Jordan's economic performance has been determined, to a large extent, by its economic relations with neighbouring oil exporting countries through the following factors: financial transfer of both the private (workers remittances) and public (official grants) sector, capital flows (mainly soft loans) and trade flows.

During the 1970's, the increased level of economic activity in the Gulf countries, caused by the sharp rise in oil prices, created an economic boom; this boom through its economic relation with these countries affected the Jordanian economy. Rising exports helped finance capital formation and rising imports. The flow of the financial transfer contributed to a build up of international reserves. As a result, the Gross domestic product (G.D.P) recorded double-digit growth rates, external indebtedness was minimal, and inflation remained moderate.  

The objectives of the medium term economic and financial challenges include accelerated growth, creating additional employment opportunities and sustaining viable budgetary and balance of payments positions. It is also recognized two constraints deserving attention, namely, Jordan's growth population, and increasing scarcity of water.
**Jordan’s Economic Planning**

Jordan is constantly involved in drawing up plans and studies to back up various segments of the comprehensive multi-year plans. Nonetheless, Jordan's multiyear plans, although by no means entirely realized, have been of significant help in development process.

1. They have lent direction, coherence, and emphasis to the overall effort.

2. They sketch out specific designs for planned growth in G.D.P, personal income, and trade, which in turn are benchmarks against which progress may be measured.

3. Explicit major and many minor projects are listed in detail. This planning exercise is not only a description of what is to be done, but also provides a major document for development fund raising purposes, that is the document may be (and is) used as a sophisticated shopping list.

The first Plan was a general five-year plan covering the 1962-1967 period. It was scrapped in 1964 and replaced by a seven-year plan that gave much more detail about specific projects and was thus more usable as means to attract financing. It also provided a blueprint for Jordan's capital investment intentions for the subsequent seven years. With the onslaught of regional and domestic nation threatening events, planning was virtually forgotten in the 1967-72 period. In 1972, an interim three-year plan was published, making Jordan's return to
normalcy. The five-year plan of 1976-1980 was considerably more significant including as it did growth projections for all sectors as well as a listing of numerous projects in these sectors.\(^2\)

The 1981-1985 development plan was publicity presented by the national planning council in spring 1981, the fifth plan. The sectoral development projections were:

1. Agricultural income would grow 40 percent at an annual rate of 7%.
2. Industrial and mining income would increase at a phenomenal 17% annual, service-sector income growth would be slow, at 8.2% per annum. The plan includes a series of projects and programs ranging from a focus on Jordan valley development and livestock.
3. Improvement to the potash mining and attendant industries, light manufacturing, and joint ventures with other Arab countries.

Another important feature of the plan in the balancing of domestic government revenues with expenditures and increasing domestic income through improved taxes and a stimulated economy. About one third of Jordan's rapid economic growth originated in the industrial sector which includes manufacturing, construction, and water and electricity. Industrial income derived mainly from three heavy industries: phosphate extraction, cement manufacturing, and petroleum refining. Growth, however, slowed during the 1980's and 1990's. In the decade of the 1970's the growth in the service sector
was due to activity in the real estate market. The government policy of rationing credit by fixing interest rates regardless of the prevailing inflation rate led investors to look for quick profit by investing in short-term projects such as real estate and housing projects. The government services accounted for the bulk of the service sector share, as the government remains the main employer and provider of public services such as education and health care.

Jordan’s Agricultural Products

Jordan’s main agricultural products are cereal, fruits, and vegetables. The share of agricultural products in GDP was 10.7% in 1970, went down to 6.3% in 1975, then declining to only 5.3% in 1985, then rising somewhat to 2% in 1990.

Product yield varied widely, depending on prevailing weather conditions. For example, record high yields of wheat and barley in 1974 were severely reduced by drought in subsequent years. During the last 20 years, drops in agricultural productivity occurred seven times—almost every other year. The growth rate in the agricultural sector fluctuated between a negative rate of 43.7% in 1973 to a positive rate of 77.9% in 1980. In recent years, many farmers have left farming for more secure incomes in the towns where industry is located.

The details in the following three tables 1a, 1b and 1c gives the Gross National Product at current prices, the component of...
Table 1a:
Gross National Product at current Prices and share of Agriculture (1970-1979) (million JD)

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Table 1b: (1980-1989)
Table 1c: (1990-1997)

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Source: Central Bank of Jordan statistical series, different issues
agriculture, forest and fishing and its percentage share in total GNP. The GNP at current prices has been taken from the period of 1970 to 1997 covering the three decades of 1970's, 1980's and 1990's. In the 1970's the GNP has grown steadily from JD 235.1 million in 1970 to 1008.2 million in 1979. Whereas there was very little growth in the early 1970's. In 1975 the GNP was JD 449.5 million which more than doubled in 1979 to JD 1008.2 million. The share of agriculture, forest and fishing has been given as one competent because of the allied activities. Agriculture and allied activities contributed JD 24.6 million in 1970 for a total of 10.4% in the GNP. The contribution of the agriculture has fluctuated quite a lot during the 1970's. Its contribution in 1970 was JD 24.6 million, in 1973 it was JD 25 million. It jumped to JD 76.9 million in 1978 and was JD 61.4 million in 1979, in 1979 it was JD 61.4 million. Thus we see that the difference between the highest and lowest output of agriculture is almost three times. These wide fluctuations show the dependence on rainfed agriculture, the price of the output as well as the inputs. In fact the alarming situation is that the percentage share of agriculture, forest and fishing has gone down from a high of 12.1% in 1971 and 1972 it touched the highest at 14.5% in 1974 at 14.5% contribution to the GNP decline to only 6% in 1979.

In the 1980's decade the GNP increased from JD 1213.7 million in 1980 to JD 2180 million almost doubling over the last decade. But the increase in growth were in the early decades of 1980's where it
increased from JD 1213.7 million in 1980 to JD 2015.5 million in 1985. Thereafter the growth in the later part of the 1980's for the GNP was almost stagnant remaining in the range of JD 2000-2200 million only. In contrast the component of agriculture in the GNP increased steadily from JD 139.8 million in 1989. There were slow in and steady increases over the decade but the percentage contribution of agriculture in the GNP remained low. In fact the declining contribution had started itself in the 1970's with percentage contribution from above two digit (10 to 14%) falling below to single digit level of 6 to 9% for the 1980's the contribution of agriculture did not increase more than 7.3% in 1980 with contribution percentage falling to 4.9 in 1985. Though in the late 1980's the contribution of agriculture to GNP was around 6.2 to 6.4%.

In the 1990's decade the GNP increased from JD 2428.8 million in 1990 to JD 4898.4 million in 1997 almost doubling in these years. Almost every year of the 1990's show some growth in the GNP. This is in sharp contrast to agriculture, forestry and fishing, whose output in 1990 was JD 187.8 million increased to JD 246.9 million in 1992 and thereafter declined to JD 193.3 million in 1993. After that there was a steady decline with a low of JD 147.5 million in 1997. Due to the decline of the output the contribution of agriculture in the GNP has further decline from a high of 8.1% in 1991 the contribution of agriculture in 1997 has fallen to only 3%. This fall to only 3% as of the GNP reflects the fact that agriculture was affected by droughts has
**production of main agricultural crops**  
(1970-1979)  
(thousand tons)

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<td>1996</td>
<td>42.7</td>
<td>29.2</td>
<td>1.1</td>
<td>2</td>
<td>291.3</td>
<td>43.1</td>
<td>74.2</td>
<td>106.4</td>
<td>88.6</td>
<td>21.9</td>
<td>133.1</td>
<td>29.1</td>
</tr>
<tr>
<td>1997</td>
<td>41.8</td>
<td>29.4</td>
<td>2.7</td>
<td>2.1</td>
<td>324</td>
<td>39.7</td>
<td>62.2</td>
<td>124</td>
<td>57.1</td>
<td>18.3</td>
<td>168.9</td>
<td>18.2</td>
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to be modernized and access to water supply and other inputs be
to be more easily done. It also reflects the fact that Jordan is becoming a
more dynamic and open economy with services sector and
nontraditional items of export becoming very important. Thus over the
three decades of the 1970's, 1980's and 1990's, in absolute term the
value of the agriculture has increased from JD 24.6 million in 1970
touching high of JD 246.9 million in 1992 and then falling down to JD
147.5 million in 1997.

From the three tables 2a, 2b and 2c the productions of main
agricultural crops have been divided into the three decades of 1970's,
1980's and the 1990's. The production has been taken in thousand
ton as that gives an idea of physical production. The production in
terms of JD would have the problems of inflation and the price index
would have to be used to deflate it. The major field crops are wheat,
barley, and tobacco with recent additions of corn and clover in the
1990's. The major vegetables are tomatoes, eggplant, cucumbers,
melons, cauliflower, and cabbages. Major fruit trees are olives,
grapes, citrus fruits, bananas, apple, and peach. There are wide
variations in the outputs of almost each of the product. In 1970 wheat
output was 54.1 thousand ton, going up to 244 thousand ton in 1974,
 decreeing to 16.5 thousand ton in 1979. In the 1980's the highest
 and the lowest output for wheat was 50.6 thousand-ton and 133.5
 thousand ton. In the 1990's the variation is less and the output does
not increase more than 75.4 thousand ton which was in 1992. In fact
there has been an overall decline in the output of wheat. In fact, the output of wheat has shown a steady decline over the three decades as well as major fluctuation in consecutive years. For example, output in 1970 was 54.1 thousand ton in 1970, increased dramatically to 168.1 thousand ton in 1971, further went up to 211.4 thousand ton in 1972 to fall back to only 50.4 thousand ton in 1973. This shows the dependence on rainfed operations of agriculture and the effect of drought. In fact, the output of wheat has stagnated in the 1990 in the range of 40 to 70 thousand ton with it being only 41.8 thousand ton in 1997.

Among the field crops, barley has also shown almost the same trend of decline as that shown by wheat. In 1970 the production of barley was only 5.3 thousand ton, jumped almost 5 times next year to 26.2 thousand ton in 1972 but again declined to 5.9 thousand ton in 1973. With a further decline in 1979 to 4.8 thousand ton, in the 1980's also lots of fluctuations is shown. In 1980 the production of barely is 33.1 thousand-ton falling to 19.2 thousand ton next year. Again in the decades of 1980's the output fluctuated between a low of 9.0 thousand ton in 1989. The picture in the 1990's was no different for barley production. The fluctuation continued with output touching a high of 68.9 thousand ton in 1992. Subsequently in the next few years output has stagnated between 27.4 thousand ton in 1994 to 29.2 thousand ton and 29.4 thousand for 1996 and 1997 respectively.
In the case of another field crop, tobacco, the crop output has shown not much change. A output of 0.9 thousand ton in 1970 it went up to a high of 1.5 thousand ton in 1974 shipping back to 1.1 thousand ton in 1979. The 1980 being 3.3 thousand ton touching a high of 5.9 thousand in 1983. In fact the production of Tobacco did not touch this level in next many years. The 1990’s decade shows some fluctuations in the output, with it touching 4.8 thousand ton in 1995 but again was a low of 2.7 thousand ton in 1997.

Another field crops, a lentil has shown a slow decline in output over the three decades. From a low of 5.0 thousand ton in 1970, output went up to 22.4 thousand ton in 1972, a high of 31.0 thousand ton in 1974 which was the best year. Subsequently it started declining touching an alarming low of only 0.8 thousand ton in 1997. In the 1980’s output stagnated between lows of 5.9 thousand-ton and only 1.7 thousand ton. The 1990’s were no better with output stagnating below 4.8 thousand ton in 1993 and 2.1 thousand tons in the last three years of 1995, 1996 and 1997.

In the group of vegetables there have been fluctuations but they do not show a decline. In fact Tomatoes, Eggplant, cucumbers and Melons have shown growth in output over the three decades of 1970’s, 1980’s and 1990’s. In the 1990’s there have been other vegetables, which have also become important like Cauliflower and Cabbages, Potatoes and Zucchini. The output of Tomatoes was 137.4 thousand ton in 1970, touched 203.9 thousand ton in 1978 but falling
to 171.8 thousand ton in 1979. In the decade of 1980, it increased to 250.4 thousand ton in 1989. The 1990's also showed strong growth with output touching a high of 490.3 thousand ton in 1992 though it subsequently declined to 324.0 thousand ton in 1997. Over the period of three decades, there was steady growth in Tomatoes.

In the case of Eggplant the output shows a small increase. In the output over the three decades. In 1970 the output of Eggplant was 23.1 thousand-ton touching a high of 73.4 in 1995 but going down to 39.7 thousand ton in 1997. In the 1980's the output was in the range of above 50 thousand ton. Thus for Eggplant there was consistent high level output in the 1980's and major fluctuations in the 1990's through there is growth over the three decades.

Similarly Cucumbers and Melons show a growth over the years. The output of Cucumber was only 3.4 thousand-ton in 1970, which showed to be 62.2 thousand ton in 1997. In fact the output showed consistent growth in the 1970's and 1980's. Melons have also shown growth over the three decades. The output of Melons in 1970 was only 22.5 thousand-ton touching a high of 63.0 thousand ton in 1979. In the 1980's the output touched over 80 thousand-ton consistently in some years. In the 1990's the output stabilized over the 1000 thousand ton in 1994 though declining a little to 124.0 thousand ton in 1997. Thus the group of vegetables have shown growth in output over the three decades. What though is important to realize
that major fluctuations have taken, which could be due to the effect of
droughts.

In the case of fruits also there have growth over the years. Olives, Grapes, Citrus fruits, and Bananas. Over the three decades
have grown and in the 1990's the output of Apple and Peach have
grown in importance in the 1990's.

Olives have shown dramatic growth over the three decades. In
1970 it touched a high of 40.5 thousand ton in 1974 falling back to the
low level of 6.8 thousand ton in 1979. In 1980's output started with
44.5 thousand ton in 1980 touching 70.8 thousand ton in 1988. In the
1990's output touched a high of 94.1 thousand ton in 1994 though
showing a decline to 57.1 thousand ton in 1997. Even though output
fluctuated over the years from lows and highs the output has steadily
increased over the three decades.

In the case of other fruits also increased they show growth in
output, Grapes output was 6.4 thousand ton in 1970 touched 18.2
thousand ton in 1980, a high of 50.2 thousand ton in 1992 though
again declining to 18.3 thousand ton in 1997. In the case of citrus
fruits the increase of output has been very dramatic. In 1970 the
output was only 3.8 thousand ton, went up to 49.0 thousand ton in
1980, increased to 154.1 thousand ton in 1990 finally reaching 168.9
thousand ton in 1997. In the case of Bananas, the growth has been on
the low side. Output was 8.2 thousand ton in 1970, a low of 6.2
thousand ton in 1980, going up to 18.9 thousand ton in 1990 and
stagnant at 18.9 thousand ton in 1997, after touching 30.3 thousand ton in 1993. Also Apple and Peach have increased their output in the 1990's with output of Apple increasing from 18.8 thousand ton in 1992 to 31.0 thousand ton in 1997. In the case of Peach output fluctuated from 5.5 thousand ton in 1992 touching 17.2 thousand tons in 1994 and declining to 3.8 thousand in 1997.

Taking the three broad groups of field crops, vegetables and fruits, the groups of field crop have shown an overall decline has been coming through major fluctuations in the outputs. In the case of vegetables and fruits, there have been improvements in output and some have shown very impressive increase. But again the increases have come over the decades through major fluctuations in the output. One reason could be the effect of droughts for which proper access to water should be provided with to the different crops, vegetables and fruit.

The agricultural share of the labor force declined from 33.1 % in 1967 to only 10 % in 1989. The drop in the agricultural sector's share has favored the growth of the industrial sector in the Jordanian economy as shown in the above figure.

A reliance on rain for cultivating over 90% of the cultivable land makes water a particularly important resource for agricultural production. The average annual rainfall varies from 600 mm or more in high regions to less than 200 mm in desert areas. The aggregate
amount of annual rainfall is estimated at about 6,885 mm cu. Annual water consumption is estimated at 550 mm cu.

Surface water is concentrated in the areas of the Jordan valley, the Dead Sea basin and Wadi al-Arab. The productive capacity of these sources is about 850-mm cu. except for the Jordan valley. The water of these sources is primarily used for irrigation. 2,887 million cubic meters of irrigation water to the Jordan valley which sufficient to irrigate approximately 325,000 du.

Agriculture Development in Jordan

The agriculture development plan (1981-1985) is committed to a development strategy, which achieves a balance between the agricultural sector and other sectors, and ensures the minimum equipment of food security. This strategy includes the following elements:

1. Trying to develop agriculture within the framework of integrated rural development and the creation of sources of additional income for agricultural workers and small-holders.

2. Increasing participation in the development of the agricultural sector through the establishment of co-operative or organizing workers via popular organizations.

3. Intensification of efforts in the field of irrigated and unirrigated agricultural land and raising its productivity(10,6),(991,992).
introducing modern techniques and overcoming the problems of fragmentation of holdings.

4. Attempts to integrate animal and plant production; and paying more attention to animal wealth.

5. Turning production toward commodities where Jordan enjoys relative advantages, and at the same time keeping to the minimum of national and Arab food security.

6. Creating a strategic stock of basic foodstuffs, and the completion of the infrastructure

Despite the limited natural resources such as land and water in Jordan, the agricultural upswing there has absorbed modern techniques, particularly in irrigated agriculture, vegetable production, livestock meat, and eggs.

Food security has been among the priorities of agricultural development plans. To achieve a minimum of national food security, the government has adopted an agricultural development policy involving the execution of a) agricultural projects; and b) national strategic stock of basic foodstuffs such as Wheat, Rice and Sugar, and increased storage capacity to help ensure this stock by building stores and silos.

Introducing modern methods on the dry land farms has been somewhat problematic. The use of labour-saving devices such as tractors and combines is widespread; both private entrepreneurs and agricultural cooperatives provide them. Fertilizers, pesticides, and
Herbicides are also increasingly available and in use, again through both private communities based cooperative channels. The introduction of the new grains developed in the green revolution, however, has been slow, because of two underlying problems. The new seeds require more water than average Jordanian rainfall provide, and they are soft wheat varieties rather than the hard wheat variety that require less water have been (and continue to be) developed.

The dry land area also produces Wheat, Barley, various animal forage crops, legumes, and other vegetables like Lintels, Chickpeas, Beans, Tobacco and Sesame. Fruit and nut trees as well as grapes are also grown widely olive trees are perhaps the major fruit bearing trees.

The Jordan valley is highly productive area. Realizing that this valley was the only region in which agriculture could be dramatically increased, the government has put considerable effort and resources into it.

Jordan has been attempting throughout the last decade to build up an agricultural infrastructure capable of meeting domestic demand for agro-products and farming a significant national income source, especially through exporting these products to the highly absorptive markets of GCC countries. In fact, a major portion of investment in agriculture has been devoted to the development of projects in the agro-export sector. The loss of the GCC markets will mean that these
projects will have to be adapted and adjusted; they will most likely have to undergo radical changes to respond to new cropping patterns, such as growing grains to meet local demand instead of growing export-oriented fruits and vegetables.

The Jordan government adopted in 1973 a development plan for the Jordan valley with the objective of building up infrastructure facilities, extending irrigation canals, reclaiming new areas and constructing housing facilities. The Jordan valley authority was set up then to be in charge of development program in the valley. In the rainfed areas, trees planting were encouraged by the government, particularly olive trees. With a sufficient local market, poultry expanded through private investments.

Arable land in Jordan around 15% of the total Jordan land. The climate in the country is basically a Mediterranean climate characterized by dry hot summers and mild wet winters and extreme variability in rainfall within and among years.

Dry land regions of Jordan are characterized by low and highly variable rainfall. Unreliability and variability of rainfall increases as the amount of rainfall decreases.

The rainfed area in Jordan is essentially a fixed resource and any future additions to the cropped lands must come either from conversion of natural grazing lands or from reclamation of areas that are, at present, not used for agricultural production.
Farmers in the dry land regions of the world historically, have been ingenious in devising ways of managing and manipulating difficult environments within the constrains imposed by soil and climate. Now the problem facing the Jordanian farmers is the traditional methods of cropping with the risks and hazards of dry land agriculture (e.g.; fallow, sowing, methods, plowing, etc) are breaking down under population pressure, while modern technology has not yet produced acceptable alternatives.

The challenge facing farmers, agriculturists, and policy makers in Jordan is how to raise productivity of the dry land farming. A well organized program for the development of rain fed and arid areas is essential and is expected to bring about considerable economic and social benefits, particularly as more than 85% of the farming population lives in the rain fed areas and most of the live stock depends to varying degrees upon grazing over the arid rangelands. Any further delay in providing investment support to developing these areas poses the following hazards:

1. Progressive erosion resulting in loss of soil and soil productivity.
2. Threat of desertification; and
3. Low farm income leading to migration of the rural population to urban centers.

The Jordan government has always stressed the importance of increasing productivity in the agricultural sector, in particular. This increase in productivity is planning to be achieved through introducing
modern production techniques, applying research finding and developing extension services. Some of the project undertaken is to conduct agricultural development research on different aspects of rainfed agriculture in the highlands of Jordan. Another is to develop agricultural extension services through the training of qualified staff for this purpose. The extension services will be vehicle of disseminating research results and finding to the farming community in the highlands. The projects call for a complete survey of potential agricultural lands in the country and decisions regarding their optimum use.

There were a number of soil conservation projects like the Zarqa river catchment project, which aimed to develop and increase agricultural productivity in the lower Zarqa river catchment area of about 82,000 hectare.

Suitable soil and water conservation measures have been and will be built on farmer's lands as needed. In addition, the projects will work to develop rangelands in the catchment and increases their productive capacity. Other major projects, which will be initiated and/or continued for agriculture growth and its sustained development are:

1. Soil conservation and fruit tree planing on lands unsuitable for cereal production;
2. Seed improvement and multiplication project. Foundation and certified seed of cereal and legume crops will be produced
through cooperative efforts of the ministry of agriculture and the Jordan cooperative organization,

3. Introducing grain legumes and forage crops in the crop rotation. It is hoped that this will lead to a better integration of crop production and animal husbandry in the rural areas of the country and,

4. Mechanized agricultural services. The Jordan cooperative organization will develop agricultural machinery stations. The services offered by these stations are expected to increased crop yield in the rainfed sector through the use of modern machinery and cultural practices for crop production.

**Agricultural Credit System**

A credit institution set up to provide investment for the rural sector. This investment is a means of promoting innovation and, perhaps, efficiency in the agricultural sector. Through improved efficiency, it is also seen as a means of abating the poverty of farmers.

Easy credit, however, does not often lead to the desired end results, but instead to ever-increasing indebtedness of farmers; and examples of bankrupt institutions are common. The factors contributing to these can be divided into two categories, those, which are external to the credit agency, and those, which are, concerned with the practices of the agency itself.
Some of the problem internals to the agency are:

1. The use of land for urban development (often necessary as farm workers migrate to industrialized areas in search of work). As a contributing factor to reducing available land for agricultural use and, therefore, to reducing the incomes of farmers;

2. Problems of land by fragmentation, which decreases efficiency of land use;

3. Wastage of pasture land by deforestation, soil erosion etc;

4. Inefficient water distribution networks;

5. Difficulties in supplying agricultural inputs; and

6. Deficiencies in supportive services, for example, poor market information or a lack of storage facilities.

Internal problems are often unique to the country involved. However, more general lessons may be learned from the identification of the problems within a specific situation.

In Jordan, there are three separate semi-government agencies exist to disburse credit to the agricultural sector; the Agricultural Credit Corporation (ACC), the Jordanian Cooperative Organization (JCO), and the Jordan Valley Farmers Association (JVFA).

The ACC, JCO, and JVFA have different areas of responsibilities, the ACC concentrates on the building up of livestock reserves, the JCO on the provision of basic foodstuffs such as wheat and barley, and the JVFA on vegetables crops. The lines of responsibility are not, however, so clearly defined for example the JCO and ACC can both
lend money for the purpose of purchasing machinery. This raises the possibility of the farmer receiving a loan for the same purpose from more than one source and making an insufficient increase in profit to allow him to make the necessary repayments.

Those who receive loans and the manner in which loans are disbursed are other problem areas for the agencies in Jordan. The ACC lends to individual farmers; the JCO to the co-operatives and the IVFA to farmers who are members of the association and co-operatives in the area.

The general aim of establishing a credit agency is to service the rural sector. These are to provide investment to promote innovation and efficiency, and to reduce the poverty of farmers. There can be added other general aims for example, ensuring food security in the nation. The provision of cheap and accessible credit is a useful tool for development but only where it forms part of an overall strategy to lead to improvement in the performance of the agricultural sector and therefore, to the generation of income for farmers.

The precise role of credit in agricultural development is not always easy to determine. Even though credit has often been regarded by government as a primary factor in promoting a agricultural development, credit can only have an ancillary role following the establishment of some basis for new investment. Probably new technical knowledge and possibly also a degree of structural change in rural society. The popularity of agricultural credit
programmes is due, in part, to the ease with which most of them can be carried out. But credit should not be seen as the panacea for the problems of the agricultural sector.

Cropping, Rainfall, and Sowing Pattern

The cropping program is developed and administered within the ministry of agriculture. Production limits are determined within the agricultural economic branch of the ministry's office in Amman. The production organization subgroup of the agricultural economic branch has both planning and monitoring (follow-up) functions. The programme-planning group actually specifies the details of the program - makes estimates of the required area of each crop by season and by region. The following group, also within the agricultural economic branch, is responsible for monitoring the program.

The cropping pattern program is an allocation of crop areas based on the forecast constructed for each region during each of the two seasons - winter and summer. Individual forecasts are done for each of domestic fresh consumption, domestic processing use, and exports.

Once the production desires and forecasted needs have been determined, ministry of agriculture officials makes tentative assignment for each region (Jordan valley and highlands) and for each season. Allocations for individual farms may be based on the
farm's historical area or the allocation may be based on the requested area made by the farmer.

The cropping pattern programme for irrigated vegetable production in Jordan has motivated primarily by the desire to effect an increase in price of four major vegetables: cucumbers, tomatoes, squash, and eggplant. A secondary objective was to increase the production of other vegetable and field crops. An analysis indicates that the price of the four vegetable crops did not increase as a result of the rather severe reductions in production of the four primary vegetable crops. This is explained by suggesting that Jordan is a small agricultural producing country, in which the export market plays a significant role in price determination. There exist several substitute-producing countries, which apparently did not make simultaneous effort at supply control. There are also price controls in the domestic market. In technical terms the demand function facing Jordanian vegetable producers (those producing vegetables for export) is elastic. Reducing production resulted in lower total revenue to Jordanian farmers.

Farmers in the rainfed areas of Jordan have to contend with extreme temporal and spatial variability of climate and with a high level of spatial variability of soil and other physical factors. Rainfall is the most variable and most important of these factors. In a country of such environmental diversity, it is important to assess the effect of the environment variability on agricultural production.
In dry land farming (Abandah)\textsuperscript{9}, agriculture interfaces with a
dynamic complex of natural conditions, among which meteorological
factors are the most prevalent and the most changeable. The effect of
these factors on agricultural processes and subjects determines, to a
considerable extent, harvest size, product volume, cost, and operation
efficiency. Because of these reasons, the accurate calculation and
measurement of meteorological components, as well as the use of
information concerning weather phenomena and climate resources,
are needed for the efficient solutions of many agricultural problems in
the country.

Land use in the rainfed agricultural sector are inefficient, partly
because of a lack of information on capabilities of soils for crop
production, as not much attempt has been made to document
available soil survey information for land assessment purposes
according to Qudah\textsuperscript{10}. Agricultural specialists in Jordan should view
the conservation of the country's agricultural lands as their highest
priority and determine the best use of these limited resources to
maximize food production.

Traditional crop rotations, which are practiced in Jordan, were
based on the follow system and conventional tillage practices. This
system performed reasonably well in the past, however, with the
increased population pressure and mechanization of the dry land
farming, new and highly improved tillage practices are needed to
stabilize both soil resources and crop production.
The dry land farming systems, which developed around the Mediterranean over more than 2000 years were based on delicate balances between crop and livestock systems, tree crops and rangelands, and cereals and grazed fallow. This balance is being disturbed by rapid growth of population. Soil erosion, extension of cropping areas to the marginal lands and uncontrolled increase of livestock numbers.

Tillage as a component of mechanized dry land farming has contributed to the imbalance of the cropping system in Jordan and other countries in the Mediterranean basin. Conventional tillage, used by farmers, should be studied as to timing, costs, and implements. Experiments should be initiated to evaluate the effects of each tillage operation on the following: soil, and implements. Experiments should be initiated to evaluate the effects of each tillage operation on the following: soil moisture, erosion control, weed control, sequence of tillage implements and its effects on weed control and weed control and weed population, and crop residues left on the soil surface following tillage.

Research is needed to develop conservation tillage systems for the major soil types throughout the country. Basic information is needed on tillage effects on soil properties that control infiltration and evaporation, in order to increase soil moisture storage and water use efficiencies.
Information is needed on how to manage crop residues under minimum or no-tillage systems if these new systems are to be adopted in certain dry land farming areas of the country. New and improved practices need to be developed for weed control, planting and for fertilizer application.

Also, more efficient herbicides, including pre-emergence ones, should be introduced and tested under local conditions. These herbicides should be highly specified affecting subsequent crops in the crop rotation. Improved equipment for drilling seeds in stubble is needed, these drills should be able to operate in heavy stubble and produce a uniform stand. Obviously, a large number of variables are to be studied simultaneously to develop a sound village system for the major dry land farming areas in the country.

The problem in agriculture is not merely a business cycle one, but how to ensure steady and noticeable growth in agricultural income to meet the country's needs, and potentially to become a net exporter of food items.
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