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Northeast Ghor Irrigation and Rural Development Project Jordan

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EMENA Projects Department

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CURRENCY EQUIVALENTS

US\$1	= JD 0.3215
JD 1 = 1,000 fils	= US\$3.11
JD 1,000	= US\$3,110
JD 1,000,000	= US\$3,110,000

WEIGHTS AND MEASURES

1 millimeter (mm)	= 0.039 inches
1 meter (m)	= 3.28 feet
1 square meter (m ²)	= 10.76 square feet
1 cubic meter (m ³)	= 1.31 cubic yards
1 million cubic meters (Mm ³)	= 810.7 acre feet
1 cubic meter per second (m ³ /sec)	= 35.31 cubic feet per second
1 liter per second (l/sec)	= 0.035 cubic feet per second
1 kilometer (km)	= 0.62 miles
1 square kilometer (km ²)	= 0.386 square miles
1 hectare (ha)	= 2.47 acres = 10 dunums (dn)
10 dunums (dn)	= 1.0 hectare
1 kilogram (kg)	= 2.205 pounds
1 metric ton (ton)	= 2,205 pounds

ABBREVIATIONS

ACC	= Agricultural Credit Corporation
AMO	= Agricultural Marketing Organization
FA	= Farmers Association
JCC	= Jordan Cooperative Organization
JVC	= Jordan Valley Commission
NPC	= National Planning Council
NRA	= Natural Resources Authority
PWD	= Public Works Department

FISCAL YEAR

January 1 - December 31

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

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This report is based on the findings of an appraisal mission which visited Jordan in September 1973 consisting of Messrs. M. Altaf Hussain, Sadiq M. Niaz, Michael Raczynski and Harry Walters (IDA).

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IBRD 10746R

SUMMARY AND CONCLUSIONS

i. Jordan has an area of 190,000 sq. km and a population of 2.7 million, increasing at a rate of 3.3% per year. Its agriculture accounts for about one-fifth of GDP and is the largest production sector in the economy, providing one-half of exports and employment for one-third of the labor force. Despite this, agricultural commodities mainly cereals, meat, fruit and vegetables are imported annually to meet the nation's needs, and the agricultural trade deficit is currently over US\$62 million.

ii. Irrigation is necessary to increase agricultural production; both land and water resources are available for its expansion. At present only 25,000 hectares, or less than 10% of the 350,000 hectares cultivated, are irrigated, but by value their produce accounts for 70% of the agricultural production. The national Development Plan (1973-75), and within its framework the three year Development Plan for the Jordan Valley, emphasizes the development of irrigation to increase production, narrow income distribution margins and provide the rural development facilities. The proposed North-east Ghor Irrigation and Rural Development Project would contribute to the realization of these objectives. The Government of Jordan has requested an IDA credit to help finance the project.

iii. Bank Group lending to Jordan since it began in 1961 consists of 8 credits totalling US\$40.3 million (net of cancellations); two for agriculture, three for water supply, one for highways, one for education and one for power. Except for the latest water supply and the power projects, on which it is too early to report, the implementation of projects and disbursements have been generally satisfactory.

iv. The project would develop 7,700 hectares of which about 86% is already gravity irrigated. The currently unirrigated 14% (1,040 hectares) together with 1,720 hectares of the currently irrigated area would be provided with gravity-powered sprinkler irrigation. The project would also provide facilities in the form of domestic water supply, health, education, communications and community development to benefit the project population of 25,000 persons. To serve 2,760 ha by sprinkler irrigation, the project works would include two small diversion weirs, 55 km of primary and secondary pipelines and a distribution network. To improve production on the existing gravity irrigated area, the project would provide land leveling of about 3,000 ha and tile drainage of about 520 ha. In addition the project would include 30 km of farm roads, seasonal and medium-term credits, two assembly markets and community development facilities consisting of construction of treated water supply facilities for 10 villages, of three health centers and expansion of an existing one, 150 schoolrooms for preparatory and primary classes, a vocational training center, 10 community centers and improvement of a 60 km of roads.

v. The project would be executed by the already established Jordan Valley Commission (JVC) with the help of relevant government agencies. The irrigation works (43% of project cost) would be constructed with the assistance of the Natural Resources Authority (NRA), the agency responsible for

irrigation. A consultant firm would assist JVC and NRA in the design and construction supervision of all irrigation works, which would be constructed under one international contract. Specialist assistance in marketing, grading and accounting would be provided to ensure efficient marketing of produce.

vi. Total project cost is estimated at US\$17.4 million, of which the foreign exchange would be US\$9.1 million (52%). An IDA credit of US\$7.5 million would finance 82% of the foreign exchange requirement. Government would finance the foreign exchange gap of US\$1.6 million and 92% of local costs (US\$7.6 million equivalent) either under bilateral assistance arrangements or with its own resources. The remaining 8% of local costs (US\$0.66 million), representing 20% of farm development costs, would be contributed by project farmers. Construction would be started in 1974 and completed by 1978. The cost of the project, excluding contingencies, that could be tendered, would be US\$13.5 million, of which works, equipment, supplies and services costing about US\$8.9 million (66%) would be procured following international competitive bidding. The remaining works, of small magnitude and scattered over time and location, would be executed following local competitive bidding.

vii. At full development in 1983, the project would increase annual production of main crops: citrus by 13,000 tons, bananas by 2,500 tons, vegetables by 69,000 tons and cereals by 7,000 tons. Most of the incremental production would be domestically consumed; however, some top grades of the early vegetables and citrus would be exported. At full development by 1983, gross value of annual production would increase from the present US\$9.3 million to US\$17.4 million. Annual gross foreign exchange earnings from the export of a third of the project's produce are estimated at US\$6.0 million. The economic rate of return for the project is estimated at 24%. At full development the per capita income of sharecroppers, representing 60% of the farmers, would reach about JD 100 to JD 125 (US\$310 to US\$390), i.e. slightly above the projected national per capita income of JD 97 (US\$300) in 1983.

viii. The project would be suitable for an IDA credit of US\$7.5 million on conventional terms. The borrower will be the Government of the Hashemite Kingdom of Jordan.

JORDAN

Northeast Ghor Irrigation and Rural Development Project

I. INTRODUCTION

1.01 The Government of the Hashemite Kingdom of Jordan has requested an IDA credit of US\$7.5 million to finance 82% of the foreign exchange cost (including physical and price contingencies) of the Northeast Ghor Irrigation and Rural Development Project. The 1972 Bank economic mission observed that the Jordanian agricultural sector offers the most productive development potential and that water and agricultural land remain the most important of the country's exploitable natural resources to be developed for additional production, exports and employment. Since there is little possibility of expanding rainfed cultivation, the only expansion possible is by increasing irrigation of the cultivated lands. The country's three-year development plan (1973-75) emphasizes the development of water, improvements in infrastructure and expansion of social service facilities. The proposed project would involve agricultural and rural development of the northern third of the Jordan Valley (East bank), while the remaining two-thirds would be developed with assistance from other donors, mainly the Kuwait Fund for Arab Economic Development, US-AID and the Federal Republic of Germany. It would not only conform to the objectives of the Plan, but also aims at reducing the constraints to agricultural development as identified by the 1972 Bank Economic Mission, lack of streamlined organization, want of greater attention to research and extension, inadequacy of credit and a weak marketing system.

1.02 Bank Group lending to Jordan began in 1961 and to date the Association has made eight credits totaling US\$40.3 million (net of cancellation). The first four credits--two for agricultural credit (US\$6.0 million) and two for water supply (US\$4.0 million)--were made before 1967 when war and local disturbances interrupted Bank Group operations until 1971. All of these credits have been fully disbursed. Four additional credits have been approved since mid-1971: one for a highway project (US\$6 million in 1971), one for education (US\$5.4 million in 1972), one for power (US\$10.2 million in 1973) and one for water supply (US\$8.7 million in 1973). With the exception of the last two credits, on which it is too early to report, progress has been satisfactory. The proposed credit of US\$7.5 million would be the ninth credit made to Jordan but it would be the first for irrigated agriculture and rural development.

1.03 This report is based on technical feasibility studies on Jordan Valley development prepared in 1969 by consultants Nedeco and Dar el Handasah, supplemented by subsequent studies by the Jordan Valley Commission (JVC) and the FAO/IBRD Cooperative Program (1973). Several additional studies and data on water resources, drainage, marketing, credit and other related aspects were

also available for use by the mission. The project was appraised in September 1973 by Messrs. M. Altaf Hussain, Sadiq M. Niaz, Michael Raczynski and Harry E. Walters who also prepared this report.

II. BACKGROUND

Country

2.01 Jordan is situated in the arid zone of the Middle East, and covers 190,000 km² of which about 6,000 km² lie on the West Bank of the Jordan River now under Israeli occupation. The population of Jordan, as estimated in mid-1973, is 2.68 million, of which 770,000 live on the West Bank and 1.91 million in the rest of the country. The population growth has averaged 3.3% per annum since 1961. The Government is a hereditary constitutional monarchy with a bicameral legislature consisting of Notables appointed by the King and a Council of Representatives elected by male suffrage. Executive power is vested in the King who appoints the Cabinet and the Prime Minister.

2.02 Prior to the 1967 war the economy was growing at about 8% per year. The growth in per capita GNP averaged 4.7% between 1961 and 1966. This trend was interrupted by the war, which resulted in the loss of the West Bank. While the West Bank represented only 6% of Jordanian territory its loss resulted in a 35-45% drop in GNP and a substantial reduction in tax revenues and foreign exchange earnings. In 1969, however, the economy partially recovered, largely due to the exceptionally good climatic conditions which enabled increased agricultural production. Civil disturbances in 1970, however, halted this trend, causing the economy to fall to the 1967 level. The Government therefore prepared a Three-Year Development Plan (1973-75) in mid-1972, with the objectives of increasing GDP by 8% annually, creating 70,000 new jobs, narrowing income discrepancies and reducing budget and trade deficits.

Agricultural Sector

2.03 Agriculture accounts for one-fifth of GDP in East Jordan and is the largest production sector in the economy. It provides the main source of livelihood for one-third of the labor force and nearly one-third of the export revenues. The principal agricultural exports are tomatoes and citrus. Although agriculture is an important sector it does not meet the nation's needs of several agricultural commodities. Food grains, mainly wheat and rice, meat and dairy products and fruit and vegetables are the major import commodities. The trade deficit which can be narrowed in agricultural commodities is currently over JD 20 million a year.

2.04 The most important exploitable resources in Jordan are land and water. Out of the total area of 19 million ha, only 350,000 ha or 1.8%, is cultivated. More than 90% of the cultivated land is dependent on limited and irregular rainfall. There is little possibility of expanding the area which can be cultivated under rainfed conditions. Most of the 25,000 ha of irrigated land, which accounts for 70% of agricultural production, lies in the Jordan Valley. The Valley has land and water suitable for expansion of irrigated agriculture. In order to accelerate its exploitation, the Jordan Valley Commission, with wide administrative and executive power, was set up in 1972. The Commission, as a starting point, prepared for the Valley a Three-Year Development Plan (1973-75) within the overall concept of the National Development Plan. The Plan emphasizes water development; and the proposed project prominently figures in it.

III. THE PROJECT AREA

Location

3.01 The project area covers 7,700 ha and is located in the northern part of the Jordan Valley. Its boundaries are the Jordan River on the west, Wadi Yabis in the south, the Yarmouk River to the north and the foothills of the Eastern high Plateau to the east.

Climate

3.02 The climate is Mediterranean with characteristic hot, dry summers and moderately cool, wet winters. Rainfall averages 360 mm, about 90% of which falls during November to March and 45% in December and January. Average monthly temperatures range from 14°C in January to 31°C in August. Monthly mean maximum and mean minimum temperatures are about 12° above or below these values. Frost occurs occasionally in January. Clear skies are typical. Sunshine hours range from 54% in January to 90% in August. Winds are light to moderate and predominantly from west to southwest. High temperatures and dry air in summer as well as cool weather in winter are constraints for certain crops. Climatic data are summarized in Annex 1.

Topography and Drainage

3.03 The project area is subdivided into two natural zones, the Zor which extends along the Jordan river and the Ghor which includes the side terraces. The Valley has a general slope of 1% from north to south. The project area is cut by three wadis: Arab, Ziglab and Jurum. The cross slopes of the Valley vary from almost 0 to 1% in the Zor area, 1 to 3% in the Lower Ghor and 2 to 5% in the Upper Ghor. The transition zone between Zor and Ghor is irregular and only a very small part of this area would be irrigated by the project. The project area is drained, in general by the wadis. The irrigated area below the canal is served by surface drains, some of which do not function effectively.

Soils

3.04 Soils on the Chor terraces are of colluvial origin, moderately fine-textured with a depth varying from 90 cm to several meters. Isolated spots show heavy textures with restricted drainage. The Zor has deep, alluvial soil without profile development. Textures are medium to moderately coarse. According to United States Bureau of Reclamation (USBR) standards, about 93% of the soils in the project area belong to Classes I and II and only 7% to Class III and as such are suitable for growing a wide variety of crops. Salinity and alkalinity hazards are confined to isolated patches of restricted drainage which add up to 725 ha. Subsurface drains are being installed in a part of this area.

Population

3.05 The population of the project area is 25,000 persons, of which one-third is born in the area. About half are refugees from Palestine and the remainder immigrants from other parts of the country. The city of North Shuneh, located within the project area, is the largest settlement in the Jordan Valley with a population of about 7,700. Two other villages in the project area, Waqqas and Mashare, have populations above 3,000.

3.06 Approximately 53% of the population is below 15 years old which is close to the national average of 55%. The male and female population is evenly divided and an average size household has 5.7 persons of which one-third are of working age, with a potential of about 62.5 man-days of labor per month. 21% of the population is of school-age (5,250 children). This family size is smaller than the national average but the working age group is larger because some non-active population left the Valley during the 1967 War and civil disturbances.

Land Tenure and Farm Size

3.07 Jordanian law requires that landholdings in government-developed irrigation areas should be allocated in 3 ha holdings of Class I and II land and 5 ha of Class III land. The maximum holding in such areas, which is allowed to present large owners should not exceed 20 ha. There are no size restrictions on land ownership in unirrigated areas.

3.08 A survey carried out in February/March 1973 in the project area indicated that about 85% of holdings in the project area are within the range of 3 to 6 ha (Annex 2). About 40% of the project area is owner-operated and 60% sharecropped or rented to tenants. Sharecropping, mostly on holdings of 3 ha is the dominant form of farming.

3.09 The newly irrigated area of the project has been acquired and will be reallocated to comply with existing Jordanian law. The Natural Resources Authority has the legal and administrative machinery for land acquisition and reallocation. Priority is given to existing owners engaged in farming, followed by sharecroppers and tenants living in the area. If there is still

some land available, it is given to landless laborers (Annex 2). There is no need to bring settlers into the area for the new irrigated land. The old owners are compensated on fixed price which is charged to the new owners. The payment of the compensation is spread over 5 to 20 years depending on the amount involved - the higher the amount the longer the period.

Transport and Communications

3.10 The road network which is the only means of transport for the project area adequately serves to move present agricultural production. Further expansion is planned under U.S. bilateral aid. The network consists of the North-South National Highway which extends from Adasiya in the north to the Dead Sea. This highway is connected to the Eastern Plateau by four roads, one of which starts in the project area. The North Shuneh-Irbid road joins northern towns of the Jordan Valley with Iraq passing Irbid and Mafraq; another branch forks to the north connecting Syria and Lebanon with Jordan. The most direct route to Amman starts in Al Ardha, but because of steep grades is unsuitable for heavy traffic. All roads are asphalted and usable throughout the year. Feeder roads within the project area exist, but need improvement.

Electricity

3.11 There are only isolated electricity and power supply systems within the project area. Generation in all cases is by means of small diesel/generator sets, while distribution is by low voltage networks. The project, however, would require no additional power for direct uses because the sprinkler system would be gravity fed. Any future requirements for industrial and urban needs would be provided under the proposed aid program of the Federal Republic of Germany which is currently being discussed.

Domestic Water Supply

3.12 Only the town of North Shuneh has regular water supply constructed and operated by local authorities. The remainder of the project obtains its water from either local wells or springs. Piped water supply up to community points would be provided under the project for almost all villages and towns.

Present Land Use and Yields

3.13 Out of 7,700 ha about 6,660 ha are irrigated; the remainder 1,040 ha is dry-farmed. Overall cropping intensity is 99%. On irrigated land the cropping intensity is about 106% and on dry land, where a wheat and fallow rotation is practiced, 50%. The main crops grown in the area are vegetables, fruit trees and to a minor extent cereals. Present yields of vegetables range around 17 tons/ha for tomatoes, 15 tons/ha for eggplants and 10 tons/ha for cucumber and squash. Citrus orchards yield about 17 tons/ha. The total production of the project area amounts to 72,000 tons of vegetables, 25,000 tons of fruit and 2,000 tons of grains. Present yields, production and cropping intensity can be substantially increased through irrigation of dry land, improvement of present irrigation practices, changing of cropping patterns and

greater application of technology. Annex 1 gives details of the present and proposed cropping pattern, areas, yields and production.

Agricultural Research and Extension

3.14 Agricultural Research in the project area was interrupted during 1967 war and was not resumed until 1973, when a research program for the Jordan Valley was started by the Ministry of Agriculture, Department of Research and Extension. The main objectives of research are to increase yields, reduce production costs and gear production towards market demands. The existing main experiment station at Deir Alla is not typical of the ecological conditions of the project area. However, it has a substation at Wadi Yabis which has representative conditions and could be equipped to carry out necessary experiments.

3.15 The Ministry of Agriculture, Department of Research and Extension is responsible for agricultural extension in the Valley. The service is poor, lacking in staff, basic equipment and means of transportation. An UNDP-FAO Technical Assistance Program is assisting the department to improve its services.

IV. THE PROJECT

Description

4.01 The project would consist of: (a) the main works for the development of 7,700 ha net, of which 6,660 ha are already under irrigation; (b) the provision of facilities (minor works) for domestic water supply, health, education, transport and community development to benefit the project population of 25,000. Proposed project works are summarized below; details are presented in Annex 3 and Map 10746R.

(a) Main Works

- (i) 2 diversion weirs and siltation reservoirs;
- (ii) 55 km of primary and secondary pipelines and a distribution network to serve by sprinkler irrigation, a total of 2,760 ha net;
- (iii) 30 km of farm roads;
- (iv) land leveling of about 3,000 ha;
- (v) tile drainage of about 520 ha;
- (vi) rehabilitation works on the existing East Ghor Canal; and
- (vii) 2 assembly markets.

(b) Minor Works

- (i) treated water supply system for about 10 villages;
- (ii) 3 new health centers and extension of an existing center;
- (iii) about 150 classrooms;
- (iv) a vocational training center;
- (v) improvements to about 60 km of roads; and
- (vi) about 10 community development centers.

The project would provide equipment and materials for maintenance of irrigation works and roads and furniture and equipment for the health centers, schools and community centers. The project would also provide an agricultural credit component to help finance loans for agricultural and on-farm development.

4.02 The project, which would take about 4 years to complete, would be executed by appropriate Government agencies under the overall responsibility of the Jordan Valley Commission (JVC). Consultant services for design and construction supervision of irrigation works would be furnished under the project, and existing management, agricultural research and extension services would be strengthened.

Main Works

4.03 Of the presently irrigated part of the project area (6,660 ha net), about 5,940 ha net receive supplies from the network of the existing East Ghor Canal and about 720 ha net, lying above the command of this canal, are irrigated by local use of the flow from 3 perennial wadis. Under the project, the area irrigated by the 3 wadis (720 ha) and about 1,000 ha out of the area irrigated by the East Ghor Canal would be converted from gravity to sprinkler irrigation. In addition, about 1,040 ha net of new area, lying above the command of the canal and presently subjected to rainfed agriculture, would be provided with sprinkler irrigation. About 4,940 ha would continue to receive irrigation from the East Ghor Canal system. Land leveling and tile drainage would be provided in parts of this area to improve production. Details of works to be constructed for introduction of sprinkler irrigation and improvement of agriculture in the canal-irrigated areas are given below.

4.04 Diversion Weirs. Two weirs, about 15-20 m long, would be constructed on Wadi Arab and Wadi Jurum to enable diversion of supplies into the primary pipeline of the sprinkler system. Before entering the pipeline, water would pass through a siltation reservoir, where the suspended silt load would settle. A weir or siltation reservoir would not be required on Wadi Ziglab, as a storage dam (capacity 4.3 Mm³) already exists there. The outlet pipe from the

reservoir would be directly connected to the primary pipeline. Both weirs and the dam would divert water at such level that adequate pressure would build up in the pipeline by gravity and a pressure of at least 3 1/2 atmospheres would be available at the field outlets.

4.05 Primary and Secondary Pipelines. An asbestos cement pipeline of varying diameter would be buried along the eastern project boundary, generally at the (-) 195 m contour level, and would extend from Wadi Jurum in the south to a point about 8 km north of Wadi Arab. A short stretch of pipeline would extend south of Wadi Jurum. To feed about 1,000 ha lying below the East Ghor Canal, pipelines would branch off from the primary pipeline at suitable locations, cross the canal and run parallel to the canal. The total length of these primary and secondary pipelines is estimated at 55 km.

4.06 Distribution Network. The distribution network would consist of buried tertiary pipes, farm outlets and farm mainline pipes. Tertiary pipes would take off either directly from the primary pipeline, as in the case of the area above the East Ghor Canal, or from the secondary pipelines, as in the area below the canal. The tertiary pipes would be aligned perpendicular to the natural ground slope and would be 450 m apart. Each tertiary pipe would provide suitably located farm outlets along its length. Each outlet would serve two farms, one on either side, through independent farm mainline pipes. Sprinkler risers, 12 m apart, would be provided on farm pipes. The sprinkler system would be designed to furnish a maximum of 0.56 l/sec/ha at a pressure of at least 3 1/2 atmospheres at the sprinklers. The capacity of each outlet would be about 4.5 l/sec.

4.07 Farm Roads. About 30 km of farm roads would be constructed in the area above the East Ghor Canal. These roads would be 5 m wide; the central 3-m width would be gravelled to provide all-weather access to the farms.

4.08 Land Leveling. Land leveling would be carried out on about 3,000 ha lying below and irrigated from the East Ghor Canal. Because of steep ground slopes, which vary from 1 to 3%, irrigation is carried out by zigzag furrows. After land leveling, straight furrows would be introduced which would result in a substantial saving in labor input. An average of 300 m³/ha would have to be moved. In the new area, above the canal, some leveling would be carried out to remove occasional high spots.

4.09 Tile Drainage. Local units of tile drainage systems would be provided to improve drainage on about 520 ha of the area currently served by the East Ghor Canal. Open drains exist in this area but do not provide effective drainage; consequently most of this area has already gone out of cultivation. Field drains 10 cm in diameter and collector drains 15 to 20 cm in diameter would be installed. Collector drains would discharge into the existing drains, which outfall into the Jordan River.

4.10 Rehabilitation Works on East Ghor Canal. In the head reach of the East Ghor Canal, some works would be constructed to improve cross-drainage of surface flow. These would include two overchutes for hill torrents presently outfalling into the canal, construction of boundary drains to avoid the entry

into the canal of drainage flow from canal cuts and improving surface drainage through existing culverts across the canal. These works, by reducing entry of debris into the canal, would increase its efficiency and reduce annual maintenance.

4.11 Assembly Markets and Packing and Grading Stations. There are no assembly markets in the project area. Further south, however, there are two small private markets. This project would establish two assembly markets adjoining each of the existing packing and grading stations at Wadi Yabis and North Shuneh. These stations established in 1966 are currently little used mainly due to ill defined responsibility and poor management for their operation. Each has a large, well constructed building with equipment and facilities. The grading line in North Shuneh is in good condition but the line in Wadi Yabis was badly damaged during civil disorders of 1970. Both would be refurbished under the project. Details are in Annex 4. The present management of the packing and grading stations is unsatisfactory. In the future the Agricultural Marketing Organization (AMO), an existing semi-autonomous institution responsible for market supervision and management in Jordan would manage and supervise these stations. AMO would charge a fee of 5% and 1% of the gross value of produce handled for packing and grading respectively. Assurances were obtained that the operating and managing rights would be transferred to AMO not later than September 30, 1974.

4.12 Operation and Maintenance Equipment. Equipment and vehicles required to operate and maintain the sprinkler irrigation system, the East Ghor system and farm roads would be provided. Some office and workshop equipment together with small quantities of asbestos cement pipes, pipe fittings, valves, water meters etc. would also be provided for initial maintenance of the sprinkler network. A list of equipment is given in Annex 5.

4.13 On-Farm Development. The on-farm sprinkler systems would be designed by the consultant and the on-farm portable pipes and sprinklers would be supplied to the farmers under medium-term credit. Other on-farm developments would also be carried out under medium- and long-term credits. The farmers would contribute 20% of the total cost of such investments and the project would finance the balance. NRA assisted by consultants would prepare specifications and import the mobile sprinkler equipment. Imports would be phased over two to three years to match the construction schedule. NRA would store this equipment at its workshop at Deir Alla for direct sale to project farmers or transfer to them upon presentation of credit agreement with ACC.

Minor Works

4.14 Within the project area and along the north-south road, JVC is reconstructing 10 villages destroyed during the 1967 war and following disturbances. As a housing program has already started the project would not provide for this item. However, except for North Shuneh, none of the villages have either a proper drinking water supply, health facilities or school buildings. The project would provide the villages with these facilities and would enlarge

and improve the existing facilities in North Shuneh. In addition existing village roads, mostly along laterals of the East Ghor Canal system, would be improved and regravelled. Ten community centers, one in each village, would be constructed and the vocational school would be supplemented.

4.15 Domestic Water Supply. Water supply for domestic purposes would be furnished to 10 project villages from the primary pipeline of the sprinkler irrigation system. Filtration tanks would be provided at suitable locations, and after chlorination water would be conveyed through asbestos cement pipes of appropriate diameter to small overhead tanks. Distribution system within the villages would serve community taps, which would be located at suitable points along village streets. The new system for water supply to North Shuneh would supplement and enlarge the existing system. Like the irrigation system, the water supply main lines and distribution lines would also be pressurized by gravity and no pumping would be required.

4.16 Health Centers. At present no health facilities exist in the project area, except one health center at North Shuneh which would be enlarged into an 8 bed field hospital consisting of an out-patient's block, X-ray and dentistry facilities and a small laboratory, and would be provided with necessary equipment, furniture and instruments. An ambulance and a vehicle would also be provided to transport patients requiring specialist attention to the hospital at Irbid. Three health centers would be constructed at Adasiya, Waqqas and Mashare these would also be provided with necessary equipment, furniture and instruments. The field hospital and the 3 centers would be adequately staffed by Government in order to provide reasonable comprehensive medical care.

4.17 Schools. About 150 class rooms would be constructed under the project to replace rented facilities and schools damaged or destroyed during the 1967 war and following disturbances. The exact size of the school or schools for each village would be determined by JVC and the Education Department. Most of the schoolrooms would be for preparatory and primary level classes while some would be for preparatory level. Necessary equipment and furniture for these schools would also be provided. The facilities described would satisfy the needs for 6,000 students.

4.18 Vocational Training Center. Government is expanding, under UNDP/FAO assistance, a field research and extension station at Deir Alla for strengthening the activities of the Department of Research and Extension in the Jordan Valley. Under the project a vocational training center, which would also serve the whole Valley would be constructed at the substation in Wadi Yabis. The center would be used primarily for short- and long-term training of the Valley farmers in agricultural activities relevant to the Valley including sprinkler irrigation techniques. Two lecture halls, a workshop and necessary equipment would be provided under the project.

4.19 Roads. Apart from the paved north-south road, the existing road along the East Ghor Canal and the existing roads along the laterals of the Canal provide the means of transport between various project villages and the project area. The roads along the Canal (35 km) and the roads along the laterals (60 km) falling within the project area would be improved under the

project and some of these would be regravelled. The road (2.5 km) connecting the existing Ziglab dam to the main road would be provided with 4 m wide asphalt top.

4.20 Community Centers. Ten community centers - one in each project village would be constructed. These centers, consisting of 3 rooms and ancillary facilities, would be used by extension agents for educating the farmers and would also serve as local offices of the Farmers's Association. In general they would be used to promote social development of the farmers in the project area. Necessary furniture and equipment would be provided.

Water Demand, Supply and Quality

4.21 Water Demand. At full irrigation demand (1976), the gross water demand for the gravity irrigated part of the project area (4,940 ha) is estimated at 55.3 Mm³, whereas the gross demand for the sprinkler-irrigated area (2,760 ha), at its full development in 1979, would be 25.1 Mm³. These demands are based on the proposed cropping pattern and an irrigation intensity of 120%. An overall efficiency of 65% for gravity and 80% for sprinkler irrigation has been assumed. Details are given in Annex 7.

4.22 Water Supply. The project area would use water from two sources: (a) the existing East Ghor Canal, which draws its supplies from the Yarmouk river, and (b) Wadis Arab, Ziglab and Jurum - three major tributaries of the Jordan river within the project area. The Yarmouk river has an average annual flow of 438 Mm³ near the East Ghor Canal intake, of which an average of 119 Mm³ per annum (maximum of 157.3 Mm³ in 1971-72) is withdrawn into the Canal. Wadis Arab, Ziglab and Jurum have a respective average annual flow of 31.8 Mm³, 10.6 Mm³ and 11.2 Mm³ (Annex 7). The three Wadis irrigate only 720 ha at present and their surplus water flows into the East Ghor Canal. Both the Canal water and the waters of the three Wadis have been wastefully used for irrigation in the past (15,830 m³/ha) with low efficiency. Under the project, the area to be served by sprinkler irrigation (2,760 ha) would use about 9,112 m³/ha and the area which would continue to remain under gravity irrigation (4,940 ha) would need 11,215 m³/ha (Annex 7).

4.23 Areas presently irrigated from the two supply sources and the quantity of water presently used for irrigation are given below along with the future areas to be irrigated from these sources and the future water demand:

<u>Source</u>	<u>Present Irrigation</u>		<u>Future Irrigation</u>	
	<u>Area</u> (ha)	<u>Water Used</u> (Mm ³)	<u>Area</u> (ha)	<u>Water Demand</u> (Mm ³)
<u>East Ghor Canal</u>	<u>5,940</u>	<u>94.0</u>	<u>4,940</u>	<u>55.2</u>
<u>Three Wadis</u>	<u>720</u>	<u>11.4</u>	<u>2,760</u>	<u>25.1</u>
Area above East Ghor Canal	720	11.4	720	6.5
Area below East Ghor Canal	-	-	1,000	9.1
Unirrigated Area above East Ghor Canal	<u>-</u>	<u>-</u>	<u>1,040</u>	<u>9.5</u>
Total	6,660	105.4	7,700	80.4
Unirrigated	<u>1,040</u>	<u>-</u>	<u>-</u>	<u>-</u>
Total Project Area	7,700	105.4	7,700	80.4
Saving of Water				25.0

The total water demand under the project would amount to 80.4 Mm³, which even after (a) bringing an additional area of 1,040 under irrigation, and (b) maintaining the presently irrigated area of 6,660 ha but with better water management, would result in an annual saving of 25.0 Mm³.

4.24 Water Quality. The Yarmouk water and waters of Wadis Arab and Ziglab are of medium salinity and low sodium and alkali hazard (C₂S₁ Class). Wadi Jurum water, classified as C₃S₁, has a salinity, only slightly above the C₂ limit (Annex 7). In general, these waters are of acceptable quality especially as they have been and would be used on areas with adequate natural drainage. In some parts of the project area where drainage is a problem, tile drainage would be provided under the project.

Water Rights

4.25 The Yarmouk is an international river with Syria and Jordan as riparian states. Israel is a downstream beneficiary. An international treaty, signed between Jordan and Syria in June 1953, assures enough water from the Yarmouk for the project. As in the future the project would only use 59% (55.3 Mm³) of the Yarmouk water presently used in the project area (94.0 Mm³) the project is not considered harmful to the interest of the downstream riparians. Waters from the side wadis would continue to be used entirely in Jordan. If necessary, JVC can acquire any private water rights on the waters of these wadis, under the powers vested in the Commission by JVC Law.

Construction Schedule

4.26 JVC plans to employ a consulting firm as soon as possible to prepare designs and contract documents for the main contract comprising irrigation works and for its construction supervision. This contract would be

awarded by November 1974, after international competitive bidding, and construction would be completed by March 1977. Other works, mostly small in magnitude, would be designed by departments concerned and constructed by local contractors. Their construction would be scattered between October 1974 and December 1976. Procurement of on-farm sprinkler equipment, under medium-term credit, and disbursement of credit for other purposes would extend up to 1978. A detailed construction schedule is attached as Chart 8379R (Annex 8).

Cost Estimates

4.27 The total project cost, excluding import duties, is estimated at US\$17.4 million (JD 5.6 million), including US\$4.9 million (JD 1.6 million) for physical and price contingencies. The foreign exchange cost is estimated at US\$9.1 million (JD 2.9 million), or 52% of the total cost. The cost of the main development works, including physical and price contingencies, amounts to US\$14.0 million (JD 4.5 million), with a foreign exchange cost of US\$7.5 million or 53%. The cost of the minor works, including physical and price contingencies, is US\$3.4 million (JD 1.1 million) with a foreign exchange cost of US\$1.6 million or 48%. The social development works are about 20% of the total project cost. The cost estimates are based on unit rates estimated for similar works in the southern part of the Jordan Valley and other relevant cost data. For irrigation works, physical contingencies are estimated at 15%, and for all other items at 10%. For all civil works, price contingencies are compounded at annual rates of 12% (1974), 10% (1975); and 8% (1976 and 1977); whereas for equipment costs the rates used are 9% (1974), 7% (1975) and 5% (1976 to 1978). For land, engineering and administration, price contingencies are estimated at 6.5% compounded for foreign expenditure and 10% compounded for local expenditure. Detailed estimates are given in Annex 9, Table 1 and are summarized below:

	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Foreign</u>
	-----JD '000/a-----	-----JD '000/a-----	-----JD '000/a-----	-----US\$ '000/a-----	-----US\$ '000/a-----	-----US\$ '000/a-----	Exchange %
<u>Main Works</u>							
Irrigation Works	716	894	1,610	2,226	2,781	5,008	56
Other Works	25	25	50	78	78	156	50
Land Acquisition	20	-	20	62	-	62	-
Equipment and Materials	19	161	180	59	501	560	90
Farm Machinery and Working Capital	296	504	800	920	1,568	2,488	63
Engineering and Administration	<u>406</u>	<u>144</u>	<u>550</u>	<u>1,263</u>	<u>448</u>	<u>1,711</u>	26
Subtotal	1,482	1,728	3,210	4,608	5,376	9,985	54
<u>Contingencies</u>							
Physical Price	185	219	404	576	681	1,257	54
	<u>431</u>	<u>462</u>	<u>893</u>	<u>1,340</u>	<u>1,435</u>	<u>2,758</u>	22
Subtotal	<u>616</u>	<u>681</u>	<u>1,297</u>	<u>1,916</u>	<u>2,116</u>	<u>4,015</u>	53
Total	2,098	2,409	4,507	6,524	7,492	14,000	53
<u>Minor Works</u>							
Works	368	302	670	1,145	939	2,084	45
Land Acquisition	2	-	2	6	-	6	-
Equipment and Materials	21	84	105	65	260	325	80
Engineering and Administration	<u>32</u>	<u>6</u>	<u>38</u>	<u>99</u>	<u>19</u>	<u>118</u>	16
Subtotal	423	392	815	1,315	1,218	2,533	48
<u>Contingencies</u>							
Physical Price	42	39	81	131	122	253	48
	<u>108</u>	<u>99</u>	<u>207</u>	<u>335</u>	<u>308</u>	<u>643</u>	48
Subtotal	<u>150</u>	<u>138</u>	<u>288</u>	<u>466</u>	<u>430</u>	<u>896</u>	48
Total	573	530	1,103	1,781	1,648	3,429	48
Grand Total	<u>2,671</u>	<u>2,939</u>	<u>5,610</u>	<u>8,305</u>	<u>9,140</u>	<u>17,429</u>	52

/a Discrepancies due to rounding.

4.28 The proposed schedule of expenditure, given in Annex 10, is summarized below:

Jordan Fiscal and Calendar Year	1974	1975	1976	1977	1978	Total
	-----US\$'000-----					
Local	755	2,602	3,330	1,409	190	8,286
Foreign	<u>456</u>	<u>3,775</u>	<u>3,045</u>	<u>1,652</u>	<u>215</u>	<u>9,143</u>
Total	<u>1,211</u>	<u>6,377</u>	<u>6,375</u>	<u>3,061</u>	<u>405</u>	<u>17,429</u>

Financing

4.29 An IDA credit of US\$7.5 million would finance about 43% of the project cost, and would cover about 82% of the foreign exchange cost. Government would finance the balance (18%) of the foreign exchange cost (US\$1.6 million) and about US\$7.6 million equivalent or 92% of local costs. Project farmers would put up the balance 8% of the local costs (US\$0.66 million equivalent) - as their share representing 20% of the agricultural credit requirement. The IDA credit would include retroactive financing of about US\$175,000 to cover the cost of consultants to be appointed shortly. The financing plan would be as follows:

	JD '000	US\$'000	<u>% of Project Costs</u>
IDA Credit	2,412	7,500	43
Government	2,985	9,267	53
Project Farmers	<u>213</u>	<u>662</u>	4
Total	<u>5,610</u>	<u>17,429</u>	100

Procurement

4.30 The irrigation works and the main system of rural water supply, costing US\$5.5 million, would be grouped into one contract, which would be awarded by JVC in consultation with the agencies concerned after international competitive bidding in accordance with World Bank guidelines. Domestic suppliers would receive a preference equivalent to the existing import duties or 15% of the c.i.f. cost, whichever is the lower. Contracts for procurement of equipment and materials (US\$3.4 million) including the on-farm sprinkler system and other farm equipment and materials exceeding US\$10,000 in value, would also be awarded following international competition in accordance with World Bank guidelines. Assurances were obtained to this effect. Equipment and materials contracts costing less than US\$10,000 would be awarded locally subject to an aggregate of US\$100,000 in accordance with normal government procedures, which are satisfactory.

4.31 Other project works (construction of schools, health centers, roads, etc. (US\$1.8 million) are of varying nature, small in magnitude and located in several project villages. These would, therefore, be constructed under several contracts after local competitive bidding in accordance with normal

Government procurement procedures. For local contracts exceeding US\$200,000, bidding documents would be furnished to IDA for approval prior to their issue to prequalified local contractors and awards would be made in consultation with IDA. Assurances were obtained to this effect.

Disbursements

4.32 The proposed IDA credit of US\$7.5 million would be disbursed over 5 years, including retroactive financing of not more than US\$175,000 of foreign exchange expenditure of the consulting firm, to finance:

<u>Civil Works</u>	- 50% of total expenditure
<u>Equipment and Materials</u>	- the CIF cost of directly imported goods and 80% of total costs of goods purchased from local suppliers.
<u>Technical Services</u>	- 100% of the foreign exchange costs of the consulting firms and individual experts.
<u>Mobile Sprinkler Equipment, Other Farm Machinery and Inputs</u>	- 38% of loan payments made by Agricultural Credit Corporation (ACC) against short-, medium-, and long-term credit to project farmers.

Disbursement requests would be supported by full documentation, except for loans made to farmers to be disbursed against a statement of expenditures, the supporting documents of which would be retained by the executing agency and be available for review by project supervision mission. All savings, after project completion, would be cancelled. An estimated quarterly disbursement schedule is given in Annex 11.

Land Acquisition

4.33 Project works would require about 75 ha, which would be acquired under the existing laws after payment of compensation but prior to the award of respective construction contracts. Assurances were obtained to this effect.

Environment and Health

4.34 The project area is free of endemic diseases like malaria and bilharzia. Malaria was endemic to the Jordan Valley prior to 1953, but with assistance from WHO and UNRWA it was eradicated by 1961. Government's Health Department is adequately equipped to take necessary preventive measures. Assurances were obtained that the Health Department would monitor the project area for any recurrence of malaria and promptly take necessary remedial measures.

4.35 The project would not adversely affect the environment but would in fact improve it as the flow of the three wadis, presently in open channels, would be piped for sprinkler irrigation.

V. ORGANIZATION AND MANAGEMENT

Jordan Valley Commission

5.01 The Jordan Valley Commission (JVC) was established under law in 1973 as a public entity with the sole responsibility of economic and social development of the entire Jordan Valley (Enclosure Annex 6). The project would involve the northern third of the Valley, while the remaining two-thirds would be developed with assistance from other donors, mainly the Kuwait Fund for Arab Economic Development, US-AID and the Federal Republic of Germany. JVC has adequate administrative and financial powers for its operations. It is headed by a President, who is also its ex-officio Director General, who reports directly to the Prime Minister, and three Commissioners. The Commissioners are appointed by the Council of Ministers on the recommendation of the President of JVC and can be government officials or private individuals. JVC would have overall responsibility for project implementation, including overall planning, coordination, supervision and financial control. At present, JVC is working mainly with borrowed staff, which is inadequate to perform its functions. Therefore, it should be organized on proper lines and staffed adequately as a matter of priority. It has been agreed with JVC that the following 4 directorates (Chart 8371R Annex 6) would be established: (a) Irrigation, Drainage and Farm Roads; (b) Agriculture, Marketing and Credit; (c) Town Planning, Housing, Public Services and Highways; and (d) Financial Management and Administration. In addition, an officer directly reporting to the Deputy Director General would deal with social and community development. Substantial progress has been made in staffing the five directorates. Assurances were obtained that JVC will continue to be staffed with qualified personnel and that any change in its organizational structure be implemented in accordance with IDA.

5.02 The powers of JVC and its relations with Government, government agencies, contractors and other groups are explicitly set forth in the law establishing it. The law establishes provisions whereby:

- (a) JVC can receive proceeds of any loans or credits arranged by Government as well as supplemental funds allocated by Government in the budget. It can also receive funds from other sources.

- (b) JVC can employ consultants for project works, award contracts, exercise overall supervision and financial control and make payments for works completed.
- (c) JVC can delegate to NRA execution and supervision responsibility for irrigation and other related works, and NRA will have to establish a separate unit to carry out these duties. The head of this unit will report directly to JVC.
- (d) JVC can transfer funds to ACC, through a subsidiary loan agreement, for carrying out the credit provisions of the project. ACC will have to establish a separate accounting system for these funds and will be responsible to JVC for carrying out the provisions of this agreement.
- (e) JVC has the authority to make appropriate arrangements with other government agencies -- AMO, Department of Research and Extension, Public Works, etc. -- to carry out project elements appropriate to these agencies, and to ensure their proper implementation.

JVC will thus receive project funds and act as the management agency in the project area exercising firm management and financial control over all project elements. It will not, however, have the staff to exercise detailed supervision over specific aspects of the numerous project elements. This function, therefore, will be delegated to other agencies, which will be fully responsible. JVC will retain the ultimate authority and the right to undertake those activities which are not carried out to its satisfaction.

Project Execution, Operation and Maintenance

5.03 Because of its multi-sectoral nature, the project would be executed by several government agencies under the arrangements outlined in para 5.02. NRA would be fully responsible for the construction of all hydraulic works including tile drainage, land leveling and rural water supply. It would also be responsible for operation and maintenance of the gravity and sprinkler irrigation systems, rural water supply, drainage and farm roads, for which equipment (Annex 5) would be provided under the project. The Public Works Department would be fully responsible for the construction of primary markets, health centers, schools, the vocational training center, public roads and community centers, and also for the maintenance of these facilities. The Ministry of Agriculture, Department of Research and Extension would provide extension and research services and training support for the project. AMO would manage the primary markets and packing and grading stations and would be responsible for providing facilities for marketing and market intelligence. It would also collect project charges for NRA and recover loans for ACC. AMO would also train professional staff of the Farmers' Association (FA) with a view to transferring its functions to FA, as soon as possible. Assurances were obtained that IDA would be consulted prior to this transfer. The Agricultural Credit Corporation (ACC) would be responsible for assessing the credit requirements of the project farmers, with the assistance of the extension staff and FA,

and meeting these requirements in time. The Education and Health Departments would coordinate with JVC and the Public Works Department during the planning and construction phase of the schools and health centers. Following their completion, these Departments would provide adequate operational and supervisory staff and be responsible for the efficient operation of these education and health facilities, and assurances were obtained to this effect. All the above listed agencies are competent to carry out the work to be entrusted to them under JVC's overall guidance. Operation and maintenance costs of the project (excluding JVC headquarter staff) are estimated at JD 80,000 (US\$248,000) per annum; these would amount to JD 10.4/ha (US\$33/ha).

Consultants

5.04 JVC is finalizing a contract with the consultants Nedeco and Dar el Handasah, who prepared the feasibility studies on Jordan Valley development, to assist NRA in the design and supervision of all irrigation works, including the new sprinkler system and the rural water supply works. Assurances were obtained that the firm would be appointed on terms and condition acceptable to IDA and that JVC and NRA would second local engineers and other staff to work with the firm, who would provide in service training to them. Proposed terms of reference and manpower requirements are given in Annex 11.

Liaison and Advisory Committee

5.05 Since many government agencies would be involved in project execution, strong liaison among these agencies and JVC is essential. Such liaison, in addition to avoiding bureaucratic delays, duplication of effort and inter-agency friction, will ensure the availability of competent professional advice for all project components and will impart a feeling of active participation to the representatives of the executing agencies. A Liaison and Advisory Committee (LAC) has been formed under the chairmanship of the President of JVC. Its membership consists of senior representatives of all agencies concerned. The Director of Administration of JVC is its secretary. The membership of LAC is indicated in Chart 8371. LAC will meet at least every 3 months to assign work priorities, coordinate project activities among the executing agencies, and resolve difficulties. Assurances were obtained that membership of LAC and its Terms of Reference would not be changed without IDA's consultation.

Farmers' Association

5.06 JVC would establish a Farmers' Association (FA) for the whole Valley with branches in each of its 3 subdivisions - one branch would serve the project area. The proposed draft of a law for establishing FA has been approved by the Council of Ministers. Each farmer, whether an owner, share-cropper or lessee, would be a member with the right to vote for FA's Executive Board. FA would assist the farmers in obtaining credits, inputs and other services, as well as in marketing their produce. In the provision of these services FA would operate to ensure an open competitive supply of inputs at the lowest possible prices - through lowest bids on bulk supplies, etc. - and open and competitive auctioning of produce to obtain the highest possible

prices for member farmers. It would not, however, engage itself in commercial activities providing these services on a monopoly basis. Enactment of a law establishing FA on these lines and election of its Executive Board would be a condition of effectiveness.

Credit

5.07 The Agricultural Credit Corporation (ACC) is the only public institution which extends seasonal and medium-term credit for agriculture on a countrywide basis. In 1973, ACC's total loans outstanding amounted to JD 4.7 million. Its loans in the North Ghor area alone amounted to JD 347,532 in 1972. The Jordan Cooperative Organization (JCO) plays a limited role. In 1972, its total loans for all of Jordan, for all purposes, amounted to JD 343,507. In the past, it has not demonstrated a strong interest in agricultural production or marketing operations. ACC meets only a fraction of the total demand for seasonal credit requirements. Its lending rate is 8% per annum for seasonal loans which is reduced to 7% for borrowers who repay on time. For medium-term credit the interest rate is 6% per annum with no concession for timely repayment. ACC's lending rates and procedures have evolved from its dealings with IDA and are satisfactory. ACC is short of funds and plans to request a third credit from the Association; the first 2 IDA credits of US\$6.0 million were obtained before 1968. The project cost estimate (JD 800,000 for credit) includes full credit requirements for both seasonal and medium-term loans for the project farmers, who would contribute 20%. Of the balance, to be advanced by ACC, 38% would be met from IDA credit and the remaining 62% would be put up by Government. The financial needs of project farmers would be assessed by the local staff of ACC, with the assistance of the extension service and local representatives of FA. The assessment list would be forwarded to the nearest branch of ACC, which would give credit up to 80% of the indicated amount to the farmers. ACC would inform AMO of the amount loaned to each farmer and AMO would recover the seasonal credits together with due instalments of medium-term credit at the primary markets where all project farmers would be obligated to sell their produce as members of FA. Seasonal credit extends for one year or less. Medium-term credit for 1 to 7 years and long-term credit 8 years or longer. Mobile sprinkler equipment would be financed with 7 year loans from ACC. These loans and other intermediate and long-term loans would be undertaken by land owners and the equipment provided to sharecroppers or tenants unless the latter have long term leases.

5.08 A subsidiary loan agreement would provide that Government will lend to ACC, through JVC, the full amount of the project's credit component including contingencies, less farmers contribution of 20% or JD 852,000 (US\$2,650,000), (of which 38% would be met from IDA credit). ACC will lend to project farmers at its prevailing rates of 8% for seasonal loans, with 1% refunded for timely repayment and 6% for medium-term loans. Although commercial credit terms are undoubtedly higher, they are obscured by commission agent practices and it would be impractical to have project credit funds lent at rates which were out of line with other ACC rates. Since the IDA credit component is relatively small (38%), it is not likely that Government could be convinced to raise its interest rates on the 62% of credit funds it provides. Furthermore,

higher rates for project loans would create an arbitrarily high interest rate for project loans compared with other ACC loans. The present ACC practice of rebating 1% of the 8% rate charged for seasonal loans when repaid on time is a desirable practice in Jordan where loan repayment experience has not been good. Project credit operations will be accounted for separately from other ACC operations. With improved collection through AMO initially and FA eventually, the project will assist ACC in improving its collection record, a major objective of the Bank. The last IDA credit (1967) required Government to lend to ACC at 3-1/4% which ACC on-lent to farmers at 5-1/2 to 6%. Since half of the project loans would be on-lent at 7 or 8% and the remainder at 6%, and collection improved, Government can lend funds for project loans to ACC at 4-1/4% and still allow ACC an adequate margin. Assurances were obtained that ACC would maintain separate accounts for project credit operations, lend project funds to project farmers for the purposes stipulated and that Government would lend project funds, through JVC to ACC, at an interest of not less than 4-1/4% to be repaid over a period of 15 years for on-lending to project farmers at not less than prevailing ACC rates.

Marketing

5.09 At present marketing of produce is handled by commission agents. Part of the produce goes through the Amman and Irbid wholesale markets and part is exported by road to neighboring countries. There are no assembly markets in the project area and much produce moves into and through the area from the West Bank. The current practice is disadvantageous for small farmers. To ensure favorable prices to farmers the project would require that all project produce pass through the assembly markets. The project would provide two assembly markets and staff to operate them. AMO would provide market intelligence and guidance in field preparation of produce for marketing. It would also supervise the two assembly markets and manage the two existing packing and grading stations refurbished under the project. For providing the marketing facilities, which include premises, accounting, lighting, security, cleanliness, operating staff, weighing, etc., AMO would charge a fee of 1% of the gross value of the produce sold in the markets. The Amman wholesale market currently provides similar services at a fee of 2% which generates an income well in excess of costs. A fee of 5% would be charged by packing and grading stations, which would include the costs of packing materials. This produce, 12,000 tons per year, would bring much higher prices than ungraded and unpacked produce in the assembly markets. By the early 1980's, the proposed level of fees would cover full operation and maintenance costs and leave a margin for the operating agency. During the early years of the project, however, the quantity of produce marketed and the amount of resulting fees would be small, and therefore a part of the operational costs would be met from project funds. AMO would transfer the packing and grading stations and the assembly markets to FA (para 5.03) as soon as FA staff had been trained. In order to accelerate this transfer an evaluation committee has already been established. Assurances were obtained that collection of market fees would be levied from the first year of operation of such facilities and that IDA would be consulted before the marketing facilities are transferred to FA. Details of costs of physical facilities for markets and stations and staff are in Annex 4.

5.10 During the first three years of the project, expatriate specialists in grading, marketing and accounting would be provided for 36 man months to assist AMO and to train FA personnel in the relevant fields of activity. Assurances to that effect were obtained.

Agricultural Extension, Research and Training

5.11 Extension services are provided by the Research and Extension Department of the Ministry of Agriculture. At present, only 2 extension agents graduated from secondary schools are allocated to the project area. These would be increased to 8 under the project and would be provided with transport and demonstration material. New Agents would be university graduates. The extension service would be supported by the research stations located in the Valley at Wadi Yabis and Deir Alla. A complete outline of the staff and equipment required is given in Annex 1, Table 3.

5.12 Agricultural research is also the responsibility of the Department of Research and Extension of the Ministry of Agriculture. The main experimental station in the Valley at Deir Alla does not fully reflect the agronomic conditions of the project area. A research substation, at Wadi Yabis, at the southern boundary of the project area, is more representative of conditions in the project area. It would be provided with additional equipment and staff under the project. At present it has 1 agronomist and 4 research assistants, but under the project these would be increased to 4 agronomists and 9 research assistants. The additional equipment would include transport vehicles, tractors and other farm machinery and laboratory facilities. The training program would emphasize refresher courses for staff and short courses for farmers. At present, some facilities for training exist at Deir Alla under the UNDP project. In order to fully equip a vocational training center at Wadi Yabis, the project would provide two lecture halls, a workshop and equipment. These expanded facilities would serve the whole Valley. Assurances were obtained that adequate staff and equipment and facilities for extension and research would be provided.

Accounts and Audit

5.13 Separate accounts would be kept by JVC and other Government agencies for all expenditures related to the project, and such accounts would be audited annually by independent auditors acceptable to IDA. The audited accounts would be submitted to IDA every year within 4 months after the close of the Jordanian fiscal year. Assurances were obtained to this effect.

Recovery of Project Costs

5.14 At present, Government recovers a part of the costs of irrigation projects constructed with public funds through a charge on an area basis. The amount varies by crop depending on water requirements. Such recoveries until recently have been 1 fil/m³ up to 18,000 m³/ha/year and 2 fils/m³ for quantities exceeding that limit. These charges did not fully cover operation and maintenance costs, let alone investment costs. The Government has raised its water charges to farmers from 1 fil/m³ to 3 fils/m³ in February 1974 and has decided to gradually raise them to 6 fils/m³.

5.15 This new level of charges would cover operation and maintenance costs and all direct investments chargeable to the project at 5% interest per year. In order to measure the subsidy element, the full project cost as well as all project revenues were discounted at 10% over 40 years. The calculation shows that the present value of the Government subsidy to the beneficiaries amounts to JD 2.5 million (US\$7.75 million) or 40% of the costs. The recovery rate as proposed is considered reasonable to assure adequate incentives for farmers to increase production. Assurances were obtained that the Government, commencing with the first year of irrigation in the sprinkler-irrigated areas and by not later than the third year in the gravity irrigated areas receiving project services, would recover a water charge of not less than 6 fils/m³. These charges would be collected by AMO on behalf of NRA and transferred to the Treasury. Assurances were also obtained that these charges would be periodically reviewed to ensure recovery of full operation and maintenance costs and 60% of the investment costs with 10% interest over the project life.

VI. ECONOMIC EVALUATION

Production

6.01 Without the project, yields on the currently irrigated project area (6,660 ha) are expected to increase at 2% annually for the next five years (1974-78), beyond which no further improvements due to application of known technology are expected. No possibility for yield improvement is foreseen in the 1,040 ha presently unirrigated.

6.02 After the project, production in the project area (7,700 ha) would be doubled; on 4,940 ha of the presently irrigated area due to land leveling, improved water distribution and drainage, on the remaining 1,000 ha of already irrigated area due to conversion to sprinkler irrigation, and on 1,760 ha due to conversion of Wadi irrigated and rainfed area into sprinkler irrigation. With the project the present cropping intensity of 99% (106% on the irrigated area and 50% on the unirrigated area) would increase to 120%. Greater use of technology through improved extension service, credit and marketing facilities would support development.

6.03 At present, conditioned by scanty rainfall, only cereal crops are grown in the unirrigated area and their yields are low. In the irrigated area, intensity of irrigation and yields are low because of poor land leveling and lack of drainage. Farmers have made only simple, on-farm adjustments, such as zig-zag furrows, which consume much labor and limit development of cropping intensity. With the project, these constraints would be removed (Annex 1). At full production in 1983, the project's cropping pattern and incremental production would be as follows:

<u>Crop</u>	<u>Cropped Area</u>		<u>Production</u>		
	<u>Without</u> <u>Project</u> <u>-----ha-----</u>	<u>With</u> <u>Project</u> <u>-----ha-----</u>	<u>Without</u> <u>Project</u> <u>-----tons-----</u>	<u>With</u> <u>Project</u> <u>-----tons-----</u>	<u>Incremental</u>
Citrus	1,150	1,150	19,550	32,200	12,650
Bananas	350	350	5,250	7,700	2,450
Early Tomatoes	890	1,380	15,130	34,500	19,370
Late Tomatoes	810	440	13,770	11,000	-2,770
Early Eggplant/Pepper	320	590	4,800	13,570	8,770
Late Eggplant/Pepper	1,370	1,320	20,550	30,360	9,810
Early Cucumber/Squash	460	490	4,600	9,800	5,200
Late Cucumber/Squash	240	370	2,400	7,400	5,000
Other Vegetables	920	<u>/a</u> 990	<u>/b</u> 11,040	22,770	11,730
Onions		<u>/c</u> 380		6,460	6,460
Beans		<u>/c</u> 380		5,700	5,700
Maize	70	960	280	7,680	7,400
Wheat (irrigated)	500	400	1,250	1,400	150
Wheat (dry)	<u>520</u>	<u>-</u>	<u>780</u>	<u>-</u>	<u>-780</u>
	7,600	9,200	99,400	190,540	91,140

/a Potatoes, cabbage, cauliflower, beans, onions.

/b Excludes onions and beans.

/c Included in other vegetables.

Market Prospects

6.04 Cereals. The project area at present produces a small quantity of cereals, mostly wheat, in the rainfed area. With the project, wheat production will decline from 2,000 tons to 1,400 tons, while maize production will rise from 280 tons to 7,680 tons. Increased maize production would more than offset reduced wheat production, yet cereal production in the project area would have little effect on Jordan's large cereal import deficit. Total cereal production in Jordan is about 210,000 tons annually and imports average 175,000 tons. Domestic demand, much of it in the project area, would consume the increased output of cereals from the project area.

6.05 Vegetables. Vegetable production in Jordan is about 280,000 tons, of which about 200,000 tons is produced in the Ghor Valley and 78,000 tons in the project area. Tomatoes (about 150,000 tons) dominate, with eggplant (35,000 tons) and cauliflower (15,000 tons) second and third. Jordan exports 60,000 to 80,000 tons of vegetables yearly, mostly tomatoes and eggplant. About 20,000 tons of vegetables, mostly onions, potatoes and dry broad beans are imported. Vegetable production in the project area would rise from its present level of 78,000 tons to about 140,000 tons gross by 1983. Because of the overall limits on agricultural production in Jordan, despite good possibilities in the Ghor, the rapid rate of population growth (3.5%) and high per capita consumption of vegetables (144 kg/year) much of the incremental production will be consumed in the domestic market. Vegetable consumption

is projected under modest assumptions to grow from its present level of about 185,000 tons to between 231,000 and 260,000 tons by 1980, 270,000 to 320,000 tons by 1985, and 370,000 to 450,000 tons by 1995. Thus by 1983, when the project would be in full production, an additional 62,000 tons gross or about 55,000 tons net (deducting 10% for waste and 1,400 tons for local consumption) would be available, while the domestic market for vegetables would have grown by about 80,000 to 100,000 tons. Part of the domestic market would be supplied by production of other parts of the Valley.

6.06 The export market for vegetables would continue to be influenced by strong competition among neighboring producers. Political disruptions and import policies of neighboring countries are likely to result in temporary closure of markets like that of Syria (and consequently Lebanon) in 1972. The advantage of the Ghor area lies in its ability to meet winter and early spring demand. This advantage would be improved by the project which would produce large quantities of vegetables in October-November and January-May. The organized marketing and emphasis on quality in the project, combined with proper grading and packing for export markets, would greatly improve the project's competitive position in domestic and export markets. About one-third of the project produce would be exported.

6.07 Fruits. Present fruit production in Jordan is about 136,000 tons and consumption is about 125,000 tons. Consumption is expected to rise to 156-206,000 tons by 1980; 182,000-240,000 tons by 1985, and 250,000-330,000 tons by 1995. The project's incremental citrus and banana production would be 12,650 tons and 2,450 tons respectively. Domestic increases in consumption would thus provide a local market for these modest increases. However, as in the case of vegetables, timing is favorable in export competition but low quality has been a handicap to Jordan in foreign markets. The project would increase output substantially in October-December and slightly in January-March. With the project marketing organization, which would stress initial field sorting and then grading and packing, the competitive position of project production in domestic and export markets should considerably improve.

Prices

6.08 One set of prices has been used for both financial and economic analysis of the project. Prices have been derived from those prevailing in the Amman wholesale market in recent years (1968-73) with deduction for commission charges, market fees, transport expenses and packaging costs appropriate to the project area and its distances from Amman. Adjustments have been made for inflation and seasonal and annual instability in fruit and vegetable prices. The method of deriving the prices is explained in Annex 13 and the actual prices used are given in Table 3, Annex 13. Import duties on agriculture commodities and on production requisites and subsidies on certain inputs are not explicitly incorporated because: (i) although there is a nominal import duty of 20% on bananas and 11% on citrus, it is not evident that these duties are consistently collected nor is it clear how they might influence Jordanian prices because of the inflow of citrus from the West Bank,

which is regarded both as imported and locally produced; (ii) Government subsidies are generally negligible, and since most fertilizer, seeds, pesticides and other inputs are traded through private agencies in a competitive market, the influence of subsidies on farm level prices is negligible. We have assumed, therefore, that duties and subsidies offset each other. Prices for the highly perishable produce of the project area can be expected to be influenced primarily by domestic and neighboring market demand and supply conditions and by the project areas ability to improve its competitive position in these markets. Global price trends are likely to be much less influential.

Farmers' Income

6.09 Farm budgets for typical vegetable, fruit and vegetable and citrus farms, of 3, 4 and 15 ha both owner-operated and sharecropped, are presented in Annex 14. Farmers' income has been calculated at current average farm-gate prices, with adjustments for seasonal fluctuations and inflation (Annex 13). Production costs include all inputs, valued at current average prices, and take into account family and hired labor and machinery required by different farms, owner-operated or sharecropped. Family and hired labor have been costed at JD .75 and JD 1.0 per day. The cost of establishing orchards for the pre-fruit yielding years, including cost of water and irrigation equipment, has been annualized at 10% per year. Interest on working capital has been taken into account, at 10% per annum for 12 months for perennial crops and for 6 months for seasonal crops. Also included in costs is a JD 1/ha tax on agricultural land. Project charges after the project have been levied at 6 fils per m³ of water used. Based on these assumptions and after payment of project charges the incremental income from 3 ha vegetable farms, 3 ha fruit and vegetable farms and 4 ha citrus farms is estimated at JD 496-566, 427-468 and 734. On large 15 ha farms which only represent about 1% of the project area, the incremental income is estimated at JD 3,040-3,189 on fruit and vegetable farms and JD 2,091 on citrus farms. The range of incomes for certain types reflects the differences in gravity and sprinkler costs. Based on a family size of 5.7 persons the income per capita of sharecroppers would increase from JD 54 to JD 97-106 on vegetable farms and from JD 86 to JD 124-127 on fruit and vegetable farms. If owner operated the per capita income from these farms would increase from JD 118 to 217 and JD 180 to 267 respectively. This compares with an average national per capita income of JD 82 at present and JD 96 projected for 1983. The project charges would range between 17% and 36% of the incremental income for 3 ha and 15 ha farms respectively.

Economic Benefits

6.10 The major quantifiable economic benefit is the significant increase in the production of high value fruits and vegetables which would result in: (a) additional foreign exchange earnings valued at US\$6.0 million per year. (b) increased domestic supplies of fruits and vegetables; and (c) improved incomes for about 1,700 farm families.

6.11 The annual net value of production would rise from JD 1,760,000 which it would have reached and stabilized at in 1978 without the project, to 3,762,000 by 1983, an incremental benefit of about JD 2.0 million.

6.12 The project includes a social development component accounting for 20% of project costs. While the social development component does not generate quantifiable benefits, it makes a substantial improvement in the lives of project area residents, most of whom are small farmers. These benefits would be in the form of 150 new classrooms, three new health centers and an extension of an existing one, domestic water supply, community centers and institutional improvements.

Economic Return

6.13 The project's rate of return, costing hired labor at the market rate of JD 1 and family labor at JD 0.75 per day is estimated at 24%. Sensitivity tests show that a 25% increase in costs would reduce the rate of return to 18.9% and a 25% decrease in benefits would reduce it to 17.9%. With both a 25% decrease in benefits and 25% increase on costs, the rate of return would still be 14.5. If the social development component is also excluded, the rate of return would be 29%. Details of the economic analysis are presented in Annex 15.

6.14 Three factors have favorably influenced the economic rate of return. First the project makes improvements in the already irrigated area which require relatively low incremental investment costs to unlock the productivity potential of an existing irrigation system. Second, the presently unirrigated area can be served by a gravity-powered sprinkler system thereby avoiding expensive operational costs. Third, the project strengthens the extension, transportation, credit and marketing services which are weak at present.

Employment

6.15 The project is expected to increase direct employment from the present 1.8 million man-days to 2.3 million man-days at full development. In addition it would generate employment in the supply of inputs and grading, packing, processing and marketing of project produce, estimated at about 100,000 mandays per year.

VII. AGREEMENTS REACHED AND RECOMMENDATION

Agreements Reached

7.01 Agreement was reached on the following main points:

- (a) The operational responsibility of grading and packing stations located in North Shuneh and Wadi Yabis would be transferred before September 30, 1974 to the Agricultural Marketing Organization, and AMO would, in consultation with IDA, transfer

the operating and managing responsibility of assembly markets and packing and grading stations to the Farmers Association as soon as the latter's staff has been trained (paras. 4.11, 5.03, 5.09).

- (b) Following project completion, the Education and Health Departments would provide adequate staff for efficient operation and supervision of the education and health facilities, including monitoring for malaria (paras. 4.33, 5.03).
- (c) JVC would retain a firm of Consultants to design and supervise the construction of project irrigation and water supply works. The firm would be employed in consultation with and on terms and conditions acceptable to IDA. JVC and NRA would second counterpart staff to work with consultants for in-service training. Expatriate specialists in grading and marketing and accounting would be employed to assist AMO and to train FA in the relevant fields of activity (paras. 5.04, 5.10).
- (d) The membership of the Liaison and Advisory Committee and its Terms of Reference would not be changed without IDA's concurrence (para. 5.05).
- (e) The Agricultural Credit Corporation would (i) obtain project credit funds from Government through JVC at not less than 4-1/4% to be repaid over a period of 15 years. The lending rate to project farmers would not be less than 8% for seasonal loans with 1% rebate for repayment on time, and 6% for medium-term and long-term loans and (ii) maintain separate accounts for project credit operations (para. 5.08).
- (f) The Government, commencing with the first year of irrigation in the sprinkler-irrigated area and by not later than the third year in the gravity-served areas, would recover a water charge of not less than 6 fils/m³ which would be reviewed periodically to ensure recovery of (i) full operation and maintenance costs annually and (ii) entire investment costs with 5% interest over the project life of 40 years (para. 5.15).

Condition for Effectiveness

7.02 Enactment of law establishing Farmers Association and election of its Executive Board would be a condition of credit effectiveness (para. 5.06).

7.03 With the aforementioned agreement and fulfillment of condition of effectiveness, the Project constitutes a suitable basis for a credit of US\$7.5 million to be repaid over 50 years including 10 years grace. The borrower would be the Government of the Hashemite Kingdom of Jordan.

May 10, 1974

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTAgricultureGeneral

1. Out of a total of 350,000 ha of arable land in Jordan only 25,000 ha are irrigated. The Jordan valley and its side Wadis cover 76% of all irrigated lands. There are no possibilities to expand the cultivated area under rainfed condition. Agricultural production can be increased significantly by irrigating dry lands mainly in the Jordan valley and to a limited extent in the desert. Water is the limiting factor in Jordan and agricultural development should envisage more efficient use of water resources. The North East Ghor Irrigation and Rural Development Project aims at improved water use efficiency and extended irrigation. It would include 7700 ha presently irrigated by the East Ghor canal, the side Wadis or dry farmed (Table 1). It would extend over 32 km from the Yarmouk river in the north to Wadis Yabis in the South with its width varying between two and four kilometers. The altitude decreases from -192 m in the north to about -230 m in the south.

Climate

2. The climate of the project area is predominantly mediterranean with local modifications resulting mainly from topography. The summers are dry and hot while the winters are only moderately cool and wet. Precipitation occurs in the winter months. Prevailing winds are from west and southwest but periodically shift to the east and north. Relative humidity varies between 50% and 70%. (Table 2)

3. Average monthly precipitation decreases from 380 mm in Adassiya to about 300 mm per year at Wadi Yabis. Total rainfall shows a strong variation from year to year ranging from 218 to 470 mm per year in a 15 year period. The dry period may extend to 6 months but even during the rainy season supplementary irrigation is required for most crops grown in the area.

Soils and Topography

4. The soils in the Jordan valley were initially formed by lacustrine marl sediments. This parent material was deposited when a lake covered the valley during the early quaternary. As the lake retreated to the Dead Sea, the Jordan river cut through forming its own flood plain and alluvial material was deposited originating the Zor in the valley. The Ghor terraces were covered with fluvial colluvial sediments which originated from the bordering uplands.

5. The slopes of the project area towards the Jordan River vary from 0.2 to 1% in the Zor, from 1 to 3% in the lower Ghor and from 2 to 5% in the upper Ghor. The general slope north south is about 1%. About 30% of the project area because of topography would require sprinkler irrigation. Most of this land is concentrated in the Upper Ghor adjacent to the East Ghor canal.

6. In 1953/54 the Baker/Harza Company carried out a detailed survey, resulting in a land classification for irrigated agriculture according to the Standards of the Bureau of Reclamation, USA. In 1964/65 the Institute of Pedology and Technology, Zagreb made a special salinity and alkalinity survey of the soils in the valley. These surveys together with supplementary information provided by Dar-Al Handassah Consulting Engineers, Beirut and Netherland Engineering Consultants (Nedeco), the Hague, adequately picture the soil potential indicating their suitability for growing a variety of crops. Soil depth varies from 90 cm to several meters and most of the soils have moderately fine textures.

7. Drainage problems only occur in isolated spots affecting a total of about 725 ha. These areas require subsurface drainage for full development, which is already being provided for 200 ha.

Present Land Use and Yields

8. Out of 7700 ha only 6660 are irrigated and 1040 dry farmed. The present overall cropping intensity is 99%. On irrigated land the cropping intensity is about 106% and on dry land where wheat and fallow is interchanged the intensity averages about 50%. The cropped area totals 7600 ha per year and present yields and production levels are given below. Vegetables have been classified in early vegetables which are harvested between January and June and obtain better average prices and late vegetables which are harvested between July and December.

<u>Crop</u>	<u>Net %</u>	<u>Area Ha</u>	<u>Average Yield Production</u>	
			<u>t/ha</u>	<u>t</u>
Citrus	15.1	1,150	17	19,550
Banana	4.6	350	15	5,250
Early Tomatoes	17.7	890	17	15,130
Late Tomatoes	10.7	810	17	13,770
Early Eggplant/Pepper	4.2	320	15	4,800
Late Eggplant/Pepper	18.0	1,370	15	20,550
Early Cucumber/Squash	6.1	460	10	4,600
Late Cucumber/Squash	3.2	240	10	2,400
Other Vegetables /1	12.1	920	12	11,040
Maize	0.9	70	4	280
Wheat irrig.	6.6	500	2.5	1,250
Wheat dry	6.8	520	1.5	780
Total		7,600		99,400

/1 Potatoes, cabbage, cauliflower, beans, onions.

9. Present yields of vegetables and field crops are low because of in-availability of suitable varieties, inefficient fertilization, plant protection measures and irrigation. Water is applied by wild flooding in cereals and by zig-zag furrows in row crops. The zig-zag furrow method is labor consuming and does not permit the use of machinery. As the farmer cannot provide the required labor input, fields are invaded by weeds which compete for water and nutrients and favor the spreading of pests and diseases. Citrus production is presently affected by improper timing of irrigation, lack of hedging, pests and diseases and deficiencies of minor elements. High temperatures and hot dry winds cause deficiencies in fruit setting and have a negative effect on yields. Banana yields are affected by frosts, cold weather and nematodes.

Future Cultivation

10. With the project a net area of 7700 ha will be irrigated. The water application efficiency will be improved by land leveling and introduction of sprinkler irrigation. This will permit the use of straight furrows for row crops and borders for cereals. For cultivation operations machinery will be used which will properly time operations and better weed control and plant protection measures. With adequate supporting services, use of good seeds, correct amounts and types of fertilizers, timed applications of insecticides and pesticides and improved irrigation methods, yields will increase as shown below. Projection have taken into account eventual damages due to frosts and low average temperatures. The cropping intensity will increase to 120% with maize, squash and cucumber as main second crops. Growing conditions for maize are very favorable as long as planted in early February or July to avoid pollination in the hottest months. The area planted with solanaceas will be reduced from about 55% to 45% in order to permit a better control of nematodes.

11. Citrus yields are expected to increase to 28 ton/ha mainly as a result of better plant protection, timed irrigation and hedging. Banana yield will increase due to better adapted varieties, improved water availability and plant protection. Due to adverse low temperatures and occasional frosts in the winter, yields will not be above 22 ton/ha. The expansion of orchards areas is not envisaged. In addition to climatic constraints fruit trees are grown under licenses and no new planting will be permitted as long as there are areas short of water that can be successfully irrigated from the same system in the valley.

Crop	Net Area		Yield t/ha	Production t
	Ha	%		
Citrus	1,150	12.5	28	32,200
Banana	350	3.8	22	7,700
Early Tomatoes	1,380	15.0	25	34,500
Late Tomatoes	440	4.8	25	11,000
Early Eggplants/Pepper	590	6.4	23	13,570
Late Eggplant/Pepper	1,320	14.3	23	30,360
Early Cucumber/Squash	490	5.3	20	9,800
Late Cucumber/Squash	370	4.0	20	7,400
Onion	380	4.1	17	6,460
Beans	380	4.1	15	5,700
Other vegetables /1	990	10.8	23	22,770
Maize /2	960	10.4	8	7,680
Wheat	400	4.3	3.5	1,400
	9,200			190,540

- /1 Early Potatoes 140 ha
Late Potatoes 320 ha
Cauliflower 250 ha
Cabbage 250 ha

- /2 240 ha planted in February, 720 planted in July.

Agricultural Research

12. Agricultural Research in the project area was interrupted during the Middle East crisis. A new research program has been started by the Ministry of Agriculture, Department of Research and Extension for the Jordan Valley. The project will support this program, whose main objectives are increase of yields, reduction of production costs and production of quantities and qualities which satisfy the marketing demands. The main experimental station at Deir Alla does not represent the ecological conditions of the project area. Therefore its substation at Wadi Yabis will be equipped and staffed. The staff will be increased to 4 Agronomists specialized in horticulture, fruticulture, field crops and plant protection, and 9 assistants (Table 3). All research work will be coordinated with the extension service and other related institutions active in the valley.

13. The research program should include the following:

- (1) Introduction of new varieties, testing of their production potential, disease resistance, cold resistance, shipping and processing quality and marketability.
- (2) Studies on time of planting in order to provide adequate information for sound rotations and a cropping sequence to coincide with the various market demands.

- (3) Studies on method of planting, optimum plant density and spacing.
- (4) Fertilizer trials to establish optimum rates and to develop sound criteria for fertilizer recommendations based on soil analysis.
- (5) Water requirement trials.
- (6) Study of production of off-season crops under plastic tunnels.
- (7) Production-processing studies to improve the processing of vegetable crops.
- (8) Introduction of new potential crops to be grown in the area.

With respect to plant protection the station should be capable to identify infected or infested plant specimens and to recommend control measures. Research activities should include biological studies of insects, diseases and nematodes, screening of varieties for disease and nematode resistance, testing of chemicals to control insects diseases, nematodes and weeds.

14. The current practice of seed multiplication on the experimental farms and on private farms under close supervision of the research staff will be continued. The Department of Research and Extension will sell the seeds against cash or credit.

Agricultural Extension

15. The Ministry of Agriculture, Department of Research and Extension is responsible for agricultural extension in Jordan. With the project the service will be improved by staffing, equipment and transportation facilities. The extension work in the Jordan valley is coordinated by an Extension Superintendent stationed in Deir Alla. For the project area a Supervisor would be stationed in North Shuneh. The present staff of three agents all graduates from agricultural schools would be increased to nine and the new recruits would be university graduates. Their work would be backed by technical advise of five subject matter specialists, which would be available on a part time basis. They will be specialists in fieldcrops, vegetables, fruit trees, plant protection and soils-irrigation. The extension offices would be located in the community centers to be build under the project and make use of the facilities available at the experimental station in Wadi Yabis and at the Vocational School. A complete list of the staffing, equipment and transportation provided under the project is shown in Table 3.

Vocational Training Center

16. The Government plans to establish a Vocational Training Center in the valley. The program consists (a) training of young farmers in a two-year fulltime course in different agricultural activities, and (b) training of

farmers including owners, sharecroppers and farm labor in short practical courses to be programmed in accordance to the necessities and nature of the agricultural circumstances in the area. The project would benefit mainly from the second objective and therefore includes classrooms, workshops and equipment for the training center to be established at Wadi Yabis (Table 4). It is assumed that professionals of different relevant institutions will participate in the preparation and implementation of the courses.

FAO Training Program

17. UNDP with FAO as executing agency is carrying out an assistance program for agricultural field research and extension services. The project started in December 1, 1972 and has a duration of five years. This project contributes to the agricultural development process of the project area. Its main objective is to strengthen the capacities of the Department of Research and Extension, to plan and conduct applied research and assist the extension services and to train staff in development activities. Strengthening of these capacities will increase the departments abilities to respond to the demand of better agricultural advise and service in the project area. UNDP inputs include three permanent foreign advisors, (research and extension programming expert, research specialist, extension expert), plus short-term consultants. In view of this assistance, no further foreign expertise would be provided under the project to support the agricultural services.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Project Areas

	<u>Present Situation</u>				<u>With Project</u>			
	<u>Gravity Irr.</u>	<u>Sprinkler Irr.</u>	<u>Dry Land</u>	<u>Total</u>	<u>Gravity Irr.</u>	<u>Sprinkler Irr.</u>	<u>Dry Land</u>	<u>Total</u>
	ha	ha	ha	ha	ha	ha	ha	ha
Irrigated:								
Above EGC	720	-	-	720	-	1,760	-	1,760
Below EGC	5,940	-	-	5,940	4,940	1,000	-	5,940
Dry Farmed	-	-	1,040	1,040	-	-	-	-
 Total	 6,660		1,040	7,700	4,940	2,760		7,700

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Monthly Average Climatic Data /1

Month	Mean Extreme Temperature		North Shuneh (32036'N)				Sunshine	Wind Speed	Evaporation
	Temperature		Mean Monthly	Rainfall	Humidity	Hours	km/hour /3	(Pan)	
	oC	oC	Temperature	mm	%	%/2	mm /4		
	High	Low	oC						
January	23.8	5.3	14.4	79.3	69	54	7.5	60	
February	26.0	5.2	15.5	60.0	67	64	8.0	70	
March	30.4	5.6	17.7	48.2	64	62	7.0	97	
April	38.7	9.2	21.3	16.8	56	66	6.3	186	
May	42.1	11.3	25.5	7.8	51	75	5.5	252	
June	43.8	17.6	28.6	-	51	88	3.9	318	
July	41.5	20.0	30.5	-	55	89	3.7	319	
August	41.8	20.8	31.3	-	59	90	6.0	276	
September	40.9	18.3	29.3	-	57	81	8.1	208	
October	39.7	15.2	26.6	11.7	54	79	7.4	174	
November	33.9	10.4	21.7	49.1	52	70	10.7	138	
December	28.6	6.9	16.7	86.2	66	57	11.9	81	
Annual Mean	35.9	12.2	23.3	-	58	73	7.2	-	
Annual Total	-	-	-	359.1	-	-	-	2,179	

- /1 Average 1951-67
 /2 Average ratio of actual to possible hours of sunshine
 /3 Measured at Deir Alla
 /4 1965-1967

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Research and Extension

	<u>JD</u>	<u>SUB-TOTAL</u>	<u>TOTAL</u>
<u>I. RESEARCH</u>			
<u>1. Staff</u>			
3 Agronomists (JD 1200X3 years X 3)	10,800		
5 Assistants (JD 600X3 years X 5)	9,000		
12 Labor (Spec.)(JD 300X3 yearsX12)	10,800		
1 Administrative employees (JD 600 X 3 years)	1,800		
2 Drivers (JD 360X3 years X2)	2,160		
10% Allowances	3,440	38,000	
<u>2. Transport</u>			
2 Pick ups	3,500	3,500	
<u>3. Materials and Supplies</u>			
Pesticides and Chemicals	2,000		
Seeds and Fertilizers	1,000		
Others	1,000	4,000	
<u>4. Machinery and Equipment</u>			
Furniture	100		
Machinery			
1 Tractor 80 HP	3,000		
Equipped with:			
Rotary Plow	450		
Mold Board Plow	300		
Disc Plow	300		
Chisel Plow	200		
Disc Harrow	300		
Spring Tooth Harrow	200		
Ridger	250		
1 Tractor 25-35 HP with Tool Bars front and rear plus implements	2,500		
2 Small Rototillers	400		
1 4 Row planter for direct seeding of small vegetables	250		
2 planet Jr one Seeder Unit	100		
1 Fertilizer applicator for band placement	300		
1 Boom Sprayer (Pesticides)	300		
4 Napsak Sprayer	400		
2 Mist blower Napsack	100		
1 Field Sprayer Herbicides	150	9,600	55,100

	<u>JD</u>	<u>JD</u> <u>SUB-TOTAL</u>	<u>JD</u> <u>TOTAL</u>
5. <u>Laboratory</u>			
1 Set insect collecting instruments	150		
2 Insect collecting cabinets	50		
2 Disecting instrument sets	30		
1 Water destiller	50		
1 Pan Lab. scale (250 Jr)	30		
1 Grocers scale (10 Jr)	100		
1 Research sterobinocular	150		
1 Drying oven	150		
1 Incubator	70		
1 Refrigerator 9 Jr	70		
1 Small centrifuge	50		
1 Sieve Set	150		
1 Fume Hood	250		
Various	300		
Furniture	400	2,000	
TOTAL RESEARCH			<u>57,100</u>
<u>II. EXTENSION</u>			
1. <u>Staff</u>			
6 Agents, Salary (JD 720X3 years X 6)	12,960		
1 Extension supervisor, (JD 840 X 3 years)	2,520		
Subject Matter Specialist			
5 Experts for the whole valley project 1/3, (salary 1,200 JDX3 years 5/3)	6,000		
Extension superintendent, (salary JD 1,200 X 3 years) for whole valley project 1/3	1,200		
2 Drivers (JD 360 X 3 years X 2)	2,160		
5 Drivers subject matter specialists (JD 360 X 3 years X 5/3)	1,800		
10 % Allowance	2,660	29,300	
2. <u>Transport</u>			
2 Pick ups	3,500		
10 Motorcycles	1,700	5,200	
3. <u>Materials</u>			
Agents Outfit - 250 JD/each	2,500		
Fertilizers and pesticides	3,000		
Furniture	1,000		
Others	500	7,000	
TOTAL EXTENSION			<u>47,500</u>
TOTAL RESEARCH & EXTENSION			<u>98,600</u>

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

	<u>Vocational School</u>		
	<u>JD</u>	<u>JD</u>	<u>JD</u>
		<u>SUB-TOTAL</u>	<u>TOTAL</u>
<u>1. Buildings</u>			
2 Lecture Halls	25,000		
Workshop and Store Rooms	25,000	50,000	
<u>2. Vehicles</u>			
1 Bus	3,300		
1 Pick up	1,700	5,000	
<u>3. Machinery and Equipment</u>			
Equipment, Tools and Training			
Material for Workshop	3,000		
1 Tractor 60-80 HP	3,000		
Equiped with :			
Rotary Flow	450		
Mold Board Flow	300		
Disc Flow	300		
Chise Flow	200		
Disc Harrow	300		
Spring Tooth Harrow	200		
Ridger	250		
1 Tractor 25-35 HP with Front and Rear Tool Bars Plus Implements	2,500		
Various Small Machinery and Tools	500	11,000	
<u>4. Staff</u>			
One Training Expert (JD 840 X 3 years)	2,520		
2 Drivers (JD 360 X 3 years X 2)	1,080		
Plus 10% Allowances	360	3,960	<u>69,960</u>

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTLand Tenure and Farm Size

1. The project area of 7,700 ha located along the East Ghor canal is partly irrigated and partly unirrigated as shown below:

Irrigated by canal	59,400 dunums /1
Irrigated by side wadis	7,200 dunums
Unirrigated	<u>10,400</u> dunums
Total	77,000

/1 10 dunums = 1 ha.

2. Jordanian Law (No. 12, 1968) requires that land holdings in government developed irrigation areas cannot be less than 30 dunums of class I and II land and 50 dunums of class III land. The maximum holding in such irrigated areas cannot exceed 200 dunums. There are no size restrictions on unirrigated areas.

3. A social and economic survey of the East Jordan Valley carried out in February/March 1973 indicated that 88% of the holdings in the project area - 85% of the area - are within the range of 30 to 60 dunums. The details of ownership are in Table I, a summary of which is given below:

<u>Size of Holdings</u> (dunums)	<u>Number of</u> <u>holding</u> (No.)	<u>% of Holding</u> (%)	<u>Area /1</u> (dunums)	<u>% of Area</u> (%)
Under 30	52	3	288	0.3
30-40	430	24	13,254	17
40-50	691	39	29,552	38
50-60	446	25	22,438	30
60-80	146	8	9,850	13
Over 80	<u>14</u>	0.8	<u>1,480</u>	2
Total	1,779		76,862	

/1 There is a slight discrepancy between the total area covered by the survey and the project area due to differences in coverage.

The above figures include both irrigated and unirrigated areas, which slightly raises the average size of holding. Data for the irrigated portion of the project area from the National Resource Authority (NRA) land

records show even greater concentration of holdings in the size range between 30 and 50 dunums. According to the NRA land records only 11 holdings reach or are near the 200 dunum maximum.

<u>Size of holding</u> (dunums)	<u>Number of Holdings</u>	<u>%</u>
About 30	347	20.9
30-40	948	57.1
40-50	200	12.1
More than 50	<u>164</u>	<u>9.9</u>
Total	1,659	100

4. About 40% of the holdings in the project area are operated by owners and 60% by sharecroppers or tenants. Complete sharecropping of entire holdings is the dominant form of farm operation in the project area, and is fairly uniformly distributed among holdings of all sizes, with the largest number of sharecroppers (188) and area sharecropped (5,553 dunums) in holdings of from 26-30 dunums. The largest concentration of area is in farm holdings of 101-150 dunums (10,905 dunums), 26 to 30 dunums (8,712 dunums) and 31 to 35 dunums (7,245 dunums) as shown in Table I and summarized below:

	<u>No. of Holdings</u>	<u>%</u>	<u>Area</u> (dunums)	<u>%</u>
Entirely owner-operated	673	39.3	26,794	34.1
Entirely sharecropped	813	47.5	36,223	46.1
Entirely rented for cash	76	4.4	3,222	4.1
Partly owner-operated	151	8.8	12,336	15.7
Area owner-operated			(3,990)	(5.1)
Area sharecropped or rented			<u>(8,346)</u>	<u>(10.9)</u>
	1,713	100	78,575	100

5. When the unirrigated area above the canal is brought under sprinkler irrigation as a result of the project, JVC and NRA have the legal power and NRA has the administrative machinery to acquire the land and reallocate it according to the minimum and maximum limits for irrigated areas. Priority is given to existing land holders and those farming the land presently as was done when the area currently served by the canal was reallocated.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT

Description of Project Works

General

1. The project area, located on the east bank of the Jordan river, is bounded by the Yarmouk river in the north, the foothills of the Jordanian plateau in the east and Wadi Yabis in the south (Map 10746R). The project consists of the following main components:

- (a) Main Works: development of 7,700 ha net, by providing irrigation to a new area of 1,040 ha, improving existing irrigation in the other 6,660 ha and improving technical and supporting services in the project area;
- (b) Minor Works: development of the area by either providing new or improving the existing facilities in respect of drinking water, health, education, transportation and community development.

Agricultural and Rural Development

2. Main Works. The proposed works for providing irrigation to the new area and improving existing irrigation (Map 10746R) are:

- (a) two diversion weirs on Wadis Arab and Jurum;
- (b) primary and secondary pipelines about 55 km long to convey, under adequate pressure created by gravity, the waters of wadis Arab, Ziglab and Jurum to 2,760 ha to be served by sprinkler irrigation;
- (c) a distribution network to convey irrigation supplies from the primary pipeline to field outlets for irrigating 2,760 ha;
- (d) about 30 km of farm roads to serve the area to be irrigated above the East Ghor Canal;
- (e) landleveling in about 3,000 ha currently irrigated by the East Ghor Canal;
- (f) tile drains serving about 520 ha;

- (g) rehabilitation works on East Ghor Canal; and
- (h) assembly of two market centers.

3. Diversion Weirs. The weir on Wadi Arab, and also the weir on Wadi Jurum, would divert the wadi water to a silting reservoir, located adjacent to each weir, where the suspended silt load would be allowed to settle. Clear water would then enter the primary pipeline. The weirs would be so located that adequate pressure would build up in the pipeline by gravity and a pressure of at least 3-1/2 atmospheres would be available at the field outlets. The weirs would be about 15-20 m long and would be founded on solid rock. No weir on silting reservoir would be required on Wadi Ziglab, as the outlet works on the existing storage dam would provide silt-free water to the primary pipeline under adequate pressure.

4. Primary and Secondary Pipelines. The primary and secondary pipelines, about 55 km long, would be aligned along the foothills in the east, generally along the (-) 195 m contour. It would extend from a point 8 km south of Wadi Jurum to about 8 km north of Wadi Arab and would receive the water supply from Wadis Jurum, Ziglab and Arab through three short pipelines conveying water from the diversion weirs (Wadis Arab and Jurum) and the dam (Wadi Ziglab). These pipelines pressurized by gravity due to difference in water elevations, would serve a part of the project area (2,760 ha) by sprinkler irrigation. One or two secondary lines would take off at suitable points and extend westward, across the East Ghor Canal, to serve about 1,000 ha by sprinklers, which lies below the canal. Both the primary and the secondary lines would be of asbestos cement.

5. Distribution Network. The distribution network would consist of buried tertiary pipes, farm outlets and farm mainline pipes. The tertiary pipes would take off directly either from the primary pipeline or, as in the case of East Ghor Canal area, from the secondary pipeline and would be rather short in length as the width of land to be served by sprinkler irrigation mostly varies from 200 m to 1,000 m. The tertiary pipes would be spaced about 450 m apart and would be aligned perpendicular to the natural slope. Depending upon the width of the area, farm outlets, generally in pairs, would be provided on these pipes at a spacing of about 180 m. Each outlet, equipped with a meter, would serve one farm through a farm mainline pipe, which would be buried along the farm boundary, with sprinkler risers provided at every 32 m. The sprinkler lines would be arranged by the farmers themselves through credit.

6. The sprinkler system would be designed to furnish a maximum of 0.56 l/sec/ha, at a pressure of at least 3 atmospheres at the sprinklers. This supply rate would meet the peak demand, which occurs in October, on the basis of 24 hours per day irrigation.

7. The on farm portable equipment for the area to be provided with sprinkler irrigation would be procured by NRA and paid on credit by the farmer. The layout of the on farm system would be standardized by the consultants for farms of various sizes and shapes. The project extension staff would advise and assist the farmers in working out the requirements of the on farm equipment.

8. Farm Roads. Farm roads already exist in the East Ghor Canal area and new roads would be provided only in the area above the Canal. Farm roads would be spaced about 450 m apart and would be 5 m wide. The central 3 m width of the roads would be surfaced by gravel. The total length of the new road construction would be about 30 km.

9. Land Leveling. Below the East Ghor Canal, the project area has a general slope of 1 to 3%, whereas above the Canal the slopes are somewhat steeper. No land grading was carried out in the East Ghor area when canal irrigation was introduced, although most of the area needs some earth-moving to make it suitable for surface irrigation. Currently, in the absence of grading, irrigation is carried out through zigzag furrows instead of straight furrows. This practice is limiting the growth of irrigation intensity. Under the project land grading would be carried out in those areas, which are not being converted to sprinkler irrigation. In such areas, estimated as 3,000 ha, the quantity of earth to be moved would vary from 200 m³ to 750 m³ per ha, with an average of about 300 m³ per ha. Small quantities of land grading in local pockets would also be necessary in the new area above the East Ghor Canal.

10. Tile Drainage. Due to lack of local drainage, about 725 ha of East Ghor area, in several non-contiguous blocks, are affected by water logging. Most of these areas have already gone out of cultivation. Some of the affected blocks lie in those areas which would be converted into sprinkler irrigation under the project and drainage facilities would not be required; In the remaining blocks, estimated at 520 ha, tile drains would be constructed to provide local drainage systems, which would discharge the effluent into the existing open drains.

11. Rehabilitation Works on East Ghor Canal. In the head reach of the East Ghor Canal, large quantities of sediments are brought into the Canal by a hill torrent, which inlets into the Canal. In this reach, some high slopes also drain directly into the Canal. Under the project, an over-chute would be constructed for the torrent. Adjacent to the high slopes, the Canal bank would be widened and a drain would be provided at the foot of the slopes, which would discharge the surface runoff into the nearby culvert under the Canal. Other minor works, all for the improvement of surface drainage, would also be carried out in this reach.

12. Assembly Markets and Packing and Grading Stations. There are two grading and packing stations at Wadi Yabis and North Shuneh. Both are provided with more equipment and facilities than it has been possible to use.

Facilities for assembly markets would be provided adjacent to these stations, so that the need for additional storage and office buildings would be reduced. It would also ensure, with minor repairs and adaptation, the use of the grading and packing facilities which have hitherto been practically unused. Moreover, supervision and management would be more efficient and less costly for the complementary operations of marketing, packing and grading.

Minor Works

13. The proposed works for social development facilities would include:

- (a) domestic water supply to about ten villages;
- (b) construction of three new health centers, and improvement and additions to an existing health center;
- (c) construction of about 150 schoolrooms;
- (d) construction of a vocational training center;
- (e) construction of ten community development centers; and
- (f) improvements to and regravelling of about 60 km of roads;

14. Domestic Water Supply. Drinking water supply would be made available to about 60 project villages. At present only a part of one of these villages is provided with piped water supply. Water intended for this use would be filtered and chlorinated. It would then be piped to the villages and other smaller settlements along the north-south main road. Within each village, several community taps would be provided in the streets at suitable locations.

15. Health Centers. The existing health center at North Shuneh would be enlarged by additions to the existing building, and would be converted into a field hospital. It would consist of an outpatient's block, x-ray and dentistry facilities, a small laboratory and about 8 beds. A resident doctor, a dentist, a nurse and a midwife would be on its regular staff. Smaller health centers would be constructed at Adasiya, Waqqas and Mashare. Each of these three centers would be attended by a doctor, a nurse and a midwife. All four centers would be provided with necessary equipment, instruments and furniture. An ambulance and a vehicle, to be stationed at North Shuneh, would be furnished to transport emergency medical and surgical cases from this project area to the nearest hospital at Irhid.

16. Schoolrooms. Except for North Shuneh, none of the villages in the project area has its school in a proper building. Under the project, a total of about 150 schoolrooms and ancillary facilities would be constructed to provide the required number of elementary and preparatory schools in the area. The exact number of schoolrooms to be constructed in each village would be

determined by the Ministry of Education and JVC. Furniture and equipment required by the new schools would be provided under the project.

17. Vocational Training Center. Two lecture halls, and a workshop with a store would be built at the field research and extension station at Wadi Yabis. The total area of these buildings, which would be mainly used for the training of project farmers would be about 1,000 m². Educational aids including farm machinery, tools, and equipment would also be provided.

18. Community Center. Ten community centers would be constructed in the project villages. Each of these centers would have a total area of 100 m² with three main rooms. These centers would be used as the headquarters for the extension agent and the local office of the Farmer's Association. These centers would also be used as farmer education centers. Furniture and equipment for educational aids would be furnished under the project.

19. Roads. Farm roads along the laterals of the East Ghor Canal and a road along the Canal already exist. A dirt road connecting the main valley road and the Ziglab Dam also exists. Under the project, the road to Ziglab Dam would be asphalted and the farm roads along irrigation laterals would be improved and regravelled where necessary. The road along the Canal would also be improved where necessary.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Assembly Markets and Packing and Grading Stations

1. There are two packing and grading stations in the project area - one in the northern part of the area at North Shuneh and one at the southern end at Wadi Yabis, 22 km apart. These stations were established in 1966. Each has a large, well constructed building in a good location with a variety of other equipment and facilities. Originally both buildings were equipped with grading lines. The grading line in North Shuneh - washing, waxing and multiple grading for citrus - is in good condition but has been used little. The equipment in Wadi Yabis - vegetable grading - has been largely dismantled. Neither station has fully operated, partly because of the 1967 war and the guerrilla activities until 1970 and partly due to inadequate management, poor organization and the absence of a demonstrated need for, or profitability of, grading.
2. There are no public assembly markets in the project area, although two small private ones operate during the winter season farther south in the valley - one in Karameh and one in Saoualha. This project includes the establishment of two assembly markets associated with and adjoining each of the existing packing and grading stations.
3. The 1973 government plan for the entire valley calls for the establishment of three assembly markets at Wadi Yabis, Maadi and South Shuneh. The latter two are 35 and 75 km south of the project area. Preliminary designs and estimates for these markets have been developed by the Agricultural Marketing Organization (AMO) and the Government. Each market is designed to handle 400 tons/day with peak period loads of 800 tons/day. Although a market at North Shuneh was earlier considered, the expectation of slower development in the North Ghor area (prior to preparation of this project) resulted in its being dropped.
4. Originally (1972) the assembly markets proposed for the valley were modest, covering 1 ha., providing no storage facilities and costing from JD 16 to 20 thousand. Subsequently (1973) revised plans called for a larger market area covering 3 ha and including a shed for storage, raising the cost to JD 43,000 (Table 1).
5. An advantage claimed by the Government for the Wadi Yabis location (which applies equally if not more to North Shuneh) is that it would not require a storage shed (the most costly item in the market) since the existing unused packing and grading building was larger (approximately 2,400 m²) than the proposed shed (1,600 m²).

6. The assembly markets proposed for this project are based on modifications of the Government's designs and the flow of produce, and take into account the facilities which already exist.

Assembly Markets - Wadi Yabis and North Shuneh

7. The existence of packing houses at both locations would reduce the need for new storage and office space. However, since the project would utilize the packing and grading facilities separate sheds for storage at each of the two markets would be constructed. The cost to establish these two assembly markets are itemized in Table 2.

Packing and Grading Stations

8. The packing houses at both North Shuneh and Wadi Yabis are well constructed and in good condition. No significant costs should be involved beyond normal upkeep. The grading line at North Shuneh is in good working order but may require some simple repairs. Similar equipment for vegetables at Wadi Yabis has been partially dismantled as parts were removed which could be sold. The existing line would be adapted as a simple conveyor, since there is no demonstrated need for more sophisticated equipment. The North Shuneh station also has two small tractors for moving heavy loads inside the building, neither have been used.

9. JD 10,000 would be needed for the adaptation of the grading line at Wadi Yabis or its replacement with simple conveyor belts, and for acquisition of basic equipment, such as hand trucks, tables, etc. at both stations:

<u>Item</u>	<u>Cost JD</u>	<u>US\$</u>
1. Conveyor belts (two)	3,300	10,000
2. Repairs to motors or replacement	965	3,000
3. Sizing machines (two)	5,000	12 - 15,000
4. Hand trucks (6 for each station)	965	3,000
5. Office machines	650	2,000
	<u>9,880-10,880</u>	<u>30 - 33,000</u>

Operation of Assembly Markets and Packing and Grading Stations

10. Table 3 shows the monthly and daily tonnages of fruits and vegetables which are produced now and will be produced in the project area at full development.

11. Table 4 shows the net daily marketable supply of fruits and vegetables in the project area at full production. The net marketable supply was derived from the total daily production as follows:

- (a) the 1973 project area population, excluding Wadi Yabis was about 25,000 (28,062 - 3,186 (Wadi Yabis) = 24,886).
- (b) Population growth rate assumed 2.8%, higher than present rate in the project area. The population in the project area in 1983 would thus be 33,000.
- (c) Per capita consumption of fruits and vegetables in Jordan in 1970 is estimated by FAO as follows:

<u>Commodity</u>	<u>Kg/per capita/year</u>
Fruits	130
of which citrus and bananas	30
Vegetables	144

- (d) Following quantities are assumed to be consumed from the Project production:
- | | |
|--------------------|------------------------|
| Citrus and bananas | 30 kg/per capita/year |
| Vegetables | 120 kg/per capita/year |
- (e) Waste and field losses for fruit are assumed to be 5% and for vegetables 10%.
- (f) Based on these assumptions the daily and annual consumption of fruits and vegetables in the project area would be as follows:

<u>Commodity</u>	<u>Year</u>	<u>Total Consumption</u>	
		<u>Daily</u>	<u>Annual</u>
-----tons-----			
Vegetables	1973	10.0	3,650
Vegetables	1983	14.0	5,110
Fruits	1973	2.1	770
Fruits	1983	2.8	1,020

13. After deducting field losses and self consumption in the project area, an allowance was made for produce moving through the project area markets, primarily Wadi Yabis, from outside the project area. The Wadi Yabis market is at the extreme southern boundary of the project area. The next nearest market would be 35 km south. It is assumed that at least 1/2 as much produce will pass through the Wadis Yabis market from the area immediately south as from the project area itself. This will be primarily vegetables.

14. Since the Farmers Association Law stipulates that all produce in the project area will pass through the assembly markets, Table 6 indicates

that this flow would not exceed the peak capacity of these two markets (1,600 tons daily, or 800 tons daily per market). The flow of produce is likely to come close to this level only during May and June. For most of the year the markets will operate at 300 to 400 tons/day, the level of operation for which they were designed.

Staffing and Operating Costs of Assembly Markets
and Packing and Grading Stations

15. The staff for the two assembly markets would consist of the following:

<u>Permanent Staff (Markets and Packing Houses)</u>	<u>Monthly Salary</u>
1 Director (to supervise both locations)	100 JD
2 Asst. Directors (one for each location, 2 x 75 JD)	150 JD
4 Accountants (two for each location, 4 x 60 JD)	240 JD
4 Clerks (two for each location, 4 x 60 JD)	240 JD
4 Scales Operators (two for each location, 4 x 30 JD)	120 JD
12 Auctioneers (six for each location, 12 x 60 JD)	<u>720 JD</u>
	1,570 JD
 <u>Labor (Markets)</u>	
14 Unloading and loading (7 each market, 14 x 1 JD x 25)	35 JD

16. The staff for the packing and grading station would consist of:

<u>Staff</u>	<u>Monthly Salary</u>
2 Technicians (one each station, 2 x 70 JD)	140 JD
4 Foremen (two each station, 4 x 60 JD)	240 JD
20 Packers (ten each station, 20 x 30 JD)	<u>600 JD</u>
	980 JD

The capacity of each station is 40 tons/day or 1,000 tons/month. Since there have been sporadic experiments but no full scale packing and grading operations at any of the three packing and grading stations in Jordan, this element of the activity would be phased and the full staff strength would be reached at the end of the third year for six months a year.

Phasing and Costs of Employment

17. Table 5 gives the phasing of employment and costs for the assembly markets and packing and grading stations during the first three years of the project. The construction works and equipping of the markets and packing houses would be completed in about 6 months. The markets would be ready to commence operation in October 1975. At that time however the project would not as yet have much impact on the production. Therefore the flow of produce through the markets would be essentially as indicated in the "present" situation in Table 3.

18. During the initial years of the operation of the markets auctioneers and much of the labor would be provided by the project, unlike Amman where commission agents are well established and employ the auctioneers and much of the labor. This would ensure success of the operation.

Financing of the Operations

19. The assembly markets and packing and grading stations would not only be self supporting but would also return an income. A fee of one percent of gross marketings would be charged. During the early years of operation approximately 80,000 tons would flow through the two markets. At full operation the annual tonnage flowing through the two markets would be 200,000 tons, including that from outside the project area (Table 4) but excluding project area consumption and 5% waste for fruits and 10% for vegetables. At an average farmgate price of JD 30/ton and a fee of 1% (half that charged at the Amman wholesale market) this would generate annual revenues of JD 24,000 in the early years, rising to JD 60,000 by 1983.

20. The packing and grading stations have a capacity of 40 tons per day for each station. At full capacity about 12,000 tons would be handled in a six month operation. An average price of JD 45/ton for graded and well packed fruit would yield JD 540,000. A packing and grading fee of 5%, which would include the costs of packaging, would produce JD 27,000 in revenue annually.

21. Difficulties are expected initially in reaching assumed levels of performance, but by 1983, when the project would be in full operation, these fees would produce incomes of JD 80 to 90,000 per year. Allowing for annual operating costs of 20,000 - packing materials, boxes, etc. - JD 10,000 for depreciation and JD 21,000 for staff costs, which would total about JD 51,000, an operating surplus of nearly JD 40,000 would remain. This could be returned to Farmers Association (FA) members as dividends or used to expand the operations of the assembly markets and packing and grading stations.

JORDAN

ANNEX 4

Table 1

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Revised Assembly Market Designs (AMO- Government- 1973)

Leveling of 30 dunums JD 0.1 x 30,000 m ²	3,000
Surfacing and asphalt JD 0.6 x 30,000 m ²	7,200
Fencing - 500 m x JD 2.5	1,250
Weighing Station	5,000
Offices 175 m ² x JD 20.0	3,500
Shed 1600 m ² x JD 12.0	19,200
Equipment	1,850
Miscellaneous	1,000
Contingencies	<u>1,000</u>
	JD <u><u>43,000</u></u>

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ANNEX 4

NORTHEAST GHOR IRRIGATION AND
RURAL DEVELOPMENT PROJECT

Table 2

Assembly Markets at Wadi Yabis and North Shuneh

Wadi Yabis Assembly Market

<u>Item</u>	<u>JD</u>
Leveling 1 ha (10,000 m ² at 0.1 JD/m ²)	1,000
Surfacing - 10,000 x 0.6 JD/m ²	6,000
Fencing - 500m x 2.5/m	1,250
Scales	3,300
Shed - 800m ² x 12 JD/m ²	9,600
- Concrete platform and cladding	5,500
Equipment	1,000
Total	JD 27,650
	US\$ 86,000

North Shuneh Assembly Market

<u>Item</u>	<u>JD</u>
Leveling 0.9 ha (9,000 x 0.1 JD/m ²)	900
Surfacing 9,000 x 0.6 JD/m ²	5,400
Fencing 450 m x 2.5 JD/m ²	1,125
Shed - 800 m ² x JD 12 JD/m ²	9,600
- Concrete platform and cladding	5,500
Equipment	1,000
Total	JD 23,525
	US\$ 73,163

Note: The North Shuneh station has a 60 foot scale and numerous other facilities and equipment, including an auxiliary power plant. The area presently attached to the station is 0.9 ha.

Total cost of establishing Assembly Markets

JD	51,175
US\$	159,163

JORDANNORTHEAST GHOR IRRIGATION
AND RURAL DEVELOPMENT PROJECTTable 3 Monthly and Daily Production of Fruits
and Vegetables In the Project Area, Present and Future

<u>Month</u>	<u>Citrus</u>		<u>Banana</u>		<u>Total Fruit Production</u>			
	<u>Monthly Tonnage</u>				<u>Monthly</u>		<u>Daily</u>	
	<u>Present</u>	<u>Future</u>	<u>Present</u>	<u>Future</u>	<u>Present</u>	<u>Future</u>	<u>Present</u>	<u>Future</u>
	-----tons-----				-----tons-----			
January	5,000	5,000	300	500	5,800	5,500	212	220
February	3,000	3,000	350	500	3,350	3,500	134	140
March	1,000	2,000	350	500	1,350	2,500	54	100
April	500	1,000	350	500	850	1,500	34	60
May	150	300	350	500	500	800	20	32
June	150	300	350	500	500	800	20	32
July	150	300	400	600	550	900	22	36
August	100	300	400	600	500	900	20	36
September	500	1,000	600	700	1,100	1,700	44	68
October	1,000	3,000	700	1,000	1,700	4,000	68	160
November	3,000	4,000	700	1,000	3,700	5,000	148	200
December	5,000	12,000	400	800	5,400	12,800	216	512

	<u>Vegetable Production</u>				<u>Fruit and Vegetable Production</u>	
	<u>Monthly</u>		<u>Daily</u>		<u>Daily</u>	
	<u>Present</u>	<u>Future</u>	<u>Present</u>	<u>Future</u>	<u>Present</u>	<u>Future</u>
	-----tons-----				-----tons-----	
January	4,887	10,100	195	404	407	624
February	5,080	10,648	203	426	337	566
March	3,735	7,937	149	317	203	417
April	7,693	14,975	307	599	342	659
May	13,022	26,905	521	1,076	541	1,108
June	13,120	20,625	524	836	545	857
July	10,485	13,525	419	541	441	577
August	5,240	4,750	210	190	230	226
September	5,290	4,700	217	188	256	256
October	5,345	11,140	214	446	282	606
November	2,605	13,900	104	556	252	756
December	0	0	0	0	216	512

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTNet Daily Marketable Supply of Fruits and Vegetables in the
Project Area At Full Production

	<u>Fruits</u>		<u>Vegetables</u>		<u>Total Fruits and Vegetables Marketed Daily</u>		<u>Total</u>
	<u>Production</u>	<u>Marketed</u>	<u>Production</u>	<u>Marketed</u>	<u>From Project Area</u>	<u>From Outside Area 1/</u>	
January	220	207	404	350	557	175	732
February	140	131	426	369	500	184	684
March	100	93	317	271	364	136	500
April	60	55	599	525	580	269	849
May	32	29	1,076	955	984	478	1,462
June	32	29	836	738	767	369	1,136
July	36	32	541	473	505	237	742
August	36	32	190	157	189	79	268
September	68	62	188	155	217	78	295
October	160	150	446	387	537	194	731
November	200	188	556	486	674	243	917
December	512	985	0	0	485	0	485

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Staffing and Costs of Assembly Markets and Packing and Grading Stations

	<u>First Year</u>			<u>Second Year</u>			<u>Third Year</u>		
	<u>No.</u>	<u>Months</u>	<u>Annual Salary</u>	<u>No.</u>	<u>Months</u>	<u>Annual Salary</u>	<u>No.</u>	<u>Months</u>	<u>Annual Salary</u>
<u>Assembly Markets and Packing and Grading Stations</u>			(JD)			(JD)			(JD)
<u>Permanent Staff</u>									
Director	1	6	600	1	12	1,200	1	12	1,200
Asst. Directors	2	6	900	2	12	1,800	2	12	1,800
Accountants				2	6	720	4	12	2,880
Clerks				2	6	720	4	12	2,880
Scales Operators				2	6	360	4	12	1,440
Auctioneers	—		—	<u>6</u>	6	<u>2,160</u>	<u>12</u>	8	<u>5,760</u>
Sub Total	3		1,500	15		6,960	27		15,960
<u>Assembly Labor, Markets</u>				14	6	2,100	14	8	2,800
<u>Packing Houses</u>									
Technicians	2	6	840	2	6	840	2	12	1,680
Formen				2	6	720	4	12	2,880
Packers	—		—	<u>20</u>	3	<u>1,800</u>	<u>20</u>	6	<u>3,600</u>
Sub Total	2		840	24		3,360	26		8,160
TOTAL	<u>5</u>		<u>2,340</u>	<u>53</u>		<u>12,420</u>	<u>65</u>		<u>24,120</u>

JORDAN

NORTHEAST GHOR IRRIGATION

AND RURAL DEVELOPMENT PROJECT

List of Equipment and Materials

<u>Item</u>	<u>Number</u>	<u>Estimated Cost</u> (US\$)
1. <u>Irrigation</u>		
a. <u>Equipment</u>		
Land Rover, 4 wheel drive	8	40,000
Motorcycle	4	2,000
Backhoe, 125 hp	1	35,000
Bulldozer, 140 hp	2	50,000
Bulldozer, 75 hp	2	40,000
Dragline, 1 ³ m ³	1	30,000
Flatbed Truck	1	30,000
Truck, 10 ton	4	32,000
Motor Grader, 125 hp	1	27,000
Road Roller	1	15,000
Water Tanker	1	10,000
Office		20,000
Workshop Equipment		20,000
Spare Parts		40,000
Subtotal		<u>391,000</u>
b. <u>Materials</u>		
Asbestos Cement Pipe and Fittings		15,000
Valves, Meters, Outlets, etc:		<u>5,000</u>
Subtotal		20,000
Total		<u>411,000</u>
2. <u>Research and Extension</u>		
a. <u>Equipment</u>		
Pick-up, 2 ¹ / ₂ ton	4	20,000
Motorcycle	10	5,000
Tractor, 80 hp with implements	1	15,000
Tractor, 35 hp with implements	1	8,000
Rototiller	2	2,000
Seeding and Fertilizing Equipment		2,000
Sprayers for Pesticide and Herbicide		3,000
Laboratory Equipment		<u>6,000</u>
Subtotal		61,000
b. <u>Materials</u>		
Furniture		5,000
Seeds		3,000
Fertilizer		3,000
Pesticide and Herbicide		10,000
Miscellaneous Supplies		<u>8,000</u>
Subtotal		29,000
Total		<u>90,000</u>

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

List of Equipment and Materials

<u>Item</u>	<u>Number</u>	<u>Estimated Cost</u>
3. <u>Marketing</u>		
Equipment for Packing and Grading Center		40,000
Equipment for Assembly Markets		<u>19,000</u>
Total		<u>59,000</u>
Grand Total		560,000
		=====

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Organization and Consultants

Jordan Valley Commission

1. The headquarters organization of JVC would consist of a President (also the Director General), a Deputy Director General and four directorates, each of which would be headed by a Director. These directorates would deal with (a) irrigation, drainage and farm roads; (b) agriculture, marketing and credit; (c) town planning, housing, public services and highways; and (d) administration and financial management. In addition an officer, directly reporting to the Deputy Director General, would deal with social and community development aspects. JVC will be assisted in its task by a Liaison and Advisory Committee (LAC), which consists of senior representatives of various agencies that are directly involved in the project execution. Organization of JVC and LAC is illustrated in Chart 8380. The Law establishing JVC is attached as an enclosure to this Annex.

2. JVC would also establish a field office at Deir Alla, which is located in the central part of the Valley, outside the project area. This office, assisted by the headquarters staff, would broadly supervise all field activities of the various executing agencies in the whole Valley, including the project area. Cost of JVC headquarters staff and its field office would be met by the three development projects in the Valley; the IDA project would pay for one-third of the costs.

Consultants

3. Irrigation Works. The irrigation works constitute about 70% of the project works and include two diversion weirs and siltation reservoirs, a sprinkler irrigation system to serve about 1,760 ha above and about 1,000 ha below the East Ghor Canal, farm roads to serve the area to be irrigated above the East Ghor Canal, land levelling in about 3,000 ha and tile drainage of about 520 ha out of the area irrigated by the East Ghor Canal, and some works on the East Ghor Canal. These works would be included in one construction contract. Out of the minor development works the filtration and chlorination of the domestic water supply and installation of pipes conveying the treated water to the villages would also be included in the contract for irrigation works.

4. Jordan has neither the experience nor the staff to design and supervise the construction of the above works. Therefore, an experienced consulting firm would be employed by JVC to assist NRA in the design of these works and for supervision of their construction. This firm would also train the local engineers and other technical staff in design, construction, operation and maintenance of these works. The proposed terms

of reference for this consulting firm, for the aforementioned works, are summarized below:

- (i) carry out surveys, investigations and tests necessary to prepare detailed designs;
- (ii) prepare detailed designs, contract drawings, technical specifications and other contract documents for the construction contract;
- (iii) evaluate bids and make recommendations for award of the construction contract;
- (iv) administer the construction contract, approve contractor's work schedules, verify work performed each month and certify payments due;
- (v) check layout of works and supervise their construction in all respects;
- (vi) prepare instructions for operation and maintenance of the works;
- (vii) prepare specifications and contract documents for the procurement of project equipment and materials;
- (viii) assist JVC in analysis of bids for equipment supply contract, make recommendations for its award and administer this contract after award;
- (ix) verify deliveries under the equipment supply contract and certify payments due; and
- (x) train local engineers and other technical staff seconded for this purpose in design, construction, operation and maintenance of the irrigation works.

The consulting firm would prepare for JVC quarterly and annual progress reports, as directed.

5. The consulting firm would appoint an experienced engineer to head its project team in Jordan. Other experienced engineers and experts would be employed by the firm, as necessary, in accordance with work requirements. The estimated manpower requirement of the firm is given in Table 1. As necessary, local engineers and other staff would be seconded by JVC and NRA to work with the consulting firm, to receive in-service training on design, construction supervision and operation and maintenance of the irrigation works.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT

LAW ESTABLISHING THE JORDAN VALLEY COMMISSION ^{1/}

- Section I - This law shall be called "The Jordan Valley Commission Law of 1973" and it shall come into effect as from the date of its publication in the Official Gazette. ^{2/}
- Section II - All the words and terms mentioned in this Law shall have the meaning ascribed to them hereunder unless an intention to the contrary has been indicated.
- (a) The term "Jordan Valley" means: the Ghor Areas in the basin of the Jordan River including the neighboring and overlooking heights and the side Wadis, as shown in the plan attached to this Law.
- (b) The word "Commission" means the commission for the development of the Jordan Valley which is established by virtue of this Law.
- Section III - There shall be established by virtue of this Law a Commission called "The Jordan Valley Commission", composed of a President of ministerial rank and three members to be appointed by the Council of Ministers on their personal merits on the recommendation of the President of the Commission and they may be from the governmental staff or from outside. The term of office shall be for three years subject to renewal.
- Section IV - The Commission shall be responsible for the economic and social development of the Jordan Valley, and may construct and carry out to achieve the said goal, including the repair and supply of materials to public and private construction, study, design and execution of irrigation, agriculture and domestic water projects, town planning, processing and marketing of agricultural products, establishment of public services, health, social, educational and touristic services centres and others.
- Section V - The President of the Commission shall be appointed by a Royal Decree based on a decision of the Council of Ministers.

^{1/} Free translation supplied by the Jordan Valley Commission to the CP mission.

^{2/} Published in the Official Gazette, vide no. 2402, dated 1.2.1973.

- Section VI - The President of the Commission shall be the executive general manager of the Commission and the Council of Ministers shall determine his salary, allowances and conditions of services.
- Section VII - The President of the Commission may delegate in writing any of his powers to any member of the Commission or official thereof.
- Section VIII - (a) The Commission shall elect a Vice-President who shall act on his behalf during his absence outside the country.
- (b) The meetings of the Commission shall not be valid unless they are attended by an absolute majority of its members. Decisions shall be taken by the majority of those attending.
- Section IX - The Commission shall determine the dates of its meetings, the method of invitation, the procedure therein and any other matters relating thereto.
- Section X - The Commission may invite whomsoever it deems necessary to participate in its sessions to discuss any plan or subject, provided that they shall not have the right to vote.
- Section XI - The Commission shall have the right of acquisition and immediate possession by virtue of effective laws, of lands and water rights or both and any other easements relating to land or water in the areas falling within the Jordan Valley.
- Section XII - The Commission shall enjoy financial and administrative independence and the Council of Ministers may order that its accounts be audited in the manner it deems fit. The Commission shall be a legal entity and may purchase, rent and own movable and immovable property, enter into contract, institute legal suits in its name and delegate one of the officials of the Public Prosecution Department to represent it in the judicial proceedings and may appoint an attorney of its own.
- Section XIII - (a) The Commission may delegate to the governmental ministries, departments and corporations the execution of works and projects as falls within their specialty, according to conditions to be agreed upon.

- (b) Notwithstanding the provisions of paragraph (a) of this section, the Commission may execute the works and projects in any other manner it deems fit including:
- i. The establishment of its own cadre whom the Commission may delegate to work thereon, and staff the Commission with special employees for the above purpose.
 - ii. The contracting with local and foreign consulting offices and firms and contractors.
- Section XIV - (a) The sources of the Commission's finance shall be the funds allotted by the government in the budget for the Commission.
- (b) Investment of the Commission's receipts and other revenues.
- (c) Loans, gifts and local and foreign aid-funds contracted by the Commission with the sanction of the Council of Ministers.
- Section XV - The Commission shall have the right to operate completely or partially any completed projects until its operation is transferred to the ministry, department, corporation, municipality or village council.
- Section XVI - Any person authorized by the Commission may carry out investigations or any other works and may enter any land in the Jordan Valley, and the Commission shall pay to the owner of the land fair compensation for any material damage caused as a result of the pursuit of the duties by the said person.
- Section XVII - The ministry, department or corporation charged with the execution of any project shall appoint a manager for that project or work to be agreed upon by the Commission, shall be responsible directly to the President of the commission or to whomsoever it authorizes; it shall have all the necessary powers and shall be supplied with the required staff and other needs to enable it to carry out the work with which it is charged.

- Section XVIII - A special fund shall be established in the Commission in which shall be deposited all its funds and the Commission may deposit the said fund in a special account or transaction with the Central Bank in the capital and with any of the local banks in the governorates.
- Section XIX - (a) The Commission shall have its own cadre of staff and the provisions of the Civil Pension Law No. (34) of 1959 and amendments thereto, together with provisions of the Civil Service Regulation No. (23) of 1966 or any other legislation substituting therefore, shall be applied to the classified staff, provided that the President of the Commission shall have the powers of a Minister and the Vice-President or whomsoever he authorizes shall have the powers of the Deputy Minister, which the said regulations define.
- (b) As for the unclassified staff and employees, the Commission may issue special regulations for them by virtue of the provisions of this Law, to determine their appointment, rights, grades, dismissal, termination of service, compensation and all administrative matters relating to them.
- Section XX - The Commission shall prepare a draft budget to be approved annually by the Council of Ministers.
- Section XXI - The funds of the Commission shall be considered as state funds and shall be collected by virtue of their provisions of the collection of State Funds Law in effect, and the Commission shall have for the said purpose all the powers granted to the Administrative Governor and the collection of State Funds Committee mentioned in that Law.
- Section XXII - The Prime Minister may invite any official from any ministry, board, department or corporation, to serve with the Commission cadre for the period of time specified in their order, and the service of the pensionable official in this Commission shall be considered as pensionable service.
- Section XXIII - No public construction works in the Jordan Valley shall be carried out except with the consent of the Commission, provided that this shall not apply to the maintenance, administration and operation of the present government construction works and public services.

- Section XXIV - No private buildings or construction works of whatever kind or for whatever purpose shall be constructed unless a permit has been issued by the Commission, provided that this shall not apply to the construction works under execution at the date this Law comes into effect or to the land irrigation works.
- Section XXV - Government land in the Jordan Valley shall not be loaned, rented or sold except with the consent of the Commission.
- Section XXVI - The annual remuneration of the President and members of the Commission shall be determined by the Council of Ministers.
- Section XXVII - Any person who commits a breach of any of the provisions of this Law or of the regulations issued thereunder, shall be punished with imprisonment for a period not exceeding two years or a fine not less than five dinars or with both penalties.
- Section XXVIII - The Council of Ministers may on the recommendation of the Commission issue the regulations which it deems fit for carrying out the provision of this Law.
- Section XXIX - The Prime Minister and the Ministers shall be charged with carrying out of the provisions of this Law each within his jurisdiction.

JORDAN

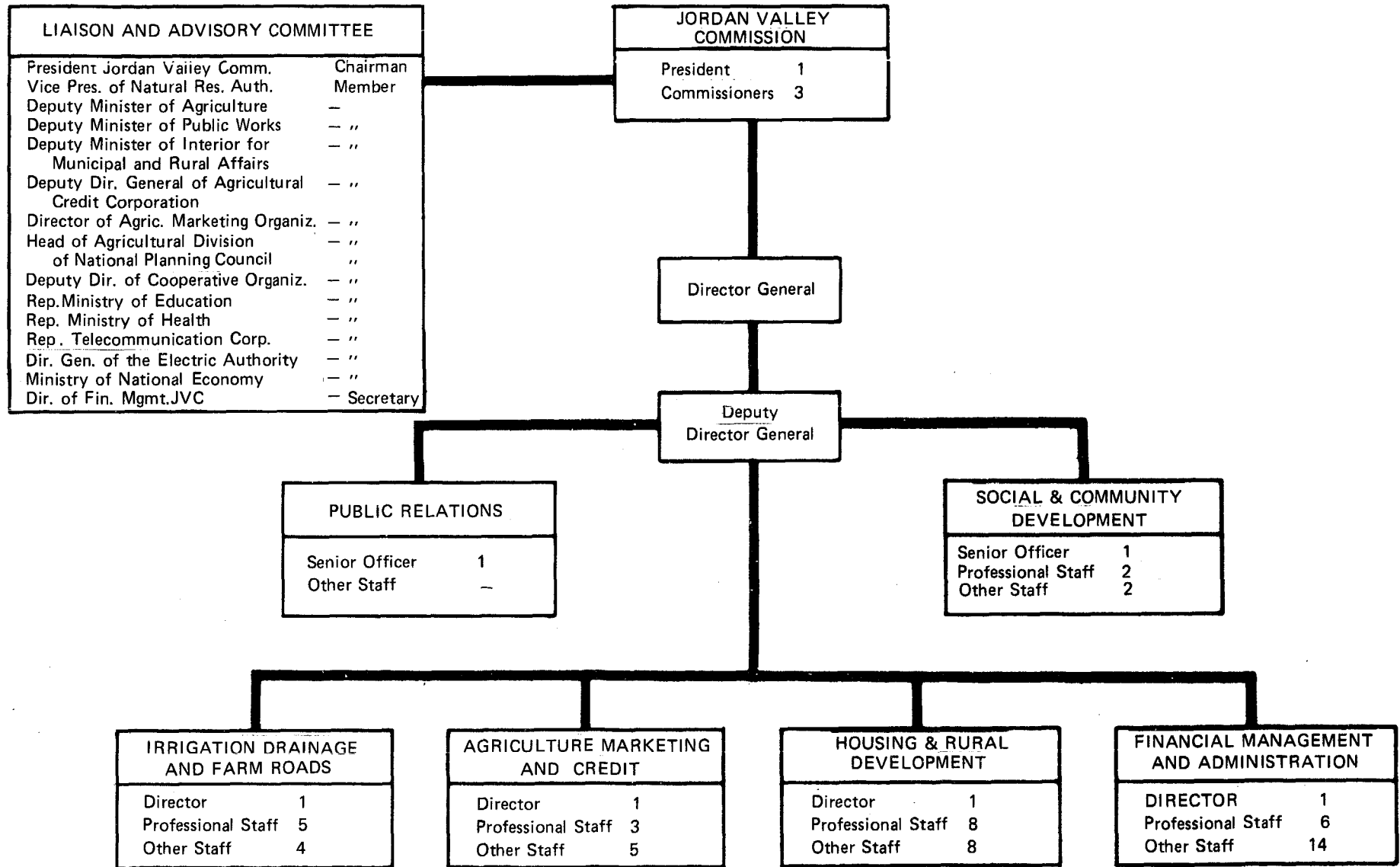
NORTHEAST GHOR IRRIGATION

AND RURAL DEVELOPMENT PROJECT

Manpower Requirement of Consultants

<u>Category</u>	<u>Number of experts</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>Total</u>
		----- man/months -----				
Chief Resident Engineer	1	9	12	12	6	39
Design Engineer	2	18	24	-	-	42
Specifications Engineer	1	9	3	-	-	12
Construction Engineer	3-4	-	24	48	12	84
Short-term specialists	<u>2</u>	<u>-</u>	<u>3</u>	<u>3</u>	<u>-</u>	<u>6</u>
Total		<u>36</u>	<u>66</u>	<u>63</u>	<u>18</u>	<u>183</u>

ORGANIZATION OF JORDAN VALLEY COMMISSION



JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTWater Demand, Supply and QualityWater Demand

1. Water requirements of crops have been estimated using the Blaney Criddle method with modified crop factors. The mean temperature was calculated by taking half the sum of the maximum and minimum monthly temperatures at North Shuneh. The percentage of day time hours as percentage of the year corresponding to 32° latitude North has been used. Effective rainfall was assumed to be 65% of precipitation from 75 to 100 mm per month, 82% of precipitation between 50 and 75/mm, 90% of precipitation between 25 and 50/mm, and 95% of precipitation between 10 and 25 mm; less than 10 mm per month was ignored. Crop factors recommended by Blaney Criddle and the US Soil Conservation Service were adjusted for stage of growth and average prevailing temperature. For all crops planted in the dry season a preirrigation of 60 mm was added.

2. Average water requirements are low because the main growing seasons coincide in part with the period of precipitation. Demand is highest in the months of August, September and October, when net water requirements average between 850 and 1,130 m³/ha, Table 1.

3. With the project, water requirements will increase mainly because of 1,040 ha additional land and a higher cropping intensity, which will increase from 106% to 120% on irrigated land. Assuming a 65% and 80% irrigation efficiency respectively for gravity and sprinkler systems and based on the proposed development schedule and cropping pattern the gross irrigation requirements would be as below:

<u>Year</u>	<u>Gravity without Improvement</u>	<u>Gravity with Improvement</u>	<u>Sprinklers</u>	<u>Dry Total Land Area</u>	<u>Gross Ir- rigation Demand m³</u>
		<u>ha</u>			
Oct.73-Sept.74	6,660	0	0	1,040 7,700	70.8
Oct.74-Sept.75	4,190	2,470	0	1,040 7,700	77.3
Oct.75-Sept.76	1,720	4,940	300	740 7,700	74.8
Oct.76-Sept.77	860	4,940	1,460	440 7,700	75.9
Oct.77-Sept.78	0	4,940	2,560	200 7,700	77.8
Oct.78-Sept.79	0	4,940	2,760	0 7,700	80.4
Oct.79-Sept.80	0	4,940	2,760	0 7,700	80.4

Water Supply

4. The Yarmouk River and The East Ghor Canal. Currently 6,660 ha is being irrigated in the project area (7,700 ha), of which 5,940 ha receive its water supply from the Yarmouk river through the East Ghor Canal and 720 ha is irrigated by the local use of the waters of Wadis Arab, Ziglab and Jurum. The remaining 1,040 ha, rainfed at present, would be brought under irrigation under the project. The Yarmouk river, with a catchment of 6,800 km², has an average annual flow of 438 Mm³, varying from a minimum of 240 Mm³ to a maximum of 870 Mm³. Its monthly flows have been recorded since 1928. The East Ghor Canal offtakes from the river near Adasiya and flows in a general north-south direction. It has a capacity of 20 m³/sec and an existing length of 78 km, of which the first 38 km lies in the project area.

5. At present, according to Nedeco (The Hague) and Dar Al-Handasah (Lebanon), the average annual water use in the Valley is about 15,830 m³/ha. Under the project, about 1,000 ha of the East Ghor Canal area would be converted into sprinkler irrigation using the waters of Wadis Arab, Ziglab and Jurum (para. 4), and the other 4,940 ha would continue under gravity irrigation from the Canal. On the basis of the recommended cropping pattern, the gross average annual water demand for gravity irrigation of 4,940 ha, estimated as 11,210 m³/ha (Table 1) would be about 55.3 Mm³ against its present use of about 78.2 Mm³.

6. Wadis Arab, Ziglab and Jurum. These three perennial Wadis originate from the plateau and are fed by deep springs. Apart from the Yarmouk and Zarqa rivers, these Wadis are the most important eastern tributaries of the Jordan river. With the completion of the East Ghor Canal in 1965, the surplus flow of these wadis, after local irrigation use (720 ha) is inlet to the canal. Flow records of Wadis Arab, Ziglab and Jurum are available from 1928, but are incomplete between 1963 and 1971. Therefore, for project purposes only ten years continuous dates prior to 1962-63, presented in Tables 2, 3 and 4, have been considered. Flow in these wadis is rather steady with slight monthly variations and surface flow contribution, due to winter rainfall, is small. The average annual base flow of Wadis Arab, Ziglab and Jurum is respectively 31.8 Mm³, 10.6 Mm³ and 11.2 Mm³. A dam with storage capacity of 4.3 Mm³ exists on Wadi Ziglab and the construction of a dam on Wadi Arab, under Japanese bilateral aid, is under consideration.

7. Under the project, about 2,760 ha would be irrigated by a sprinkler system from the combined waters of Wadis Arab, Ziglab and Jurum, of which 1,760 ha lie above and about 1,000 ha below the East Ghor Canal. On the basis of the recommended cropping pattern, the gross average annual water demand for this area, estimated at 9,112 m³/ha (Table 1), would be 25.1 Mm³, against the present use of about 27.9 Mm³. The combined annual availability of supplies from the three wadis, without taking into account the regulation at either the existing Ziglab dam or the future Arab dam, varies from a minimum of 35.4 Mm³ to a maximum of 71.1 Mm³, with an average of 53.5 Mm³.

8. At present the irrigated part (6,660 ha) of the project area is using about 105.4 Mm³ of water annually from the Yarmouk river and the three wadis. After the project, the total annual water demand for the project area (7,700 ha), from these sources, would be about 80.4 Mm³. Even after bringing 1,040 ha of new area under irrigation and improving the intensity of irrigation from 106% to 120% on 6,660 ha, the project would result in an estimated annual saving of about 25 Mm³ of water.

Water Quality

9. The National Resources Authority is responsible for the water quality control in the valley. Numerous analysis of the different waters have been made and the results are shown in Table 5. In general waters are satisfactory for irrigation. The quality of the water varies inversely with the discharge, consequently improves significantly in the winter. It would further improve after storage facilities planned upstream from the East Ghor Canal intake on the Yarmouk River become available because of mixing of summer and winter flows. According to the United States Department of Agriculture-Salinity Laboratory Standards the waters would be classified as C₂S₁ with medium salinity and very low sodium or alkali hazard. Such waters are suitable for irrigation when the drainage requirements are met. Sensitive crops like lemons, oranges, and eggplants are already grown successfully in irrigated project areas.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Estimated Water Requirements

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>	<u>APRIL</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUGUST</u>	<u>SEPTEMBER</u>	<u>OCTOBER</u>	<u>NOVEMBER</u>	<u>DECEMBER</u>	<u>TOTAL</u>
1. CLIMATE DATA													
Average Temp. (°C)	14.4	15.5	17.5	21.3	25.5	28.6	30.5	31.3	29.3	26.6	21.7	16.7	
Percent Daytime hours(%)	7.20	6.97	8.37	8.72	9.63	9.60	9.77	9.28	8.34	7.93	7.11	7.05	
Rainfall (mm)	79.3	60.0	48.2	16.8	7.8	-	-	-	-	11.7	49.1	86.2	359.1
Effective Rainfall (mm)	51.5	42.2	43.4	16.0	-	-	-	-	-	11.1	44.2	56.0	264.4

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>	<u>APRIL</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUGUST</u>	<u>SEPTEMBER</u>	<u>OCTOBER</u>	<u>NOVEMBER</u>	<u>DECEMBER</u>	<u>TOTAL</u>
2. ESTIMATED NET WATER REQUIREMENTS													

<u>Crop</u>	<u>Planting Season</u>	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>	<u>APRIL</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUGUST</u>	<u>SEPTEMBER</u>	<u>OCTOBER</u>	<u>NOVEMBER</u>	<u>DECEMBER</u>	<u>TOTAL</u>
Citrus	1,150	-	-	80	621	1,026	1,587	1,759	1,748	1,479	1,133	168	-	
Banana	350	-	67	140	385	609	791	896	882	721	532	214	42	
Tomato	1	440	-	141	519	700	805	-	-	-	-	-	-	
	2	380	26	79	-	-	-	-	-	604	429	288	-	
	3	500	60	95	215	-	-	-	-	-	695	205	115	
	4	500	85	120	200	480	-	-	-	-	-	360	25	
Eggplant	1	500	-	-	160	590	795	935	1,010	825	400	-	-	
	2	440	29	94	176	422	638	726	-	700	497	295	79	
	3	540	65	103	216	518	783	988	-	-	707	221	125	
Pepper	1	140	-	-	40	165	212	266	287	282	231	112	-	
	2	150	9	29	60	144	218	248	-	238	170	101	27	
	3	140	20	32	68	163	247	311	-	-	223	70	33	
Potato	1	140	-	-	40	154	203	-	-	-	-	-	-	
	2	320	-	-	-	-	-	-	579	512	461	198	-	
Cauliflower	250	30	63	-	-	-	-	-	-	398	283	168	45	
Cabbage	250	30	63	-	-	-	-	-	-	398	283	168	45	
Cucumber	1	250	-	-	80	240	340	-	-	-	-	-	-	
	2	200	-	-	-	-	-	-	362	296	252	100	-	
Squash	1	240	-	-	77	230	346	-	-	-	-	-	-	
	2	170	-	-	-	-	-	-	307	262	214	85	-	
Broad Beans	380	-	-	-	-	-	-	-	-	604	483	220	46	
Maiz	1	240	-	-	101	264	382	-	-	-	-	-	-	
	2	720	-	-	-	-	-	1,164	1,403	1,281	1,008	-	-	
Onion	1	185	11	24	30	-	-	-	-	-	257	72	22	
	2	195	12	37	62	101	-	-	-	-	-	142	10	
Wheat	400	68	124	160	216	-	-	-	-	-	556	156	37	
TOTAL	9,170	445	930	2,046	5,212	6,499	6,657	6,445	6,573	8,549	8,695	3,431	651	56,133

Net Water Requirement m ³ /ha (Based on Physical Area 7,700 ha)	59	121	265	677	844	864	837	854	1,110	1,129	445	85	7,290
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3. GROSS WATER REQUIREMENTS m³/ha	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
Sprinkler : 80% Efficiency	74	151	331	846	1,055	1,080	1,046	1,068	1,388	1,411	556	106	9,112
Gravity Irri: 65% Efficiency	91	186	408	1,041	1,298	1,322	1,288	1,314	1,708	1,737	684	131	11,215

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Wadi Arab Monthly Flows

<u>Water Year</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
	----- Mm ³ -----												
1962-63 ^{/1}	1.6	1.6	1.9	2.3	2.3	1.6	1.3	1.5	1.3	1.3	1.4	1.4	19.5
1961-62	1.5	1.6	2.1	2.0	1.9	1.9	1.4	1.4	1.3	1.4	1.3	1.4	19.2
1960-61	3.0	3.1	2.8	3.0	2.2	2.0	1.9	1.7	1.4	1.5	1.5	1.5	25.6
1959-60	2.7	2.7	2.8	2.5	2.3	2.7	2.3	2.4	2.3	2.4	2.6	2.5	30.2
1958-59	2.7	2.6	2.9	3.0	2.9	3.3	2.6	2.7	2.6	2.7	2.7	3.3	34.0
1957-58	2.1	3.2	3.5	3.7	3.1	2.2	2.2	2.4	2.6	2.6	2.7	2.6	32.9
1956-57	2.8	2.7	3.6	3.6	3.4	3.6	2.8	2.7	2.6	2.7	2.7	2.7	35.9
1955-56	3.1	3.9	4.1	3.7	3.4	3.5	2.8	2.7	2.6	2.6	2.6	2.5	37.5
1954-55	3.5	3.5	3.9	4.2	3.9	3.2	3.7	3.2	3.1	2.9	2.9	2.9	40.9
1953-54	2.9	5.3	3.1	3.3	3.9	3.5	3.4	3.5	3.3	3.1	3.2	3.3	41.8
Average	2.59	3.02	3.07	3.13	2.93	2.75	2.44	2.42	2.31	2.32	2.36	2.41	31.75

^{/1} Due to war of 1967 and civil disturbances, flow data for years after 1962-63 is either incomplete or not available.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Wadi Ziglab Monthly Flows

<u>Water Year</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
	----- Mn ³ -----												
1962-63 / ¹	0.6	0.7	0.7	0.8	0.7	0.7	0.5	0.6	0.4	0.5	0.5	0.5	7.2
1961-62	0.5	0.5	1.5	1.1	1.1	1.0	0.7	0.5	0.8	0.5	0.5	0.5	9.2
1960-61	0.6	0.7	0.7	0.8	0.7	0.5	0.7	0.7	0.6	0.5	0.5	0.5	7.5
1959-60	0.8	0.7	0.8	0.7	0.6	0.7	0.9	0.7	0.6	0.6	0.5	0.5	8.1
1958-59	0.9	0.9	0.9	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.7	0.7	10.0
1957-58	1.0	1.1	1.8	1.7	1.0	0.9	0.8	0.9	0.8	0.9	0.9	0.9	12.7
1956-57	0.8	0.8	1.6	1.6	1.0	1.2	0.8	0.8	0.8	0.9	0.9	0.9	12.1
1955-56	0.9	1.3	1.4	1.3	0.8	1.1	0.8	0.8	0.8	0.8	0.8	0.8	11.6
1954-55	1.2	1.1	1.4	1.2	0.9	1.1	1.0	1.0	0.9	0.9	0.9	0.9	12.5
1953-54	1.0	2.0	1.3	1.2	1.8	1.0	1.1	1.1	1.0	1.0	1.1	1.1	14.7
Average	0.83	0.98	1.21	1.14	0.96	0.91	0.81	0.79	0.73	0.73	0.73	0.73	10.55

¹ Due to war of 1967 and civil disturbances, flow data for years after 1962-63 is either incomplete or not available.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Wadi Jurum Monthly Flows

<u>Water Year</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
	----- Mm ³ -----												
1962-63 ^{/1}	1.0	0.8	1.1	0.8	1.1	0.8	0.7	1.0	0.8	0.7	0.9	0.9	10.6
1961-62	0.7	0.7	0.6	0.6	0.5	0.7	0.8	0.9	0.9	0.9	0.9	0.8	9.0
1960-61	0.7	0.7	0.7	0.7	0.6	0.7	0.8	0.9	0.9	0.7	0.6	0.6	8.6
1959-60	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.7	9.2
1958-59	1.1	1.1	1.0	1.0	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9	11.5
1957-58	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.0	12.5
1956-57	0.9	0.9	1.0	1.0	0.9	0.9	0.9	1.0	0.9	1.0	1.0	1.0	11.4
1955-56	1.0	1.0	0.9	0.8	0.7	0.8	0.9	0.9	0.9	1.0	1.0	0.9	10.8
1954-55	1.3	1.3	1.4	1.2	1.1	1.2	1.1	1.2	1.1	1.1	1.0	0.9	13.9
1953-54	1.1	1.2	1.2	1.3	1.1	1.1	1.2	1.3	1.3	1.3	1.3	1.2	14.6
Average	0.98	0.95	0.98	0.93	0.87	0.90	0.90	0.99	0.94	0.94	0.94	0.89	11.21

^{/1} Flow data for years after 1962-63 is either incomplete or not available.

JORDAN
NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Water Quality ^{/1}

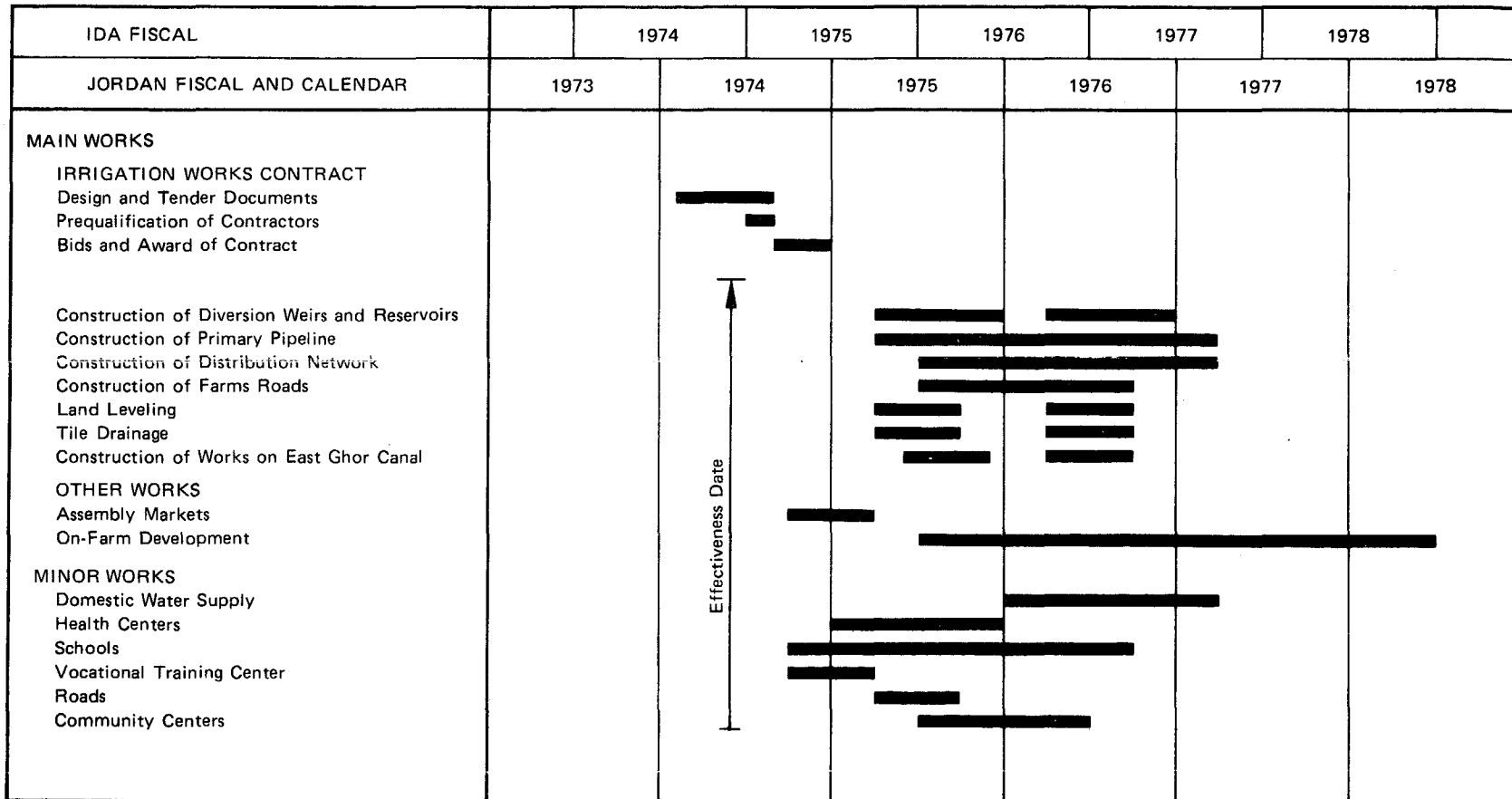
		<u>E.C.</u> mhos/cm	<u>T.D.S.</u>	<u>pH</u>	<u>Ca++</u>	<u>Mg++</u>	<u>Na+</u>	<u>K+</u>	<u>Cl-</u> Meq./l	<u>CO₃⁻⁻</u>	<u>HCO₃⁻</u>	<u>SO₄⁻⁻</u>	<u>SSP</u> /2	<u>SAR</u> /3	<u>Class</u>
WADI ARAB	Mean Value	0.630	403	8.30	3.00	2.90	1.50	-	1.60	0.15	4.00	1.22	20.3	0.9	C ₂ S ₁
	Minimum Value	0.370	237	7.80	0.40	0.50	0.50	-	0.50	0.00	0.30	0.30	33.3	0.7	C ₂ S ₁
	Maximum Value	0.910	582	9.60	4.00	4.40	2.09	-	2.90	0.70	5.10	2.04	19.9	1.0	C ₃ S ₁
WADI JURUM	Mean Value	0.761	504	7.9	3.8	3.50	1.75	-	2.08	0.25	5.13	0.98	19.3	0.9	C ₃ S ₁
	Minimum Value	0.700	446	7.7	2.00	2.40	1.67	-	2.00	0.00	4.00	0.42	27.5	1.1	C ₃ S ₁
	Maximum Value	0.880	363	8.2	4.90	5.00	1.84	-	2.30	0.30	6.20	1.92	15.7	0.3	C ₃ S ₁
WADI ZIGLAB	Mean Value	0.635	407	8.0	2.68	3.00	1.13	-	1.38	0.26	4.50	0.71	16.6	0.7	C ₂ S ₁
	Minimum Value	0.380	242	7.9	1.60	1.00	0.50	-	0.60	0.00	2.30	0.54	16.1	0.4	C ₂ S ₁
	Maximum Value	0.760	486	8.6	3.10	3.60	1.67	-	3.30	0.05	5.40	1.67	19.9	0.9	C ₃ S ₁
YARMOUK RIVER	Mean Value	0.740	470	8.20	2.50	2.20	2.43	0.14	2.01	0.18	3.73	1.10	33.4	1.5	C ₂ S ₁
	Minimum Value	0.270	173	7.33	1.00	0.90	0.50	0.09	0.50	0.00	1.67	0.28	20.1	0.5	C ₂ S ₁
	Maximum Value	1.670	1069	9.40	3.45	3.60	7.00	0.75	8.40	0.50	5.56	4.20	47.3	3.7	C ₃ S ₁

/1 Analysis made by the Natural Resources Authority during 1956 and 1968

/2 $SSP = \frac{\text{Sol. Sodium Concentration (Meq./l)} \times 100}{\text{Total Cation Concentration (Meq./l)}}$

/3 $SAR = \frac{Na+}{\frac{Ca++ + Mg++}{2}}$

JORDAN
NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT
SCHEDULE OF CONSTRUCTION



World Bank-8379(R)

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT
Cost Estimates /1

MAIN WORKS	Local	Foreign	Total	Local	Foreign	Total	Foreign
	-(JD'000)-			-(US\$'000)-			(%)
<u>1. Irrigation Works</u>							
Diversion Weirs	16	24	40	49	75	124	60
Siltation Reservoirs	12	8	20	37	25	62	40
Primary Pipeline	244	366	610	759	1,138	1,897	60
Distribution Network	216	324	540	672	1,007	1,679	60
Farm Roads	24	16	40	74	50	124	40
Land Leveling	144	96	240	448	299	747	40
Tile Drainage	35	35	70	109	109	218	50
Works on East Ghor Canal	25	25	50	78	78	156	50
Subtotal	<u>716</u>	<u>894</u>	<u>1,610</u>	<u>2,225</u>	<u>2,781</u>	<u>5,007</u>	56
<u>2. Other Works</u>							
Primary Markets	25	25	50	78	78	156	50
<u>3. Land Acquisition</u>	20	-	20	62	-	62	-
<u>4. Equipment and Materials</u>							
Irrigation	13	119	132	42	369	411	90
Research and Extension	4	25	29	11	79	90	88
Marketing	2	17	19	6	53	59	90
Subtotal	<u>19</u>	<u>161</u>	<u>180</u>	<u>59</u>	<u>501</u>	<u>560</u>	90
<u>5. Incremental Working Capital</u>							
On-Farm Sprinkler Equipment	72	288	360	224	896	1,120	80
Farm Machinery	26	54	80	81	168	249	67
Annual Inputs	<u>198</u>	<u>162</u>	<u>360</u>	<u>615</u>	<u>504</u>	<u>1,119</u>	45
Subtotal	<u>296</u>	<u>504</u>	<u>800</u>	<u>920</u>	<u>1,568</u>	<u>2,488</u>	63
<u>6. Engineering and Administration</u>							
Project Organization	260	-	260	809	-	809	-
Research and Extension	70	-	70	218	-	218	-
Marketing	50	40	90	156	124	280	44
Consultants	26	104	130	80	324	404	80
Subtotal	<u>406</u>	<u>144</u>	<u>550</u>	<u>1,263</u>	<u>448</u>	<u>1,711</u>	26
TOTAL	<u>1,482</u>	<u>1,728</u>	<u>3,210</u>	<u>4,608</u>	<u>5,376</u>	<u>9,984</u>	54
<u>7. Contingencies /2</u>							
Physical	185	219	404	576	681	1,257	54
Price	<u>431</u>	<u>462</u>	<u>893</u>	<u>1,340</u>	<u>1,435</u>	<u>2,775</u>	22
Subtotal	<u>616</u>	<u>681</u>	<u>1,297</u>	<u>1,916</u>	<u>2,116</u>	<u>4,032</u>	53
GRAND TOTAL	<u>2,098</u>	<u>2,409</u>	<u>4,507</u>	<u>6,524</u>	<u>7,492</u>	<u>14,000</u>	53
<u>MINOR WORKS</u>							
<u>1. Works</u>							
Water Supply - Mains	60	90	150	187	280	467	60
Distribution	16	24	40	49	75	124	60
Health Centers	22	14	36	67	45	112	40
Schools	209	140	349	650	435	1,085	40
Vocational Training Center	30	20	50	94	62	156	40
Roads	14	6	20	43	19	62	30
Community Centers	17	8	25	55	23	78	30
Subtotal	<u>368</u>	<u>302</u>	<u>670</u>	<u>1,145</u>	<u>939</u>	<u>2,084</u>	45
<u>2. Land Acquisition</u>	2	-	2	6	-	6	-
<u>3. Equipment and Materials</u>	21	84	105	65	260	325	80
<u>4. Engineering and Administration</u>	<u>32</u>	<u>6</u>	<u>38</u>	<u>99</u>	<u>19</u>	<u>118</u>	16
	<u>423</u>	<u>392</u>	<u>815</u>	<u>1,315</u>	<u>1,218</u>	<u>2,533</u>	48
<u>5. Contingencies /2</u>							
Physical	42	39	81	131	122	253	48
Price	<u>108</u>	<u>99</u>	<u>207</u>	<u>335</u>	<u>308</u>	<u>643</u>	48
Subtotal	<u>150</u>	<u>138</u>	<u>288</u>	<u>466</u>	<u>430</u>	<u>896</u>	48
GRAND TOTAL	<u>573</u>	<u>530</u>	<u>1,103</u>	<u>1,781</u>	<u>1,648</u>	<u>3,429</u>	48
OVERALL TOTAL	<u>2,671</u>	<u>2,939</u>	<u>5,610</u>	<u>8,305</u>	<u>9,140</u>	<u>17,429</u>	52

/1 Discrepancies due to rounding

/2 For irrigation works, physical contingencies are estimated at 15%, and for all other items at 10%. For all civil works, price contingencies are compounded at annual rates of 12% (1974), 10% (1975), and 8% (1976 and 1977). For equipment and farm development costs, contingencies are compounded at annual rates of 9% (1974), 7% (1975) and 5% (1976-78).

/3 At 15% for physical and price

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Schedule of Expenditure /1

MAIN WORKS	Total Cost		1974		1975		1976		1977		1978	
	Total	Foreign	Total	Foreign	Total	Foreign	Total	Foreign	Total	Foreign	Total	Foreign
US\$'000												
1. Irrigation Works												
Diversion Weirs	124	75	-	-	70	50	42	20	12	5	-	-
Siltation Reservoirs	62	25	-	-	34	18	22	5	6	3	-	-
Primary Pipeline	1,897	1,138	-	-	826	590	683	340	388	203	-	-
Distribution Networks	1,679	1,007	-	-	530	410	730	370	419	227	-	-
Farm Roads	124	50	-	-	70	37	42	10	12	3	-	-
Land Leveling	747	299	-	-	420	220	251	50	76	29	-	-
Tile Drainage	218	109	-	-	120	73	80	25	18	13	-	-
Works on East Ghor Cana.	156	78	-	-	90	52	60	20	6	6	-	-
Subtotal	5,007	2,781	-	-	2,160	1,450	1,910	840	937	497	-	-
2. Other Works												
Primary Markets	156	78	70	30	86	48	-	-	-	-	-	-
3. Land Acquisition	62	-	30	-	32	-	-	-	-	-	-	-
4. Equipment and Material												
Irrigation	411	369	30	27	-	-	381	342	-	-	-	-
Research and Extension	90	79	20	13	70	66	-	-	-	-	-	-
Marketing	59	53	-	-	59	53	-	-	-	-	-	-
Subtotal	560	501	50	40	129	119	381	342	-	-	-	-
5. Incremental Working Capital												
On-farm Sprinkler Equipment	1,120	896	-	-	190	150	400	320	530	426	-	-
Other Farm Investments	249	168	-	-	-	-	83	56	82	58	84	54
Annual Inputs	1,119	504	250	110	383	183	127	59	149	57	210	95
Subtotal	2,488	1,568	250	110	573	333	610	435	761	541	294	149
6. Engineering and Administration												
Project Organization	809	-	114	-	260	-	270	-	165	-	-	-
Research and Extension	218	-	33	-	70	-	70	-	45	-	-	-
Marketing	280	124	33	15	100	40	110	40	37	29	-	-
Consultants	404	324	150	115	130	110	100	80	24	19	-	-
Subtotal	1,711	448	330	130	560	150	550	120	271	48	-	-
Total	9,984	5,376	730	310	3,540	2,100	3,451	1,737	1,969	1,080	294	149
7. Contingencies /2												
Physical	1,257	681	77	32	466	285	441	216	243	133	26	15
Price	2,758	1,438	74	28	809	480	1,056	495	739	384	85	51
Subtotal	4,035	2,119	151	60	1,275	765	1,497	711	982	517	111	66
Grand Total	14,019	7,495	881	370	4,815	2,865	4,948	2,448	2,951	1,597	405	215
MINOR WORKS												
1. Works												
Water Supply- Mains	467	280	-	-	70	70	352	180	45	30	-	-
- Distribution	124	75	-	-	-	-	100	70	24	5	-	-
Health Centers	112	45	-	-	100	45	-	-	-	-	-	-
Schools	1,085	435	185	35	500	300	400	100	-	-	-	-
Vocational Training Center	156	62	65	25	91	37	-	-	-	-	-	-
Roads	62	19	-	-	62	19	-	-	-	-	-	-
Community Centers	78	23	-	-	37	15	41	8	-	-	-	-
Subtotal	2,084	939	250	60	860	486	905	358	69	35	-	-
2. Land Acquisition	6	-	3	-	3	-	-	-	-	-	-	-
3. Equipment and Materials	325	260	-	-	245	196	80	64	-	-	-	-
4. Engineering and Administration	118	19	47	19	50	-	21	-	-	-	-	-
Total	2,533	1,218	300	79	1,158	682	1,006	422	69	35	-	-
5. Contingencies /2												
Physical	253	122	-	-	142	75	100	42	11	5	-	-
Price	643	308	30	7	262	153	321	133	30	15	-	-
Subtotal	896	430	30	7	404	228	421	175	41	20	-	-
Grand Total	3,429	1,648	330	86	1,562	910	1,427	597	110	55	-	-
Overall Total	<u>17,429</u>	<u>9,143</u>	<u>1,211</u>	<u>456</u>	<u>6,377</u>	<u>3,775</u>	<u>6,375</u>	<u>3,045</u>	<u>3,061</u>	<u>1,652</u>	<u>405</u>	<u>215</u>

/1 Discrepancies due to rounding

/2 For irrigation works, physical contingencies are estimated at 15%, and for all other items at 10%. For all civil works, price contingencies are compounded at annual rates of 12% (1974), 10% (1975), and 8% (1976 and 1977). For equipment and farm development costs, contingencies are compounded at annual rates of 9% (1974), 7% (1975) and 5% (1976-78).

/3 At 15% for physical and price

JORDANNORTHEAST GHOR IRRIGATIONAND RURAL DEVELOPMENT PROJECTEstimated Schedule of Disbursements

<u>IDA Fiscal Year and Quarter</u>	<u>Cumulative Disbursement at End of Quarter</u> (US\$'000)
<u>1974/75</u>	
September 30, 1974	40
December 31, 1974	200
March 31, 1975	480
June 30, 1975	1,420
<u>1975/76</u>	
September 30, 1975	2,220
December 31, 1975	3,440
March 31, 1976	3,970
June 30, 1976	4,550
<u>1976/77</u>	
September 30, 1976	5,390
December 31, 1976	5,800
March 31, 1977	6,390
June 30, 1977	6,850
<u>1977/78</u>	
September 30, 1977	7,050
December 31, 1977	7,350
March 31, 1978	7,420
June 30, 1978	7,470
<u>1978/79</u>	
September 30, 1978	7,500

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTCredit and MarketingCredit

1. Existing Facilities. The major source of seasonal credit (cash and in kind) in the project area is commission agents. The Agricultural Credit Corporation (ACC) which has received IDA credits in the past, has gained considerable experience and expanded its operations which, however, are still small in the project area. Its loans in the project area (north of Wadi Yabis) have risen from JD 15,000 in 1970 to JD 141,000 in 1972 and JD 124,000 during the first half of 1973. The ACC has a branch office at Wadi Yabis with a staff of seven. During 1972, 21% of its loans in the project area were seasonal, the balance was medium- and long-term. All ACC loans are secured by land or fixed property, and are not made to sharecroppers or tenants.

2. The Jordan Cooperative Societies, which prior to 1967 had concentrated their activities in the West Bank, are weak in the project area. There are 12 small thrift and credit societies, some of which are 20 to 25 years old but have part of their assets frozen. The two packing and grading stations in the area have been nominally under the supervision of the Jordan Cooperative Organization but failed to operate most of the time partly due to insufficient management or supervision. Credit supplied by Cooperative Societies to the area is limited and about a third of its loans are in kind. These societies are accustomed to deal with groups rather than individual farmers and considers that credit operations can only succeed if subsidized.

3. There is thus a major seasonal credit deficit in the region which is now supplied partially by commission agents and ACC. Sharecroppers (60% of all farmers) borrow from commission agents or land owners at rates above the 8% charged by ACC (7% if paid on due date), but since commission agents also supply inputs and market most of the produce of the area, the real interest charged by commission agents can not be accurately determined.

4. Future Credit Requirements. After the project, farmers would require medium-term loans for on-farm sprinkler equipment and seasonal loans for incremental annual production costs to attain the expected yield levels. JD 852,000 including contingencies and representing 80% of the total credit requirements, have been provided in the project.

5. ACC has demonstrated its ability to expand its lending activities satisfactorily when it has adequate funds. It has also indicated willingness to work through the Farmers Association (FA) in distributing the loans to

farmers in the project area and maintain separate accounts for these activities. Under these conditions ACC would be willing to make direct loans to individual farmers and sharecroppers.

6. A subsidiary loan agreement will be signed stipulating that Government will lend to ACC, through JVC, JD 800,000 at an interest rate of 4-1/4%. ACC will on-lend to project farmers at its existing rates of 8% for seasonal loans, 7% if repaid on time, and 6% for medium-term loans. This will permit ACC a margin of about 2-3/4% on the average for project loans and loan collection through AMO and FA will assist ACC in improving its loan collection record. The lending rate to ACC and the on-lending rate to farmers would both be about 1% higher than the rates in the last IDA credit to Jordan for ACC. Although commercial credit terms are undoubtedly higher than ACC rates, commission agent practices obscure the effective rate of interest of commercial credit. Despite the higher interest rates of commercial credit, it would be impractical for ACC lending rates for project loans to be out of line with other ACC loans. The rate of inflation in Jordan during 1970-72 was relatively low, 2% per year. Although it appears to have increased in 1973, the rate of increase is not yet accurately measured and farm product prices have not risen substantially.

Marketing

7. In the second year of the project (1975 winter season) all crops would pass through the two assembly markets which would be operated by the Agricultural Marketing Organization (AMO), with staff provided by the project. AMO has worked with the UNDP agricultural Marketing project for the past three years and has developed much knowledge about the problems and possibilities involved in marketing, grading and packing. It has also developed knowledge about the nature of Jordan's major markets and what is needed to improve the competitiveness of Jordan's fruits and vegetables in these markets. When the FA is able to take over the operations of the assembly markets the management and the trained staff will pass from AMO to the Farmers Association. The operational rights of the packing and grading stations, would be clearly transferred to AMO, and the stations would be prepared for operation and re-equipped (ANNEX 4) in order to commence trial packing and grading operations. These stations and their staff would also be transferred to the FA when it is able to manage their operation.

8. Provision is made in the project for a full-time specialist to supervise the operation of the assembly markets and packing and grading stations for three years in addition to specialist services for shorter periods. The specialist would help in marketing fruits and vegetables, concentrating in the first year on initial field sorting jointly with the extension service and training of staff at the markets and packing houses. In the second year his major concern would be development of the domestic and neighboring markets for project area produce. His third year would be devoted to developing other markets such as Europe, for specially graded, packed and shipped fruits and vegetables.

9. The role of ACC, AMO and FA in the provision of credit and marketing would be expanded under the project to ensure that the close link between the provision of expanded services, increased production and improved marketing is maintained, thereby ensuring success of the project and equitable distribution of its benefits to all farmers, especially smaller farmers, the majority of whom are sharecroppers. The present provision of credit, inputs and marketing services by commission agents and large farmers (often the same persons) works to the disadvantage of the smaller farmers and sharecroppers. The extent of this disadvantage is difficult to quantify because of the disguised elements of costs and prices prevailing in such a system -- sharecroppers can not obtain loans directly and their produce is marketed against payments for credit and inputs.

10. Competition among commission agents is limited in the project area and their main concern appears to be with transactions outside the project area -- profits in the Amman or Irbid wholesale markets or in foreign markets. As a result, efficient and low cost provision of services in the project area and early preparation of produce for market at the farm or project area level has been retarded, and incentives to improve production and marketing to benefit the project area have lagged.

11. The project's reliance on ACC, AMO and FA is designed to inject new services into the project area to ensure competitive operations in the areas of credit, input supply and marketing. Beyond the primary markets it is expected that the private sector, commission agents and others, will continue to perform the marketing and transport services they presently perform. The private sector is also not prohibited from continuing its activities in the provision of credit and inputs. An element of competition is simply introduced into both types of activities with emphasis placed on maximizing the benefits in the project area and especially those obtained by its smaller farmers. Since the produce leaving the project area would double by 1983 the demand for the services of the private sector would therefore substantially increase. The institutions relied on, ACC and AMO, appear to be the best available for introducing this kind of competition and carrying out these activities.

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTFarmgate Prices

1. Farmgate prices in the project area were derived from Amman wholesale market prices (Table 1) with the following deductions:

Commission agent fee	5%
Market fee	2%
Transport cost	1.5 fils/kg
Field boxes	
Tomatoes	2 fils/kg
Others	1 fil/kg

2. One wooden field box costs 80 fils and holds 20 kgs of vegetables. Each box on average can be used four times. The average cost per trip, per box of 20 kgs is thus 20 fils, or 1 fil/kg.

3. Tomatoes receive more care and therefore better boxes are used. On this basis the box cost per kg for tomatoes was doubled to 2 fils/kg.

4. Cost of sacks for dried onions and potatoes amount to 1 fil/kg per trip.

5. Cost of transport from the Northeast Ghor area to Amman (70 to 100 km) is reported as JD 10 to 15 per truck. Average loads range from 10 to 15 tons. The higher range of 1.5 fils/kg has been used.

6. The above deductions were based on field discussions in the project area and at the Amman wholesale market, and correspond to information contained in the following reports of the UNDP Agricultural Marketing Project in Jordan:

(a) Preliminary Note on the Establishment of Assembly Markets, Grading and Packing Centers for Fresh Horticultural Commodities in the Jordan Valley (Report 2/73).

(b) Pre-feasibility Study - Assembly - Sorting - Grading and Packing Stations (August 1972).

7. The derived farmgate prices are given in Table 2.

Adjustments

8. Prices for the winter period (January-May) 1973 were substantially higher for a number of commodities than they were in the same period 1972

(Table 1). For individual commodities, however, they were lower than in certain previous years. The winter period in 1972 was exceptional because of closure of the Syrian border which caused prices to fall. The 1973 winter period is assumed to have some element of inflation reflected in its prices (about 6%), but, relatively high prices in 1973 also reflect short supplies. Average winter prices during recent years were as follows:

	1973	Previous Peak Prices	1971-73	1968-73	1968-72	Basic Price Used for Analysis
	-----Fils/kg-----					
Tomatoes	42.1	40.2	32.5	31.6	29.4	33
Onions	34.7	43.1	22.6	25.5	23.6	26
Potatoes	44.9	39.3	38.7	35.1	33.1	39
Green beans	88.6	85.8	81.8	75.1	72.4	82
Broad beans	55.2	46.8	48.4	43.7	41.1	48
Cucumbers	59.8	72.8	59.5	62.1	62.6	63
Squash	29.1	35.6	28.9	30.4	30.6	31
Eggplant	45.9	40.3	37.9	34.7	32.4	38
Cauliflower	33.8	27.3	24.0	19.3	16.4	24
Sweet peppers	47.7	75.6	51.1	55.8	57.8	58
Hot peppers	75.6	57.0	72.2	68.3	66.0	72
Bananas	62.6	62.6	61.0	60.9	62.0	62
Oranges	37.5	31.9	30.3	29.2	27.7	30
Lemons	42.1	58.9	43.6	37.8	36.9	42

9. It may be seen that excluding or including 1973 prices from the longer-term average (1968-72 or 1968-73) has little impact on the average price level. In some cases inclusion of 1973 raises the average and in other cases it lowers it. The 1973 prices were, except for two commodities, well above the longer period average, and in 9 out of 14 cases above previous peak levels. This suggests a rising trend in prices despite the high degree of seasonal and annual instability. Since price movements among commodities are not uniform it is not reasonable to select any one series as an appropriate base. The 1971-73 average winter price has therefore been selected as base point. Where the 1971-73 average price is equal to or above the 1968-73 average prices it has not been adjusted. Where it is below the longer term average, the base price has been raised to equal the highest price, not to exceed the 1973 prices for winter crops. For summer crops, where annual fluctuations are relatively small, the 1970-72 crop price has been used. Actual prices used are in Table 3.

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Wholesale Prices Amman (Weighted Average per Season) in Fils/kg

	1968		1969		1970		1971		1972		1973
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter/1	Summer	Winter
Tomatoes	28	24	47	26	35	27	37	34	30	22	49
Onions (dry)	15	17	36	33	49	27	20	22	21	24	40
Potatoes	37	25	35	39	38	31	37	38	45	42	51
Green beans	75	39	73	51	81	55	95	49	79	53	98
Broad beans	41	125	51	120	42	115	53	96	49	140	62
Cucumbers	76	30	76	38	65	29	81	39	52	35	67
Squash	35	27	39	37	37	29	41	26	26	29	34
Eggplants	40	14	37	24	32	23	46	19	33	23	52
Cauliflowers	16	26	24	29	15	30	32	29	11	32	39
Peppers (sweet) 1/3	-	-	84	36	56	33	46	41	43	31	54
Peppers (hot) 2/3	-	-	-	-	64	40	63	36	94	36	84
Water melons	-	8	41	11	57	17	-	15	-	9	-
Sweet melons	-	22	-	28	-	27	-	28	-	21	-
Grapes	-	49	-	45	-	46	-	48	-	44	-
Bananas	-	-	-	-	68	70	70	76	65	69	70
Oranges	27	32	37	40	35	32	34	36	34	43	43
Lemons	33	39	39	40	39	40	35	40	66	50	48

1 Closure of Syrian border.

Winter (January-May)
Summer (June-December)

JORDAN

NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Farmgate Prices in Project Area in Fils/Kg /1

	1968		1969		1970		1971		1972		1973	Average	Average
	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	1970-72	1971-73	
Tomatoes	22.5	18.8	40.2	20.7	29.1	21.6	30.9	28.1	24.4	17.0	42.1	22.2	32.5
Onions (dried)	11.0	13.3	31.0	28.5	43.1	22.6	16.1	18.0	17.0	19.6	34.7	20.1	22.6
Potatoes	31.9	20.7	30.0	38.8	32.8	26.3	31.9	32.8	39.3	36.6	44.9	31.9	38.7
Green Beans	67.2	33.8	65.4	44.9	72.8	48.6	85.8	43.1	71.0	46.8	88.6	46.1	81.8
Broad Beans	35.6	113.7	44.9	109.1	36.6	104.4	46.8	84.8	43.1	127.7	55.2	105.6	48.4
Cucumbers	68.2	25.4	68.2	32.8	57.9	24.5	72.8	34.3	45.9	30.0	59.8	29.6	59.5
Squash	30.0	22.6	33.8	31.9	31.9	24.5	35.6	22.1	22.1	24.5	29.1	24.0	28.9
Eggplant	34.7	10.5	31.9	19.8	27.3	18.9	40.3	15.2	28.2	18.9	45.9	17.7	37.9
Cauliflower	12.4	21.7	19.8	24.5	11.5	25.4	27.3	24.5	11.0	27.9	33.8	25.9	24.0
Peppers (sweet)	-	-	75.6	31.0	49.6	28.2	68.5	35.6	37.5	36.3	47.7	33.4	51.1
Peppers (hot)	-	-	-	-	57.0	34.7	56.1	31.0	84.9	31.0	75.6	32.2	72.2
Water Melons	-	5.0	35.6	7.7	50.5	13.3	-	11.5	-	5.9	-	9.6	-
Sweet Melons	-	18.0	-	23.5	-	22.6	-	23.5	-	17.0	-	21.0	-
Grapes	-	43.1	-	39.3	-	40.3	-	42.1	-	38.4	-	40.2	-
Bananas	-	-	-	-	60.7	62.6	62.6	68.2	57.9	61.7	62.6	64.2	61.0
Oranges	22.6	27.3	31.9	34.7	30.0	27.3	26.3	31.0	27.1	37.5	37.5	31.9	30.3
Lemons	28.2	33.8	33.8	34.7	33.8	34.7	30.0	34.7	58.9	44.0	42.1	37.8	43.6

/1 Amman wholesale price less commission agent fee, marketing fee, transport and packaging costs.

/2 Closure of Syrian border.

Winter (January-May)

Summer (June-December)

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTPrices Used For Project Analysis

	<u>Winter</u>	<u>Summer</u>
	-----files/kg-----	
Tomatoes	33	22
Onions	26	20
Potatoes	39	32
Green beans	82	46
Broad beans	48	106
Cucumbers	63	30
Squash	31	24
Eggplant	38	18
Cauliflower	24	26
Sweet pepper	58	32
Hot pepper	72	32
Water melons	-	10
Sweet melons	-	21
Grapes	-	40
Bananas	62	64
Oranges	30	32
Lemons	42	38
Wheat	30	30
Maize	25	25

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTFarm Budgets, Project Charges and Farmers' IncomeFarm Budgets

1. Farm budgets have been prepared for the following typical farm models:

- (a) 3 ha vegetable farm,
- (b) 3 ha fruit and vegetable farm,
- (c) 4 ha citrus farm,
- (d) 15 ha citrus farm,
- (e) 15 ha fruit and vegetable farm.

These farm models reflect the impact of the project. Both owner-operated and sharecropped conditions are presented. Without the project, production costs (Tables 1 and 2) include annual costs, land taxes, water costs (on the presently irrigated area) and interest on working capital, which has been assumed at 10% per annum for a period of 12 months for perennial and six months for annual crops. These costs vary with farm size. Costs of family labor are shown separately. With the project, production costs (Tables 1 and 2) consist of annual costs, establishment costs of orchards, land taxes and interest on working capital and on intermediate loans to acquire on-farm pipes. The establishment costs of citrus and bananas takes into account maintenance costs during pre-fruiting years. These costs have been annualized by assuming a 40-year life for citrus and 8 years for bananas. Farmgate prices are given in Annex 13, Table 3.

Project Charges

2. Investment costs (including replacement costs) and all operation and maintenance costs are proposed to be recovered over the project life of 40 years on a volume basis for both gravity and sprinkler systems which would be 6 fil³ m³. On this basis the project charges would amount to a minimum of 17% and a maximum of 36% of the incremental income of 3 ha and 15 ha farms respectively. 15 ha farms only represent 1% of the project area.

Farmers Income

3. The farmer's incremental incomes, after payment of project charges and the per capita income based on a family size of 5.7 persons would be as follows:

	Owner Operated		Sharecropped ^{/1}	
	Incremental Income	Per Capita Income	Incremental Income	Per Capita Income
	JD	JD	JD	JD
3 ha vegetable farm				
Sprinkler	566	217	297	106
Gravity	496	205	749	97
3 ha fruit and vege- table farm				
Sprinkler	468	255	232	127
Gravity	427	262	213	124
15 ha fruit and vege- table farm				
Sprinkler	3,189	1,099	-	-
Gravity	3,040	1,125	-	-
4 ha citrus farm				
Gravity	734	378	-	-
15 ha citrus farm				
Gravity	2,091	1,000	-	-

^{/1} Incremental benefit to and per capita income of sharecropper.

JORDAN

NORTH EAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Annual Production Costs per hectar- Range for Different Farm Types and Sizes

Crop	Machinery	Fertilizer + Manure	Plant Protoc.	Seeds	Water	Tax	/1			/2			/3		
							Hired Labor	Family Labor	Total Cost	Hired Labor	Family Labor	Total Cost	Hired Labor	Family Labor	Total Cost
1. Without Project															
1.Citrus	4.5	45.2	3.0	31.0 ^{/1}	13.1	6.0	-	-	-	18.1	155.9	276.8	159.0	48.6	313.4
2.Banana	-	103.1	-	154.0 ^{/1}	22.4	15.0	-	-	-	18.2	161.5	474.2	170.8	47.4	512.7
3.Tomato	10.0	23.8	18.0	6.0	5.4	1.0	36.0	133.3	233.5	17.0	147.4	228.6	155.9	43.2	263.3
4.Eggplant/Pepper	10.0	23.2	14.1	4.8	14.8	1.0	30.0	127.7	225.6	16.1	133.3	217.3	144.6	40.7	253.2
5.Cucumber/Squash	10.0	25.4	11.5	8.5	5.7	1.0	25.0	97.4	184.3	11.8	101.0	174.9	110.5	26.9	199.5
6.Onion /2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.Beans /2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.Other Vegetables /3	10.0	24.1	8.4	16.2	5.0	1.0	27.0	102.8	194.5	12.5	113.6	190.8	120.0	33.0	217.7
9.Maize	10.0	11.8	-	3.0	9.0	1.0	15.1	55.4	105.3	7.1	61.4	103.3	65.0	18.0	117.8
10.Wheat	14.0	-	-	7.0	5.0	1.0	7.4	27.5	61.9	3.5	30.0	60.5	32.0	8.4	67.4
2. With Project															
<u>Gravity Irrigation</u>															
1.Citrus	21.0	79.6	9.0	26.0	6	-	-	-	-	20.6	150.3	316.5	152.0	47.3	350.9
2.Banana	-	105.6	-	150.0	15	-	-	-	-	22.0	137.3	429.9	152.6	43.3	474.5
3.Tomato	38.0	40.4	20.0	10.0	1.0	19.4	97.2	226.0	15.0	100.5	224.9	107.3	31.3	248.0	
4.Eggplant/Pepper	33.6	39.8	15.3	8.3	1.0	17.8	89.4	205.2	14.0	91.5	203.5	96.0	28.5	226.5	
5.Cucumber/Squash	25.5	37.3	12.5	12.0	1.0	16.4	82.2	186.9	13.0	84.8	186.1	89.2	26.5	204.0	
6.Onion	25.5	38.4	12.5	22.0	1.0	15.2	76.4	191.0	11.0	75.0	185.4	84.2	24.6	208.2	
7.Beans	23.0	32.1	6.0	18.0	1.0	17.7	88.7	186.5	12.0	78.8	170.9	96.2	29.0	205.3	
8.Other Vegetables /4	31.7	45.6	12.5	34.2	1.0	15.0	72.0	212.0	14.0	94.0	233.0	80.0	23.3	228.3	
9.Maize	18.5	15.3	2.5	9.0	1.0	6.1	30.7	83.1	5.0	31.5	82.8	34.0	9.8	90.1	
10.Wheat	19.5	13.4	2.5	10.0	1.0	4.2	20.9	71.5	3.0	21.8	71.2	22.0	6.8	75.2	
3. With Project															
<u>Sprinkler Irrigation</u>															
1.Citrus	21.0	79.6	9.0	26.0	6	-	-	-	-	22.6	152.3	316.5	162.0	47.3	350.9
2.Banana	-	105.6	-	150.0	15.0	-	-	-	-	22.0	137.3	429.9	160.6	43.3	474.5
3.Tomato	35.0	40.4	20.0	10.0	1.0	15.3	92.8	214.5	14.0	93.8	214.2	100.0	29.3	235.7	
4.Eggplant/Pepper	32.5	39.8	15.3	8.3	1.0	14.0	83.0	193.9	12.5	85.9	195.3	88.0	28.3	215.2	
5.Cucumber/Squash	22.5	37.3	12.5	12.0	1.0	12.8	77.4	175.5	12.2	78.0	175.5	82.4	25.2	192.9	
6.Onions	22.5	38.4	12.5	22.0	1.0	11.8	71.4	179.6	10.5	66.3	174.8	76.0	23.3	195.7	
7.Beans	20.0	32.1	6.0	18.0	1.0	14.0	81.4	174.4	12.0	71.3	160.4	89.5	27.4	194.0	
8.Other Vegetables /4	28.7	45.6	12.5	34.2	1.0	11.9	66.0	200.5	13.0	84.8	219.8	73.0	21.0	216.0	
9.Maize	15.5	15.3	2.5	9.0	1.0	4.9	28.1	76.0	4.0	28.5	75.8	29.8	9.2	82.3	
10.Wheat	16.5	13.4	2.5	10.0	1.0	2.4	14.7	60.5	2.0	14.9	60.3	15.6	4.8	63.8	

- ^{/1} Establishment annualized at 10% over 40 years for citrus and 8 years for Bananas
^{/2} Included in other vegetables
^{/3} Weighted average of Cauliflower,Cabbage, beans, onions, potatoes, etc
^{/4} Weighted average of Cauliflower,Cabbage, Potatoes
^{/5} 3 ha vegetable farm
^{/6} 3 ha fruit and vegetable farm
^{/7} 15 ha Fruit and Vegetable Farm

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Annual Production Costs Per Hectare For Different Size Citrus Farms

	<u>/2</u>							<u>/3</u>				
	<u>Machinery</u>	<u>Fertilizer</u>	<u>Plant</u>	<u>Establish.</u>	<u>Water</u>	<u>Tax</u>	<u>Hired</u>	<u>Family</u>	<u>Total</u>	<u>Hired</u>	<u>Family</u>	<u>Total</u>
		<u>& Manure</u>	<u>Protec.</u>	<u>Costs /1</u>			<u>Labor</u>	<u>Labor</u>	<u>Cost</u>	<u>Labor</u>	<u>Labor</u>	<u>Cost</u>
	-----JD/ha-----											
1. <u>Without Project</u>												
Citrus	4.5	45.2	3.0	31.0	13.1	6.0	10.0	166.0	280.8	119.3	76.5	298.6
2. <u>With Project</u>												
Citrus	21.0	79.6	9.0	26.0		6.0	15.0	166.0	322.6	164.3	59.3	365.2

/1 Establishment Costs taking into account intercropping with vegetables during first two years, and annualized at 10% per year over 40 years amounts to JD 31, if water costs are included and JD 26 without water charges

/2 4 ha owner operated farm

/3 15 ha owner operated farm

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

CROP	Farm Budget									
	3 ha Vegetable Farm									
	Area Cropped ha	Yield t/ha	Produc. t	Price JD/t	GPV JD	Produc. Cost JD/ha	Total Prod. Cost JD	NPV JD	Produc. Cost JD/ha	Total Prod. Cost JD
							Gravity-Irrig.	Sprinkler-Irrig.		
<u>1) Without Project</u>										
Citrus										
Banana										
Early Tomatoes	0.45	17	7.65	33	252	234	105			
Late Tomatoes	0.30	17	5.10	22	112	234	70			
Early Eggplant/Pepper	0.15	15	2.25	41	92	226	34			
Late Eggplant/Pepper	0.68	15	10.20	20	204	226	154			
Early Cucumber/Squash	0.23	10	2.30	47	108	185	43			
Late Cucumber/Squash	0.11	10	1.10	27	30	185	20			
Other Vegetables	0.38	12	4.56	34	155	195	74			
Maize	0.07	4	0.28	25	7	105	7			
Wheat	0.80	2.5	2.00	30	60	62	50			
Total	3.17		35.44		1020		557	464		
<u>2) With Project</u>										
Citrus										
Banana										
Early Tomatoes	0.56	25	14.00	33	462	226	127	215	120	
Late Tomatoes	0.19	25	4.75	22	105	226	43	215	41	
Early Eggplant/Pepper	0.23	23	5.29	41	217	205	47	194	45	
Late Eggplant/Pepper	0.49	23	11.27	20	225	205	100	194	95	
Early Cucumber/Squash	0.15	20	3.00	47	141	187	28	175	26	
Late Cucumber/Squash	0.10	20	2.00	27	54	187	19	175	18	
Onion	0.15	17	2.55	26	66	191	29	179	27	
Beans	0.15	15	2.25	48	108	186	28	174	26	
Other Vegetables	0.38	23	8.74	29	253	212	81	200	76	
Maize	0.50	8	4.00	25	100	83	42	76	38	
Wheat	0.70	3.5	2.45	30	74	72	50	60	42	
Total	3.60		60.3		1805		594	1211	554	1251
Incremental due to Project								747		787

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

CROP	Farm Budget 3 ha Fruit & Vegetable Farm											Observations
	Area Cropped ha	Yield t/ha	Produ t	Price JD/t	GPV JD	Prod. Cost JD/ha	Total NPV JD	Prod. Cost JD/ha	Total NPV JD	Prod. Cost JD/ha	Total NPV JD	
1) Without Project												
Citrus	1.12	17.0	19.05	28	533	277	310					
Banana	0.38	15.0	5.70	63	359	474	179					
Early Tomatoes	0.23	17.0	3.90	33	129	229	53					
Late Tomatoes	0.15	17.0	2.55	22	56	229	34					
Early Eggplant/Pepper	0.08	15.0	1.20	41	49	217	17					
Late Eggplant/Pepper	0.34	15.0	5.10	20	102	217	74					
Early Cucumber/Squash	0.11	10.0	1.10	47	52	175	19					
Late Cucumber/Squash	0.08	10.0	0.80	27	22	175	14					
Other Vegetables	0.19	12.0	2.30	34	78	191	36					
Maize	0.07	4.0	0.30	25	8	103	7					
Wheat	0.45	2.5	1.15	30	35	60	27					
Total	3.20		43.15		1423		770	653				
2) With Project												
Citrus	1.12	28.0	31.36	28	878	317	355	317	355			
Banana	0.38	22.0	8.38	63	528	430	163	430	163			
Early Tomatoes	0.28	25.0	7.00	33	231	225	63	214	60			
Late Tomatoes	0.17	25.0	4.25	22	94	225	38	214	36			
Early Eggplant/Pepper	0.11	23.0	2.53	41	104	204	22	195	21			
Late Eggplant/Pepper	0.24	23.0	5.52	20	110	204	49	195	47			
Early Cucumber/Squash	0.08	20.0	1.60	47	75	186	15	176	14			
Late Cucumber/Squash	0.05	20.0	1.00	27	27	186	9	176	9			
Onion	0.07	17.0	1.19	26	31	185	13	174	12			
Beans	0.07	15.0	1.05	48	50	171	12	160	11			
Other Vegetables	0.19	23.0	4.37	29	127	233	44	220	42			
Maize	0.25	8.0	2.00	25	50	83	21	76	19			
Wheat	0.38	3.5	1.33	30	40	71	27	60	23			
Total	3.39		71.58		2345		831	1514	812	1533		
Increment due to Project								861		880		

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NORTHEAST CHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Farm Budget
4 ha Citrus Farm Owner Operated

<u>Crop</u>	<u>Area</u> <u>Cropped</u> <u>ha</u>	<u>Yield</u> <u>t/ha</u>	<u>Production</u> <u>t</u>	<u>Price</u> <u>JD/t</u>	<u>GPV</u> <u>JD</u>	<u>Prod.</u> <u>Cost</u> <u>JD/ha</u>	<u>Total</u> <u>Prod.</u> <u>Cost</u> <u>JD</u>	<u>NPV</u> <u>JD</u>
							----- Gravity - Irr.	
<u>1. Without Project</u>								
Citrus	4	17	68	28	1,904	281	1,124	
Total	4		68		1,904		1,124	780
<u>2. With Project</u>								
Citrus	4	28	112	28	3,136	323	1292	
Total	4		112		3,136		1292	1844
Increment due to project							<u>1,064</u>	

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Farm Budget

15 ha Fruit and Vegetable Farm

Crop	Area Cropped ha	Yield t/ha	Produc- tion t	Price JD/t	GVP JD	Gravity Irr.			Sprinkler Irr.		
						Prod. Cost JD/ha	Prod. Cost JD	NVP JD	Prod. Cost JD/ha	Prod. Cost JD	NVP JD
<u>Without Project</u>											
Citrus	6.00	17	102.00	28	2,856	313	1878				
Banana	2.00	15	30.00	63	1,890	512	1024				
Early tomatoes	1.10	17	18.70	33	617	263	289				
Late tomatoes	0.70	17	11.90	22	262	263	184				
Early eggplant/pepper /1	0.35	15	5.25	41	215	253	88				
Late eggplant/pepper /1	1.60	15	24.00	20	480	253	405				
Early cucumber/squash /2	0.55	10	5.50	47	259	200	110				
Late cucumber/squash /2	0.25	10	2.50	27	68	200	50				
Other vegetables /3	0.90	12	10.80	34	367	218	196				
Maize	0.20	4	0.80	25	20	118	24				
Wheat	2.10	2.5	5.25	30	158	67	141				
Total	15.75		216.70		7,192	4,389	2803				
<u>With Project</u>											
Citrus	6.00	28	168.00	23	4,704	351	2,106	351	2106		
Banana	2.00	22	44.00	63	2,772	474	948	474	948		
Early tomatoes	1.30	25	32.50	33	1,073	248	322	236	307		
Late tomatoes	0.45	25	11.25	22	248	248	112	236	106		
Early eggplant/pepper /4	0.55	23	12.65	41	519	226	124	215	118		
Late eggplant/pepper /4	1.15	23	26.45	20	529	226	260	215	247		
Early cucumber/squash /5	0.35	20	7.00	47	329	204	71	193	67		
Late cucumber/squash /5	0.25	20	5.00	27	135	204	51	193	48		
Onion	0.30	17	5.10	26	137	208	62	194	58		
Beans	0.30	15	4.50	48	216	205	62	194	58		
Other vegetables /6	0.80	23	18.40	29	534	228	182	216	172		
Maize	1.10	8	8.80	25	220	90	99	82	90		
Wheat	1.70	3.5	5.95	30	179	75	127	64	108		
Total	16.25	349.60	349.60		11,595	4,526	7,069	4,433	7,262		
Increment due to project							4,266		4,359		

/1 85% Eggplant and 15% Pepper.

/2 50% Cucumber and 50% Squash.

/3 46% Cauliflower-Cabbage, 6% Onion, 42% Beans and 6% Potato.

/4 75% Eggplant and 25% Pepper.

/5 50% Cucumber and 50% Squash.

/6 15% Early Potato, 33% Late Potato and 52% Cabbage and Cauliflower.

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Farm Budget

15 ha Citrus Farm - Owner Operated

<u>Grop</u>	<u>Area Cropped ha</u>	<u>Yield t/ha</u>	<u>Produc- tion t</u>	<u>Price JD/t</u>	<u>GVP JD</u>	<u>Gravity Irr.</u>		
						<u>Prod. Cost JD/ha</u>	<u>Total Prod. Cost JD</u>	<u>NVP JD</u>
<u>Without Project</u>								
Citrus	15	17	255	28	7,140	299	4,485	
Total	15		255		7,140		4,485	2,655
<u>With Project</u>								
Citrus	15	28	420	28	11,760	360	5,400	
Total	15		420		11,760		5,400	6,360
Increment due to project								<u>3,705</u>

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Farm Type /1	Summary Farm Budgets							
	GPV JD	Costs to /2		Net Benefits to /3		Incremental Net Benefits		
		Owner JD	Sharecropper JD	Owner JD	Sharecropper JD	Owner JD	Sharecropper JD	
<u>1. Sharecropped Farms</u>								
3 ha Vegetable Farm								
Without Project	1020	143	203	367	307	-	-	
With Project Gravity Irrigation	1805	289	346	613	556	246	249	
With Project Sprinkler Irrig.	1805	262	299	640	604	273	297	
3 ha Fruit Vegetable Farm								
Without Project	1423	177	220	535	492	-	-	
With Project Gravity Irrigation	2345	424	468	749	705	214	213	
With Project Sprinkler Irrig.	2345	403	448	769	724	234	232	
<u>2. Owner Operated Farms</u>								
3 ha Vegetable Farm								
Without Project	1020	346	-	674	-	-	-	
With Project Gravity Irrigation	1805	635	-	1170	-	496	-	
With Project Sprinkler Irrig.	1805	565	-	1240	-	566	-	
3 ha Fruit Vegetable Farm								
Without Project	1423	357	-	1026	-	-	-	
With Project Gravity Irrigation	2345	892	-	1453	-	427	-	
With Project Sprinkler Irrig.	2345	851	-	1494	-	468	-	
4 ha Citrus Farm								
Without Project	1904	482	-	1422	-	-	-	
With Project Gravity Irrig.	3136	980	-	2156	-	734	-	
15 ha Fruit Vegetable Farm /1								
Without Project	7192	3967	-	3225	-	-	-	
With Project Gravity Irrigation	11595	5330	-	6265	-	3040	-	
With Project Sprinkler Irrig.	11595	5181	-	6414	-	3189	-	
15 ha Citrus Farm /1								
Without Project	7110	3496	-	3614	-	-	-	
With Project Gravity Irrig.	11760	6055	-	5705	-	2091	-	

/1 15 ha farms only represent about 1% of the project area, Fruit Vegetable farms if sharecropped are given to several sharecroppers.

/2 When sharecropped establishment cost orchards paid by owner, hired labor by sharecropper, interest on operation capital presently paid by owner in the future equally shared, all other inputs equally divided. Watercost at proposed project level assumed equally shared and estimated at 6 fils/m³. Family labor not considered.

/3 GPV divided on a 50:50 basis.

JORDANNORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECTEconomic Rate of Return and Sensitivity Analysis

1. The economic rate of return of the project, costing family labor at 750 fils (JD 0.75) per day and hired labor at the market rate of JD 1 per day, would be 24%. A breakdown of investment costs, and operation, maintenance and replacement costs as well as total and net benefits over the project lifetime of 40 years (1974-2013) is presented in Table 1. Net benefits excluding the social development component (minor works) are given in Table 2. The bases of annual production costs are given in Tables 1-2 of Annex 14 and the prices used to evaluate benefits are given in Annex 13, Table 3. The development pattern of various crops is presented in Annex 14. Major assumptions made for calculating the initial economic rate of return include:

- (a) the economic life of on-farm sprinkler pipes, valves and related equipment would be 15 years while that of other structures would be 40 years;
- (b) investment costs exclude costs of land acquisition, price contingencies and credit for annual production inputs, the latter being included in annual production costs;
- (c) the value of production foregone due to dislocation caused by land leveling, installation of sprinkler equipment, drainage and other project works, most of which will be carried out in the present off season and much of which will have a minimal impact on the area, is assumed to equal the 2% annual increase in net value of productions which would have taken place during the construction period (1975-78) without the project; and in land physically lost to project structures is accounted for by the reduced area available for cultivation after the project;
- (d) full development would be achieved in 1983. Production costs and benefits commence in the year following completion of works in specific areas, they increase 50% in the first two years and 50% in the following three years. These developments are phased separately for the sprinkler and gravity irrigation areas;
- (e) project investment costs, production inputs and project benefits are costed at current prices and maintained for the project life;

- (f) the operation of the assembly markets and packing and grading stations is assumed as self-sustaining. Their operating and replacement costs and benefits are excluded from the analysis, but initial investment and staff costs for the first three years are included.

2. The results of sensitivity tests are summarized below:

<u>Assumption</u>	<u>Economic Rate of Return</u>
(a) Initial run	24.00%
(b) Benefits reduced 25%	17.92%
(c) Costs increased 25%	18.96%
(d) (b) & (c)	14.54%
(e) Without social development component (minor works)	29.13%

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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Economic Costs and Benefits

	<u>Costs</u>			<u>Benefits</u> ^{/2}	<u>Net Benefits</u>
	<u>Investment</u> ^{/1}	<u>O, M and R</u>	<u>Total</u>		
1974	240	-	240	-	(240)
1975	1,552	-	1,552	-32 ^{/3}	(1,584)
1976	1,547	25	1,572	21	(1,551)
1977	681	40	721	254	(467)
1978	27	170 ^{/4}	197	574	377
1979	-	220	220	1,005 ^{/5}	785
1980	-	220	220	1,415	1,195
1981	-	220	220	1,714	1,494
1982	-	220	220	1,902	1,682
1983	-	220	220	2,002	1,782
1984-91	-	220	220	2,002	1,782
1992	-	580 ^{/6}	580	2,002	1,422
1993	-	220	220	2,002	1,782
1994-2006	-	220	220	2,002	1,782
2007	-	580 ^{/6}	580	2,002	1,422
2008-12	-	220	220	2,002	1,782
2013	-	220	220	2,002	1,782

^{/1} Excludes land acquisition costs ; price contingencies and credit for annual inputs accounted for in production costs.

^{/2} Net of production costs.

^{/3} Incremental benefits (and costs) are phased to commence in each stage of improvement (50% in first two years, remainder in following three years).

^{/4} Commencement of annual extension staff.

^{/5} Net production, without project, would increase at 2% compounded until 1978.

^{/6} Fifteen year replacement of sprinkler pipes.

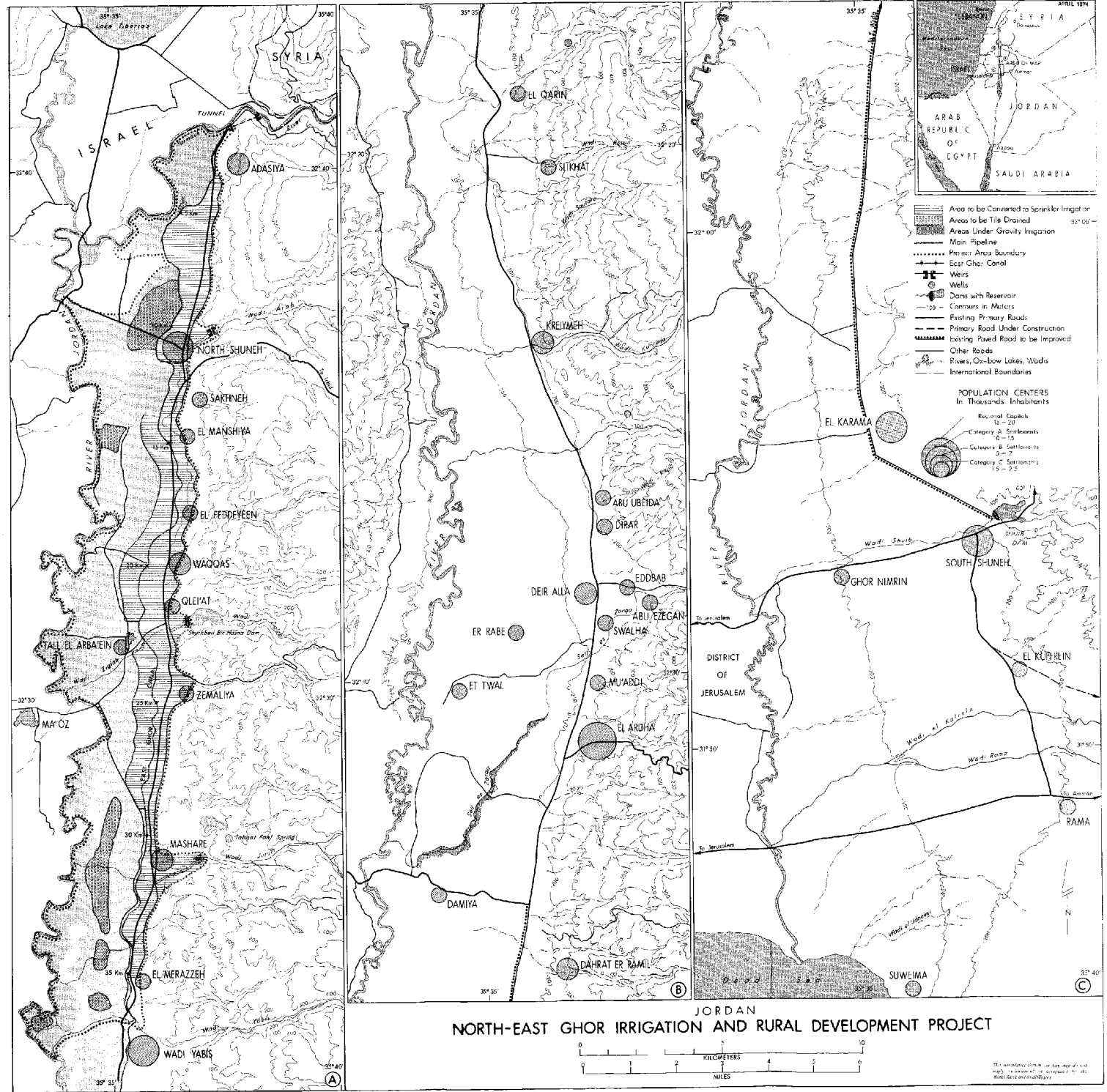
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NORTHEAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT

Economic Costs and Benefits (Excluding Social Development Component)

	Costs			Benefits	
	Investment	O, M, and R	Total	Benefits	Net Benefits
	-----JD thousand-----				
1974	145	-	145	-	(145)
1975	1,134	-	1,134	-32	(1,166)
1976	1,191	20	1,211	21	(1,190)
1977	655	30	685	254	(431)
1978	27	160/3	187	574	387
1979	-	204	204	1,005	801
1980	-	204	204	1,415	1,211
1981	-	204	204	1,714	1,510
1982	-	204	204	1,902	1,698
1983	-	204	204	2,002	1,798
1984-91	-	204	204	2,002	1,798
1992	-	564/2	564	2,002	1,438
1993	-	204	204	2,002	1,798
1994-2006	-	204	204	2,002	1,798
2007	-	564/2	564	2,002	1,438
2008-12	-	204	204	2,002	1,798
20013	-	204	204	2,002	1,798

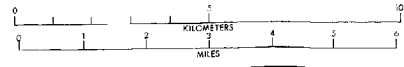
See table 1 for notes.



- Area to be Converted to Sprinkler Irrigation
- Areas Under Gravity Irrigation
- Main Pipeline
- Project Area Boundary
- East Ghor Canal
- Wells
- Dams with Reservoir
- Chambers in Meters
- Existing Primary Roads
- Primary Road Under Construction
- Existing Paved Road to be Improved
- Other Roads
- Rivers, Ox-bow Lakes, Wadis
- International Boundaries

- POPULATION CENTERS**
In Thousands Inhabitants
- Regional Capitals 15 - 20
 - Category A Settlements 7.5 - 15
 - Category B Settlements 5 - 7.5
 - Category C Settlements 1.5 - 2.5

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NORTH-EAST GHOR IRRIGATION AND RURAL DEVELOPMENT PROJECT



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