly northward to Lake Tiberias and partly southward into a channel leading to the East Ghor Canal.

3. The East Ghor Canal: this 113-kilometer long canal would be fed mainly from the Adasieyh Diversion Dam and Lake Tiberias. Its capacity would vary from 20 to 36 cubic meters per second. It would meander through the East Ghor almost to the Dead Sea. Its main function would be for irrigating the East Ghor, though it would be utilized for generating hydroelectric power.<sup>118</sup>

4. West Ghor Canal: this 47-kilometer long canal would be fed, through a siphon across the River Jordan,

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<sup>117</sup>Burhan Dajani, op. cit., p. 93.

<sup>118</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 103.

from the East Ghor Canal. The capacity of the siphon and that of the canal would be approximately 15 cubic meters per second. It would cross the West Ghor from a point below the northern truce line of the West Bank almost to the Dead Sea. It would provide water for irrigating the West Ghor.<sup>119</sup>

5. Power Plants: this plan envisaged the construction of six power plants; four large ones on the Yarmuk between the Maqarin Dam and the Adasieyh Diversion Dam; and two small ones on the East Ghor Canal. These plants would supply 167 million kilowatt hours at a total cost of \$ 53,119 thousand.<sup>120</sup>

This plan provided 760 million cubic meters of Yarmuk and Jordan waters for Jordan to irrigate 513,751 dunums within its territory in River Jordan watershed. It is interesting to note that this study discovered more irrigable lands in Jordanian areas of the valley than had previously been estimated. All essential irrigation features, except one-fifth of the land to be irrigated, would

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<sup>119</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 103.

<sup>120</sup>Ibid., p. 101 and p. 103.

depend upon gravity flow.<sup>121</sup> Total cost of the plan was estimated at \$ 169,993,000 of which \$ 116,874,000 would be for irrigation and \$ 53,119,000 for power development. The major features of this plan would be executed in 12 years.<sup>122</sup>

The plan expected to raise net farm income in the valley from a low level of \$ 725,000 in 1953 to a high level of \$ 14,237,000 per year. Thus, average net farm income would have been \$ 463 per farm per year for 30,700 farm units in the valley upon the completion of the plan. These figures would be more meaningful when contrasted with the pre-plan figures of 1953; then net farm income averaged \$ 190 for the 3725 farms in the valley.<sup>123</sup>

As for its effect on employment, the plan was expected to support 224,000 persons of whom 160,000 persons-farm operators and their families- would be employed in primary agricultural occupations, and the

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<sup>121</sup>UNRWA Economic Bulletin No. 14, op. cit. p. 101 and 105.

<sup>122</sup>Ibid., p. 101.

<sup>123</sup>Ibid., pp. 107 - 108.



remaining 64,000 persons would be occupied in ancillary employment. This was based on the assumption that the ratio of direct agricultural to ancillary employment was 2.5 to 1. Thus, net increase in employment would be 143,000 persons or 175 percent.<sup>124</sup>

Two cropping patterns were offered as alternatives. Cropping pattern "A", which emphasized cereals, was in accordance with the economic and social objectives of small farming. Cropping pattern "B", which emphasized sugar beets, peanuts and sesame, was meant to alleviate the balance of trade deficit.<sup>125</sup>

The "Baker-Harza Plan" is unique in its comprehensiveness. It included, among other things, detailed studies of soils, cropping patterns, estimates of agricultural income potentials, population capacities and economic feasibility. It provided scientific estimate of the hydrological and agricultural capacities of Jordan and demonstrated that

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<sup>124</sup>UNRWA Economic Bulletin No. 14, op. cit., p. 109.

<sup>125</sup>Ibid. An analysis of this point is found in Chapter II, page 43 of this work.

there were more irrigable land in the Jordanian sector of the valley than was previously realized. This is so because it resulted from a detailed field study and was not just a desk plan.

In retrospect, this plan was in line with Bungar's proposals. It confirmed the technical feasibility of a Yarmuk River dam. However, it differed from the Arab Plan in the sense that it provided for storing the Yarmuk flood waters in Lake Tiberias. The revised Arab Plan provided for storing Yarmuk flood waters in Wadi Khalid.<sup>126</sup>

From the economy standpoint, the Baker Harza Plan is sound. "It is felt, therefore, that the benefit-cost ratio of 2.58 to 1 is substantially correct presentation of the economic feasibility of the project."<sup>127</sup>

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<sup>126</sup>Burhan Dajani, op. cit., p. 94. In a speech, late Muhammad Ahmad Selim pointed out that he met in Iran in 1959 Mr. Davis, Director of Baker-Harza, and discussed with him the issue of "one or two storage dams on the Yarmuk". Mr. Davis confessed that he was obliged to advise for one dam according to his government's instructions as a result of Israeli pressure. See Abdel-Hafeez Muhammad, op. cit., p. 135.

<sup>127</sup>Baker-Harza, op. cit., Vol. VIII, p. 77.

As it has been demonstrated, Johnston's mission was doomed to failure as a result of the Israeli stubbornness. Therefore, the Jordanian government considered carefully and seriously the execution of this plan. However, it started with a midget project pertaining to the irrigation features, namely the East Ghor Canal Project.

## CHAPTER IV

### THE EAST GHOR CANAL PROJECT

The inception of the proposal for an East Ghor Canal Project dates as far back as 1938, when M.G. Ionides first proposed the utilization of the Yarmuk River to irrigate the East Ghor.<sup>1</sup> Since then, numerous studies have been undertaken, aiming at irrigating the Jordan Valley lands. This irrigation project actually forms a common feature of virtually all the schemes that have been proposed for the utilization of the waters of the River Jordan and its tributaries. The most comprehensive and detailed of these schemes is the Baker-Harza, eight-volume "Yarmouk-Jordan Valley Project", produced in 1955. This study was based, and contained, data relating to availability of water at different points, dam sites, electricity, canals and water distribution structures, soil classification, land use and the economic feasibility of the project. In 1962, Harza

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<sup>1</sup>See Chapter III, pp. 54-60.

Engineering Company produced two further volumes on the second stage of the "Yarmouk-Jordan Valley Project".

The East Ghor Canal Project may be looked upon as a modified version of the first stage of the "Yarmouk-Jordan Valley Project". It is located on the East Bank of the River Jordan in the northern part of the Jordan Valley. The project is bounded on the north by the Yarmuk River; on the east by the Main Canal; on the west by the River Jordan; and on the south by the Zarqa River.<sup>2</sup>

#### OBJECTIVES OF THE EAST GHOR CANAL PROJECT

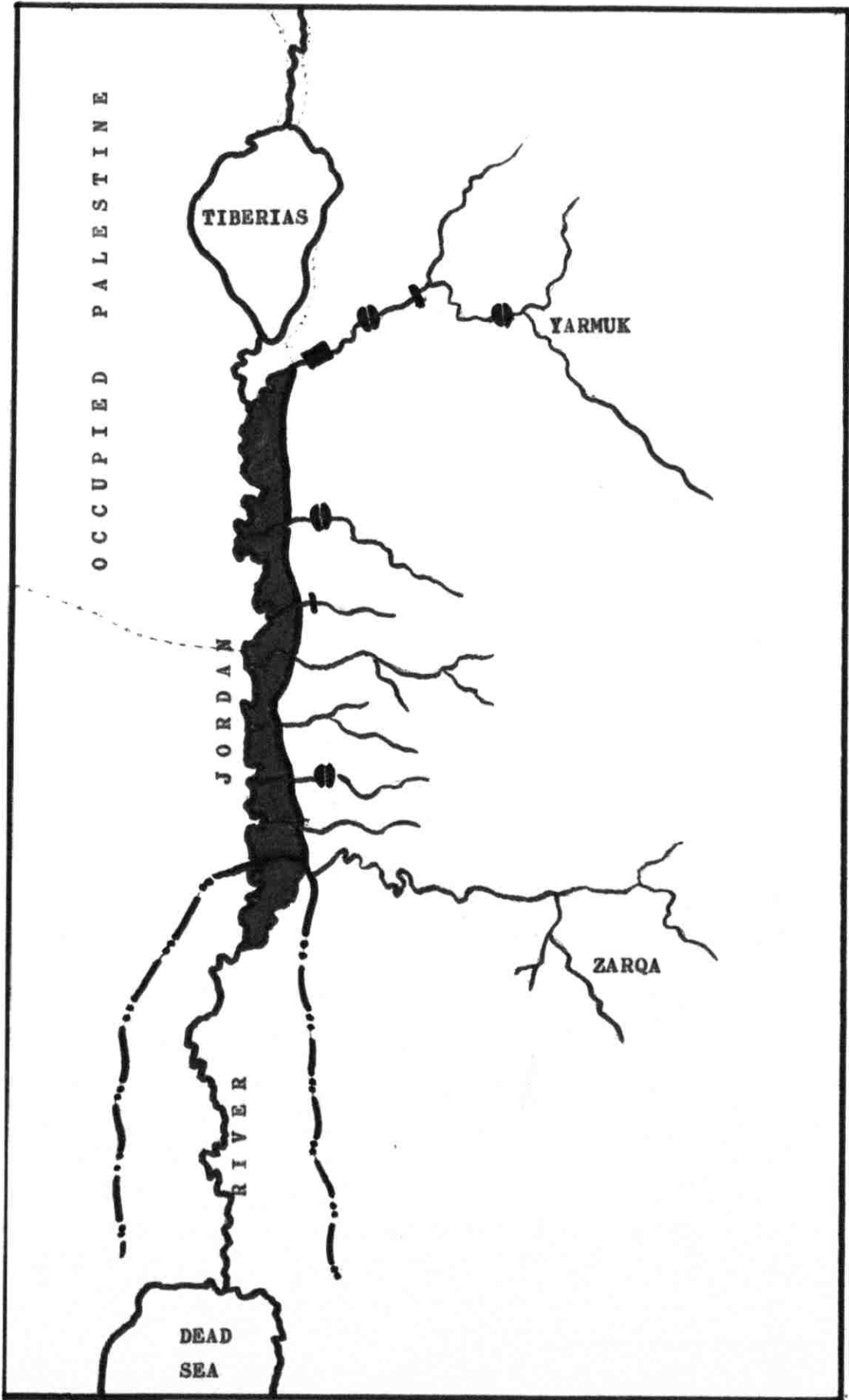
Of all the plans for development, there is no doubt that projects relating to the development of irrigation are playing the most important role in raising the production per capita and, consequently, the standard of living in Jordan. The optimum utilization of the limited water resources in the country had been accorded the highest priority in the Jordanian government plans for economic development.<sup>3</sup>

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<sup>2</sup>See the green-shaded area in Map 1, p. 108.

<sup>3</sup>See Chapter II, pp. 44-46.

EAST GHOR CANAL PROJECT



The basic objective of the East Ghor Canal Project is, obviously, the utilization of the Yarmuk waters to irrigate the East Ghor. Thus, the project aims at diverting the Yarmuk River waters by gravity flow, through an intake structure leading into a tunnel. The water is then conveyed in a canal meandering along the River Jordan and constructed at the foot of the mountains.

Several small perennial streams flow into this canal, thus adding to the water supply. These streams are the Arab, Ziglab, abu-Ziad, Jurum, Kufrinji, Rajeb and Zarqa. The total water supply feeds an irrigation and drainage system that covers 120 thousand dunums.<sup>4</sup>

The objectives of this project can be stated as follows:<sup>5</sup>

1. To provide farms in the area with water for irrigation by constructing a main canal and a distribution system of laterals.

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<sup>4</sup>East Ghor Canal Authority, East Ghor Project, Questions and Answers (Amman: Modern Printing Company, 1962), p. 4.

<sup>5</sup>Ministry of Information, Water Resources Projects (Amman: Hashemite Press, 1966), pp. 13-15.

2. To consolidate land ownership and to redistribute farm units so as to obtain a pattern of farms serviceable with the irrigation system.

3. To provide assistance to farmers for the development and modernization of the farm units of the project to assure maximum benefit from the irrigation facilities.

4. To provide irrigation water which will increase the agricultural output of the lands by proper utilization of services.

5. To provide a higher standard of living for families in the East Ghor area.

#### DESCRIPTION AND COST

Work on the East Ghor Canal Project was begun on August 7, 1958 and progressed steadily ever since.<sup>6</sup>

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<sup>6</sup> East Ghor Canal Authority, Special Pamphlet on the Progress of Works in East Ghor Irrigation Project and Wadi Ziglab Dam (Amman: East Ghor Canal Authority, 1965), p. 1.



The project was divided into three sections, comprising together the 120,000 dunums of the project. Work on the Yarmuk River diversion constructions, the tunnel and the Main Canal for the three sections had been completed and taken delivery of by the East Ghor Canal Authority in June 1963. Work on the distribution and drainage systems, also in the three sections, was completed in July 1966.<sup>7</sup>

The principal features of this irrigation project consist of 120 meters of diversion channel to divert Yarmuk River water to the tunnel inlet. Water then passes through a two-meter diameter horseshoe-shaped tunnel, about 980 meters in length, through the side of a hill, which is on the south bank of the Yarmuk River. The water then pours into the north end of the Main Canal. This canal is 69 kilometers long, "V" shaped, concrete lined and extends to a point 5 kilometers to the south of Zarqa River. Along the way, the canal receives water from the side wadis for final distribution to the farms. The

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<sup>7</sup>Natural Resources Authority, Progress Report for July - September 1966 (Amman: Natural Resources Authority, 1966), p. 1.

capacity of the canal is 20 cubic meters per second and it contains a drop of 4.30 meters<sup>8</sup> and water control structures for regulating the flow. From the canal, water feeds 398.6 kilometers of cement lined laterals constituting the distribution system which extends all over the irrigated land. Water is finally conveyed, through headgates, to the highest point in the surface of each farm unit. To avoid excess salinity of the soil, 300 kilometers of primary drainage channels were constructed. Another salient, though vital, feature of this project is a farm-to-market graveled road of 332 kilometers. This network links every farm unit in the project to the main highway.<sup>9</sup>

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<sup>8</sup>Development Board Technical Team, East Ghor Canal Scheme, East Ghor Main Canal (Amman: Development Board, 1958), East Ghor Drawing No. 13, p. 4.

Upon exclamation about the reason for this economically unjustified drop, Engineer A. Suwais, Engineering Division, Point IV, remarked that the pre-drop canal level is higher than that of Lake Tiberias. The drop makes it possible for the canal to receive water from the lake in the future. It is noteworthy that this drop made it impossible for the potentially irrigable lands to the east of the canal to receive water from the canal by gravity flow. Thus, the area of cultivable land in the Ghor is reduced.

<sup>9</sup>Information compiled by the writer from unpublished materials, documents and files of East Ghor Canal Authority.

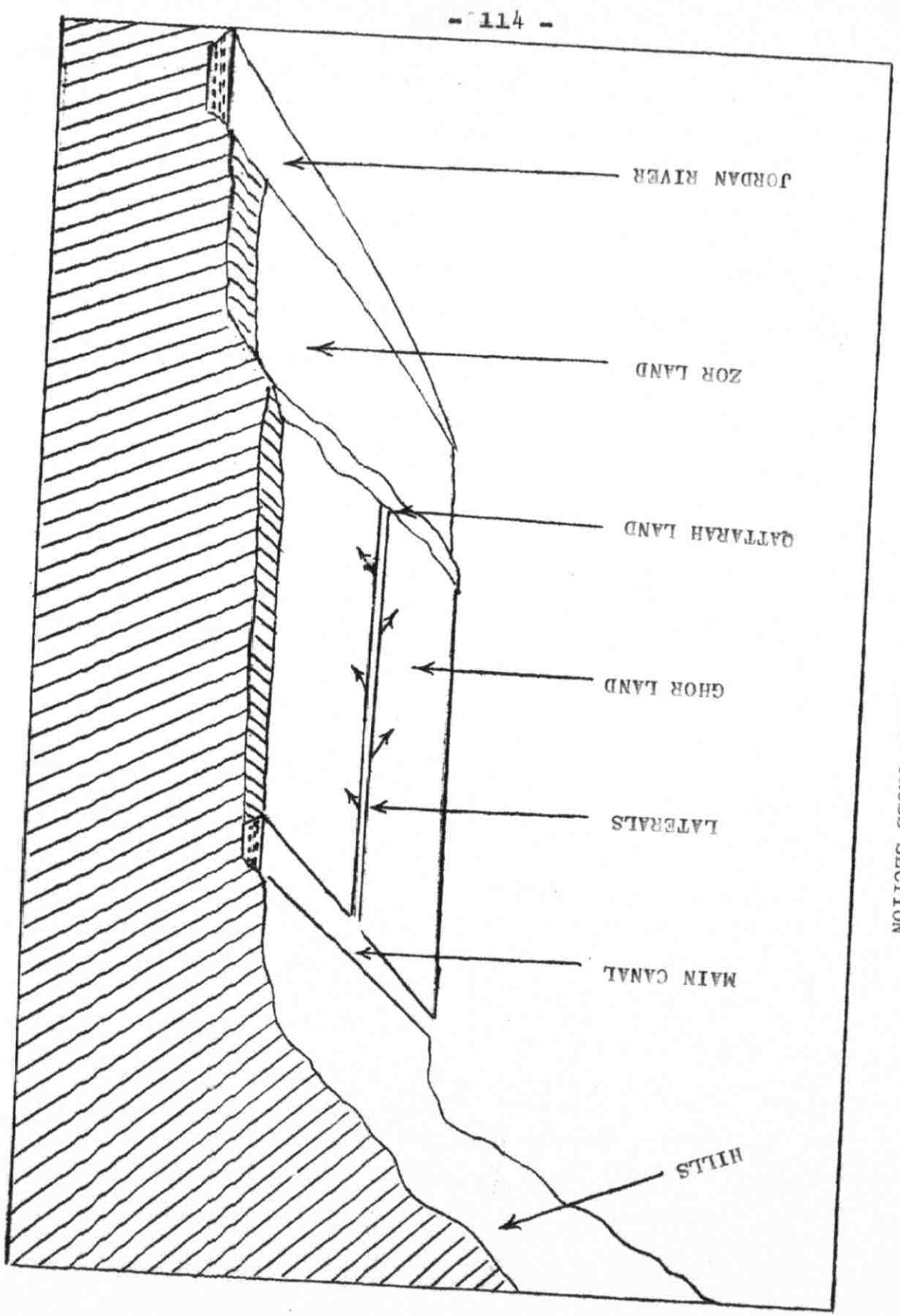
Looking at the East Ghor in cross section, it is easily noticed that the hills come down on the right. The Main Canal, in the form of a trench with sloping sides, runs along the eastern side of the first terrace area, the Ghor. The Ghor, where most of the irrigable lands are, slopes toward the River Jordan. The second terrace area is the Qattarah, virtually all of which is desert. Then comes the Zor which also slopes towards, and adjacent to, the River Jordan.<sup>10</sup>

Soil in the Ghor was originally classified, according to its fertility, by Baker and Harza, into six classes. The first three classes are irrigable. Class 4 lands are irrigable after leaching. Class 5 lands consist wholly of range lands and not to be found in the East Ghor Canal Project area. Finally, class 6 lands are unsuitable for irrigation because these lands are mainly steeply tracts covered with marles, clay and stones. The area of each class, except for classes 1 and 2 which are reported together as one total, is shown in Table 22. It is noted that the first three classes comprise approximately the 120,000 dunums of the project.

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<sup>10</sup> See Chart Number 2, p. 114.

CHART 2  
EAST GHOR CANAL PROJECT CROSS SECTION



Thus, by tapping the waters of the Yarmuk River and the side wadis draining in the area of the East Ghor Canal Project, some 120,000 dunums of potentially fertile Ghor land are benefiting from this scientifically designed irrigation project. The area of the project has been divided into 3424 distributable farm units. The average size of the farm being 35 dunums. There are in addition 245 tracts which are unsuitable for distribution because either they belong to class 6 lands or they lie entirely

TABLE 22  
LAND CLASSIFICATION IN THE EAST  
GHOR CANAL PROJECT  
(in dunums)

Section	Area	Classes 1 & 2	Class 3	Class 4	Class 5	Class 6
I	37273	31677	1723	47	None	3826
II	45287	29556	3365	10	None	12354
III	86198	46751	6220	3642	None	29585
Total	168758	107984	1308	3699	None	45765

Source:

Compiled by the writer from unpublished materials made available to the writer by Mr. Yacoub Zuraykat, Head of Survey Division, Land Department, East Ghor Canal Authority.

in the Qattarah region. This makes the total number of farms in the project area 3669 units as can be seen in Table 23. Farms were distributed to qualified farmers in accordance with a predetermined policy as specified in Articles VIII and X of the East Ghor Canal Temporary Law.<sup>11</sup>

TABLE 23  
LAND DISTRIBUTION STATUS  
AS OF MARCH 31, 1968

Section	Total Farm Units	Alloted Farm Units	Unalloted Farm Units	Units Unsuitable For Distribution
I	990	955	None	35
II	991	910	1	80
III	1688	1530	28	130
Total	<u>3669</u>	<u>3395</u>	<u>29</u>	<u>245</u>

Source:

Compiled by the writer from the Monthly Report dated April 13, 1968, prepared by the Land Department, East Ghor Canal Authority and submitted to the Vice-President, Natural Resources Authority.

<sup>11</sup>See Appendix XX.

The principal sources of water on which the East Ghor Canal Project draws are the Yarmuk River and the side wadis. No ground water is pumped from the present water wells in the area because the Water Table is already low. Seventy percent of the base flow of the Yarmuk and 89 percent of the total discharge of the side wadis will meet the total water requirements of 180 million cubic meters per year for irrigating the 120,000 dunums with 40 percent double cropping. During the year 1967, a total of 166 million cubic meters of water were utilized for irrigation. Of this total, 136 million cubic meters were diverted from the Yarmuk River and the remaining 30 million cubic meters were collected from the side wadis.<sup>12</sup>

The total cost of the project amounted to J.D. 7,913,140. This amount was provided by the Jordanian Government, the United States Government and the United Nations as shown in Table 24.

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<sup>12</sup>Interview with Mr. Fahd Natur, Head Operations and Maintenance Division, Irrigation Department, East Ghor Canal Authority. Mr. Natur remarked that the reason for diverting only 166 million cubic meters is, obviously, the Israeli Aggression of June 1967.

TABLE 24  
EAST GHOR CANAL PROJECT COST  
(in J.Ds.)

Source	Amount
Jordanian Government	2,174,367
United States	5,712,773
United Nations	26,000
	<hr/>
TOTAL	7,913,140
	<hr/> <hr/>

Source:

Finance Department, Natural Resources Authority, data compiled by the writer.

The Operations and Maintenance costs of the project varied from one year to another. During 1966, these costs amounted to J.D. 113,000, while in 1967, they rose to J.D. 129,000. The 1966 figure was relatively low because certain constructional works were going on until July of that year. The 1967 figure is higher because certain damages were caused to the Main



Canal and appurtenant structures, due to the Israeli Aggression of June 1967.<sup>13</sup>

#### ADMINISTRATIVE ASPECTS

Construction of the irrigation system is really the simplest part of the development project. The most difficult is the distribution of land, the introduction of successful and economic farming, and the effective functioning of the administrative setup which plays an important role in the efficient implementation of the project.

The pattern of land ownership which prevailed in the Ghor area was characterized by the predominance of small size holdings. More than half of the tracts were less than 50 dunums. However, very large holdings existed too. Thus, there were 21 tracts with an average size of 27,235 dunums. On the other extreme, there were 477 holdings with an average size of 5 dunums (see Table 25).

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<sup>13</sup>Data made available to the writer by the personnel of the Operations and Maintenance Division, Irrigation Department, East Ghor Canal Authority.

TABLE 25  
PATTERN OF LAND OWNERSHIP IN THE GHOR  
IN 1953

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Area in Dunums	Number of Holdings	Size in Dunums	Average Size of Holding
Less than 10	477	2532	5
10 - 20	432	6106	14
20 - 30	396	9655	24
30 - 50	684	26254	38
50 - 100	876	59957	68
100- 200	487	67252	138
200- 400	256	71304	279
400- 700	84	43449	517
700- 1000	47	39225	834
1000- 1500	34	44895	1320
1500- 2500	21	40073	1908
2500- 5000	10	34993	3499
5000 and above	21	571947	27235

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Source:

UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), compiled from Table on page 11.

This pattern of maldistribution of ownership was verified by the Department of Statistics Survey of 1961. It is noteworthy that this latter survey was carried out after the passage of the East Ghor Canal

Temporary Law in which the size of land ownership was limited. Hence, by the time of the survey many large land holdings were already broken up and distributed to members of the owners' families.

Nevertheless, a large part of the project area was owned by few people, whereas a large number of owners had title to a small part of the project area. To illustrate, 1309 farmers owned 5496 dunums, whereas 42 landlords owned an area of 37,026 dunums. In other words, 35.68 percent of land owners had title to only 3.47 percent of total area. At the other extreme, 1.15 percent of land owners owned 23.39 percent of total area (see Table 26).

This situation has been remedied. The re-organization of the land ownership pattern in the project area to fit the irrigation system was a major accomplishment. In order to distribute the irrigable lands to small land owners, and to help the farmers utilize the new irrigated lands and attain a better standard of living, the Jordanian government promulgated, early in 1958, the East Ghor Canal Project Law. This law, which provided for the creation of the East Ghor Canal Authority,

TABLE 26  
PATTERN OF LAND OWNERSHIP IN THE  
EAST GHOR CANAL PROJECT AREA IN 1960

Area in Dunums	Landowners		Area Owned (a)	
	Number	Percentage of Total	Dunums	Percentage of Total
1 - 9	1309	35.68	5496	3.47
10 - 19	708	19.30	9935	6.28
20 - 29	378	10.31	9069	5.73
30 - 75	866	23.61	39086	24.69
76 - 100	113	3.08	9869	6.23
101 - 500	252	6.87	47815	30.21
501 - 1000	32	0.87	21782	13.76
Over 1000	10	0.28	15244	9.63
TOTAL	3668	100.00	158296	100.00

Source:

Department of Statistics, The East Jordan Valley, A Social and Economic Survey (Amman: Department of Statistics, 1961), Table 62, p. 155.

(a) The total area does not include 46,811 dunums of land owned by the State.

was substituted later by the East Ghor Canal Temporary Law of 1962.

According to this law, the East Ghor Canal Authority is charged with the responsibilities for "planning, constructing, operating and maintaining the East Ghor Canal Project as well as carrying out activities relative thereto. . ." <sup>14</sup> Hence, the overall area to be served with water, and the size and shape of the farm units, have been determined on the basis of soil and land classification surveys. Where the land is best, 30 dunums have been determined to be an economically-sized farm. Where there are minor deficiencies in the slope of the land or its classification, the appropriate size has been increased to 50 dunums. The maximum size of a farm unit is set at 200 dunums. <sup>15</sup> The law guards against fragmentation of farms by permitting group ownership. Thus, when the farm owner dies, his heirs will collectively own the farm. They are not allowed to divide it among themselves. In this connection the law does not provide for the way the collectively owned farm is to be managed.

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<sup>14</sup> East Ghor Canal Temporary Law, Article III, paragraph A, p. 4.

<sup>15</sup> East Ghor Canal Temporary Law, Article VIII, paragraph A, p. 7.

To carry out its activities properly, the East Ghor Canal Authority carried out an assessment of land values and seized lands exceeding the allowable maximum limit specified by the law.<sup>16</sup> The area of the land thus expropriated is 175,331 dunums,<sup>17</sup> the value of which is appraised at J.D. 2,393,451. Compensations are being paid in annual instalments over 10 years. A total of J.D. 1,425,267 has been settled by April, 1968.<sup>18</sup>

On the other hand, farmers who owned less than the minimum received additional land to achieve a total of 30 dunums, in case of classes 1 and 2, and 50 dunums in case of class 3 lands. Thus, these land owners bought the supplementary land from the Authority, receiving in the meantime title to these lands. The total amount due

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<sup>16</sup>East Ghor Canal Temporary Law, Article VIII, Paragraph B, p. 7.

<sup>17</sup>It is noticeable that the area of irrigable land in the East Ghor Canal Project is 120,000 dunums, while the expropriated land is 175,331 dunums. Of the difference of 55,331 dunums, approximately 6,000 dunums are roads, canals and laterals. The remaining 49,331 dunums belong to classes 4 and 6 lands. Information obtained from Mr. Khalil Khayyat, Deir Alla Experiment Station.

<sup>18</sup>Land Department, East Ghor Canal Authority, the Monthly Report, dated April 13, 1968 and submitted to the Vice -President, Natural Resources Authority.

to the Authority from the recipient farmers is J.D. 2,631,467 of which J.D. 230,455 was collected up to April 1968. In this manner fragmented and large land holdings in the project area disappeared. <sup>19</sup>

Besides limiting the size of individual ownership, the law specifies the qualifications of recipient farmers. To distribute the farms in the project area, a "Farmers Selection Committee" was established. A list of priorities was determined whereby first priority was accorded to holders who themselves exploit their lands. Second priority was assigned to professional farmers residing in the project area. Third priority was given to farmers from the district inhabitants. Fourth priority was given to professional farmers from inhabitants of other districts. The fifth priority was given to holders who utilize their land by lease or share cropping within the project area. <sup>20</sup>

By the end of March 1968, 3395 farms of the total 3424 distributable farm units were allotted to

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<sup>19</sup> Ibid.

<sup>20</sup> East Ghor Canal Temporary Law, Article X, paragraph F, see Appendix XX.

farmers. The 245 tracts which are labelled "unsuitable for distribution" are registered in the name of the East Ghor Canal Authority. The Authority has already paid the original land owners the value of these tracts. However, few of these tracts are currently being cultivated by the previous land owners. This is so probably because some of the cadastral maps were inaccurate.<sup>21</sup> At any rate, this act will eventually have adverse effect on the other farms because water supply is limited.

Each farmer is charged, in measured quantities, for all the water he uses at a price of 1 Jordan Fils per cubic meter for the first 1800 cubic meters used on each dunum per year. To encourage water conservation, the price is increased to 2 Jordan Fils per cubic meter for any quantity of water over the 1800 cubic meters used on each dunum annually.<sup>22</sup>

Of unusual interest and because of its peculiar significance worth quoting in its entirety, is Article XIII.

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<sup>21</sup>A discussion with Mr. Abdul Wahhab Awwad, Principal Assistant, United States Operations Mission - Jordan.

<sup>22</sup>Fahd Natur, East Ghor Canal Project Manual (Amman: Mimeographed, 1968), p. 13.



This article, which concludes what might be called a substantive portion of the East Ghor Canal Temporary Law, states:

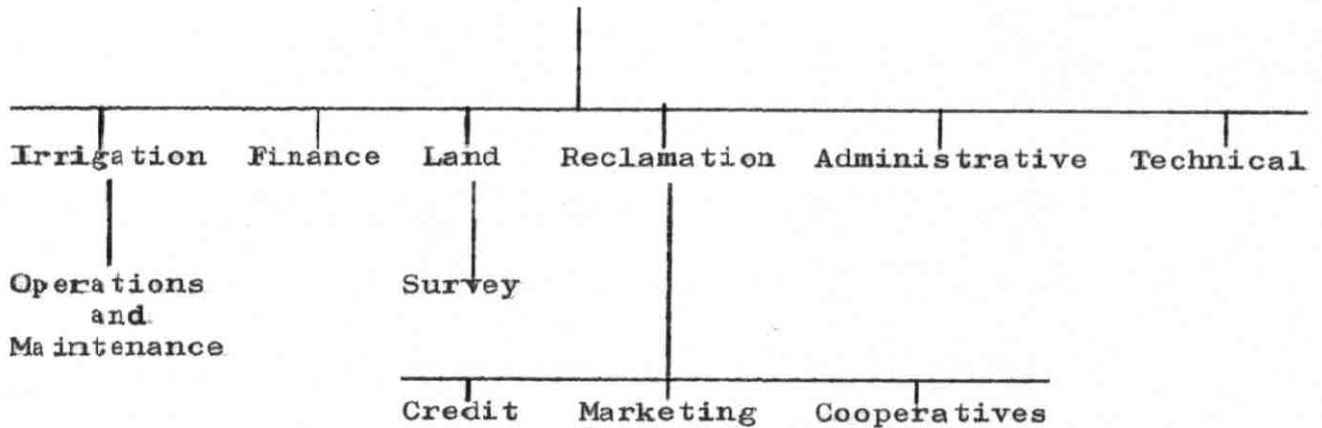
"The Authority, in cooperation with ministries and departments concerned, each within its possibilities, responsibilities, and functions, shall direct and help farmers in project area in all technical, economical, social, financial and health matters. The Authority, within its possibilities, shall carry out any direct work relative to agricultural loans, setting up cooperative societies, organizing marketing, agricultural guidance and soil conservation affairs, establishing model farms, improving practices, and other work relative to raising the level of agricultural economy and social level in project area."<sup>23</sup>

The East Ghor Canal Authority, which is linked to the Natural Resources Authority, directly administers the East Ghor Canal Project. It is functionally departmentalized with territorial divisions wherever necessary. The organizational chart of the Authority indicates that there are six departments for irrigation, finance, land, reclamation, administrative and technical (see Chart No. 3).

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<sup>23</sup>East Ghor Canal Temporary Law, Article XIII, pp. 17 - 18.

CHART 3  
ORGANIZATIONAL CHART  
EAST GHOR CANAL AUTHORITY



Within each department in the Authority, there are numerous divisions. The head of each division is centralized in the headquarters in Amman, with a senior assistant in each of the three sections of the project area.<sup>24</sup>

Other parties presently involved in the project are various ministries and authorities of the Jordanian government as follows:<sup>25</sup>

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<sup>24</sup>A discussion with Mr. Fawzi Shuraim, Land Department, East Ghor Canal Authority, on May 17, 1968.

<sup>25</sup>Ibid.

1. The Ministry of Agriculture which provides extension, veterinary and research assistance to farmers. It also provides marketing facilities through the Marketing Department.

2. The Jordanian Central Cooperative Union (J.C.C.U.) which assists in developing agricultural cooperatives and provides short-term credit to members.

3. The Agricultural Credit Corporation (A.C.C.) which provides long- and intermediate- term credit for the needs of the farmers.

4. The Regional Corporation for the Utilization of the River Jordan Tributaries. This corporation was established on May 15, 1965 as a direct outcome of the first Pan Arab Summit Conference held in Cairo in 1964.<sup>26</sup> Since then it was charged with the responsibilities of implementing, within Jordanian territory, the decisions taken during the said conference. Accordingly, it was responsible for building Khaled Ben al-Waleed Dam on the Yarmuk and extending the East Ghor Canal for 8 kilo-

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<sup>26</sup> Ministry of Information, Water Resources Projects, op. cit., p. 20.

meters. This extension is meant to irrigate the Zor lands which were adversely affected due to the Israeli diversion of the major portion of the River Jordan from Lake Tiberias.<sup>27</sup>

5. Other ministries such as the Ministry of Public Works which constructed a farm-to-market road, the Ministry of Health which provides clinical services in the project area, the Ministry of Education and various others.

The East Ghor Canal Project which was initiated in 1958 and which was almost completed in 1967, started paying back during the early and mid sixties. Its impact on agricultural production and income is assessed next.

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<sup>27</sup>A discussion with Mr. Abdel Ra'oof Daqqaq, Agricultural Engineer, The Regional Corporation for the Utilization of the River Jordan Tributaries, Amman, on June 4, 1968.

## CHAPTER V

### IMPACT OF THE EAST GHOR CANAL PROJECT

#### PRE-CANAL PRODUCTION AND INCOME

Agricultural production and income in the Jordan Valley during the pre-canal period was reported in a Jordan-Valley Agricultural Economic Survey, published by UNRWA in 1954 and in the East Jordan Valley, a Social and Economic Survey, published by the Jordanian Department of Statistics in 1961. The findings of the 1953 study also appear in Volume VIII of the Baker-Harza study of 1955.<sup>1</sup>

#### UNRWA Study

The UNRWA study of 1953 covered 3825 farms<sup>2</sup> on a total area of 260,000 dunums. Some 80,000 dunums of the land was classed as non-irrigated, while the remaining 180,000 dunums were partially or fully irrigated.<sup>3</sup> Total

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<sup>1</sup>A review of the available literature dealing with Jordan's agricultural development and especially with the East Ghor Canal revealed no other reliable sources of information on this subject.

<sup>2</sup>UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), p. 11.

<sup>3</sup>Ibid., p. 1.

agricultural production on this land during the year of the study was 60,989 tons.<sup>4</sup>

Gross agricultural income for the area was J.D. 1,219,977; of which 93 percent was attributed to crops; 6 percent to livestock; and 1 percent from other sources. Total expenses amounted to J.D. 925,962 or 76 percent of the gross income. Thus the remaining net income amounted to J.D. 294,015.<sup>5</sup> Viewing these figures on farm basis, it was found that average gross income per farm was J.D. 319, average expenses were J.D. 242, and average net income amounted to J.D. 77.<sup>6</sup>

The farms ranged in size from less than 10 dunums to more than 1000 dunums. Three percent of the farms, 86 units, were larger than 1000 dunums and covered more than 68 percent of the total farm land in the area.<sup>7</sup> Ten farms were between 2,500 to 5,000 dunums in size. At the other extreme, 23 percent of the farms, 909 in all, were 20 dunums or less and covered 0.71 percent of the land. Of

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<sup>4</sup>UNRWA, op. cit., computed by the writer from Tables 5-18, pp. 7-30.

<sup>5</sup>See Appendix XXI.

<sup>6</sup>UNRWA, Ibid., pp. 23-24.

<sup>7</sup>Ibid., pp. 33-38.

the 3825 farm units covered in the study, 51.8 percent were 50 dunums or smaller.<sup>8</sup>

Such wide variations in the size of the farm units minimize, to a considerable extent, the value of income data presented on a per farm basis. Greater emphasis, therefore, should be placed on per dunum income figures. The gross income per dunum for the 260,000 dunums in the area studied was J.D. 4.7 and expenses were J.D. 3.6, leaving a net income per dunum of J.D. 1.1.<sup>9</sup>

#### East Jordan Valley Study

This study was conducted by the Jordanian Department of Statistics and contained detailed production and income data for the crop year 1959-1960. It centered on 3,341 farm units covering 207,941 dunums of land in the valley.<sup>10</sup> This area includes all of the 117,000 dunums in the present East Ghor Canal Project. The composition of the 207,941 dunums in the study is shown in Table 27.

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<sup>8</sup>UNRWA, op. cit., pp. 33-38.

<sup>9</sup>Ibid., computed by the writer from Table 27, p. 44.

<sup>10</sup>Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), Table 63, p. 159.

TABLE 27

COMPOSITION OF THE EAST GHOR AREA

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Category	Percent of Total	Number of Dunums
Fully Irrigated	14.9	31,037
Partly Irrigated	58.5	121,675
Rain-fed	18.4	38,201
Fallow	6.7	13,928
Uncultivable	1.5	3,100
	<u>100.0</u>	<u>207,941</u>

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Source:

Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), Figure 11, p. 170.

The Volume of agricultural goods produced in the area during the 1959-1960 crop year was 54,387 tons.<sup>11</sup>

Total gross income for the 3,341 farm units was J.D. 781,199 of which J.D. 35,913<sup>12</sup> was income from the sale of animals or animal products. Total expenses were

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<sup>11</sup>Department of Statistics, op. cit., computed by the writer from Tables 69, 70 and 71, pp. 177-179.

<sup>12</sup>Ibid., Table 104, p. 250.



J.D. 314,927.<sup>13</sup> Thus, total net income amounted to J.D. 466,272.<sup>14</sup> The average gross income per farm was J.D. 234, and the average net income was J.D. 140.

On a per dunum basis, the average gross income was J.D. 3.8, and the average net income was J.D. 2.2.<sup>15</sup> These averages would be slightly higher had the 3,100 dunums that were uncultivable been excluded. The gross income per dunum on a fully-irrigated farm of 20 to 39 dunums, given as an example in the study,<sup>16</sup> was J.D. 12.3, expenses were J.D. 2.6, leaving a net income of J.D. 9.7 per dunum. The total expenses in this case, amounted to 20.9 percent of the gross income, whereas for the entire area expenses were 40.3 percent of the gross income.

Production and income data for 1959-1960 will be compared later in this chapter with similar data for the 1965-1966 crop year.<sup>17</sup> It must be mentioned that the earlier year was one of the poorest in Jordan's recent history. This

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<sup>13</sup>Department of Statistics, op. cit., Table 89, p. 219.

<sup>14</sup>Ibid., Table 104, p. 250.

<sup>15</sup>Ibid., Table 105, p. 254.

<sup>16</sup>Ibid., Table 66, p. 163.

<sup>17</sup>See pp. 160-161 of this Chapter.

fact makes a comparison between the two sets of data only of limited value. Rainfall during the 1959-1960 growing season was about one-half the average amount recorded during the past two decades. At some weather stations in the Jordan Valley, the amount of rainfall was actually the lowest on record. Conditions were made worse by the extreme dryness of the soil due to below-average rainfall in the two previous seasons.<sup>18</sup>

No dry land was double-cropped during the year of the study, and only 17,735 dunums of irrigated land produced two crops. Because of the limited supply of water,<sup>19</sup> almost half (48.4 percent) of the irrigated land was sown in wheat or barley.

#### The Two Studies Compared

A major discrepancy in the two studies is the reported volume of expenses as a percentage of gross farm income. The UNRWA study tabulates expenses at 76 percent

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<sup>18</sup>Department of Statistics, op. cit., Tables 60 and 61, pp. 146-149.

<sup>19</sup>It is important to note that the flow from the side wadis was drastically reduced because the villagers upstream diverted water for their own use, see Department of Statistics, Ibid., p. 149.

of gross income, whereas the Department of Statistics study reports expenses at 40.3 percent. This variation may be attributed to the fact that the earlier study included payments for taxes, depreciation and rent in calculating total expenses, whereas the latter study did not include these charges. The income and expense figures per farm unit, for the two studies, are summarized in Table 28.

TABLE 28  
INCOME AND EXPENSES PER FARM UNIT  
(in J.Ds.)

Item	1953 Study <sup>(a)</sup>	1961 Study <sup>(b)</sup>
Average Gross Income	319	234
Average Expenses	242	94
Average Net Income	77	140

Source:

(a) UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), pp. 23-24.

(b) Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), computed and compiled by the writer from Table 89, p. 219, and Table 104, p. 250.

The second difference is the lower gross income per farm in the 1961 study. This difference resulted principally from the poor yields in 1959-1960 and partly from the smaller size of the average farm-62 dunums compared to almost 68 dunums in the 1953 study. Because of the latter variation, greater significance attaches to income and expense data on a per dunum basis, which are presented in Table 29. Average net income per dunum in 1961 amounted to J.D. 2.242, or 198 percent of that of 1953.

TABLE 29

AVERAGE GROSS INCOME, AVERAGE EXPENSES  
AND AVERAGE NET INCOME PER DUNUM  
(in J.Ds.)

Item	1953 Study <sup>(a)</sup>	1961 Study <sup>(b)</sup>
Average Gross Income	4.692	3.757
Average Expenses	3.561	1.515
Average Net Income	1.131	2.242

Source:

(a) UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), computed and compiled by the writer from Table 27, p. 44.

(b) Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), compiled from Table 105, p. 254.

But these data are somewhat misleading. The expense data as tabulated in the 1953 study are higher, as a percentage of gross income, than that in the 1961 study because of the inclusion of charges for taxes, depreciation and rent. Because of this latter variation, only the gross income data can be correctly compared in the two studies under consideration. Again, due to the fact that the 1961 was an unusually poor year, any comparison would be ill-founded.

PRODUCTION AND INCOME IN  
1964/65 AND 1965/66

The first study to measure the economic benefits resulting from the East Ghor Canal Project was carried out, by the personnel of the Agricultural Division of the United States Agency for International Development, in the spring and early summer of 1965, it was similar to and a predecessor of the 1965/66 study. It dealt with the crop year running from May 1, 1964 to April 30, 1965. During that time, 2,760 farm units<sup>20</sup> were in operation.

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<sup>20</sup>Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1966), p. 16.

A random sample was carefully determined and consisted of 60 farmers who had received deeds to farm units in Sections I, II and III of the Project Area. Data were thus acquired for 70 units totalling 2,450 dunums.<sup>21</sup> Thus, the average size of all farm units in the sample was 35 dunums. Because of multiple ownership or operation, the 2,450 dunums in the sample was 2.1 percent of the 117,000 dunums in the East Ghor Canal Project.

Gross income for the 2,450 dunums in the sample was J.D. 58,543, total expenses were J.D. 32,052, and net income amounted to J.D. 26,461.<sup>22</sup> These data on a per dunum basis were as follows: gross income, J.D. 23.9; expenses, J.D. 13; and net income, J.D. 10.8. Income data for the entire Project in that year could be determined by attributing these average figures to all dunums with the following results: gross income for the Project Area was J.D. 2,795,715; total expenses were J.D. 1,530,711; and net income amounted to J.D. 1,265,004.<sup>23</sup>

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<sup>21</sup>Agricultural Division, United States Agency for International Development, op. cit., p. 26.

<sup>22</sup>Ibid., p. 2.

<sup>23</sup>Ibid., Table 4, p. 19.

On a per farm basis the average gross income was J.D. 836, average expenses were J.D. 458, and average net income amounted to J.D. 378.<sup>24</sup>

Of the 2,450 dunums in the sample 18 percent was sown in grain crops, 48 percent in vegetables, 16 percent in fruit trees (mainly citrus and banana), and the remaining 18 percent was idle.<sup>25</sup>

The second study, conducted by the same division as the first, covered production and income in the Project Area for the crop year ending April 30, 1966. This study was similar to the one of the previous year, although it differed in certain minor respects. Both studies, however, were designed to acquire the same kind of information on production and income.

To conduct this study, a random sample, which consisted of 120 farm units, was selected. These constituted 4 percent of the 3,003 units that were being farmed during that period. They covered an area of 4,063 dunums,<sup>26</sup> thus

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<sup>24</sup>Agricultural Division, United States Agency for International Development, op. cit., Table 4, p. 19.

<sup>25</sup>Ibid., p. 19.

<sup>26</sup>Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), p. 21.

making the average size of each farm slightly less than 34 dunums.

The total gross income for the 120 farms during the crop year under study was J.D. 117,129, expenses were J.D. 61,849, and total net income amounted to J.D. 55,280. On a per farm basis then, gross income was J.D. 975, expenses were J.D. 515, and net income was J.D. 460.<sup>27</sup>

Gross income per dunum for the 4,063 dunums in the sample was J.D. 28.8. Expenses per dunum were J.D. 15.2 and net income was J.D. 13.6.<sup>28</sup> Since the sample is considered representative of the 117,000 dunums in the Project Area, income and expenses for the entire region can be determined by multiplying the per dunum figures just cited by the total number of dunums. This operation indicates that gross income for the Project Area was J.D. 3,372,876, expenses were J.D. 1,780,974, and total net income amounted to J.D. 1,591,902.

In addition to the income from crops summarized above, a number of farmers received income from non-crop

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<sup>27</sup>Agricultural Division, United States Agency for International Development, op. cit., p. 24.

<sup>28</sup>Ibid.



sources. The total net income received from non-crop agricultural activities amounted to J.D. 3,379. Approximately three-fourths of this came from the sale of sheep and milk, and the remainder was acquired from the sale of animal products such as hair, fat, manure and eggs. Several farmers also earned relatively substantial income from operating gas stations, or trucks or from renting tractors. Total net income generated from all non-crop activities amounted to J.D. 13,314.<sup>29</sup>

Other findings of this study worth noting pertain to land use. Of the 4,063 dunums in the sample, 282 dunums, or 6.9 percent, were not planted at all during the crop year under consideration. The total cultivated area then was 3,781 dunums. Of the latter, the total number of dunums effectively planted, including 635 dunums of double cropping, reached 4,416. This can be seen in Table 30, both by section of the Project and as a total.

As for the area planted with each crop for the entire 4,416 dunums planted, the study showed that approximately seven percent of the land in the sample was not cultivated. Forty-seven percent of the land was planted in grain

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<sup>29</sup>See Appendix XXII.

crops, 44 percent in vegetables, and the remaining 18 percent in fruit trees, citrus and bananas.<sup>30</sup>

TABLE 30  
LAND USE IN SAMPLE AREA IN 1965/66  
(in dunums)

Section	Sample Area	Idle Land	Cultivated Area	Double Cropped	Planted Area
I	1,270	172	1,098	139	1,237
II	1,281	72	1,209	243	1,452
III	<u>1,512</u>	<u>38</u>	<u>1,474</u>	<u>253</u>	<u>1,727</u>
Total	<u>4,063</u>	<u>282</u>	<u>3,781</u>	<u>635</u>	<u>4,416</u>

Source: Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), Table 6, p. 24.

As for the number of crops planted per farm, it was found that 33 of the 120 farmers in the sample planted only one crop. On the other hand, 3 farmers planted as many as

<sup>30</sup>Agricultural Division, Agency for International Development, op. cit., p. 25. These percentages actually add up to 116 percent, the additional 16 percent representing the extent of multi cropping.

6 kinds of crops. The remaining 84 farmers except one fell in between as can be seen in Table 31. One farmer could not plant any crops because the surface of his land is higher than the water surface in the delivery box.

TABLE 31  
DISTRIBUTION OF THE SAMPLE ACCORDING TO  
NUMBER OF DIFFERENT CROPS PLANTED

Number of Crops	Number of Farmers
0	1
1	33
2	43
3	22
4	13
5	5
6	3
	<u>120</u>

Source: Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), p. 26.

As for farm units ownership, it is interesting to note that the 120 persons in the sample owned 193 farm units.<sup>31</sup> Seventy-nine persons owned one farm each, whereas 41 persons owned more than one farm each. Two persons of the latter owned 8 and 10 farm units respectively. Ownership of the remaining 39 persons ranged between 2 and 5 farm units as can be seen in Table 32.

TABLE 32

DISTRIBUTION OF THE SAMPLE FARM UNITS  
ACCORDING TO OWNERSHIP

Number of Farmers (a)	Farm Units Owned (a)	Total (b)
1	10	10
1	8	8
4	5	20
6	3	18
29	2	58
<u>79</u>	1	<u>79</u>
<u>120</u>		<u>193</u>

Source:

(a) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), Table 9, p. 26.

(b) Computed by the writer.

<sup>31</sup>It must be mentioned that for purposes of uniformity in the study, only one farm unit per farmer was considered for income calculation.

As for the operating status of the 120 farm units, this study revealed that 66 of the farm units owners operated their own farms. Thirty-nine farms were rented out on a share-crop basis, while 10 were rented on a cash basis. Hired managers operated 5 farm units as can be seen in Table 33.

TABLE 33

OPERATING STATUS OF THE FARM UNITS

Operating Status	Farm Units
Owner Operated	66
Share-cropper	39
Cash Rental	10
Hired Manager	5
	<u>120</u>

Source:

Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), p. 27.

AGRO-ECONOMIC IMPLICATIONS

It has just been demonstrated that the implementation of the East Ghor Canal Project has raised the production and income levels of the farmers in the project area. Thus, it has also increased the total agricultural

TABLE 34  
INCOME AND EXPENSES  
IN THE EAST GHOR CANAL PROJECT  
(in J.Ds.)

Item	Baker-Harza Forecast <sup>(a)</sup>	1964/65 <sup>(b)</sup>	1965/66 <sup>(c)</sup>
Per Farm Unit			
Gross Income	433	836	975
Expenses	248	458	515
Net Income	185	378	460
Per Dunum			
Gross Income	26.4	23.9	28.8
Expenses	15.1	13.1	15.2
Net Income	11.3	10.8	13.6

Source: (a) Baker and Harza, Yarmouk-Jordan Valley Project (Pennsylvania: Baker and Harza, 1955), Vol. VIII, pp. 44-45.  
(b) Agricultural Division, United States Agency for International Development, op. cit., Table 4, p. 19.  
(c) Agricultural Division, United States Agency for International Development, op. cit., p. 24.

production of Jordan, contributed to an improvement of the country's chronic balance of trade deficit, and provided other benefits as well.

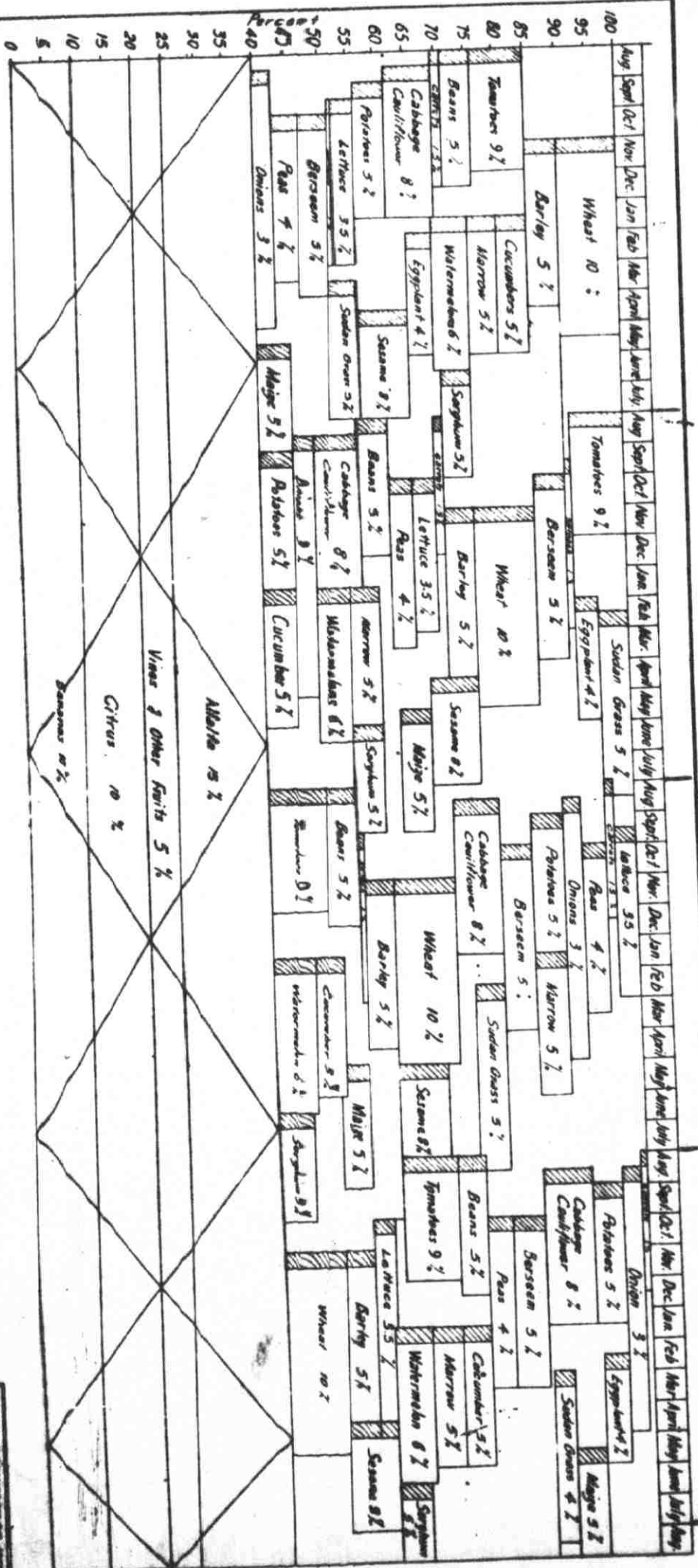
The great increase in farm income from the pre-project period to the post-period is readily apparent. Of interest is the close similarity of the per dunum figures for the post-project period (see Table 34). These data on a farm unit basis differed, however, because the Baker-Harza forecast was made on the assumption that farms would be of smaller size. The effect of the present farm size of 30-50 dunums is to raise the farmer's income. Each farm is expected to net annually between 430 and 560 Jordan Dinars.<sup>32</sup>

This relatively high yield is a result of the intensive farming practiced in the project area. The plan for utilizing the 120 thousand dunums consists of a four year cropping pattern as shown in Chart 4. The pattern involves the plantation of fruits, vegetables, legumes and small grains. Sixty percent of the area is supposed to be planted with annual crops and 40 percent with pernnial crops.

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<sup>32</sup>According to Baker-Harza study, the farm size of classes 1 and 2 soil is 15 dunums and class 3 soil is 26 dunums. See Baker-Harza, op. cit., Vol. VIII, p. 33.

CHART 46



Land under preparation  
 Land under permanent crops or permanent crops  
 Fallow land, or annual disposition

INFORMATION SUPPLIED BY AGRICULTURAL BUREAU OF THE UNITED STATES DEPARTMENT OF AGRICULTURE  
 A FURTHER EXPLANATION OF THIS CHART IS GIVEN IN THE REPORT OF THE AGRICULTURAL BUREAU OF THE UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Prepared by F. W. ...  
 ...



Of the whole project area 25 percent is proposed to be covered by fruits; 15 percent by alfalfa; 70 percent by vegetables and legumes and 28 percent by small grains. The additional 38 percent is actually the result of multi cropping. It is estimated that 11 percent of the land is left fallow.

This plan of four year cropping pattern is not actually applied in the project area. The government is not enforcing this pattern at present because it does not guarantee either the marketing or the prices of the crops. Only after improving the marketing machinery and studying the prices would the government be able to enforce a definite cropping pattern.<sup>33</sup>

The East Ghor Canal Authority has foreseen that there are a number of ingredients that must be correctly blended to achieve highly sustained yields in the project area. Thus, due consideration was given to such items as mechanization, improved seeds, fertilizers, plant protection materials, credit and agricultural information. This irrigation project, it was perceived, would in the end be judged by the farmer's ability to mix other resources with

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<sup>33</sup>A discussion with Mr. Suhail Mallah, Deputy Director, Marketing Department, Amman, on August 3, 1968.

the water to obtain high yields. Rapid increase in production is, in essence, dependent on an informed and educated farmer coupled with essential "agricultural inputs" and proper services.<sup>34</sup>

Within this context, the plan for the East Ghor Rural Development Project was conceived. The Wadi Yabes Service Center is the embodiment and headquarter of this project. The center provides the farmers with a series of services and demonstrations that act as catalysts in the process of achieving early high production.<sup>35</sup> The Ministry of Agriculture, in turn, helps the farmers to obtain improved seeds and fertilizers at reasonable prices. The combating of diseases is undertaken by the Veterinary Department at nominal charges. This department also provides the farmers with plant and animal protection materials.

Agricultural credit, in ample amounts and at fair terms, is considered to have a high priority in agricultural development. East Ghor farmers secure some of their needed credit through private channels. The Agricultural Credit

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<sup>34</sup>Forrest Hill and Arthur Mosher, Organizing for Agricultural Development (Illinois: Richard D. Irwin, Inc., 1958), p. 38.

<sup>35</sup>The Cooperative Institute, A Progress Appraisal of Wadi Yabes Rural Development Project (Amman: The Cooperative Institute, Mimeographed, 1967), p. 3.

Corporation is the sole official agency for agricultural credit in the country. One of its major district offices is located at Wadi Yabes Service Center. The Agricultural Credit Corporation has recently restricted its lending activities to long -and intermediate- term loans. The Jordanian Central Cooperative Union makes short-term and seasonal loans to cooperative societies who, in turn, make loans to their members.<sup>36</sup>

The credit program for the East Ghor farmers is actually in the early stage of its development. Much remains to be done in developing supervised credit arrangements wherein a farmer's entire credit needs are based on a "farming plan."<sup>37</sup> In April 1967, the Agricultural Credit Corporation had loans outstanding with 628 farmers totalling J.D. 229,660. To date, approximately, one-half of the East Ghor farmers have loans from the Agricultural Credit Corporation and the Jordanian Central Cooperative Union.<sup>38</sup>

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<sup>36</sup> Ministry of Interior for Municipal and Rural Affairs, Regional Planning in Jordan (Amman: Department of Country and Town Planning, 1967), Vol. II, p. 200.

<sup>37</sup> A discussion with Dr. Abdel Kareem Ta'eh, Assistant Director, Agricultural Credit Corporation, Amman, on May 30, 1968.

<sup>38</sup> Mahmoud Rashdan, Evaluation of the Supervised Agricultural Program in Jordan (Amman: The Cooperative Institute, Mimeographed, 1968), p. 7.

The development of the cooperative movement in the Eash Ghor area has been slow but steady. There are 22 cooperatives for saving and credit, agriculture, multi purpose and marketing with total membership of 3196 farmers as shown in Table 35. Total assets amounted to J.D. 281264 and total loans outstanding as of December 31, 1967 amount to J.D. 171087.

TABLE 35

COOPERATIVE SOCIETIES IN THE EAST GHOR AREA  
AS OF DECEMBER 31, 1967

Kind	Number of Cooperatives	Number of Members	Total Assets	Total Loans
Saving and Credit	4	2189	165621	92319
Agriculture	9	354	7649	5151
Multi Purpose	7	506	74961	46469
Marketing	<u>2</u>	<u>147</u>	<u>33033</u>	<u>27148</u>
Total	22	3196	281264	171087

Source:

Compiled by the writer from the files of the Ministry of Social Affairs made available by Mr. Fahd Hamawi.

The Jordanian Central Cooperative Union, having countrywide cooperative development responsibility, is currently consolidating existing small cooperatives with a goal of having one large multi purpose cooperative in each of the three sections of the project. It is projected that each cooperative will serve its members in the areas of credit, supplies and marketing.<sup>39</sup>

Because of the importance of marketing to the success of the project and the necessity of developing export markets, two modern packing plants were built within the East Ghor Rural Development Project. A Vegetable Plant was located at Wadi Yabes and a Citrus Plant was built at North Shouneh. The United Nations Special Marketing Project Fund furnished the vegetable line and the East Ghor Rural Development Project provided the citrus packing machine. Each plant can handle 40-50 tons of products during an 8-hour period. Each plant is equipped to wash, wax, grade and pack the products in the best modern manner.<sup>40</sup>

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<sup>39</sup>Mahmoud Rashdan, The Cooperative Movement and Cooperative Programs in Jordan (Amman: The Cooperative Institute, Mimeographed, 1968), p. 6.

<sup>40</sup>An interview with Mr. Suhail Mallah, Deputy Director, Marketing Department, Amman, on May 29, 1968.

Both plants were completed and started operations early in 1967. The North Shouneh Marketing Cooperative took over the operation of the citrus plant and the Marketing Department started the vegetable plant at Wadi Yabes. The latter plant, it was planned, would be operated, effective 1968 season, by the Wadi Yabes Farmers Cooperative.<sup>41</sup> The citrus and vegetable plants are supposed to facilitate the marketing of the related products in the export markets.

#### THE EXPORT MARKET FOR AGRICULTURAL PRODUCTS

Agricultural products rank high among the export items of Jordan. Their share ranged from 56 percent of total exports in 1961 to 60 percent in 1965 (see Table 36).

Jordan exported in 1966 some J.D. 9,981,738 worth of goods. Of this total, goods worth J.D. 6,427,250 were exported to the Arab countries of Kuwait, Lebanon, Syria,

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<sup>41</sup>The Cooperative Institute, Annual Report 1966/1967 (Amman: The Cooperative Institute, 1968), p. 7.

TABLE 36

AGRICULTURAL EXPORTS AS A PERCENTAGE  
OF TOTAL EXPORTS FOR  
1961-1965

Item	1961	1962	1963	1964	1965
Total Exports	4252	4929	5523	7012	7753
Agricultural Exports	2398	3162	3643	4203	4680
Percent of Agricultural Exports to Total Exports	56	64	64	60	60

Source:

Compiled by the writer from the files of the Marketing Department.

Saudi Arabia and Iraq. The remaining J.D. 3,554,488 were exports to other countries. In other words, 64 percent of total exports went to the neighbouring Arab countries, while 36 percent went to all other countries (see Table 37).

The bulk of Jordan exports to the Arab countries is composed of agricultural products. Thus, of the total

exports to the Arab countries of J.D. 6,427,250, agricultural products constituted J.D. 5,989,042 or 93.1 percent. These agricultural exports were mainly vegetables, fruits and small grains. Specifically, the most important agricultural exports are tomatoes, watermelons, bananas and flour.

TABLE 37  
JORDAN EXPORTS IN 1967  
(in J.Ds.)

Country	Amount (a)	Percent of Total (b)
Kuwait	L730534	
Lebanon	L350137	
Syria	L171220	
Saudi Arabia	L095515	
Iraq	L079844	
Total Arab Countries	6427250	64
Other countries	3554488	36
Total	9981738	100

Source:

(a) Department of Statistics, Foreign Trade Annual Statistics 1967 (Amman: Department of Statistics Press, 1967), pp. 43-60.

(b) Computed by the writer.



An examination of the relative importance of the various markets reveals that Kuwait ranks first with total agricultural exports of J.D. 1,566,841. Lebanon comes second with a total of J.D. 1,298,374. Syria, Iraq and Saudi Arabia come next with total exports of J.D. 1,107,919, J.D. 1,038,458, and J.D. 977,450 respectively (see Table 38).

TABLE 38

AGRICULTURAL EXPORTS TO SELECTED  
ARAB COUNTRIES IN 1967  
(in J.Ds.)

Country	Amount (a)	Percent of Total (b)
Kuwait	1566841	26.2
Lebanon	1298374	21.6
Syria	1107919	18.4
Iraq	1038458	17.4
Saudi Arabia	<u>977450</u>	<u>16.4</u>
Total	5989042	100.0

Source:

(a) Department of Statistics, Foreign Trade Annual Statistics 1967 (Amman: Department of Statistics Press, 1967), pp. 43-60.

(b) Computed by the writer.

## AGRICULTURAL TRENDS IN THE PROJECT AREA

A major focus of the development policy in Jordan in recent years has been upon irrigated agriculture, and the East Ghor Canal Project has been the principal manifestation of the efforts exerted in this direction. The objective of this project was not only to build an irrigation system to bring water to the farmers at the highest point of each farm unit, but also to set in motion the socio-economic development of the area. In other words, it was meant to improve the land tenure, the pattern of farming operations, the terms of land holdings and the standard of living of the people in the area.

A casual observation would not fail to indicate that positive results have been achieved in the East Jordan Valley in terms of increased irrigated areas and increased agricultural production as well as social development. Statistics have indicated that "the amount of irrigable land which has been put under intensive irrigation as a result of the execution of the East Ghor Canal Project has increased from 25,256 dunums pre-canal to 103,029 dunums of irrigable

land post-canal."<sup>42</sup> Improved farming and irrigation practices, proper use of fertilizers, and improved credit and marketing conditions have given rise to a measurable impact. Trends in agricultural production and income from the pre-canal period to the post-canal show the economic impact of the East Ghor Canal Project on the Jordanian economy.

To depict the agricultural trends in the project area, the four studies made on production and income are compared. As was shown earlier in this chapter, two of these studies pertain to pre-project period and the other two studies cover the post-project period. Later on, the post-project findings will be compared with the Baker-Harza forecast of income and expenses for the project area.

The 1965/66 study revealed that net income per dunum of land in the project area amounted to J.D. 13.6 during the crop year under review. This represents an increase of 23 percent over the corresponding previous year's figure of J.D. 10.8, and an increase of 507 percent over the J.D. 2.2 net income per dunum reported for the pre-project crop year

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<sup>42</sup>Abdul Wahhab Awwad, Increased Number of Dunums of Irrigable Lands Post-Canal (Amman: Mimeographed dated February 20, 1967), p. 2.

of 1959/60.<sup>43</sup> This data, reported in Table 39, is indicative of the economic benefit that has resulted from this irrigation project.

TABLE 39  
GROSS INCOME, EXPENSES AND NET  
INCOME PER DUNUM  
(in J.Ds.)

Item	1953 <sup>(a)</sup>	1959/60 <sup>(b)</sup>	1964/65 <sup>(c)</sup>	1965/66 <sup>(d)</sup>
Gross Income	4.7	3.7	23.9	28.8
Expenses	3.6	1.5	13.1	15.2
Net Income	1.1	2.2	10.8	13.6

Source:

(a) UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), computed and compiled by the writer from Table 27, p. 44.

(b) Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), Table 105, p. 254.

(c) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1966), Table 4, p. 19.

(d) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), p. 24.

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<sup>43</sup>Department of Statistics, The East Jordan Valley, A Social and Economic Survey, op. cit., Table No. 105, p. 254. It is recalled here that the gross income reported in the 1959/60 Survey is abnormally low because it relates to an unusually poor crop year. See pp. 135-136 of this chapter.

Income and expense data per farm unit as reported in the four studies represent another good measure of the improved economic well-being of the farmers (see Table 40). The two post-canal columns indicate the income data for the typical farmer since all farms in this period are about the same size. But the pre-canal averages ignore the variations in income which resulted from great variations in the size of farms during the pre-canal period.

TABLE 40  
GROSS INCOME, EXPENSES AND NET INCOME  
PER FARM  
(in J.Ds.)

Item	1953 <sup>(a)</sup>	1959/60 <sup>(b)</sup>	1964/65 <sup>(c)</sup>	1965/66 <sup>(d)</sup>
Gross Income	319	234	836	975
Expenses	242	94	458	515
Net Income	77	140	378	460

Source:

(a) UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), pp. 23-24.

(b) Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), Table 104, p. 250.

(c) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1966), Table 4, p. 19.

(d) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), p. 24.

The total gross agricultural income for the whole project was estimated during 1964/65 at J.D. 2,795,715. The 1965/66 study reported a total gross income of J.D. 3,372,876. In the earlier of these two years, more than 18 percent of the land in the study sample was not cultivated, while in the latter the idle land was approximately 7 percent of the total in the sample.

The increase in gross income is partly due to the decrease in idle land and partly to greater multi cropping in the field crops. But it is also the result of increased yield per dunum. Striking increases are noted for all of the crops that are involved.<sup>44</sup>

The quantity of agricultural production in the East Ghor area during 1965/66 crop year was 108,360 tons as shown in Table 41. This represents a substantial increase over the 1953 production of 60,989 tons. It also constitutes an increase of 12 percent over the preceeding year. Hence, it can be safely inferred that the tendency for agricultural production in the East Ghor area is rising.

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<sup>44</sup>See Appendix XXII.

TABLE 41  
AGRICULTURAL PRODUCTION OF THE  
EAST GHOR AREA  
(in Tons)

Item	1953 <sup>(a)</sup>	1959/60 <sup>(b)</sup>	1964/65 <sup>(c)</sup>	1965/66 <sup>(d)</sup>
Agricultural Production	60,989	54,387	95,315	108,360

Source:

(a) UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), computed and compiled by the writer from Tables 5-18, pp. 7-30.

(b) Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), computed and compiled by the writer from Tables 69, 70 and 71, pp. 177-179.

(c) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1966), p. 14.

(d) Agricultural Division, United States Agency for International Development, Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), p. 32.

Trends in agricultural production and trade from the pre-project period to the recent past show the beneficial effect of the East Ghor Canal Project on the Jordanian

economy.<sup>45</sup> Since tracts of irrigable land were distributed to farmers between 1961 and 1967, then it was during these years that the project gradually began to show results in the form of increased agricultural productivity. At present, it is not possible to determine the extent to which the East Ghor Canal Project has contributed to this increase, but it is certain that it was a major factor.

Agricultural export and import data indicate the effect which the increased productivity has had on Jordan's balance of trade.<sup>46</sup> These data unfortunately include "beverages" as an item in the category of statistics which also includes agricultural produce. However, a much greater percentage of beverages is imported rather than exported, thus, inclusion of this figure only underestimates the role of agriculture. With this reservation in mind, it can be seen that agricultural imports increased roughly by 16 percent during the period 1960-1965, while during the same period exports increased almost 170 percent. Furthermore, agricultural produce made a larger contribution to total

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<sup>45</sup>See Appendicies IX and X.

<sup>46</sup>See Appendix IX.



exports, going from 46.8 percent in 1960 to 60.4 percent in 1965.<sup>47</sup>

Indeed, annual variations exist in these data, both production and trade, due to variations in the amount of rainfall from year to year which affect annual productivity. Nevertheless, the trends over the period considered are apparent.

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<sup>47</sup>See Chapter II, pp. 42-43.

APPENDIX I

AGE AND SEX DISTRIBUTION OF POPULATION 1961 CENSUS

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Age Distribution ( year )	Males	Females	Total	Percent of total
Less than 5	159080	146491	305571	17.9
5 - 14	249664	219281	468945	27.5
15 - 19	94227	92854	187081	11.0
20 - 29	124932	134576	259508	15.2
30 - 39	81660	90583	172243	10.1
40 - 49	55107	56763	111870	6.5
50 - 59	42870	40968	83838	4.9
60 - 64	21194	19929	41123	2.4
65 - and above	<u>38863</u>	<u>37184</u>	<u>76047</u>	<u>4.5</u>
Total	867597	838629	1706226	100.0

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Source:

Ministry of Information, The Economy of Jordan, its  
Volume and Progress (Amman: Ministry of Information Press, 1966),  
p.13.

APPENDIX II

DISTRIBUTION OF POPULATION BY DISTRICTS AS OF END OF 1961

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District	Population
Amman	420945
Zarqa	105647
Balqa	79370
Irbid	259444
Karak	63206
Ma'an	28715
Jerusalem	345547
Nabblus	343209
Jenin	79503
Hebron	120017
Nomads	52929
Jordanians Abroad	<u>62863</u>
TOTAL	<u><u>1713382</u></u>

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Source: Department of Statistics, Annual Statistical Yearbook 1964 (Amman: Department of Statistics Press), pp. 1-3.

APPENDIX III

INDUSTRIAL ORIGIN OF GROSS DOMESTIC PRODUCT  
AT CURRENT FACTOR COST FOR 1960 - 1964  
( AND INDEX  
(in Million J.Ds.)

Sector	1960	1961	1962	1963	1964
Agriculture	14.62	25.30	20.90	22.08	34.14
Manufacturing	6.89	8.83	8.06	10.62	12.53
Construction	4.50	4.50	6.15	6.12	5.54
Electricity & Water Supply	0.69	0.67	0.74	0.93	1.03
Transport	11.12	12.64	12.53	12.77	12.03
Trade	19.57	24.28	23.63	26.43	28.01
Banking	0.87	1.27	1.46	1.35	1.51
Ownership of Houses	7.13	8.01	8.58	9.39	9.93
Public Administration & Defence	15.79	16.74	17.06	17.61	19.70
Services	<u>8.26</u>	<u>8.63</u>	<u>9.51</u>	<u>10.37</u>	<u>11.19</u>
Total Gross Domestic Product at Factor Cost	<u>89.44</u>	<u>110.87</u>	<u>108.62</u>	<u>117.67</u>	<u>135.52</u>
Index	100	123	121	132	152

Source: Department of Statistics, The National Accounts 1959 - 1965  
(Amman: Department of Statistics Press, 1967), p.3.

APPENDIX IV

INDUSTRIAL ORIGIN OF GROSS DOMESTIC PRODUCT AT  
CURRENT FACTOR COST FOR 1960 AND 1964 AND PERCENTAGES  
(in Million J.Ds.)

Sector	1960		1964	
	Amount (a)	Percent of Total (b)	Amount (a)	Percent of Total (b)
Agriculture	14.62	16.41	34.14	25.2
Manufacturing	6.89	7.7	12.53	9.2
Construction	4.50	5.0	5.45	4.0
Electricity & Water Supply	0.69	0.8	1.03	0.7
Transport	11.12	12.4	12.03	8.9
Trade	19.57	21.9	28.01	20.7
Banking	0.87	1.0	1.51	1.1
Ownership of Dwellings	7.13	8.0	9.93	7.3
Public Administration & Defence	15.79	17.6	19.70	14.5
Services	<u>8.26</u>	<u>9.2</u>	<u>11.19</u>	<u>8.3</u>
Total Gross Domestic Product at Factor Cost	<u>89.44</u>	<u>100.0</u>	<u>135.52</u>	<u>100.0</u>

Source:

(a) Department of Statistics, The National Accounts 1959 - 1965 (Amman: Department of Statistics Press, 1967). p.3.  
(b) Computed by the writer.

APPENDIX V

SECTORAL DISTRIBUTION OF EMPLOYMENT FOR 1961

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Sector	Employees	Percentage of Total
Agriculture	137757	35.3
Mining and Quarrying	9186	2.4
Manufacturing	32746	8.4
Construction	40159	10.3
Electricity & Water Supply	1572	0.4
Trade	31356	8.0
Transport Communication and Warehousing	11899	3.1
Services	53525	13.7
Others	<u>71778</u>	<u>18.4</u>
Total	<u>389978</u>	<u>100.0</u>

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Source:

Federation of chambers of Commerce, Industry and Agriculture for Arab Countries, The Arab Economic Report (Cairo: Federation of Chambers, 1965), p.7.

APPENDIX VI

CENTRAL GOVERNMENT RECEIPTS FOR  
1961 - 1964  
(in Thousand J.Ds.)

Sources	1961 <sup>a</sup>	1962 <sup>a</sup>	1963 <sup>a</sup>	1964 <sup>b</sup>
<b>Domestic Revenues:</b>				
Customs & Excise	6020	6367	7172	8571
Taxes	2526	3089	3453	3502
Licenses	867	941	1033	1054
Fees	2075	2330	2580	2765
Post, Telegraph & Telephone	771	1013	1102	1246
State Domain	123	66	72	69
Interests & Profits	1118	1176	1211	3484
Miscellaneous	1180	6124	2756	3137
Total Domestic Revenues	14680	21106	19379	23828
<b>Foreign Support:</b>				
Budget Grants	16419	14689	14003	13600
Budget Loans	-	-	-	5000
Economic & Technical Assistance	1979	1016	1682	1332
Development	500	2043	1301	1973
Total Foreign Support	18898	17748	16986	21905
Total Receipts	<u>33578</u>	<u>38854</u>	<u>36365</u>	<u>45733</u>

Source:

(a) Central Bank of Jordan, First Annual Report  
(Amman: Central Bank of Jordan, 1966), p.63.

(b) Ministry of Information, The Economy of Jordan, its Volume and Progress (Amman: Ministry of Information Press, 1966), p.47.

APPENDIX VII

CENTRAL GOVERNMENT EXPENDITURES FOR  
1961 - 1964  
(in Thousand J.Ds.)

Items	1961 <sup>(b)</sup>	1962 <sup>(b)</sup>	1963 <sup>(b)</sup>	1964 <sup>(a)</sup>
<u>Recurring Expenditures:</u>				
Defence, Army & Public Security	18711	19114	21021	21032
Education	2790	3124	3413	3685
Communication & Public Works	1257	1365	1465	1750
Social Affairs & Health	1272	1366	1434	1533
Agriculture & Irrigation	484	542	632	734
Other	<u>3705</u>	<u>4506</u>	<u>5228</u>	<u>5724</u>
Total Recurring expenditure	28219	30017	33193	34458
Development Expenditure	4765	7509	6154	9165
Total Expenditures	<u>32984</u>	<u>37526</u>	<u>39347</u>	<u>43623</u>

Source: (a) Ministry of Information, The Jordan Economy, its Volume and Progress (Amman: Ministry of Information Press, 1966) p.49.

(b) Central Bank of Jordan, First Annual Report (Amman: Central Bank of Jordan, 1966), p. 64.



APPENDIX VIII

BALANCE OF PAYMENTS  
1963 - 1965  
(in Million J.Ds.)

Item	<u>1963(a)</u>		<u>1964(a)</u>		<u>1965(b)</u>	
	Debit	Credit	Debit	Credit	Debit	Credit
A- Goods and Services	61.35	25.17	57.15	32.70	64.12	37.29
1. Merchandise	53.63	6.56*	49.38	8.73*	55.77	9.91*
2. Non-Monetary Gold	-	-	-	-	-	-
3. Freight & Insurance	0.31	1.75	0.44	1.22	0.21	2.00
4. Other Transportation	0.51	-	0.38	-	0.50	0.44
5. Travel	3.20	6.00	3.63	8.02	4.29	9.81
6. Investment Income	0.23	1.11	0.45	1.71	0.52	2.58
7. Government	2.53	1.19	1.49	1.11	1.69	1.94
8. Other services	0.94	8.56	1.38	11.91	1.15	10.61
Trade Balance 1 & 2	47.07	-	40.65	-	45.86	-
Balance on Current Account	36.18	-	24.45	-	26.83	-
B- <u>Transfer Payments</u>	-	24.14	-	28.52	-	29.46
9 - Private	-	1.62	-	1.95	-	2.68
10. Government	-	22.52	-	26.57	-	26.78
C- <u>Capital and Monetary Gold</u>		7.58	11.11	-	4.33	
(i) Non-Monetary		1.36		5.95		2.59
11. Private Investment		1.33		0.77		0.25
12. Local Government	-	-	-	-		0.14
13. Central Government		0.03		5.18		2.20
(ii) Monetary		6.22	17.06		6.92	
14. Central Monetary Institutions	1.74		4.92		22.62	
15. Other Monetary Institutions		7.96	12.14			15.70
Net Errors & Omissions		4.46		7.04		1.70

APPENDIX VIII (Cont'd)

Source: (a) Central Bank of Jordan, First Annual Report for the Year Ending March 31, 1965 (Amman: Modern Press, 1965), pp. 48-49.

(b) Central Bank of Jordan, Quarterly Bulletin No. 2 (Amman: Modern Press, 1967), p. 27.

\*Includes re-exports.

APPENDIX IX

COMPOSITION OF FOREIGN TRADE FOR 1960 - 1964  
(in Thousand J.Ds.)

Exports & Imports	1960(a)	1961(b)	1962(b)	1963(b)	1964(b)
<b>Exports*:</b>					
Olive Oil	N.A.	46	147	340	74
Fresh Fruits & Vegetables	2017	1626	2356	2472	2175
Cereals & Flour	N.A.	133	211	111	176
Phosphates	1305	1554	1568	1455	2354
Cigarettes	N.A.	6	35	234	591
Others	<u>159</u>	<u>887</u>	<u>612</u>	<u>911</u>	<u>1642</u>
Total Exports	<u>3481</u>	<u>4252</u>	<u>4929</u>	<u>5523</u>	<u>7012</u>
<b>Imports:</b>					
Coffee, Tea & Tobacco	N.A.	1523	1845	1410	1389
Sugar & Sugar Products	N.A.	1300	1385	3252	1974
Petroleum Products	21496	2492	2640	2664	2632
Fresh Fruits & Vegetables	N.A.	1653	2268	2346	1346
Cereals & Flour	N.A.	5629	3768	6608	3146
Textiles, Yarn & Clothing	N.A.	6006	5906	5964	5470
Machinery & Vehicles	17886	6666	8373	7459	6840
Metals & Alloys	N.A.	3164	3629	4090	3748
Others	<u>3553</u>	<u>13477</u>	<u>15815</u>	<u>17134</u>	<u>26919</u>
Total Imports	<u>42935</u>	<u>41910</u>	<u>45629</u>	<u>60927</u>	<u>53464</u>

Source:

(a) Central Bank of Jordan, Quarterly Bulletin No. 1 (Amman: Modern Press, 1965), p. 51.

(b) Central Bank of Jordan, First Annual Report for the Year Ending March 31, 1965 (Amman Modern Press, 1965) pp. 52 - 53.

\* Excluding re-exports.

APPENDIX X

PRODUCTION OF CEREALS, VEGETABLES AND FRUITS  
(1960 - 1964)  
(in Thousand Metric Tons)

Product	1960	1961	1962	1963	1964
<b>CEREALS</b>					
Wheat	43.6	138.2	111.9	75.8	294.7
Barley	13.3	61.7	35.7	23.0	97.2
Lentils	1.8	6.4	13.0	4.1	25.1
Kersenneh	3.5	6.4	8.0	3.6	13.2
Beans Dry	0.5	1.2	1.5	1.4	2.1
Chick Peas	1.1	3.8	3.0	1.5	4.2
Maize	3.0	8.1	5.3	3.4	8.7
Sesame	1.8	2.2	1.9	1.7	1.7
Other Grains	<u>0.2</u>	<u>0.4</u>	<u>1.2</u>	<u>2.1</u>	<u>2.3</u>
Total Cereals	<u>68.8</u>	<u>228.4</u>	<u>181.5</u>	<u>116.6</u>	<u>449.2</u>
<b>VEGETABLES</b>					
Tomatoes	155.6	213.8	169.4	214.6	227.8
Eggplant	51.5	51.8	52.6	48.0	41.7
Onions & Garlic	16.3	14.6	18.1	19.0	21.1
Cabages	28.6	32.6	29.8	27.3	35.9
Cucumber & Melons	90.7	163.0	165.5	165.7	224.1
Beans Green	14.3	16.4	13.0	16.7	16.2
Potatoes	16.8	13.5	10.9	12.4	10.9
Radish & Carrots	4.5	4.6	4.1	4.9	5.9
Other vegetables	<u>20.3</u>	<u>22.6</u>	<u>31.1</u>	<u>28.9</u>	<u>28.1</u>
Total Vegetables	<u>398.6</u>	<u>532.9</u>	<u>494.5</u>	<u>537.5</u>	<u>611.7</u>
<b>FRUITS</b>					
Olives	16.7	114.4	7.4	38.7	97.1
Apples & Pears	1.4	3.3	4.1	3.6	5.5
Plums & Peaches	1.4	3.3	3.8	3.4	4.0

APPENDIX X (Cont'd)

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Product	1960	1961	1962	1963	1964
Almonds	1.8	2.2	2.9	2.6	3.3
Apricots	2.1	2.6	1.9	2.4	2.1
Figs	17.7	20.9	21.1	18.9	21.1
Bananas	7.2	13.8	17.2	9.6	8.2
Citrus Fruits	7.1	16.3	21.4	38.8	37.1
Pomegranates	3.2	4.1	3.8	3.0	2.5
Grapes	43.3	78.4	79.0	58.7	76.9
Other Fruits	<u>1.9</u>	<u>2.4</u>	<u>2.8</u>	<u>3.3</u>	<u>2.1</u>
Total Fruits	<u>103.8</u>	<u>261.7</u>	<u>165.4</u>	<u>183.0</u>	<u>259.9</u>
Grand Total	<u>571.2</u>	<u>1023.0</u>	<u>841.4</u>	<u>837.1</u>	<u>1320.8</u>

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Source: Jordan Department of Statistics, Annual Statistics Yearbook 1964 (Amman: Department of Statistics Press), pp. 124 - 126.

APPENDIX XI

AVERAGE YIELD PER DUNUM OF GROPPED LAND  
FOR SELECTED PRODUCTS  
(1960 - 1964)  
(in kilograms )

Product	1960	1961	1962	1963	1964
<b>CEREALS (a)</b>					
Wheat	17.4	50.6	39.3	36.9	99.3
Barley	17.8	65.0	34.0	30.2	106.3
Bean Dry	19.2	41.7	46.9	61.4	68.6
Chick Peas	26.9	70.2	53.0	46.7	74.1
Sesame	26.2	42.6	37.4	36.6	47.6
<b>VEG ETABLES (a)</b>					
Tomatoes	1118.6	1122.9	806.3	1045.7	952.3
Eggplant	1677.5	1427.0	1377.0	1274.5	1616.3
Beans Green	812.5	848.7	764.7	821.9	650.6
Potatoes	1600.0	789.5	626.4	838.5	677.0
Cucumbers & Melons	638.7	730.0	733.6	784.0	796.8
<b>FRUITS (b)</b>					
Apples & Pears	107.7	224.5	268.0	203.4	288.0
Apricots	333.3	400.0	283.6	358.2	338.7
Bananas	960.0	1568.2	1849.5	1315.1	1438.6
Figs	218.3	260.6	259.9	250.7	263.8

Source:

(a) Department of Statistics, Annual Statistical Yearbook 1964 (Amman: Department of Statistics Press), Compiled from Table 66, p. 125.

(b) Ibid., Compiled from Table 67, p. 126.

APPENDIX XII

YEARLY AND AVERAGE RAINFALL IN SELECTED STATIONS  
(1960 - 1964)  
(in m.m.)

Station	1960	1961	1962	1963	1964	Average 1931 - 1960
Hawwara	165	291	386	254	419	359
Shuna	218	357	434	270	395	407
Jenin	260	425	548	381	523	440
'Ajlun	293	508	625	565	763	628
Tulkarm	470	527	767	537	719	606
Nablus	349	578	693	500	806	621
Deir 'Alls	118	290	284	233	337	305
H.4	43	124	79	74	92	86
Amman	143	320	323	210	438	321
Jericho	46	195	121	43	253	147
Jerusalem	176	443	395	185	644	503
Madaba	141	324	336	136	513	355
Hebron	229	510	352	270	779	486
Karak	145	273	210	102	496	386
Tafila	87	204	136	84	617	275
Bayir	8	42	58	77	32	41
Ma'an	0	34	49	27	21	39
Average	170	320	340	232	461	353

Source: Department of Statistics, Annual Statistical Yearbook 1964 (Amman: Department of Statistics Press), p. 111.

APPENDIX XIII

DETAIL OF GROSS AGRICULTURAL INCOME 1960 - 1964  
(in Million J.Ds.)

Item	1960	1961	1962	1963	1964
Grains and Legumes	2.10	5.65	4.50	3.06	10.84
Vegetables	5.71	7.87	6.87	7.36	8.57
Tobacco	0.11	0.39	0.29	0.10	0.41
Fruits, Vines and Olives	2.75	9.00	3.44	5.32	7.93
Forest Products	0.20	0.20	0.16	0.14	0.13
Sales of Animals	3.36	2.48	2.30	3.37	3.36
Animal Products	2.84	2.63	2.71	3.12	2.93
Poultry and Game	1.14	1.26	1.57	1.70	2.03
Honey	0.02	0.04	0.05	0.03	0.04
Fish	0.03	0.03	0.04	0.04	0.04
Construction on Farms	0.08	0.16	0.14	0.29	0.15
Increase in Livestock numbers	<u>na</u>	<u>na</u>	<u>2.02</u>	<u>0.84</u>	<u>1.43</u>
TOTAL	<u>18.34</u>	<u>29.71</u>	<u>24.09</u>	<u>25.37</u>	<u>37.86</u>

Source:

Department of Statistics, The National Accounts  
1959 - 1965 (Amman: Department of Statistics Press, 1967), p. 18.



APPENDIX XIV

SECTORAL DISTRIBUTION OF EMPLOYMENT FOR 1961

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Sector	Employees	Percentage of Total
Agriculture	137757	35.3
Mining and Quarrying	9186	2.4
Manufacturing	32746	8.4
Construction	40159	10.3
Electricity and Water Supply	1572	0.4
Trade	31356	8.0
Transport, Communication & Warehousing	11899	3.1
Services	53525	13.7
Others	<u>71778</u>	<u>18.4</u>
TOTAL	<u>389978</u>	<u>100.0</u>

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Source: Federation of the Chambers of Commerce, Industry and Agriculture for Arab Countries, The Arab Economic Report (Cairo: Federation of Chambers, 1965), p. 7.

APPENDIX XV

INDUSTRIAL ORIGIN OF GROSS DOMESTIC PRODUCT FOR 1965

Sector	<u>1961</u>		<u>1965</u>	
	Amount	Percent of Total	Amount	Percent of Total
Agriculture	25.30	22.8	34.11	22.6
Manufacturing & Mining	8.83	8.0	16.22	10.7
Construction	4.50	4.1	7.87	5.2
Electricity & Water Supply	0.67	0.6	1.68	1.1
Transport	12.64	11.4	12.60	8.3
Trade	24.28	21.9	31.43	20.8
Banking	1.27	1.1	2.11	1.4
Ownership of Dwellings	8.01	7.2	10.69	7.1
Public Administration and Defence	16.74	15.1	21.41	14.2
Services	<u>8.63</u>	<u>7.8</u>	<u>12.83</u>	<u>8.6</u>
Gross Domestic Product	<u>110.87</u>	<u>100.0</u>	<u>150.95</u>	<u>100.0</u>

Source: Jordan Department of Statistics, The National Accounts 1959 - 1965 (Amman: Department of Statistics Press, 1966), p. 3.

APPENDIX XVI

COMPOSITION OF FOREIGN TRADE FOR 1965  
(in Thousand J.Ds.)

Exports and Imports	1965	
	Amount	Percent of Total
<u>Exports</u>		
Agricultural Products	4680	60.4
Phosphate	2430	31.1
Others	<u>643</u>	<u>8.5</u>
Total Exports	<u>7753</u>	<u>100.0</u>
<u>Imports:</u>		
Consumption Goods	27049	48.3
Primary & Intermediary Materials	14401	25.7
Capital Goods	10048	17.9
Others	<u>4554</u>	<u>8.1</u>
Total Imports	<u>56052</u>	<u>100.0</u>

Source:

Central Bank of Jordan, Annual Report Number Three (Amman: Central Bank of Jordan, 1967), p. 59.

APPENDIX XVII

ESTIMATED CAPITAL EXPENDITURES FOR THE FIVE  
YEAR DEVELOPMENT PROGRAM 1963 - 1967  
(in million J.Ds.)

Scheme	Amount (a)	Percent of (b) Total
Agriculture	40.34	31.7
Industry	22.77	17.9
Tourism	9.81	7.7
Construction	16.50	12.9
Transport	13.22	10.4
Communication	4.19	3.3
Public Administration & Others	<u>20.49</u>	<u>16.1</u>
Total	<u>127.32</u>	<u>100.0</u>

Sources:

(a) Development Board, The Five Year Program  
For Economic Development 1962 - 1967 (Amman: Development  
Board, 1961), Compiled from Table 23 - 2A, p. 361.

(b) Computed by the writer.

APPENDIX XVIII

ESTIMATED GROSS CAPITAL FORMATION DURING  
THE SEVEN YEAR PROGRAM 1964-1970  
(in thousand J.Ds.)

Item	Public Sector		Private Sector		Total	
	Amount (a)	Percent of Total (b)	Amount (a)	Percent of Total (b)	Amount (a)	Percent of Total (b)
Agriculture	57940	39.8	16270	12.6	74210	27.0
Tourism	2795	1.9	9700	7.5	12495	4.5
Mining	7589	5.2	22645	17.5	30234	11.0
Industry Elec- ticity	5832	4.0	10980	8.5	16812	6.1
Transport	34932	24.9	-	-	34932	12.7
Communication	5810	4.0	-	-	5810	2.1
Education	4328	3.0	3125	2.4	7453	2.7
Public Health	2365	1.6	735	0.6	3100	1.1
Trade & Services	-	-	7070	5.5	7070	2.6
Construction	16494	11.3	31720	24.5	48214	17.5
Others	7571	5.2	12300	9.5	12300	4.5
<b>TOTAL</b>	<u>145656</u>	<u>100.0</u>	<u>129195</u>	<u>100.0</u>	<u>274851</u>	<u>100.0</u>

Source:

(a) Ministry of Information, The Jordanian Economy. Its Volume and Progress (Amman: Ministry of Information, 1966), p.113.

(b) Computed by the writer.

APPENDIX XIX

ESTIMATED GROSS CAPITAL FORMATION FOR AGRICULTURE DURING  
THE SEVEN YEAR PROGRAM 1964-1970  
(in thousand J.Ds.)

	Amount <sup>(a)</sup>	Percent of <sup>(b)</sup> Total
Ministry of Agriculture	373	0.5
Forestry Department	1293	1.7
Veterinary Department	193	0.3
Agricultural Extension Department	875	1.2
Agricultural Research Department	119	0.2
Agricultural Marketing	641	0.8
East Ghor Canal Authority	1188	1.6
Central Water Authority	19406	26.2
Yarmouk (including side Wadi dams)	<u>30252</u>	<u>40.8</u>
Total Central Government	54340	73.2
Water - Local Government	<u>3600</u>	<u>4.9</u>
Total Public Sector	<u>57940</u>	<u>78.1</u>
Agriculture	16060	21.6
Fishing	210	0.3
Total Private Sector	<u>16270</u>	<u>21.9</u>
Grand Total	<u>74210</u>	<u>100.0</u>

Source:

(a) Development Board, The Seven Year Program for Economic Development of Jordan (Jerusalem: The Commercial Press, 1966), compiled by the writer from Tables 4, 5 and 11, pp. 37 - 38 and 44.

(b) Computed by the writer.

APPENDIX XX

LAW No. 31 FOR THE YEAR 1962  
EAST GHOR CANAL TEMPORARY LAW

Article VIII-Paragraph B:

"If the holder has lands of thirty dunums or more in the project area, the Authority shall allot to him lands in the project area according to the following formula and, if possible, shall consider him to have a preferential right if possible in the unit in which he has land not less than 20% of the size of the new unit.

<u>Number of Irrigable Dunums Held Prior to the Project</u>	<u>Number of Irrigable Dunums to be Allotted to Holder</u>
30 - 50	- To be allotted in full.
51 - 100	- 50 dunums shall be allotted plus 25% of area exceeding 50 dunums.
101 - 500	- 62 dunums shall be allotted plus 17% of area exceeding 100 dunums.
501 - 1000	- 130 dunums shall be allotted plus 12% of area exceeding 500 dunums.
1001 - and above	- 200 dunums shall be allotted."

Article X-Paragraph F:

"The Farmers Selection Committee shall select the farm family for settlement on irrigable land within the project area with the priority for selection being as follows:

- |        |          |   |   |
|--------|----------|---|---|
| First  | Priority | - | Holders who themselves exploit their lands in the project area.                 |
| Second | Priority | - | Professional farmers residing in the project area.                              |
| Third  | Priority | - | Professional farmers from district inhabitants.                                 |
| Fourth | Priority | - | Professional farmers from inhabitants of other districts.                       |
| Fifth  | Priority | - | Holders who utilize their land by lease or share cropping within project area." |



APPENDIX XXI

FARM INCOME IN 1953

Income and Expense	Amount
Gross Income	
Income from Crops	1,134,291
Income from livestock	77,714
Others	<u>7,972</u>
Total	<u>1,219,977</u>
Cost Items	
Chemical fertilizers	10,742
Manures	53,454
Seeds	121,442
Depreciation of machinery	32,964
Maintenance	22,113
Hire of machinery	61,122
Fuel	56,226
Loss & depreciation of livestock	47,910
Wages	234,324
Land rent & water charges	201,099
Marketing	31,781
Transportation	31,656
Taxes	<u>21,129</u>
Total	<u>925,962</u>
Net Income	<u><u>294,015</u></u>

Source: UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed, 1954), p. 24.

APPENDIX XXII

NON-CROP INCOME IN 1966  
(in J.Ds.)

6

Income Source	Number of Farmers	Gross Income	Related Expenses	Net Income
Sheep	16	1,210	52	1,157
Milk	34	1,270	42	1,228
Hair-Wool	10	293	-	293
Fat	2	170	5	165
Calves	1	50	5	45
Manure	6	185	-	185
Eggs	13	349	44	306
Sub-Total		3,527	148	3,379
Gas Stations & Trucks		7,355	-	7,355
Tractor Rental		2,580	-	2,580
Sub-Total		9,935	148	9,935
TOTAL		<u>13,462</u>	<u>148</u>	<u>13,314</u>

Source: Agricultural Division, United States Agency for International Development, A Study of Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967), Table 11, p. 28.

APPENDIX XXIII

AVERAGE YIELD PER DUNUM FOR SELECTED  
CROPS IN THE PROJECT AREA  
(in kilograms)

Crop	1953 <sup>a</sup>	1959/60 <sup>b</sup>	1964/65 <sup>c</sup>	1965/66 <sup>d</sup>
Tomatoes	502	557	1371	1515
Eggplant	970	983	1433	1614
Cucumber	194	353	577	705
Broad beans	345	206	347	497
Water Melon	479	396	1000	1580
Bananas	N.A.	1316	1400	1709
Green Pepper	N.A.	422	462	877
Cabbage	N.A.	1363	1640	2018
Onion	N.A.	505	500	1159

Source: (a) UNRWA, Jordan-Valley Agricultural Economic Survey (Amman: Mimeographed 1954), compiled by the writer from Tables 9, 10, 11, 12, 14, and 17, pp. 15-21, p. 26, and p. 29.

(b) Department of Statistics, The East Jordan Valley, a Social and Economic Survey (Amman: Department of Statistics, 1961), compiled by the writer from Tables 69 and 70, pp. 177-178.

(c) Agricultural Division, United States Agency for International Development, A Study of Agricultural Production and Income in the East Ghor Project (Amman: Mimeographed, 1966), compiled from Table 5, p. 9.

(d) Agricultural Division, United States Agency for International Development, A Study of Agricultural Production and Income in the East Ghor Canal Project (Amman: Mimeographed, 1967). Compiled from Table 14, p. 32.

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