Agricultural development opportunities in the Iranian economy

Moshen Amir Fardi
Iowa State University

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AGRICULTURAL DEVELOPMENT OPPORTUNITIES IN THE IRANIAN ECONOMY

by

Mohsen Amir Fardi

A Thesis Submitted to the Graduate Faculty in Partial Fulfillment of The Requirements for the Degree of

MASTER OF SCIENCE

Major Subject: Economics

Signatures have been redacted for privacy

Iowa State University
Of Science and Technology
Ames, Iowa

1967
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CHAPTER I. INTRODUCTION

The Purpose of the Study

The primary purpose of this study is (1) to obtain some understanding about the macroeconomic characteristics of the Iranian economy; (2) to outline the policy implications of the economic development objectives in Iran; and (3) to identify and evaluate some development opportunities within the agricultural sector.

There is no single hypothesis stated nor tested. Instead, the study is directed to answer a number of questions related to the role of agriculture in the economic development of Iran. These questions are as follows:

(1) What is the relative importance of the agricultural sector to the economy of Iran?

(2) What are the implications of Iran's economic objectives for the agricultural sector?

(3) How can development in the agricultural sector contribute to the overall development of the Iranian economy?

(4) What are the investment opportunities in the agricultural sector?

General Background

Iran is characterized by a marked difference between the urban and the rural sectors. Whereas the urban sector manifests many signs of a modern economy, a trip to the villages a few kilometers outside the cities takes one back many centuries in the long history of the country.

The economy can be best described in terms of a "dualistic" economy. While more than two-thirds of the total population resides in the rural
communities, they produce only about 27 percent of the gross national product. The technological progress that has taken place during the past few decades has been in the form favoring the non-agricultural sector. With the exception of a few modern farms near the urban centers, no technological change has taken place in the peasant agriculture for many centuries.

Concentration of the existing consumption good industries, the government bureaucracy, domestic and foreign trade, educational and health services in the urban centers, especially in Teheran, has widened the gap between the urban and the rural sectors. Existence of luxury structures, such as rising towers and wide boulevards, modern public and private transportation facilities, improved health and educational services are indicative of a high rate of public and private investment in the urban sector. In contrast, the rate of investment and capital formation in the rural sector has been insignificant, if not negative.

The standard of living and welfare as measured by per capita income, the level of nutrition, and health and education, is much lower in the rural sector than in the urban sector. The gap between per capita income of the rural and the urban sectors is large. Taking per capita consumption expenditures as a measure of income, per capita consumption expenditures for the rural areas was about $104 in 1959. The comparable data for the 10 largest and 22 other small cities were $252 and $198 respectively* (38, pp. 5-6). The standard of living as measured by per capita food con-

---

*The rate of exchange for the Iranian monetary unit, rial (Rls), has been maintained at about Rls 75 to one U.S. dollar ($) since 1957.
umption is also much lower in the rural areas than in the urban areas. Per Capita calorie intake of an average peasant family is reported to be 1847 units per day, while those of the urban wage earners and proprietors are 2123 and 2658 calories per day respectively (66, p. 389).

Medical care is almost nonexistent in the rural areas. Of the country's 21,000 hospital beds available in 1963, about fifty percent were in Teheran Province, and another thirty percent in other urban centers. Whereas the ratio of hospital beds is about one bed to 327 persons in Teheran, the ratio may reach as high as one bed to 9,109 persons in rural areas such as Shahrkurd. The ratio of population per physician, as reported by the Ministry of Health, varies from 2,055 persons to each doctor in Teheran, to 43,525 persons per doctor in Shahrkurd (41, p. 18).

The rate of illiteracy in Iran is one of the highest among the underdeveloped countries. Nearly 85 percent of the total population over the age of 10 were reported illiterate at the time of the 1956 census. The problem of illiteracy is much more serious in the rural sector. Whereas 45 percent of the urban male population was reported literate, only 11 percent of the rural male population was reported literate. The respective ratios for the urban and rural female population were 21 percent and one percent respectively (41, p. 22).

Concentration of the majority of the population in the rural areas, with low levels of health, education, skills, and low level of capital formation has given rise to a high labor-capital ratio in that sector. Labor productivity in the rural areas is said to be very low, even being near zero in inactive seasons. Wages are often determined by the minimum requirements for a subsistence living. In contrast, labor-capital ratio
is low in many industries located in the urban sector, and labor pro-
ductivity and wages are relatively high.

The primary goal of production in the rural sector is subsistence consumption. The excess of production over subsistence consumption is received by the landlord as rent. This comprises the volume of agricultural production that is marketed. The peasant may exchange some of his own products for commodities not produced by the family. The rural sector relies very little on the market for acquiring its production inputs. Deficiency or absence of economic institutions, such as commodity, labor, and financial markets in the rural sector has further sharpened the "dualistic" nature of the economy.

The above description of the Iranian economy closely resembles the characteristics of a typical dualistic economy as presented in the recent economic development literature (51, 63, 81, 94). Conceptually, the process of economic development characterized by transformation of a predominantly traditional agricultural economy to one of modern industrial economy can be conceived as a transition along three phases. These phases are: the traditional phase, the transitional phase, and the commercialized phase. Diagram 1 shows the major characteristics of the traditional static phase as compared to the commercialized dynamic phase. (99, p. 11).

The traditional phase has been often described as stagnant, least developed, having redundant labor, with traditional methods of production. The production units are self sufficient with little or no factor inputs purchased from the non-agricultural sector. It is further characterized as having unused agricultural resources with the possibility of increasing output through additional employment of the existing factors with little or
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<td></td>
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Diagram 1. Summary of the major characteristics of agricultural development from the traditional phase to the commercial phase
no change in the level of technology. Increasing the area under cultivation is the major source of increase in output.

The transitional phase marks the movement from a traditional static to a commercialized dynamic agricultural economy. During this phase greater amounts of products are marketed and factor inputs and consumer products purchased from other sectors. There exists little or no readily available natural resources. Technological changes are required for increasing the level of output. This means the production function or the production surface which shows the relationship between land, labor, and output must shift upward; that is, to a higher level of output with the same or lower amounts of inputs. During this phase, a shift from traditional methods of production to more intensive and scientific methods must take place if output is to increase.

The question posed here is: "What are the reasons for the persistent existence of a subsistence traditional economy side by side with a commercialized modern economy?" There are no general theories to explain the causes of persistent dualism, however, there are some partial analyses based on not rigorously testable hypotheses. Whereas in the past attempts were made to explain dualism in terms of sociological factors, the recent trend has been toward analyzing dualism in terms of the general economic theory. The sociological determinism theory proposed by T. H. Bocke (32, pp. 274-293), and the recent hypotheses proposed by Professor T. W. Schultz regarding the behavior of the farmers in traditional agriculture (87) are two examples of the above approaches.

Sociological dualism is defined as the clashing of an imported social system as observed in the developed sector, existing side by side with an indigenous traditional social system. The indigenous social system is characterized by limited wants, backward sloping supply curves of effort
and risk taking, absence of profit motive, conscious dislike of investing in capital, lack of business qualities, lack of elasticity of supply, lack of organization, lack of discipline, and absence of specialization. Boeke's conclusion is that since western economic theory is based on unlimited wants, a money economy, and is designed to explain a capitalistic society, it is not applicable to the precapitalistic economies of the eastern villages. Any attempt at explaining the allocation of resources or the distribution of income in such societies in terms of marginal productivity theory is futile. In short, "East is East and West is West and never the twain shall meet" (32, pp. 275-277).

The great concern with achievement of economic development, or the "revolution of rising expectations" since the end of World War II in almost all underdeveloped countries contradicts Boeke's theory of sociological dualism. While some of Boeke's observations, such as limited wants and absence of profit motives in a traditional economy can be refuted on the factual grounds, others are observable in both the underdeveloped regions of the developed economies as well as in the traditional sector of underdeveloped economies. Thus it is not necessary to appeal completely to differences in cultural values to explain the economic behaviors of the people in the underdeveloped economies. However, this need not rule out the important role of noneconomic factors on occurrence and sustenance of modern economic growth.

Modern economic growth is a new phenomenon in the world. Its history goes back, at most, to the industrial revolution in Europe. The most remarkable characteristic of this modern economic growth has been rapid technological progress, which consists of the discovery of new knowledge, and the incorporation of that knowledge in productive processes. There are
no easy explanations of the causes of the initial occurrence of economic
development in particular economies. However, once growth began in a
region, it gave that region a lead over other regions. This means there is
a time element involved in the occurrence and the spread of modern economic
growth from one region to another, as well as among all sectors of an
economy.

The urban sector of the Iranian economy has been in close contact with
the advanced economies for a long time through foreign trade and cultural
exchanges. In contrast, the villages have been left undisturbed by the
outside world due to both physical isolation and social barriers. This
has given rise to the susceptibility of the urban sector to the adaptation
of new techniques, while the rural sector remains traditional. Another
possible noneconomic reason for persistence of dualism in Iran may be due
to the existence of an urban based government with little or no rural
representation. For many years revenues have been collected from the
rural residents through sales tax on consumer goods such as sugar and tea,
and by depressing the agricultural commodity prices. Meanwhile, little has
been spent by the central government in providing for the social overhead
capital and social institutions, such as schools, hospitals, roads, law
protection, provision of incentives, and properly functioning financial and
marketing channels, all of which might serve as prerequisites to a modern
economy.

An important economic reason for the persistence of dualism in
countries like Iran, as proposed by Professor Schultz (67, p. 84), is due
to the low rate of return to investment in traditional factors of pro-
duction. Stated otherwise, the price of the sources of income streams
from agricultural production is relatively high in traditional agriculture. Though precise data to test the above hypothesis rigorously is not available, as Professor Schultz admits, limited case studies and general observation appear to support it. Granted that the above hypothesis is correct, then most of traditional agriculture's attributes are explainable in economic terms. The low level of private investment in traditional agriculture, the low level of saving in agriculture, and the low rate of return on public investment in traditional factors, such as expansion of cultivated land, are due to a low rate of return to such investments. In turn, the excellent results achieved by countries like Japan from public and private investment in modern factors of production, such as investments in research and chemical fertilizer, may be due to a relatively high rate of return on investment in the modern inputs.

Economic Development Defined

Economic development has been defined and redefined by many economists. One of the better definitions given by Fei and Ranis is that "it is the process through which the individuals comprising a given society learn to improve their institutional environment so that the total real resources may be fully explored and efficiently allocated to realize the society's maximum growth potential. Thus, the process of economic development involves the interaction of three elements; the individuals of the society, the institutional environment in which they find themselves, and the economic functions which need to be performed." (20, p. 36). Diagram 2 shows the interrelationship between the economic agents, the institutional environment and the economic organization.
Diagram 2. The interrelationship of economic agents, social environment, and economic organization

\(^a\)Source: (20, p. 37).
The Scope of the Study

Although social and cultural values of a society regarding work, saving, entrepreneurship, and organization are not separable from the economic aspects of the society, no attempt will be made in this study to analyze such social and cultural values.

Another important factor influencing economic development, as well as being influenced by economic development itself, is the political environment of a society. This means the existence of a government which has both the incentive and capability of initiating and carrying out policies favorable to economic development. The existence or quick emergence of a political, social and institutional framework favoring economic development is so important that it has been taken as a basic requirement for the "take-off" or beginning of a sustained rate of growth in per capita income (84, p. 39). The interaction of the political environment and economic development is a very complex problem and by necessity has been left out of this study.

To achieve economic development in a dualistic economy at least three approaches can be used. First, by increased investment in the modern sector; that is, a general drive toward industrialization or by what is called "industrial fundamentalism". Second, by emphasizing public investment in the agricultural sector; that is, a general drive toward increased production and export of agricultural commodities, or what may be called "agricultural fundamentalism". Finally, achieving economic development by allocating scarce resources to alternative development opportunities, regardless of their sectoral location, so as to achieve the society's goals through a balanced growth.
What is meant by balanced growth is not the same as allocating resources among all sectors to ensure an equal rate of growth. Rather, it is the search for identification of the economic development opportunities and the organization of resources to achieve the economy's objectives in both sectors. This means that on the input side, the agricultural sector must be able to release labor and food surplus, and the industrial sector must expand fast enough to absorb such resources. On the output side, both sectors must be able to expand fast enough to provide effective demand for each other's output.

In discussing the development opportunities in the agriculture sector and the role of agriculture in economic development of Iran, it is the proposition of this study that industrial development and agricultural development are interdependent. In the long run, economic development cannot be achieved at a sustained rate if one or the other is neglected.
CHAPTER II. MACROECONOMIC CHARACTERISTICS OF THE IRANIAN ECONOMY

The prevalent measure of total volume of production in a country is gross national product (GNP). It is defined as the market value of the output of goods and services produced by the nation's economy. The nation's economy in this context refers to the return to labor and property supplied by the residents of the nation. GNP is comprised of purchases of goods and services by consumers and government, gross domestic investment by the private and the public sectors, and the net of international transactions.

Another measure of national income used in Iran is gross domestic product (GDP). The difference between GDP and GNP is equal to the net income from abroad (F). It consists of production abroad credited to the Iranian owned resources over production at home credited to foreign owned resources. The standard procedure is to include F in the net of foreign trade. But since the amount of income earned by foreign investment in Iran is much larger than income earned by Iranian investment abroad, it is kept out of the balance of international transactions.

Table 1 shows the components of Iran's GDP and GNP for the 1959-63 period in constant 1959 prices. Iran's GNP increased from Rls 292.5 billion ($3.90 billion) in 1959 to Rls 345.9 billion ($4.61 billion) in 1963. This represents an increase of about 18 percent over the period covered. The increase in GNP was not, however, steady. Whereas the rate of increase in GNP was about 7.4 percent in 1960, it dropped to about one percent in 1962.

The rate of growth in GNP overestimates the rate of change in the economy so far as it does not take into consideration the increase in population. A rising national income if matched by an equal or higher
<table>
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<th>Gross national product(Y)</th>
<th>Private consumption(C^p)</th>
<th>Public consumption(C^G)</th>
<th>Private gross investment(I^p)</th>
<th>Public gross investment(I^G)</th>
<th>Exports (E)</th>
<th>Imports (M)</th>
<th>Net payments from abroad (F)</th>
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<td>1959</td>
<td>312.8</td>
<td>292.5</td>
<td>220.5</td>
<td>28.4</td>
<td>33.7</td>
<td>19.7</td>
<td>63.6</td>
<td>53.1</td>
<td>-20.3</td>
</tr>
<tr>
<td>1960</td>
<td>335.5</td>
<td>314.0</td>
<td>226.7</td>
<td>30.5</td>
<td>41.7</td>
<td>20.6</td>
<td>67.7</td>
<td>51.7</td>
<td>-21.5</td>
</tr>
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<td>1961</td>
<td>346.4</td>
<td>324.6</td>
<td>233.1</td>
<td>31.1</td>
<td>38.1</td>
<td>23.1</td>
<td>72.0</td>
<td>51.0</td>
<td>-21.8</td>
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<tr>
<td>1962</td>
<td>353.2</td>
<td>327.7</td>
<td>239.7</td>
<td>31.5</td>
<td>31.3</td>
<td>21.5</td>
<td>76.1</td>
<td>46.9</td>
<td>-25.5</td>
</tr>
<tr>
<td>1963</td>
<td>374.6</td>
<td>345.9</td>
<td>246.5</td>
<td>36.2</td>
<td>35.5</td>
<td>18.6</td>
<td>82.2</td>
<td>44.4</td>
<td>-28.7</td>
</tr>
<tr>
<td>Average</td>
<td>344.5</td>
<td>320.9</td>
<td>233.3</td>
<td>31.5</td>
<td>36.1</td>
<td>20.7</td>
<td>72.3</td>
<td>49.4</td>
<td>-23.6</td>
</tr>
</tbody>
</table>

\(^a\) Source: (38, p. 34).

\(^b\) \(\text{GDP} = C^p + C^G + I^p + I^G + E - M\)

\(^c\) \(\text{GNP} = \text{GDP} + F\)
increase in population would cause a constant or falling per capita income. Thus, per capita income or its approximate per capita GNP is a better measure of an economy's performance.

While Iran's GNP increased by 18 percent, population increased by 10.5 percent. In other words, per capita income increased from Rls. 14,340 ($191) in 1959 to Rls. 15,350 ($204) in 1963. This means that per capita income increased by about 7.0 percent, or about 1.5 percent annually during the period covered. Whether this rate is high or low depends on the economy's goals which will be discussed in Chapter III.

In this chapter the macroeconomic characteristics of the Iranian economy will be discussed using two approaches. First, gross national product is considered by looking at consumption, investment, and the international transactions. This is the expenditure approach. Second, gross domestic product is considered by looking at the sectoral contributions or by the net value added approach.

Personal and Public Consumption Expenditures

Personal consumption expenditures \( (C^P) \) is the largest component of GNP. It consists of the market value of purchases of goods and services by individuals and non-profit institutions and the value of food, clothing, housing, and financial services received by them as income in kind.

During the 1959-1963 period \( C^P \) varied from 75.4 percent to 71.3 percent of GNP (Table 2). The duration of the data is not long enough to make any meaningful evaluation of the change in the propensity to consume. The major component of \( C^P \) is expenditures for food. In 1959, according to a Bank Markazi Iran (BMI) survey taken in the 10 largest and 22 small cities in Iran, consumers spent 51 percent and 60 percent of their respective incomes on food. The high proportion of income spent on food
indicates the importance of agricultural products in the family budget. Also, it is an indication of the high price of such commodities, relative to other necessities.

Public consumption expenditures ($c^G$) consist of the market value of purchases of goods for current consumption, including military equipment, wages paid to the civilian and military personnel, and rent on the government occupied properties. The consumption expenditures of the government in Iran constitutes about 10 percent of GNP. The share of the government consumption in the GNP has increased very rapidly since World War II due to increased military spendings, and increased spending on social services such as public health and education. As reported by BMI, the government’s regular budgetary spendings increased from Rls 15 billion in 1955 to Rls 69 billion in 1965. Of this amount (Rls 69 billion) 34 percent was allocated for defense and security, 32 percent for social services, 12 percent for economic services, and 22 percent for general services, including payments on debts (37, p. 16).

Keeping the public consumption expenditures within the limits of regular revenues has been an unsuccessful experience in Iran. The deficit in the government budget has usually been met by channeling funds allocated for development projects through the Plan Organization, to current expenditures. For example, though the Plan Act of 1955 appropriated 80 percent of the total oil revenue for Plan Organization’s development projects, during the course of the plan only 55 percent of the oil revenues were received by the Plan Organization. The results of this change in revenues were the elimination of some planned projects, and heavy reliance on domestic and foreign borrowing (46, p. 4).
Table 2. Iran. Percentage share of consumption, investment, and foreign trade in gross national product: 1959-1963^a

<table>
<thead>
<tr>
<th>Year</th>
<th>Private consumption CP</th>
<th>Public Consumption CG</th>
<th>Total consumption C</th>
<th>Private gross investment IP</th>
<th>Public gross investment IG</th>
<th>Total gross investment I</th>
<th>Exports X</th>
<th>Imports M</th>
<th>Net payment from abroad F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>75.4</td>
<td>9.7</td>
<td>85.1</td>
<td>11.5</td>
<td>6.7</td>
<td>18.2</td>
<td>21.7</td>
<td>18.2</td>
<td>-6.9</td>
</tr>
<tr>
<td>1960</td>
<td>72.2</td>
<td>9.7</td>
<td>81.9</td>
<td>13.3</td>
<td>6.6</td>
<td>19.9</td>
<td>21.6</td>
<td>16.5</td>
<td>-6.8</td>
</tr>
<tr>
<td>1961</td>
<td>71.8</td>
<td>9.6</td>
<td>81.4</td>
<td>11.7</td>
<td>7.1</td>
<td>18.8</td>
<td>22.2</td>
<td>15.7</td>
<td>-6.7</td>
</tr>
<tr>
<td>1962</td>
<td>73.1</td>
<td>9.6</td>
<td>82.7</td>
<td>9.6</td>
<td>6.6</td>
<td>16.2</td>
<td>23.2</td>
<td>14.3</td>
<td>-7.8</td>
</tr>
<tr>
<td>1963</td>
<td>71.3</td>
<td>10.5</td>
<td>81.8</td>
<td>10.3</td>
<td>5.4</td>
<td>15.7</td>
<td>23.8</td>
<td>12.8</td>
<td>-8.3</td>
</tr>
<tr>
<td>Average</td>
<td>72.7</td>
<td>9.8</td>
<td>82.5</td>
<td>11.2</td>
<td>6.5</td>
<td>17.7</td>
<td>22.5</td>
<td>15.4</td>
<td>-7.4</td>
</tr>
</tbody>
</table>

^aSource: (Table 1, above).
Gross private and Public Investment

Gross private investment, IP, consists of acquisition of newly produced capital goods by private business and nonprofit institutions and of the value of change in the volume of inventories held by business. It covers all new private dwellings, including those acquired by owner-occupants. Gross government investment (I^G) consists of acquisition of newly produced capital goods by the government. It covers all government spending through the Plan Organization and other agencies for development purposes and all new public construction.

In the economic development literature, one finds a great emphasis placed on the role of the high level of saving, investment, and capital accumulation in the process of economic development. A leading economist considers the central fact of economic development as rapid capital accumulation.

The central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 percent of its national income, converts itself into an economy where voluntary saving is running at about 12 to 15 percent of national income (63, p. 416).

Gross investment in Iran is higher than the norm set above for the underdeveloped economies. The typical underdeveloped economy is often pictured as one with low levels of domestic savings and investment, and restricted in import of capital goods due to unfavorable balance of payment. But this is not definitely the case in Iran. All available statistics indicate a high rate of investment due to a high rate of saving in both private and the public sectors. As reported by BMI (38), the rate of investment in Iran varied from 15.7 to 18.2 percent of GNP during the 1959-1963 period. Private investment constituted about two-thirds of the
total investment. The high level of personal savings can be observed in Table 3. During 1959-1963, personal savings was about 13.7 of the disposable income.

Table 3. Iran. National income and savings in current billion rials: 1959-1963a

<table>
<thead>
<tr>
<th>Year</th>
<th>1959</th>
<th>1960</th>
<th>1961</th>
<th>1962</th>
<th>1963</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>National income</td>
<td>259.9</td>
<td>294.9</td>
<td>303.7</td>
<td>309.3</td>
<td>327.2</td>
<td>299.0</td>
</tr>
<tr>
<td>Disposable income</td>
<td>256.2</td>
<td>290.5</td>
<td>299.0</td>
<td>305.2</td>
<td>323.0</td>
<td>294.8</td>
</tr>
<tr>
<td>Personal savings</td>
<td>35.7</td>
<td>45.5</td>
<td>41.1</td>
<td>36.4</td>
<td>43.3</td>
<td>40.4</td>
</tr>
<tr>
<td>Personal savings as percentage of disposable income</td>
<td>13.9</td>
<td>15.7</td>
<td>13.7</td>
<td>11.9</td>
<td>13.4</td>
<td>13.7</td>
</tr>
</tbody>
</table>

a Source: (38, p. 85).

The high rate of savings in a low per capita country may be due to the existence of a very unequal income distribution. A hypothesis proposed by Professor Lewis (63) is that in an underdeveloped economy most saving and investment is undertaken by only 10 percent of the people who receive nearly 40 percent of the national income. The high level of saving in the public sector is mainly due to royalties and profits received from the export of crude oil. The existence of a readily marketable resource such as oil has lessened the importance of private saving and foreign investment in Iran. However, saving and investment generated from the export of oil
can only last as long as there exists an adequate reserve. Consequently, saving and the foreign exchange receipts generated from the export of oil should be looked upon as a short run favorable factor to economic development. To meet the long run demand for saving and foreign exchange, other potential sources must be fully developed. This means developing domestic industries to increase Iran's non-oil exports and to reduce Iran's dependance on imports of many commodities, both agricultural and industrial.

A high rate of saving and investment does not necessarily lead to a high rate of growth in the national income if other factors of production, such as skilled labor and technology, are in short supply. Even if capital is considered as the most critical factor of production, the growth in national income still depends on the productivity of such capital. (This relationship will be more fully elaborated in Chapter III.)

Some investment opportunities do not contribute to the national income growth significantly due to their low output generating capacity. Investment in durable consumption goods, such as modern public office buildings, monuments, latest model transportation vehicles, and private residential constructions are some of the cases in point. In contrast, investment in key manufacturing industries such as petro-chemical, iron and steel, and agricultural processing industries with a high backward and forward "linkage effect" (34, pp. 98-119) contribute most to the growth of national income. General observations and the data cited in Table 4 indicates that investment in construction used an increasing proportion of total investment in Iran during the 1959-1963 period. Whereas investment in machinery and equipment was 41 percent of the value of total investment in 1959, it decreased to 24 percent in 1963. Some of the factors taken into
Table 4. Iran. Gross public and private investment in current million rials and percentages: 1959-1963

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Investment</th>
<th>Investment in equipment</th>
<th>Domestic production</th>
<th>Public imports</th>
<th>Private imports</th>
<th>Investment in construction</th>
<th>Public sector</th>
<th>Private sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1959 53,412</td>
<td>22,045</td>
<td>1,311</td>
<td>4,545</td>
<td>16,369</td>
<td>31,367</td>
<td>14,752</td>
<td>16,615</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>41.3</td>
<td>2.1</td>
<td>8.5</td>
<td>30.7</td>
<td>58.7</td>
<td>27.6</td>
<td>31.1</td>
</tr>
<tr>
<td></td>
<td>1960 63,575</td>
<td>23,529</td>
<td>1,547</td>
<td>4,153</td>
<td>17,829</td>
<td>40,046</td>
<td>16,247</td>
<td>23,799</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>37.0</td>
<td>2.4</td>
<td>6.5</td>
<td>28.1</td>
<td>63.0</td>
<td>25.6</td>
<td>37.4</td>
</tr>
<tr>
<td></td>
<td>1961 58,658</td>
<td>19,868</td>
<td>1,540</td>
<td>6,557</td>
<td>11,763</td>
<td>38,798</td>
<td>15,330</td>
<td>23,468</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>33.9</td>
<td>2.6</td>
<td>11.2</td>
<td>20.1</td>
<td>66.1</td>
<td>26.1</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td>1962 48,868</td>
<td>12,918</td>
<td>1,492</td>
<td>3,587</td>
<td>7,839</td>
<td>35,950</td>
<td>15,713</td>
<td>20,237</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>26.4</td>
<td>3.1</td>
<td>7.3</td>
<td>16.0</td>
<td>73.6</td>
<td>32.2</td>
<td>41.4</td>
</tr>
<tr>
<td></td>
<td>1963 48,433</td>
<td>12,005</td>
<td>1,444</td>
<td>2,437</td>
<td>8,124</td>
<td>36,428</td>
<td>13,724</td>
<td>22,704</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>23.8</td>
<td>3.0</td>
<td>5.0</td>
<td>16.8</td>
<td>75.2</td>
<td>28.3</td>
<td>46.9</td>
</tr>
</tbody>
</table>

*Source: (38, pp. 16-25).*
consideration by the public sector in its investment will be discussed in the next chapter. Despite the important role played by the private sector in undertaking investment opportunities in Iran, no systematic study has been done to identify some of the motives and the criteria used. A very large part of private investment in Iran is undertaken by individuals looking for a quick profit with the least amount of risk involved. This has given rise to large investment in real estate property, construction, and import trade. So far, little investment has been made in manufacturing by the private sector.

International Transactions

Table 5 shows Iran's receipts and payments of foreign exchange during the 1954-1964 period. Exports constitute about 23 percent and imports about 15 percent of Iran's GNP respectively. However, if payments to foreign investors are deducted from the excess of exports over imports, the surplus in the balance of payments will disappear (Table 2).

The structure of exports and imports in Iran is typical of many underdeveloped countries. The export value centers around extraction and sale of crude oil. For manufacturing products, the economy depends almost completely on imports.

The inflow of foreign exchange associated with the oil industry has greatly increased ever since nationalization of the industry in 1953. As Table 5 shows, Iran's share of profits in oil exports by the international oil cartels has increased from $22.5 million in 1954 to $665 million in 1964. In addition, the cartels purchase considerable amounts of goods and services (about $90 million in 1964) from Iran, paying in foreign exchange.
The exports of the country, excluding oil, have been largely limited to agricultural products such as cotton, wool, hides, lamb skins, nuts, and dates. Exports of finished products have remained insignificant and in fact have diminished as a percentage of value of total exports. In contrast, the export of raw materials, including crude oil, increased from 84 percent to 93 percent of the total value of exports during 1956-1963 (39, p. 23).

Expansion in the export sector has been referred to as the engine of economic development. Underdeveloped countries such as Iran can expand their export sector by expanding any of the following industries:

1. By expanding the primary production for export;
2. By expanding domestic industries to produce import substitute goods and thus save foreign exchange;
3. By expanding the manufacturing sector production for export. Increasing foreign exchange earnings by expansion of manufacturing products for export is beyond the planning horizon of countries like Iran. This is due to the fact that manufacturing sector cannot even meet the domestic demand for such products.

The static comparative advantage of Iran lies in increased production and export of primary products. Though export of agricultural products has decreased during the past decade, oil production and export has increased much faster than any other sector in Iran. However, expansion has been achieved with a minimum structural change in the domestic economy. In all probability, the oil sector will continue to expand in the foreseeable future. This can be substantiated by the recent experience of Iran in finding new oil reserves and making new concessions on a more profitable basis.
<table>
<thead>
<tr>
<th>Year</th>
<th>Total receipts</th>
<th>Merchandise exports</th>
<th>Service exports</th>
<th>Oil exports</th>
<th>Sales to oil companies</th>
<th>Foreign loans</th>
<th>Foreign aid</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>236.6</td>
<td>94.9</td>
<td>11.9</td>
<td>22.5</td>
<td>11.9</td>
<td>33.9</td>
<td>47.5</td>
<td>14.0</td>
</tr>
<tr>
<td>1955</td>
<td>324.2</td>
<td>70.1</td>
<td>11.0</td>
<td>92.2</td>
<td>46.7</td>
<td>73.0</td>
<td>19.2</td>
<td>12.0</td>
</tr>
<tr>
<td>1956</td>
<td>425.7</td>
<td>89.6</td>
<td>16.2</td>
<td>140.5</td>
<td>40.5</td>
<td>105.8</td>
<td>34.6</td>
<td>2.5</td>
</tr>
<tr>
<td>1957</td>
<td>502.5</td>
<td>98.4</td>
<td>25.3</td>
<td>207.8</td>
<td>48.2</td>
<td>96.5</td>
<td>19.7</td>
<td>6.6</td>
</tr>
<tr>
<td>1958</td>
<td>550.7</td>
<td>86.3</td>
<td>55.0</td>
<td>244.9</td>
<td>99.2</td>
<td>51.6</td>
<td>10.0</td>
<td>3.7</td>
</tr>
<tr>
<td>1959</td>
<td>617.9</td>
<td>94.7</td>
<td>64.7</td>
<td>260.9</td>
<td>76.8</td>
<td>80.3</td>
<td>33.7</td>
<td>6.8</td>
</tr>
<tr>
<td>1960</td>
<td>652.6</td>
<td>105.6</td>
<td>62.3</td>
<td>285.2</td>
<td>73.7</td>
<td>100.9</td>
<td>21.8</td>
<td>3.1</td>
</tr>
<tr>
<td>1961</td>
<td>692.9</td>
<td>88.5</td>
<td>55.8</td>
<td>291.1</td>
<td>100.2</td>
<td>121.5</td>
<td>30.0</td>
<td>5.8</td>
</tr>
<tr>
<td>1962</td>
<td>626.3</td>
<td>82.1</td>
<td>44.7</td>
<td>342.2</td>
<td>95.0</td>
<td>54.5</td>
<td>----</td>
<td>7.8</td>
</tr>
<tr>
<td>1963</td>
<td>637.8</td>
<td>96.9</td>
<td>51.1</td>
<td>388.0</td>
<td>82.8</td>
<td>14.8</td>
<td>----</td>
<td>4.2</td>
</tr>
<tr>
<td>1964</td>
<td>933.8</td>
<td>88.8</td>
<td>57.2</td>
<td>664.9</td>
<td>88.9</td>
<td>14.5</td>
<td>----</td>
<td>19.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Payments</th>
<th>Merchandise Imports</th>
<th>Service Imports</th>
<th>Payments on Loans</th>
<th>Others</th>
<th>Change in Reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>236.6</td>
<td>200.2</td>
<td>17.4</td>
<td>13.2</td>
<td>1.1</td>
<td>4.7</td>
</tr>
<tr>
<td>1955</td>
<td>279.1</td>
<td>23.6</td>
<td>14.8</td>
<td>1.1</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>345.5</td>
<td>50.9</td>
<td>20.1</td>
<td>1.1</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>1957</td>
<td>502.5</td>
<td>58.8</td>
<td>18.9</td>
<td>3.8</td>
<td>52.0</td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>431.4</td>
<td>86.5</td>
<td>58.8</td>
<td>3.2</td>
<td>-49.2</td>
<td></td>
</tr>
<tr>
<td>1959</td>
<td>486.3</td>
<td>86.6</td>
<td>79.1</td>
<td>7.8</td>
<td>-41.9</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>504.7</td>
<td>78.1</td>
<td>61.7</td>
<td>4.3</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>1961</td>
<td>490.1</td>
<td>63.7</td>
<td>118.8</td>
<td>0.8</td>
<td>19.5</td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>458.1</td>
<td>74.1</td>
<td>83.8</td>
<td>---</td>
<td>10.3</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>443.7</td>
<td>89.2</td>
<td>74.0</td>
<td>0.3</td>
<td>30.6</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>663.5</td>
<td>97.7</td>
<td>87.2</td>
<td>2.1</td>
<td>113.3</td>
<td></td>
</tr>
</tbody>
</table>

Due to the rapid increase in foreign exchange earning from the export of oil, Iran has been able to import increasing amounts of agricultural and consumer goods. Though domestic production to reduce imports has been a primary goal in government's public investment, imports have increased from $218 million in 1954 to $731 million in 1964. The share of consumer products in the total value of imports increased from 36 percent to 68 percent during the 1959-1963 period (38, Appendix Table 6). Due to the shortage of agricultural products, imports of basic food items such as wheat, fats, sugar and tea have also increased from about $23 million in 1955 to $128 million in 1964 (36, p. 113).

The Share of the Major Sectors in the Gross Domestic Product

Table 6 shows the percentage share of the value of the major sectors in Iran's GDP during 1959-1963. As can be observed, primary production consisting of agriculture and oil mining makes up for more than 40 percent of GDP. The share of industrial production in GDP is small when compared to the primary production. The contribution of the service industries is also large due to the large trade and government sectors.

The pattern of economic development, because of the diversity of natural resources, is not uniform in all countries. Nevertheless, the historical experience of economically developed countries indicates that in all cases economic development has been associated with increasing share of manufacturing and service sectors in the national income. This is primarily due to the relative absence of the secondary and tertiary sectors in the early stages of economic development.

The relative share of the major sectors in Iran's GDP may be observed by comparison with sectoral contributions of countries at about the same
Table 6. Iran. Percentage share of selected sectors in gross domestic products in current prices: 1959-1963

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary production</td>
<td>44.2</td>
<td>43.8</td>
<td>43.5</td>
<td>43.1</td>
<td>41.4</td>
<td>43.2</td>
</tr>
<tr>
<td>Agriculture</td>
<td>28.7</td>
<td>28.6</td>
<td>28.0</td>
<td>26.1</td>
<td>23.8</td>
<td>27.0</td>
</tr>
<tr>
<td>Oil</td>
<td>15.5</td>
<td>15.2</td>
<td>15.5</td>
<td>17.0</td>
<td>17.6</td>
<td>16.2</td>
</tr>
<tr>
<td>Industry</td>
<td>12.2</td>
<td>13.0</td>
<td>13.1</td>
<td>13.6</td>
<td>14.6</td>
<td>13.3</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>9.2</td>
<td>9.5</td>
<td>9.9</td>
<td>10.7</td>
<td>11.8</td>
<td>10.2</td>
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<tr>
<td>Construction</td>
<td>3.0</td>
<td>3.5</td>
<td>3.2</td>
<td>2.9</td>
<td>2.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Transportation and communications</td>
<td>6.7</td>
<td>6.4</td>
<td>6.5</td>
<td>6.7</td>
<td>6.7</td>
<td>6.6</td>
</tr>
<tr>
<td>Services</td>
<td>36.9</td>
<td>36.8</td>
<td>36.9</td>
<td>36.6</td>
<td>37.3</td>
<td>36.9</td>
</tr>
<tr>
<td>Trade</td>
<td>18.4</td>
<td>19.1</td>
<td>18.8</td>
<td>18.1</td>
<td>17.9</td>
<td>18.5</td>
</tr>
<tr>
<td>Banking and insurance</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Rent</td>
<td>5.6</td>
<td>5.4</td>
<td>5.6</td>
<td>5.5</td>
<td>5.4</td>
<td>5.5</td>
</tr>
<tr>
<td>Government</td>
<td>7.0</td>
<td>6.5</td>
<td>6.6</td>
<td>7.0</td>
<td>8.1</td>
<td>7.0</td>
</tr>
<tr>
<td>Other services</td>
<td>4.5</td>
<td>4.3</td>
<td>4.3</td>
<td>4.3</td>
<td>4.2</td>
<td>4.3</td>
</tr>
</tbody>
</table>

*Source: (38, pp. 71-72)*
stage of development and the same size. Taking per capita GNP and the population size as indicators of the level of income and size respectively, Chenery (10) calculated the "norm" of sectoral contributions for 51 countries. The sectoral value added is expressed as a logarithmic function of per capita income and population size. The regression of per capita sectoral value added has the general form:

\[
\ln V_i = \ln B_{i0} + B_{i1} \ln Y + B_{i2} \ln N
\]

Where \( V_i \) is per capita value added, \( Y \) is per capita income and \( N \) the size of population.

The coefficient \( B_{i0} \) is a constant. The coefficient \( B_{i1} \) is the growth elasticity of sector \( i \) with respect to a change in per capita income, that is:

\[
B_{i1} = \frac{dV_i}{V_i} \cdot \frac{dY}{Y}
\]

and coefficient \( B_{i2} \) is the size elasticity.

\[
B_{i2} = \frac{dV_i}{V_i} \cdot \frac{dN}{N}
\]

The estimated values of the above coefficients are shown in Table 7. To compare the relative size of the major sectors in Iran with Chenery's "norm", per capita sectoral contributions, given Iran's per capita GDP
and population, were calculated. The uniqueness of the Iranian economy can be observed by comparing the actual sectoral contributions with calculated sectoral contributions (columns 6 and 7 of Table 7).

The primary productions contribute about 43 percent of Iran's GDP, or about $92 per capita. Compared to Chenery's norm of about $73 per capita contribution of the primary sector to GDP of a typical country with the size and per capita income of Iran, the primary sector in Iran is very large. The above differences arise from an unusually high share of mining (oil) in Iran's GDP. Meanwhile, the agriculture's contribution to GDP is slightly lower than Chenery's norm.

The value of oil constitutes about 16 percent of Iran's GDP. The size of the oil contribution to GDP is expected to be even higher in the next few years, since oil production has been increasing at about 12 percent per year, a rate of increase higher than in any other sectors of the economy. The large share of the oil sector in Iran overestimates its total effect on the economy. In terms of employment, the oil sector provides employment for only about 45,000 workers. This is about 0.76 percent of the total labor force in Iran (18, p. 308). In terms of facilitating the establishment of related industries, the oil sector has had a minor role, too. This is due to the fact that the oil sector has remained an "enclave" industry, with minimum "linkage" with other sectors of the economy.

Another important characteristic of the Iranian economy brought out by the application of Chenery's model is the relatively small size of the industrial sector as compared to the norm. Whereas the norm suggests an industrial per capita value added equal to $50, the actual contribution
Table 7. Chenery's regression of production on income and size by major sectors and per capita actual and calculated value added for Iran

<table>
<thead>
<tr>
<th>Sector</th>
<th>$B_0$</th>
<th>$B_1$</th>
<th>$S_B$</th>
<th>$B_2$</th>
<th>$S_{B_2}$</th>
<th>$V_{1c}$</th>
<th>Actual per capita value added</th>
<th>Calculated per capita value added</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Primary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Agriculture</td>
<td>46.49</td>
<td>.494</td>
<td>.043</td>
<td>-.090</td>
<td>.032</td>
<td>$92.49</td>
<td>72.52</td>
<td></td>
</tr>
<tr>
<td>b. Mining</td>
<td>11.92</td>
<td>.474</td>
<td>.062</td>
<td>-.082</td>
<td>.045</td>
<td>57.89</td>
<td>60.32</td>
<td></td>
</tr>
<tr>
<td>II. Industry</td>
<td>16.95</td>
<td>1.362</td>
<td>.039</td>
<td>.046</td>
<td>.029</td>
<td>28.42</td>
<td>50.40</td>
<td></td>
</tr>
<tr>
<td>a. Manufacturing</td>
<td>11.92</td>
<td>1.441</td>
<td>.069</td>
<td>.199</td>
<td>.045</td>
<td>27.83</td>
<td>41.87</td>
<td></td>
</tr>
<tr>
<td>b. Construction</td>
<td>4.06</td>
<td>1.152</td>
<td>.074</td>
<td>-.055</td>
<td>.051</td>
<td>6.59</td>
<td>9.82</td>
<td></td>
</tr>
<tr>
<td>III. Transportation and communications</td>
<td>4.64</td>
<td>1.288</td>
<td>.066</td>
<td>-.048</td>
<td>.053</td>
<td>14.13</td>
<td>12.26</td>
<td>32</td>
</tr>
<tr>
<td>IV. Other services</td>
<td>32.70</td>
<td>1.066</td>
<td>.038</td>
<td>.014</td>
<td>.030</td>
<td>79.00</td>
<td>78.94</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)Source: (10, p. 634). Based on average percentage breakdown of national income in 1950-55 applied to average per capita national income in 1952-54. $B_0$ is a constant computed for $y = \$100$ and $N = 10$ million. $B_1$ and $B_2$ are regression coefficients and $S_{B_1}$ and $S_{B_2}$ are their standard error or estimate.

\(^b\)Coefficients not significantly different from zero at 95 percent confidence level.

\(^c\)From tables 1 and 2 above.

\(^d\)Calculated on the basis of regression line $\log V_1 = \log B_{10} + B_{11} \log Y + B_{12} \log N$, given $\$ Y = \$214$ and $N = 2.15$ million.
of the industrial sector to the Iranian economy is only $28. This is due to the relatively small size of manufacturing in the economy. So far, manufacturing has been limited to production of non-durable goods, such as textiles and agricultural products processing. The demand for capital goods has been met by importation.

The size of the transportation and communications sector in Iran is somewhat larger than the norm. This can be attributed to the emphasis placed on construction of roads, railways, and airports during the Second Plan.

The contributions of the service sector to Iran's GDP is the same as Chenery's norm, both being about $79 per capita. The service sector is larger than any other sector in terms of its share in GDP due to the large share of trade in the domestic and international markets (18.5 percent of GDP).

To restate the main conclusions of this chapter, though per capita income in Iran is low, savings and investment is relatively high. This may be due to rich natural resources, a very unequal income distribution, and a low propensity to consume. The relative underdevelopment of the economy is observable by the existence of a very small manufacturing sector and large primary and service sectors. To alter the existing conditions the government of Iran has taken an active role in drawing economic plans for investments in particular projects in order to raise the standard of living. In the next chapter some of the theoretical arguments in favor of economic planning and the experience of Iran with planning for economic development are discussed.
CHAPTER III. ECONOMIC PLANNING IN IRAN

Planning for economic development is now a major economic and political issue in almost all underdeveloped countries. This phenomenon has come about by realization that the state has a definite role in initiating and directing certain economic activities in order to achieve the society's economic objectives. The extent of state intervention varies greatly among the nations based on the existing economic conditions, political systems, and the administrative capability of the state in carrying out the plans.

An economic plan has been defined as:

A blueprint of a cumulative process of economic development in a country, as this process will evolve when started, sustained and controlled by certain induced exogenous changes in the social system, represented by purposeful state interferences as defined in the plan. This blueprint must therefore be built on a study of the circular causation running back and forth between all relevant factors in the social system of the country, "economic" as well as "noneconomic." (70, p. 85).

The extent and complexity of economic plans varies greatly among different countries. Where the basic data needed for an overall plan is still not available, planning is limited to estimation of funds available for public investment, and selection of a number of projects, often by subjective evaluation to be carried out during a certain period.

At the other extreme, in the socialist countries where state control of the factors of production is the greatest and where the experience with economic planning is longest, planning has evolved into a highly disaggregated multisectoral process. The multisectoral models are based on detailed input-output tables which can be used to project sectoral output levels, investment requirements, and allocation of resources by sectors for production, consumption, investment and other purposes (35, pp. 400-410).
In this chapter the experience of Iran with economic planning is discussed after briefly outlining the role of the price mechanism in development planning. Several stated goals of economic development in Iran are analyzed by (1) considering the existing conditions related to each goal, (2) past achievements of the Plan, and (3) implication of the goals for future plans.

The Role of the Price Mechanism

The comprehensiveness of a plan depends on the extent it is desired to replace the price mechanism, functioning through a market economy, by a state controlled and guided system which operates through a detailed economic plan. Aside from the economic debate about the ability of the market to function properly in an underdeveloped economy, there are some doctrinaire political and social welfare values, often entangled with the economic issues. As a typical case of doctrinaire views on economic relationship, Tinbergen (95, pp. 75-76) cites the examples of those economists assuming that external economies and increasing return to scale do not exist, as contrasted to those assuming that all individual decisions of producers and consumers have to be controlled by central authorities.

Setting aside the political and social aspects of the debate between market versus centrally planned economies, there remain some unsettled economic issues. Every economic system must somehow solve the following problems:

(1) What is to be produced and in what quantities.

(2) Depending on the relative scarcity of the factors of production, How to produce the commodities decided upon above.

(3) The allocation between present consumption and savings for investment in order to increase future production and consumption.
The problem of distribution, or for whom to produce.

The problem of making optimum use of scarce resources.

The problem of providing incentive for the individuals which are both the most important factors of production and the final demanders and consumers of products.

Finally, the problem of coordination between (1), (2) and (3) has to be solved so that all the interdependent production processes are properly balanced (26, pp. 13-14).

According to the classical theory of economics the market mechanism solves the above problems through interaction of supply and demand, profit motivation, competitive conditions, and the condition of small change per unit of time. Under the price system the above problems are solved as follows:

(1) The private firms decide what to produce and how much of each according to the criterion of maximizing profits.

(2) The market allocates factors of production among their alternative uses according to the criterion of maximizing returns to each factor input.

(3) The individuals decide how much of their income to consume and how much to save based on their propensity to consume and the expected future returns on savings and investment.

(4) The market distributes income to factors of production based on the supply and demand for them, and since individuals are owners of these factors, the market determines the distribution of income, which in turn determines the rationing of goods and services among consumers.

(5) Optimum use of scarce resources are made under the conditions of competition and profit motive.
(6) The market system provides for the incentive of the consumer and producer by the criteria of maximizing utility and profit.

(7) Coordination and integration of mutually interdependent production processes are achieved by independent private firms through a continuous adjustment forced by market determined changing prices of inputs and outputs.

The market performs the above functions through four stages or "equilibria":

1. Allocation of given stock of consumers' goods,
2. Allocation of production given stocks of equipment, land and labor,
3. Allocation of investment given stocks of labor, land and capital, and
4. Equilibrium in the money market between the aggregate demand and aggregate supply or the dynamic monetary equilibrium.

The market system under its assumptions can allocate the existing stock of consumer goods and perform the production process satisfactorily. However, in allocating the investment funds the market mechanism fails if the assumption of given stock of capital is not met, and when the amount and composition of investment is to be determined by many individual investment decisions. The market mechanism also fails in bringing an automatic equilibrium in the money market (83, p. 417).

At least four reasons can be cited as the cause for non-optimum allocation of resources by individual investment decisions, especially in the underdeveloped economies. These reasons are:

1. The investor tries to maximize his own marginal product. To the extent that there is a difference between the private and social benefit and cost, and to the extent that there exists external economies and complementarity of industries, individual decision making fails in optimizing allocation of resources.
(2) Investment in capital is often indivisible, or lumpy, yet the market system works under the assumption of the small change. Indivisibility may prevent the firms from fulfilling their marginal function.

(3) The productive life of many investment opportunities is longer than the planning horizon of private investors. This means that such investment either will not be undertaken or done at great risk at the expense of the investors and society.

(4) The equilibrium theory is static insofar as it reflects the economic situation as it is and not as it will be. Allocation of investment funds based on individuals valuation of the economy as it is presently fails to optimize the future returns to investment. This is particularly true about the underdeveloped economies where additional investment is likely to have a great impact on existing economic conditions (89, pp. 295-308).

It is now widely recognized that the market forces cannot ensure an automatic equilibrium between the aggregate supply and aggregate demand. Without this equilibrium, prices cease to be reliable parameters of choice and the price mechanism breaks down (83, p. 417). In short, the market mechanism functions efficiently in the consumer and producer markets, but it may not guarantee a rate of investment great enough to achieve the economy's goals. Nor does it necessarily guarantee a full employment of resources. This is particularly true in the underdeveloped countries like Iran where some of the institutions necessary for the proper functioning of the market system do not exist. Consequently, in many countries the
state has resorted to centralized investment planning in the areas where the private sector does not have the incentive, nor the capability and the information necessary for undertaking such investments.

The criteria to use for allocating resources among alternative development opportunities and the choice of techniques is still an unsettled issue in the theory of economic development. There appears to be a general agreement among the prominent economists (55, p. 193; 62, p. 257; 70, p. 89) that the neoclassical marginal analysis, so far as it applies to the static conditions of a competitive price system, fails to provide concrete guidelines in resolving the investment criteria and the choice of techniques problems. The criterion of equating the marginal productivity of the last unit of any resource used in a development project is correct so far as the static equilibrium conditions prevail, everything else remains constant, there does not exist externalities, and the aim of the plan is limited to maximizing short run output and profits.

In practice, the objectives of the plans go beyond maximizing total output alone. Other development targets which may not be necessarily in conflict with each other in the long run, but being generally inconsistent in the short run are set as the objective of the plans. Also, due to the fact that in the underdeveloped economies the number of complementary industries are small, establishment of a new industry may reduce the real cost of operating the existing industries and establishment of new industries. To the extent that external economies exist, investment on particular projects cannot be based solely on the marginal cost and return criteria.
Despite the inadequacy of the investment criteria, decisions have to be made in allocating scarce resources to alternative development opportunities in order to achieve the system's objectives. In the final analysis the investment criteria and the choice of techniques have to be correct from the point of view of the targets to be achieved. The plan and its targets, as Myrdal (70, p. 89) points out, have to be determined by decisions which represent choices made between different, alternatively possible, sets of goals and means. These choices are policy decisions, reached in terms of national development goals as determined by the political process. A detailed examination of Iran's development goals will be undertaken in the last parts of this chapter.

The Experience of Iran With Economic Development Planning

Planning for economic development, as known in Iran, began in 1948. Prior to this time the government had made some investment in selected industries and in some public projects. The primary objectives of the government in investment in consumer goods industries, such as textiles, tobacco, and sugar, were mainly to reduce dependance on the import of consumer products and to reduce the deficit in the balance of payments. Investment in social overhead capital projects, such as railways, schools and hospitals were undertaken since private initiative for undertaking such investments was absent.

Just how effective the government investment prior to 1948 proved to be, in terms of achieving its limited objectives, cannot be determined. This is mainly due to the absence of data on the size of investment, the change in domestic production, imports, and exports. Nevertheless, it can be safely stated that the public investments prior to 1948 did not change the economic structure of the country to any significant degree. The
economy remained, by all standards, very underdeveloped. One indicator of the above conclusion is that per capita income of Iran in 1947 was estimated at about $80, one of the lowest in the world, by the United Nations Economic Survey Mission for the Middle East. Another estimate made by the Iranian authorities placed per capita income in the rural sector at about $62 in 1947 (82, p. 34, p. 89).

World War II and the national political events following the war in Iran, brought about some awareness and concern about the low standard of living and productivity in the country. Meanwhile, the government's previous investment in public plants were incurring heavy losses due to their inefficient management. Also, the war had increased the government's reserve of foreign currencies and gold which could be used for developing the economy. The above conditions gave rise to the enactment of the 1948 Plan Act which established the Plan Organization. The initial function of the Plan was taken to be the management of the existing public plants and to make new investments in a number of projects suggested by foreign engineering consultant firms (46, p. 4).

To finance the investments during the First Seven Year Plan, the revenues from export of oil and loans from Melli Bank Iran were to provide for expenditures of Rls. 21 billion ($656 million at the exchange rate of Rls. 32 = $1) for the seven year period ending in 1956.

The investment opportunities were divided into four sectors, agriculture, transportation and communications, industries and mines, and public welfare. The basic policy guidelines directing the flow of investment funds to each sector appears to have been based on the common belief of the people in charge on the necessity of undertaking certain projects, such as construction of multipurpose dams, expanding transportation
facilities, repairing the existing public industrial plants, and improving public health and education. Agriculture was allotted 25 percent, transportation and communications 27 percent, industries and mines 19 percent, and public welfare 29 percent of the total expenditures (46, p. 4-5).

Two years after the inception of the Plan, the oil revenues ceased due to the oil embargo following oil nationalization. After the government's hope for borrowing from the international finance agencies did not materialize, most of the planned projects were halted.

With the resumption of oil exports in 1955, the government decided to call off the First Plan and initiate the Second Seven Years Plan. It is noteworthy that during the First Plan only 15 percent of the planned investments were made.

The Second Plan started with the same objectives as the First Plan. Again, investment opportunities were divided into four sectors. The type and the number of projects to be included in the Second Plan were decided on the basis of the First Plan's unfinished projects, expected government revenues from export of oil, and potential foreign borrowing. The objectives of the Second Plan were stated in the Second Plan Act as:

With a view to increasing production, developing exports, preparing public necessities within the country, developing agriculture and industries, discovering and exploring mines and subterranean resources, improving and completing means of communication, improving public health, fulfilling any operations designed for the development of the country, raising the education and living standards of the people of Iran and improving the living conditions . . . (46, p. 5).

Total funds allotted to the Second Plan, after several adjustments, were about Rls. 62 billion ($1,098 million) of which about 91 percent were spent by the end of the Second Plan. Table 8 shows the allocation of funds to the four major sectors.
Table 8. Iran Second Seven Year Plan expenditures in million rials: September 1955 - 1962

<table>
<thead>
<tr>
<th>Sector</th>
<th>Appropriations</th>
<th>Disbursements</th>
<th>percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and irrigation</td>
<td>24,807</td>
<td>23,464</td>
<td>31.1</td>
</tr>
<tr>
<td>Transportation and communications</td>
<td>32,973</td>
<td>29,990</td>
<td>39.8</td>
</tr>
<tr>
<td>Industry and mines</td>
<td>9,191</td>
<td>8,823</td>
<td>11.8</td>
</tr>
<tr>
<td>Social affairs</td>
<td>15,386</td>
<td>13,006</td>
<td>17.3</td>
</tr>
<tr>
<td>Total</td>
<td>82,357</td>
<td>75,251</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Source: (45, Appendix Table 5).*

The broad objectives of the Second Plan were interpreted in a number of projects, some inherited from the First Plan and some new ones. As for the allocation of funds among various investment opportunities, it appears that the final decisions were based on the strength and bargaining power of the various ministries, power groups, and officials involved with each type of investment. The personal judgment of the officials in charge with respect to the urgency and the importance of undertaking certain projects played an important role in project selection. As should be expected, the personal interests of some of the people involved with the selection and execution of projects were also among the decisive factors.

In reality, the planned projects could not have been selected primarily on the basis of their contributions to economic development. This was due to the fact that when the Second Plan was drafted, national
commitment to development planning was not widespread in Iran. There was little if any, usable data available on the quantity and the quality of resources, and on the amounts of resources needed for any given level of output. The few reports prepared by the foreign engineering firms recommending investment in certain projects were also based on expert judgment rather than on the basis of expected costs and benefits to each project.

In practice, the Second Plan fell short of achieving all its planned projects due to a number of additional limitations such as the relative absence of coordination among various government agencies and the Plan, a shortage of skilled administrators and technical personnel, a constantly upward adjustment in the costs of many projects, and the diversion of funds earmarked for development to meet regular government budget spending (45, pp. 10-13).

With the absence of quantification of the Plan's objectives and the expected contributions of its projects, it is not possible to quantify the Second Plan's contribution to Iran's economic development. However, the most important contributions of the Second Plan are considered as follows:

(1) Introduction of economic development as a national goal.

(2) Organization and training of a skilled cadre for implementation of future development activities.

(3) Successful completion of some planned projects (45, pp. 13-14).

A complete listing of all the projects planned and completed by the Second Plan is beyond the scope of this study. However, planned investment in the agricultural sector and some of the results accomplished will follow.
Planning for Agricultural Development

In both the First and the Second Plans special consideration was given to the agricultural chapters due to the importance of that sector in the economy. The funds allocated to the agricultural sector were divided into two sections; irrigation projects and production improvement programs. With little exception, Iran is an arid country with a few inaccessible seasonal rivers. The fact that water is a critical input in the Iranian agriculture led planners to allocate most of the available resources to construction of three dams, Karaj, Dez, and Sefid Rud. Table 9 shows actual public investment by the Plan Organization for agriculture during the 1955-1962 period. Of the total Rls. 23.5 billion ($313 million) investment for agriculture, about Rls. 17.3 billion ($231 million) or 74.0 percent, was spent on the primary construction of the above dams.

In contrast, investment in yield increasing programs, as shown in Table 9, were relatively small. Considering the crop area harvested annually to be about 6 million hectares, the average annual investment in yield increasing programs amounted to about Rls. 150 ($2) per hectare.

Obviously, the planners felt that more emphasis should be placed on the long range projects with low output capital ratios than on programs expected to give quick results. Whether the investment priorities established by the Plan are economically justifiable must depend on the expected contribution of each project to the society's goals rather than on the absolute amount of funds allocated.

It is stated by the Plan Organization (46, p. 18) that there still exists "a basic unanswered question as to the relative emphasis to be given to irrigation programs that would expand the area cultivable, and other programs that would increase the productivity of the existing area
Table 9. Iran. Second Plan investment in agriculture and irrigation projects in million rials: 1955-1962\(^a\)

<table>
<thead>
<tr>
<th>Project</th>
<th>Disbursements</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meteorology</td>
<td>78.8</td>
<td>0.3</td>
</tr>
<tr>
<td>Rural economy and engineering</td>
<td>98.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Forestry and pasture improvement</td>
<td>143.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Crop storage</td>
<td>191.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Agricultural industry</td>
<td>246.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Extension</td>
<td>306.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Agricultural and irrigation training</td>
<td>372.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Animal husbandry</td>
<td>430.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Loans for ganat and deep well</td>
<td>442.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Farming and crop improvement</td>
<td>463.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Pest control</td>
<td>632.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Village and land development</td>
<td>1,007.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Agricultural machinery</td>
<td>1,050.4</td>
<td>4.5</td>
</tr>
<tr>
<td>Irrigation and dam surveying</td>
<td>1,457.3</td>
<td>6.2</td>
</tr>
<tr>
<td>Irrigation and dam construction</td>
<td>15,854.9</td>
<td>67.8</td>
</tr>
<tr>
<td>Others</td>
<td>686.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Total expenditures</td>
<td>23,463.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\(^a\)Source: (45, Appendix Table 13).

under cultivation." An attempt is made in the final part of this study to answer the above question by comparing the benefits and costs of two alternative development opportunities: expanding the area under rice
under rice cultivation by the Sefid Rud project and increasing rice yields by fertilizer application.

Data on the results of the Second Plan's investment in agriculture is very scanty. In reviewing the Plan's various reports, one finds quite a few qualitative statements with little or no data to support them. In the absence of better alternatives, an attempt was made to summarize the contributions of the major agricultural projects undertaken by the Plan Organization during the Second Plan (Diagram 3). Also, to evaluate the Plan's contributions to the broad goals of the economy, a detailed examination of the conditions giving rise to each goal, and the implications of each goal for the future plans are undertaken.

The Goals of Economic Development Planning and Their Implications

As noted above the Second Plan was framed primarily as a financial document which made allocation of funds to investment sectors without containing any physical targets. By the end of the Second Plan attempts were made to categorize and list the objectives of economic planning in Iran as precisely as possible. These objectives which became the targets for the Third Plan were listed for the total economy as well as for its major sectors. The national development objectives and the agricultural development objectives were stated as follows:

(1) To achieve a sustained annual rate of growth of 6 percent in gross national product while maintaining reasonable price stability.

(2) To create an optimum number of employment opportunities.

(3) To promote a more equitable distribution of income.

(4) To increase agricultural production at a pace adequate to provide the food and industrial raw materials from agriculture needed by
## Development project

### Irrigation section

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karaj Dam</td>
<td>Provides 115 million m.(^3) water annually. Power generating capacity 185,000 kw. hrs.</td>
</tr>
<tr>
<td></td>
<td>Completed in 1961, mainly an urban project, cost $64 million. Annual revenue from sale of water $106,000, power $426,000.</td>
</tr>
<tr>
<td>Dez Dam</td>
<td>Provides water for 17,000-22,000 ha., with potential of 125,000 ha.</td>
</tr>
<tr>
<td></td>
<td>Provides 130,000 kw. hr. electricity, with potential of 500,000 kw. hr.</td>
</tr>
<tr>
<td></td>
<td>Completed in 1963 at cost of $95 million.</td>
</tr>
<tr>
<td>Sefid Rud</td>
<td>See Chapter VI for costs and potential benefits.</td>
</tr>
<tr>
<td>Deepwell and genat</td>
<td>Provided Rls. 442.5 million for long term loans. A total of Rls. 810.9 million was granted to 5,578 applicants. Plan also invested Rls. 278.7 million in eight irrigation companies. Some drilled as many as 500 semi-deepwells.</td>
</tr>
</tbody>
</table>

### Meteorology

Established 200 weather report stations and trained 90 technicians to staff them.

### Agricultural programs

**Extension**

Trained 546 agricultural extension agents, 920 village assistants, and 162 extension supervisors.

Trained 162 extension home economists, and 28 supervisors.

Provided short courses for 1,915 village headmen.

---

Diagram 3. Iran. Summary of the Second Plan's projects for agricultural development: 1955-1962\(^a\)

\(^a\)Source: (45, pp. 16-28).
<table>
<thead>
<tr>
<th>Development project</th>
<th>Direct contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop and soil improvements</td>
<td>Brought under improved seed cultivation 100,000 ha. Provided 1,000,000 orchards. Provided 120,000 tons improved cotton seed. Mapped all Iran's soils on 1:1,000,000 scale. Promoted fertilizer application from 180 tons to 50,000 tons per year.</td>
</tr>
<tr>
<td>Pest control</td>
<td>Sprayed 5 million ha. for locust control, 500,000 ha. against other crop pests. Prevented estimated loss of Rs. 25,000 million.</td>
</tr>
<tr>
<td>Animal husbandry and disease control</td>
<td>Established and improved animal breeding stations in 12 localities. Artificially inseminated 105,000 cattle. Vaccinated 3,000 cows annually. Disinfected 50,000 cows, 2,700 stables, and 250,000 ha. land annually. Vaccinated 500,000 cows against plague, prevented estimated loss of Rs. 1,250 million. Provided medical treatment for 3.5 million cattle annually. Established and improved vet. med. stations in 10 localities. Expanded Razi Inst. facilities to provide 40 million doses of animal and 1.5 million of human vaccines annually.</td>
</tr>
<tr>
<td>Crop storage</td>
<td>Modernized three 16,000 tons capacity and one 32,000 ton capacity silos in four major cities.</td>
</tr>
<tr>
<td>Agricultural industry</td>
<td>Established Teheran dairy plant, pasteurizing 60 tons of milk daily. Established fruit processing plants in five localities.</td>
</tr>
<tr>
<td>Agricultural mechanization</td>
<td>Provided Rs. 4,000 million loan to farmers to purchase 6,947 tractors, 1,065 combines, and 10,400 parts to be used on 1.5 million ha., some not cultivated before.</td>
</tr>
</tbody>
</table>
the nation to support a 6 percent annual growth in GNP while maintaining reasonable price stability (22, pp. 106-107).

In the following sections the implications of each of the above goals are examined with reference to the achievements of the Plan in the past and its future course of action.

Six Percent Rate of Growth in GNP

Achieving a six percent annual rate of growth in GNP has become one of the high priority objectives of economic planning in Iran. This means that investments must be made and idle capacity utilized so that the total volume of goods and services produced annually would increase by six percent. The question posed here is whether such a rate of growth in GNP is feasible and attainable for the Iranian economy.

The feasibility of a particular growth rate for an economy depends on the supply of resources (inputs) required for production of goods and services; and it depends on the demand for the economy's intermediary and final products (outputs). Since the national growth rate is a function of the growth rates in all major sectors of the economy, feasible sectoral growth rates, compatible with a desired national growth rate must be considered. For this type of analysis detailed input and output schedules are needed. However, this type of data is not yet available for Iran.

In cases like the above, simple models, limiting the required inputs to only one, namely capital, have been used as a first approximation for determining the feasibility of the growth rate in terms of its capital requirement. The Harrod-Domar model as utilized in the economic development literature is the case in point (93).

Initially, Domar's main objective was to discover the conditions under which an economy's productive capacity (P) equals its national income (Y).
In other words, what should be the rate of growth of the economy in order to remain in a continuous state of full employment. The answer to the above problem lies in the dual role of investment. Investment is both capacity creating and income generating. Thus the problem becomes one of maintaining equilibrium between capacity to produce and actual production.

The key determining factors of the rate of growth in national income in Domar’s model are the potential investment productivity (Y) and the marginal propensity to save and invest (α). Symbolically, Y is defined as:

\[ (3.1) \quad Y = \frac{dp}{dt} \cdot \frac{1}{\alpha} \]

Where Y is the ratio of increase in real income or output to an increase in capital, or the incremental output-capital ratio.

\( \frac{dp}{dt} \) is the annual change in capacity to produce.

I is net investment.

Assuming that Y is constant, from (3.1) it follows that:

\[ (3.2) \quad \frac{dp}{dt} = I \cdot Y \]

I. Y is the total net increase in output that an economy can produce. It represents the aggregate supply side of the economy.
The aggregate demand side of the economy is represented by the Keynesian multiplier. Defining national income as the sum of consumption and investment:

$$ (3.3) \ Y = C + I $$

Where $C = bY$ (b is marginal propensity to consume.)

Substituting for C in (3.3),

$$ Y = bY + I $$

or

$$ (3.4) \ Y = I. \ \alpha^{-1} $$

Where $\alpha = (1 - b)$ is the propensity to save.

Differentiating (3.4) with respect to time (t):

$$ (3.5) \ \frac{dY}{dt} = \frac{dI}{dt} \ \alpha^{-1} $$

In equilibrium, the capacity to produce is equal to total output.

$$ (3.6) \ P_0 = Y_0 $$

To retain the equilibrium position, the following condition is necessary:
Substituting (3.2) and (3.5) in (3.7) would give:

\[(3.8) \quad I = \frac{dy}{dt} \cdot \alpha^{-1}\]

Simplifying (3.8) by multiplying both sides by \( \alpha \) and dividing by \( I \) gives:

\[(3.9) \quad \frac{dy}{dt} \cdot \frac{1}{I} = \alpha \gamma\]

Solving (3.9) for \( I \):

\[(3.10) \quad I = I_0 \cdot e^{\alpha \gamma t}\]

is the equilibrium rate of growth.

Substituting (3.4) and (3.5) in (3.9) would give the following relationship:

\[(3.11) \quad \frac{dy}{dt} \cdot \frac{1}{Y} = \alpha \gamma\]

Solving (3.11) for \( Y \):

\[(3.12) \quad Y = Y_0 \cdot e^{\alpha \gamma t}\]
Equation (3.12) expresses the equilibrium rate of growth of national income as the multiple of the propensity to save (and invest), and the incremental output-capital ratio.

Going back to the question of the feasibility of a six percent annual rate of growth in GNP in Iran, the question can be posed as to whether the system can mobilize savings and find productive investment opportunities at a rate high enough to achieve the desired rate of growth. Table 10 shows the net output-capital ratios and the investment ratios for Iran during the 1959-1963 period, calculated from data shown in Table 1 above. A discussion of each of these factors will follow:

The net output-capital ratio varied from 0.18 to 0.56 during the 1959-1963 period. The short duration of the data, and the restrictive assumptions underlying calculation of output-capital ratio, namely, there exists no lag between the period of investment and the period during which output will be forthcoming, makes the numerical value of Y meaningless. However, the implications of the relative size of output-capital ratio for Iran's development plans can be examined without reference to its absolute size.

The incremental capital-output ratio (ICOR), which is the same as the inverse of the incremental output-capital ratio can be roughly defined as the amount of capital required to generate one unit of output in a specified time period. If it takes three units of capital investment to generate one unit of income, then ICOR = 3. This can be calculated either on a gross or net value added basis. Calculations made by Kuznets (60, pp. 252-256) based on time series for the developed countries, shows that the size of ICOR varies greatly among nations at different stages of their development. For example, during the period from 1860 to 1970 ICOR
varied from 3.5 in the United Kingdom to 11.9 in Italy.

The change in ICOR during the course of development is not consistent among the countries studied by Kuznets. The experience of Italy and Norway indicates a distinct decline in ICOR accompanied by a marked acceleration in the rate of growth of GNP. In all other countries studied the United Kingdom, Germany, Denmark, Sweden, Canada, Australia, Japan, and the United States, ICOR increased from between 3 and 4.5 in the early periods to between 4 and 6 in the recent periods.

The reasons for the changing ICOR and the differences in its level among countries may be explained in terms of the conditions that influence the use of capital, namely, investment in human resources, technological peculiarities of the economy, relative supplies of labor and capital, and the organizational structure of the economy.

The extent of the relevancy of the developed countries experiences as discussed above, to the course of development in Iran during the next decade cannot be determined. In all probability, they may not have any functional relevance at all. However, it is certain that ICOR is not constant over time and among different sectors and for different projects within a country. Thus, given a desired annual rate of growth in GNP, and given a specified level of other constraints such as availability of investable funds and the required technical personnel, the planners must find investment opportunities which would result in achieving the Plan targets.

The above simplified view of establishing investment priority on the basis of maximizing output per unit of capital is only correct so far as the productive life of any investment does not go beyond the plan period. In practice the criteria for choosing alternative investment opportunities and various production techniques are complicated by the fact that the
Table 10. Iran. Calculation of net output-capital ratios and net investment ratios in 1959 billion rials and percentages: 1959-1963\(^a\)

<table>
<thead>
<tr>
<th>Year</th>
<th>(1) Gross domestic product</th>
<th>(2) Total gross investment</th>
<th>(3) Depreciation</th>
<th>(4) Net investment ((2 - 3))</th>
<th>(5) Net domestic product ((1 - 3))</th>
<th>(6) Change in NDP</th>
<th>(7) Net output-capital ratio ((6 + 4))</th>
<th>(8) Net investment ratio ((4 + 5))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>312.8</td>
<td>53.4</td>
<td>14.6</td>
<td>38.8</td>
<td>298.2</td>
<td>-</td>
<td>-</td>
<td>13.0</td>
</tr>
<tr>
<td>1960</td>
<td>335.5</td>
<td>62.3</td>
<td>15.7</td>
<td>46.6</td>
<td>319.8</td>
<td>21.6</td>
<td>0.46</td>
<td>14.6</td>
</tr>
<tr>
<td>1961</td>
<td>346.4</td>
<td>61.2</td>
<td>16.2</td>
<td>45.0</td>
<td>330.2</td>
<td>10.4</td>
<td>0.23</td>
<td>13.6</td>
</tr>
<tr>
<td>1962</td>
<td>353.2</td>
<td>52.8</td>
<td>16.4</td>
<td>36.4</td>
<td>336.8</td>
<td>6.6</td>
<td>0.18</td>
<td>10.8</td>
</tr>
<tr>
<td>1963</td>
<td>374.6</td>
<td>54.1</td>
<td>17.3</td>
<td>36.8</td>
<td>357.3</td>
<td>20.5</td>
<td>0.56</td>
<td>10.3</td>
</tr>
<tr>
<td>Average</td>
<td>344.5</td>
<td>56.8</td>
<td>16.0</td>
<td>40.7</td>
<td>328.5</td>
<td>14.8</td>
<td>0.36</td>
<td>12.5</td>
</tr>
</tbody>
</table>

\(^a\)Source: (38, p. 34).
productive life of most fundamental projects run far beyond the five or seven year plan period. Investment in social overhead capital projects, such as communications networks, capital producing industries, and investment in human resources are the cases in point.

In the final analysis, an explicit choice must be made between output increasing projects with a short gestation period as compared to the projects which might maximize total output in the long run. The choice must be based on the existing conditions and their implications for the future. If unemployment and underemployment is widespread, the degree of inequality in income distribution is high, and there exists a shortage of consumer goods, then preference must be given to the types of investment which would maximize total output during the plan period. In contrast, if the standard of living of the masses is above a minimum critical level conducive to rapid economic development, more emphasis can be placed on investment in social overhead capital in order to maximize total output in the long run.

As Table 10, column 8 shows, the net investment ratio varied between 10.3 and 14.6 percent of GDP during 1959-1963 in Iran. As noted above, this rate is higher than the rate specified as a required rate of investment for the "take off" by Rostow (84) and Lewis (63). One implication of the above discussion is that the rate of investment must be increased even more if high capital-output ratio projects are undertaken. Thus an explicit choice must be made between a higher level of consumption at the present by emphasizing investment in development opportunities with a short gestation period, and a higher rate of growth in income in the future by putting more emphasis on long range development opportunities.
As Myrdal (70, p. 167) points out, the extent to which an under-developed country can vary its time pattern of income and consumption is determined by two limits: the extent to which it can cut down present consumption and mobilize saving; and the extent to which its institutional and productive framework is capable of absorbing these savings productively. The experience of Iran indicates that the ability to invest productively is a much more serious task than the ability to mobilize saving.

Optimum Level of Employment

The second major objective set by the policy makers for Iran's economic development is to create an optimum level of employment. It is not explained by the Plan what is meant by optimum employment in a country where a major segment of the population is either totally unemployed or underemployed. In the absence of any concrete set of data on Iran's human resources, a rigorous analysis of the Second Plan's effect on employment and the implications of the above objective for the future plans is difficult. Nevertheless, an attempt is made here to shed some light on the present conditions of employment in Iran.

The 1956 census placed Iran's population at 18,954,704. As can be observed from Diagram 4, Iran's population is very young with the median age around 20 years. About 43 percent of the total population is younger than 15 years. In contrast only 3 percent of the population is above 65 years of age. Factors inherent in economic underdevelopment, such as poor nutrition, poor health, high infant mortality, and short life expectancy are a few causes of the peculiar age distribution of Iran's population.
Traditionally, women have been kept out of the economically active labor force by Iran’s social values and economic conditions. Aside from some rural communities where the women help with the farm work at peak employment seasons, the role of the women is limited to housekeeping. Of some five million females between the ages of 15 and 65 in 1956, only 573,000 were gainfully employed (18, p. 540). This is about 8 percent of Iran’s labor force. In contrast, gainfully employed male population is more than all males between the ages of 15 and 65. Aside from statistical errors, this may be explained by the fact that there are some children below the age of 15 and some men above 65 who are in the labor force.

Iran’s population is predominantly rural with an estimated 67 percent of the total population residing in the rural communities (defined as communities having less than 5,000 inhabitants at the time of the 1956 census). As can be seen in Diagram 4, the proportion of the population within the economically active age is lower in the rural sector than in the urban sector. This is particularly noticeable for men of the 15 to 35 age group. This differential is explainable by the fact that there are many rural men who temporarily migrate to the cities to find employment, leaving behind the inactive members of the family. Table 11 shows the urban-rural composition of Iran’s population and the active labor force. An active labor force is defined as all persons between the ages of 12 and 60 excluding housewives, students, sick, conscripts, and retired (38, p. 76).

Iran’s total employment, as shown in Table 12, was about 6 million in 1956, or 31 percent of the total population. Considering the high proportion of the inactive population, the employment data appears to be
Diagram 4. Iran. Distribution of the total population by sex and sector of residence: 1956
Table II. Iran. Urban - rural composition of total population and active labor force: 1959-1963a

<table>
<thead>
<tr>
<th></th>
<th>Population (in 1,000)</th>
<th>Active labor force (in 1,000)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>20,397</td>
<td>6,622</td>
<td>13,775</td>
</tr>
<tr>
<td>1960</td>
<td>20,911</td>
<td>6,860</td>
<td>14,051</td>
</tr>
<tr>
<td>1961</td>
<td>21,440</td>
<td>7,108</td>
<td>14,332</td>
</tr>
<tr>
<td>1962</td>
<td>21,982</td>
<td>7,363</td>
<td>14,619</td>
</tr>
<tr>
<td>1963</td>
<td>22,539</td>
<td>7,628</td>
<td>14,911</td>
</tr>
<tr>
<td>Average</td>
<td>21,454</td>
<td>7,116</td>
<td>14,378</td>
</tr>
</tbody>
</table>

aSource: (38, p. 9, 77).
overestimated. With this qualification in mind, about 54 percent of the employed population is directly engaged in agriculture. Of the nonagricultural employment, manufacturing which includes small crafts, makes up for 17 percent of total employment, and sales and services for 15 percent. The mining sector provides employment for less than one percent of the total employed labor force while, as noted earlier, contributes 16 percent to the GDP.

Table 12. Iran. Total employment and its distribution by industry: 1956a

<table>
<thead>
<tr>
<th>Industry</th>
<th>1,000 Persons</th>
<th>Percent distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>5,907.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3,175.2</td>
<td>53.7</td>
</tr>
<tr>
<td>Nonagriculture</td>
<td>2,732.5</td>
<td>46.3</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1,022.4</td>
<td>17.3</td>
</tr>
<tr>
<td>Professional</td>
<td>214.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Clerical &amp; administrative</td>
<td>156.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Mining</td>
<td>51.5</td>
<td>0.9</td>
</tr>
<tr>
<td>Transportation</td>
<td>160.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Sales</td>
<td>407.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Services</td>
<td>487.0</td>
<td>8.2</td>
</tr>
<tr>
<td>Military &amp; other</td>
<td>232.4</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Source: (18, pp. 540-541).
Casual observations indicate that unemployment and underemployment is widespread in both rural and urban sectors. No detailed statistics are available to show the size of unemployment and underemployment. The sight of healthy villagers spending many hours each day, even during the active seasons, in front of the village tea houses is quite common in Iran. In the urban sector, even the high school and college graduates face the difficult task of finding employment. The large number of service employees, such as servants in civilian offices and at homes, car watchers, peddlers, and lottery ticket sellers are other indications of underemployment and disguised employment in the urban areas.*

Iran's low level of per capita income is traceable to the low level of utilizing her available labor resources. Two major types of unemployment may be identified; unemployment arising from insufficiencies in the supply of means of production and unemployment arising from lack of effective demand (71, p. 241). Unemployment due to change in taste and technology, and frictional unemployment, all arising from lack of effective demand, are by far less important in the underdeveloped economies such as Iran, than in the developed economies.

Three types of unemployment and underemployment associated with

*To cite some preliminary reports of the 1966 census (Ettelaat, airmail edition, No. 5255, p. 1, June 10, 1967) of the 16,551,100 population 10 years and older, about 8,993,200 (54.3 percent) are reported inactive economically (including housewives, students, sick, retired, etc.). Of the remaining 7,557,900 economically active population, 6,866,500 persons are gainfully employed, and the remaining 691,400 persons are unemployed, but seeking employment. This means the unemployment rate is about 10 percent.
insufficiencies in the supply of means of production, all prevalent in Iran, may be identified; disguised unemployment, structural unemployment, and underemployment of expansion.

Disguised unemployment is defined as the existence of a portion of the labor force having marginal productivity of zero. This means a portion of the labor force can be removed without reducing output. The disguised unemployment hypothesis has been presented under two different assumptions, variable technology and fixed technology (ceteris paribus). The existence of disguised unemployment when other factors of production are allowed to change is not limited to the underdeveloped economies and the agricultural sector for it can be observed even in the most developed economies. However, the existence of disguised unemployment with fixed technology has been a matter of dispute among development economists (53).

Two questions that arise with regard to the existence of disguised unemployment are:

(1) Why such labor is not substituted for other factors of production.

(2) Why labor is employed to the point of zero marginal productivity and is paid wages above the value of its marginal product.

The first question can be answered considering the fact that even the most labor intensive techniques require some minimum amount of capital per unit of labor. Professor Lewis (63) provides the answer to the second question by hypothesizing that the disguisedly unemployed labor in the peasant agricultural sector receives wages equal to the institutional wage rate, which is determined by the minimum subsistence requirements, and the social organization of the peasant society.
Whether there exists significant disguised unemployment in Iran's agricultural sector, in the absence of concrete studies, is difficult to establish. However, the general opinion of the Iranian economists is that given the existing techniques of production and the input mix, the size of the disguised unemployment is not significant (2, p. 6). However, this does not rule out the possibility of releasing a large number of people from agricultural production, if the production techniques are modified or other factor inputs are substituted for the labor.

The second type of unemployment associated with insufficiencies in the supply of means of production is structural unemployment. Structural or hidden underemployment becomes more acute with the introduction of new techniques in the primary sector, while the other sectors of the economy fail to absorb the labor surplus. Introduction of mechanized farming which releases a large number of agricultural workers is the case in point. The released labor resources constitute a loss if they are not employed in the other sectors.

Underemployment of expansion occurs in underdeveloped economies as the economy tries to expand. This is due to the failure of capital and other complementary factors of production to increase at the same rate as the rate of increase in the supply of the labor force in secondary and tertiary activities. The unemployed and underemployed, formerly peasants in the urban areas, are the cases in point.

Since population has an effect on the aggregate demand as well as on the aggregate supply of an economy's total output, its rate of increase should be of particular interest to the economic planners. Iran's population has been increasing rapidly due to a high fertility rate while the mortality rate has been falling. The annual increase in Iran's
population is estimated at 2.5 percent for the total population, 3.6 percent for the urban sector, and 2.0 percent for the rural sector (38, p. 99). The higher rate of increase in the urban sector is due to migration from the rural areas, and perhaps better health and diet conditions in the urban sector.  

An increase in the total population may enlarge the size of the market, the effective demand, and the scale of production. It is a stimulus to development if there exists excess capacity. However, in most of the underdeveloped economies, including Iran, the urgent task facing the planners is to increase the supply of goods and services fast enough to keep pace with the increase in the existing demand. Lack of effective demand appears to be more a problem of the developed economies than the underdeveloped economies. 

As population expands, the supply of goods and services must at least increase at a rate high enough to maintain the same standard of living. To increase total supply, development opportunities must be identified and investment must be made. To the extent that the economy strives to achieve a rising per capita income, total output must increase even faster than the population. To show this point, the following algebraic equations are used. Assuming that the population (P) grows by an exponential function, it may be written

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*To cite again the preliminary report of the 1966 census (Étrelant, airmail edition, No. 5255, p. 1, June 10, 1967), Iran's population is estimated at about 25,142,900 or 32.6 percent higher than in 1956. This means an annual population increase of 2.8 percent. To the extent that the population increase is higher than the 2.5 percent used in this study, overcoming the problems associated with maintaining per capita income and standard of living becomes an even greater task.*
(3.13) \( P = P_0 e^{r_0 t} \)

Rewriting the growth of income equation from the Harrod-Domar model

(3.14) \( Y = Y_0 e^{r_0 t} \)

Defining per capita income as \( Y/P \) and substituting for \( Y \) and \( P \) from (3.13) and (3.14)

(3.15) \( \frac{Y}{P} = \frac{Y_0}{P_0} e^{(r_0 - r)t} \)

Equation (3.15) states that to maintain per capita income in some future period, the rate of growth in total output (\( r_0 \)) must be equal to the rate of growth in population (\( r \)). This means, given an incremental capital-output ratio of 4:1, and an annual population increase of 2.5 percent, it would require a rate of investment equal to 10 percent of GNP to maintain the same level of per capita income.

In case the policy makers desire a positive rate of increase in per capita income, such as 3 percent, given the same assumptions as above, it would require a rate of saving and investment equal to 22 percent of current income to achieve such a goal. This is a very high required level of saving and investment when compared to the past experience of Iran as outlined in Chapter II.

Given the existing underemployment conditions, the abundance of unskilled labor, relative shortage of capital, and a policy goal to optimize employment, the task facing the economic planners in Iran is to
select the investment opportunities and the techniques of production which would maximize national income and employment simultaneously. To the extent that the planners succeed in identifying and undertaking investment opportunities which would productively employ the labor force, achievement of the above two goals are compatible.

Where labor is abundant and capital scarce, the principle of variable proportion calls for the maximum employment of the abundant input per unit of the scarce input, up to the point where the marginal productivity of the abundant input is approaching zero. However, the above principle is relevant so far as labor intensity per unit of capital does not result in a higher capital intensity per unit of output than warranted. It is conceivable to get a high capital-output ratio using a labor intensive technique. In other words, low capital to labor ratios are not desirable per se. They are only effective for development if for given labor and capital supplies, they add most to the supply of goods and services (5, p. 299).

Much of the controversy between the labor intensive versus capital extensive techniques depend on the relative values attached to each factor and the nature of each resource. Labor is a productive resource present in a large number. It is a flow resource which means that if it is not used it is lost. The opportunity cost of labor is low in particular areas and seasons. Thus it may be possible to use the labor to create capital in the form of rural roads, irrigation canals, leveling land, and building public facilities. The experience of densely populated countries like India and China gives some support to the idea that there does exist some flexibility in capital-labor ratios or the substitutability of labor for capital (32, p. 67).
However, the experience of the developed countries is said to show that the major innovations, those resulting in the most pronounced increase in output, were capital intensive. For example, investment in infrastructures and social overhead capital were necessary before the minor capital saving innovations could be made (7, p. 228).

One implication of the developed countries' experiences, assuming that they also hold true for the economic development of countries like Iran is, that to maximize real per capita income, the proportion of capital in the input mix must be increased. Thus an underdeveloped country may be forced to use intensive capital per worker techniques, which are exactly opposite of what her relative factor supply dictates. In this respect, the goals of maximizing output and optimizing employment simultaneously may not be compatible. In any case, the economic aims dictate the preference of maximum output goal over optimum employment goal, whenever such a conflict arises.

Just how effective the Second Plan's investment proved to be for optimizing the level of employment is difficult to establish. However, considering the fact that most of the Plan's projects were capital intensive and that they were carried out by foreign contractors who made maximum use of modern techniques and imported equipment, it can be safely concluded that the effects of the Second Plan on raising the level of employment were minimal. This was particularly true in the agricultural sector where investment in irrigation projects had not yet begun to pay off by the end of the Plan. It is expected that these projects make a significant contribution to future agricultural employment as new areas are brought under cultivation.
An important implication of the above discussion for Iran's future plans is the need for a definite population policy, which may serve as a supplementary measure to maximizing productive investment. This possibility has not yet been considered in Iran due to the general belief that rapid population growth is not a serious problem as long as the physical area per capita is rather large. In the absence of concrete information about the capacity of natural and human resources, using population density per unit of land is not an accurate measure of population pressure. Even if the potential resources in Iran can support a larger population, still there exists regions with poor resources and low population density, with little margin for supporting a larger population.

The problems associated with a rapidly increasing population become more serious during the transitional stages of development. In the primitive societies both the fertility and the mortality rates are high, the latter serving to control a rapid population growth. In contrast, in the developed societies both the fertility and the mortality rates are low due to family planning, industrialization and a high standard of living. However, in most of the underdeveloped economies where public action has been taken to control infectious diseases and widespread famines, the mortality rate has dropped while the fertility rate has remained constant. For example, in Iran the fertility rate is estimated at 45 per 1,000 while the mortality rate is 20 per 1,000. The mortality rate may even be lowered further if health facilities are provided for the rural sector. In contrast to the falling mortality rate, there are no signs that the fertility rates would drop automatically, if not in fact increase, in the foreseeable future.
Two possible ways to reduce population pressure in Iran are to adapt policies directed toward lowering of the fertility rate, and internal migration from overpopulated regions with poor resource bases to underpopulated regions with relatively rich resource bases.

One other possible measure, namely preventing the mortality rate from falling, is so contrary to the social and humanitarian values of the society that it need not even be considered. Reducing the fertility rate is also a difficult, if not an impossible, task. The use of most birth control methods are restricted by lack of education, and the socio-religious values of the masses. In many cases, children (especially the male), have economic significance for the family in terms of helping with the family work and being a source of security for the parents' later years.

The possibility of lowering population pressure by resettlement appears to be very promising in Iran. It may prove worthwhile for the planners to consider the costs associated with providing the means for outmigration from the poor regions, as compared to heavy investment to such poor resources.

**Equitable Income Distribution**

The third goal of economic planning in Iran is to achieve a more "equitable" income distribution. Theoretically, the distribution of income is determined by relative values of marginal product of resources. Thus, depending on the amount of resources owned, and to the extent that resources make a positive contribution to total output, an individual's income is determined. In practice, returns to owners of resources are not exactly related to their contributions to total output. Because of
the particular institutional arrangements and the imperfections in the
market system, some resources may receive more or less than their value
of marginal products.

The distribution of income in Iran is characterized by a very large
low income class, composed of the peasants and the urban manual and
service workers, and relatively small middle and high income classes. The
middle income class is comprised of the shop keepers, civil employees,
and some agricultural owner-operators. Landlords, high military personnel,
merchants, and some professional lawyers and physicians comprise the
high income class.

Table 13 gives some indication of the distribution of income in
Iran. It is based on actual expenditures of about 16,000 families in the
ten largest cities and ten smaller cities in 1959. The income distribution
may be even more unequal than expenditures distribution, so far as the
propensity to consume of high income class is lower than for low income
classes, and to the extent that income is higher in the urban sector than
in the rural sector.

It may be argued that an unequal distribution of income has a
favorable effect on the economic development since most saving and
investment is done by the high income class. The difficulty with this
potential advantage is that in underdeveloped countries such as Iran, the
highest private income is received from real estate speculation, trade,
and rent. As Bruton (7, p. 231) points out, inequality arising out of
relatively high rental income does not favor the accumulation of
productive capital equipment, but rather leads to more speculative real
estate transactions, conspicuous consumptions, and a higher degree of
inequality in income distribution.
Table 13. Iran. Distribution of consumption in the urban sector: 1959a

<table>
<thead>
<tr>
<th>Expenditures in rials</th>
<th>Percent people</th>
<th>Percent expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20,000</td>
<td>13.8</td>
<td>6.2</td>
</tr>
<tr>
<td>20,000 - 24,999</td>
<td>6.9</td>
<td>3.7</td>
</tr>
<tr>
<td>25,000 - 29,999</td>
<td>7.4</td>
<td>4.5</td>
</tr>
<tr>
<td>30,000 - 39,999</td>
<td>13.8</td>
<td>9.0</td>
</tr>
<tr>
<td>40,000 - 49,999</td>
<td>11.6</td>
<td>8.7</td>
</tr>
<tr>
<td>50,000 - 74,999</td>
<td>18.6</td>
<td>17.2</td>
</tr>
<tr>
<td>75,000 - 99,999</td>
<td>9.3</td>
<td>10.8</td>
</tr>
<tr>
<td>100,000 - 149,999</td>
<td>8.4</td>
<td>12.7</td>
</tr>
<tr>
<td>150,000 - up</td>
<td>10.2</td>
<td>27.2</td>
</tr>
</tbody>
</table>

aSource: (38, pp. 86-88).

A highly unequal income distribution, aside from being socially unjustifiable, may cause social unrest, and disruption of production. However, the most serious effect of unequal income distribution is its effect on keeping the effective demand and the size of the market for goods and services small. Thus, to the extent that a more equal distribution of income would result in a more rapid rate of productive capital accumulation, social stability, and enlarging the effective demand, it is conducive to economic development.

Establishing investment priorities on the basis of contributions to a more equitable income distribution may not be very practical, and at best, its results minimal. However, to the extent that public investment gives rise to a higher employment of labor and reduces the cost of subsistence living, inequality in the distribution of income may be reduced.

The present state of income distribution in Iran calls for enactment and implementation of policies designed to reduce the effects of market imperfection and institutional arrangements on income distribution. Some
of these policies are distribution of large estates among cultivators, establishment of cooperative associations, direct progressive taxation, minimum wage laws, and guaranteeing the rights of labor to bargain with management. In practice, it may be much easier to construct a dam than change the traditional land and water ownership rights. Yet, it is the later type of action that may alter the existing distribution of income significantly.

Agricultural Self-sufficiency

Self-sufficiency in agricultural production means that Iran must depend on increased domestic production to meet increased demand for food and fiber. Theoretically, self-sufficiency in agriculture cannot be a goal by itself. Whether a country produces certain commodities or imports them must depend on her comparative advantage.

An underlying assumption of economic planning in Iran has been the comparative advantage in meeting demand for agricultural products by domestic production (22, pp. 66-67). This implies that by and large, it is more advantageous to produce the food and fiber needed in Iran than to import them or face higher prices. This assumption, with some justification under static conditions, is made on the basis of the costs of production in Iran as compared with world markets, and on the basis of the opportunity costs of resources employed in agriculture at the present. Agricultural resources such as land and labor have a small opportunity cost. In the absence of alternative employment opportunities, failure to use such resources productively may result in higher unemployment, lower income, and deficit in the balance of payments.

Granted that the comparative advantage of Iran is to meet increased demand for agricultural products domestically, what are the implications of such an assumption?
Agricultural production for food consumption constitutes 92 to 96 percent of total production in Iran (46, p. 24). Thus, the major part of the increase in demand for agricultural products arises from increase in demand for food, which in turn is a function of population growth rate, growth in income, and income elasticity of demand for food. Algebraically, this can be shown by Ohkawa equation (51, p. 572) as:

\[(3.16) \quad D = p + e g\]

where
- \(D\) is annual change in demand for food
- \(p\) is annual rate of change in population
- \(e\) is income elasticity of demand for food
- \(g\) is annual rate of change in per capita income

Income elasticity of demand for food shows the percentage increase in demand for food as income changes by one percent. In the underdeveloped economies, income elasticity of demand for food is near unity. This means a one percent increase in income will cause the demand for food to increase by almost one percent. In Iran, average income elasticity of demand for food is estimated at 0.59 and 0.80 for the urban and the rural sectors respectively. For some food items, such as meat and fruits, \(e\) is above unity (22, pp. 36-45).

The size of increase in demand for food can be estimated by substituting the relevant data in equation (3.16). However, since the population growth rate and size of income elasticity of demand for food varies significantly between the urban and the rural sectors, equation (3.16) can be disaggregated as follows:
\[(3.17) \quad D = \left( P_u + e_u \cdot S_u \right) \frac{P_u}{P} + \left( P_r + e_r \cdot S_r \right) \frac{P_r}{P} \]

where \( P \) is total population and subscripts \( u \) and \( r \) refer to the urban and the rural sectors respectively. The other notations are the same as before. Substituting the relevant data from Iran in equation (3.17) would give:

\[(3.18) \quad D = (0.036 + 0.59 \times 0.024) \frac{34}{100} +
(0.020 + 0.80 \times 0.040) \frac{66}{100} = 0.051\]

Thus, given the past rates of increase in population, and the income elasticity of demand for food; and assuming that national income grows by six percent per year, agricultural production must increase by 5.1 percent annually.

Considering the performance of the agricultural sector in the past, achieving an annual rate of growth of 5 percent is not an easy task. Available data shows that though agricultural output has increased during the past three decades, yet when population growth is taken into consideration, the net increase in output has been lower, or at most, equal to the population growth. For the period 1935-39 to 1959-61, Christensen (11, p. 33) gives an annual compound rate of 1.9 percent increase in total agricultural output. The Third Plan Frame for Agriculture (42, p. 43) states that in 1935-39, per capita agricultural
output was 18 percent higher than in 1952-54, and 23 percent higher than in 1960-61.

The increase in demand for food has been met partially by lower per capita consumption, and by reduction in food exports, increased imports, and higher food prices.

An implicit objective of economic planning in Iran is "reasonable" price stability, while trying to achieve a six percent increase in GNP annually and being self-sufficient in agriculture. Food prices have been far from stable in Iran in the past four decades (Table 14). Since 1936, the wholesale price of all foods and foods of animal origin have increased by 30 and 48 times respectively. The retail price index of food has also increased by 19 times. In contrast, price index of producer's goods and other consumer goods have increased slower. The inflationary pressure on all prices and particularly on food prices is largely due to a lower rate of growth in total output than the rate of growth in money income and purchasing power. Also, to the extent that public investment does not increase output in the short run, while increasing disposable income, inflation is inevitable.

Since agriculture is a major sector in Iran, development in that sector, aside from providing the food and fiber needed by a growing economy, will make a positive contribution to the other goals of the society. The theoretical basis for agriculture's contribution to economic development is examined in the following chapter.
<table>
<thead>
<tr>
<th>Year</th>
<th>General index</th>
<th>Foods</th>
<th>Food of animal origin</th>
<th>Building materials</th>
<th>Fuel</th>
<th>General index</th>
<th>Food</th>
<th>Rent</th>
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*Source: (37, pp. 168-169, 180-181).*
CHAPTER IV. THE ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT

The Theoretical Framework

The process of transition from a predominantly subsistence agricultural economy to one of a commercialized industrial economy was first outlined by Professor Lewis (63). The assumption underlying the Lewis model is that there exists an unlimited supply of unskilled labor at the going level of wages in the industrial (capitalist) sector. In other words, it is possible to expand the industrial sector without facing a shortage of unskilled labor. It is also assumed that import of food is not allowed.

Since there exists an unlimited supply of labor, wages in the capitalist sector are determined by the level of earnings in the subsistence sector (institutional wage rate). Capital being the scarce factor of production, the capitalists would, according to the principle of variable proportions, employ workers up to the point where the value of marginal productivity of the last worker is equal to the institutional wage rate. The surplus or profits received by the capitalists are equal to the difference between the value of total productivity of labor and total the subsistence determined wages fund.

The capitalists can increase their profits by investing some of their previously earned surplus. Since capital is the scarce factor, additional capital in the input mix, causes an upward shift in the marginal productivity of labor schedule, causing both increased investable surplus and increased number of workers in the capitalist sector.

Expansion in the industrial sector will continue as long as the supply of labor lasts. The implications of this process for the agricultural sector are different under different assumptions regarding
the nature of employment. Two cases may be distinguished. First, the case arising from the assumption that there exists a significant supply of labor with marginal productivity equal to or near zero in the agricultural sector, which can be employed in other sectors without requiring any changes in the sector. Second, the case arising from the proposition that though seasonal unemployment exists, it is not possible to extract full time labor from agriculture while keeping the same production techniques, and not experience a reduction in total agricultural production. Each of the above cases are briefly considered below.

Assuming that disguised unemployment prevails in the agricultural sector, labor can be moved out of agriculture and employed for building infrastructures such as roads, schools, and dams. Since the marginal productivity of the extracted labor was equal to zero, total agricultural output would remain the same. Under the assumptions of the Levis model, the agricultural sector can make a positive contribution to economic development without requiring any substantial changes in the techniques of production. Extraction of the surplus labor automatically increases per capita productivity in agriculture since there are fewer people to share the total production.

For the model to be functional at least three problems must be resolved. First, the workers remaining in agriculture can be made to work longer periods and harder to make up for the partially employed labor transferred to the other sectors. This may require additional incentives for the agricultural workers. Second, the extracted unskilled labor can be profitably employed outside of agriculture. And finally, the agricultural surplus above the subsistence level which accrues to the
remaining labor force in agriculture can be extracted to feed a growing industrial labor force.

In practice, the use of the Lewis model is limited due to the inability of most systems to solve one or more of the above problems. Even if a portion of labor can be moved out of agriculture without reducing total output, the use of such labor outside of agriculture may be very limited. One indication of this difficulty is high rate of unemployment and underemployment in the urban sector as well as in the rural sector. The transfer of agricultural surplus at a minimum cost is also difficult without resorting to a highly state controlled economic system.

In the absence of significant disguised unemployment, to extract labor and capital from the agricultural sector, agricultural productivity per worker remaining in that sector must increase. This is particularly true where import of agricultural products to supplement domestic production is not feasible. As the industrial sector expands, demand for food will rise. Failure of the agricultural sector to expand output would result in higher food prices. This means the subsistence determined level of wages are forced up, causing deterioration of the terms of trade against the industrial sector. Thus, it is very crucial that the subsistence sector's marketable surplus increases as the other sector expands, otherwise higher prices of food will force nonagricultural wages up, dampening the expansion in the industrial sector.

A rapid increase in agricultural productivity per worker may push the level of wages above the subsistence level. However, since elasticity of demand for the basic food items is less than unity, increased productivity is associated with lower prices for food. In this sense,
the agricultural sector will make a positive contribution to the other
sectors by providing food at reduced costs. While agricultural production
is increasing, investments must also be made in the industrial sector.
Simultaneous growth in both sectors is necessary because: (1) the two
sectors must provide the marketing outlet for each others' products;
and (2) the industrial sector must provide the employment opportunities
for the absorption of workers released by the agricultural sector. Two
criteria which can be used as a guide for the allocation of investment
funds between the two sectors, to ensure a balanced growth are suggested
(81, p. 544). First, output criterion or the provision of mutual market
outlets. It specifies that the allocation of investment funds must be
such as to continuously maintain investment incentives in both sectors of
the economy. This means that the terms of trade between the two sectors
should not deteriorate substantially against either sector. The second
criterion is the import criterion. It specifies that the allocation of
the investment funds must be such as to enable the industrial sector to
demand, at the constant industrial real wages consistent with the output
criterion, the precise number of new workers freed as a result of the
investment activity in the agricultural sector.

During the course of development, there may be deviations from the
balanced growth path. If over-investment in the industrial sector is made
at the cost of neglecting agriculture, a shortage of food supplies will
result in a deterioration of the terms of trade for the industrial sector
and will cause an increase in industrial real wages. This calls for a
shift of new investment funds from the industrial sector to the agriculture
sector. This appears to explain the experience of Iran in recent years.
Shortage of food suggested by a rising index of food prices as compared to manufactured goods and increased imports of food are suggestive of shortage of investment in output increasing investment opportunities in agriculture.

The relevancy of the above two versions of development with unlimited supplies of labor model for the case of Iran cannot be rigorously established. This is due to the observable fact that Iran has not advanced far in the process of transformation described above. The experience of the developed countries indicates that in all cases the productivity of labor in agriculture increased sufficiently to feed, at higher per capita levels, a larger proportion of the labor force than could be fed before. This could not be achieved by simply encouraging labor migration from agriculture. Instead, a series of output increasing innovations took place in the agricultural sector giving rise to what Kuznets calls the "agricultural revolution" serving as a pre-condition for the industrial revolution (61, pp. 59-69).

Contributions of Agriculture to Economic Development

The historical experience of the developed countries with respect to the agriculture's contribution to the national product varies depending on the supplies of resources and the comparative advantage in production of certain commodities by specialization. In Europe, England and Switzerland relied on production and export of manufactured goods, and met their domestic demand for food by imports, while the United States, the Soviet Union, and Japan relied on their agricultural output as a source to finance industrialization. But even in the case of England and Western Europe the industrial revolution was preceded by a long period of agricultural improvements and experimental farming which introduced high
yielding new crops, substantially increased yields of traditional staple crops, and greatly improved the efficiency of livestock production (73, pp. 18-19).

Increasing agricultural productivity can make positive contributions to the overall development of an underdeveloped economy, especially during its early phases of development. Using the goals of economic development in Iran, as discussed in Chapter III, as the frame of discussion, agriculture's contributions can be categorized into four types as follows:

(1) The product contribution.
(2) The factors contribution
(3) Provision of mutual market outlets.
(4) Contribution toward agricultural self-sufficiency.

A brief discussion of each of the above types of contributions follows.

The Product Contribution

In most underdeveloped countries, agriculture is the major existing industry in respect to the proportion of GNP and employment originating in agriculture. In such cases, the most obvious contribution of a growing agriculture is to raise the level of GNP. The extent of a growing agriculture's contribution to the growth of national income depends on the initial share of that sector in GNP and total population. The following algebraic model demonstrates the above proposition.

Assuming that the economy can be divided into two sectors, agricultural (a), and nonagricultural (n), and defining per capita national income (y) as GNP (Y) divided by total population (P), it can be stated that:
(4.1) \[ Y = Y_n + Y_n \]

(4.2) \[ P = P_n + P_n \]

(4.3) \[ y = \frac{Y}{P} = \frac{Y_n + Y_n}{P} = \frac{Y_n}{P_n} \cdot \frac{P_n}{P} + \frac{Y_n}{P_n} \cdot \frac{P_n}{P} \]

Equation (4.3) simply states that per capita national income is the sum of contributions of each sector weighted by their relative share in total population.

Considering the process of growth in each sector as an exponential function, it can be stated:

(4.4) \[ Y_t = Y_o \cdot e^{g \cdot t} \]

(4.5) \[ P_t = P_o \cdot e^{r \cdot t} \]

(4.6) \[ Y_{st} = \frac{Y_o}{P_o} \cdot e^{s \cdot t} = Y_o \cdot e^{(s \cdot t - r \cdot t)} \]

(4.7) \[ Y_{nt} = \frac{Y_o}{P_o} \cdot e^{s \cdot t} = Y_o \cdot e^{(s \cdot t - r \cdot t)} \]

where \( g \) and \( r \) refer to the rate of growth of \( Y \) and \( P \) respectively.

Subscript \( o \) refers to the initial period and subscript \( t \) refers to some future time period. \( e \) is the base of natural logarithm and equal to 2.7183.
Substituting equations (4.6) and (4.7) in (4.3):

\[
y_t = y_{a0} \cdot e^{t(g_a - r_a)} \cdot \frac{P_{at}}{P_t} + y_{n0} \cdot e^{t(g_n - r_n)} \cdot \frac{P_{nt}}{P_t}
\]

Equation (4.8) states that the per capita income in some prospective future period is determined by present per capita contribution of the agricultural sector, the differential rates of growth of income and population in the agricultural sector, and the share of agricultural population in total population at the end of the period; plus the present per capita contribution of the nonagricultural sector, the differential rates of growth of income and population in the nonagricultural sector, and the share of nonagricultural population in total population at the end of the period.

The contribution of the agricultural sector to the growth of per capita income is greatest where the economy is predominantly rural and when the difference between the rate of growth in income and population \((g_a - r_a)\) is large. Of course, the initial share of agriculture in per capita income \(y_{a0}\) is also an important factor in determining the size of agriculture's contribution. Further, to the extent that the share of agriculture in the population declines during the course of development, there will be a continuous decline in the proportional contribution of agriculture to growth in per capita income. However, the share of agriculture in country wide per capita income need not decline if the rate of growth in that sector is higher than in the nonagricultural sector.

**The Factors Contribution**

The process of modern economic growth has been often characterized by marked transfer of labor from the agricultural sector to manufacturing and
service sectors. As data collected by Kuznets (60, pp. 106-107) shows, this transformation was achieved when the natural rate of population growth was higher in the agricultural sector than in other sectors. For instance, the share of agriculture in the total labor force declined from 85 percent to 33 percent in Japan (1872-1960 period); and from 68 percent to 12 percent in the United States (1840-1950). Structural, institutional, and technological changes made it possible for the manpower to be transferred out of agriculture without creating food shortages.

Considering the high rate of population growth, and the existing unemployment and underemployment conditions in Iran, unskilled manpower is not a limiting factor. Instead, the limiting factor appears to be the ability to create continuously an increasing number of new employment opportunities outside of the agricultural sector. Nevertheless, to the extent that the nonagricultural sector must draw on the farm labor, agriculture makes a positive factor contribution.

In the early phases of economic development when the size of the labor force in the nonagricultural sectors is small, it is a formidable task to keep the size of the agricultural population from rising. It can be shown that with the total population growing at 2.5 percent annually, and 66 percent of the population in agriculture, to keep the number of people in the agricultural sector from rising would require other sectors to absorb population by 7.4 percent in the initial period*. This is more than twice

\[ 100(1 + 0.025) = 34(1 + i) + 66(1 + 0) \]

\[ 102.5 = 34 + 34i + 66 \]

\[ i = 7.4 \text{ percent} \]
the rate of growth in nonagricultural population during 1959-1963 in Iran. Of course the required absorption rate would diminish as the size of the nonagricultural population grows.

The magnitude of the task faced by countries like Iran in transforming a predominantly rural peasant economy to an urban industrial economy can be observed by considering the experience of the developed economies. As data collected by Dovring (15, p. 93) shows, none of the 15 developed countries studied, with the exception of the United States, had a nonagricultural population growth rate exceeding 3 percent per year during the early phases of their development. The United States had an increase in nonagricultural population of 4.2 and 3.6 percent annually during 1850-1880 and 1880-1910 periods, respectively.

In short, one of the contributions of agriculture to economic development in underdeveloped countries like Iran is to provide employment for a growing labor force which in the short run has no alternative employment.

The more important factor contribution of a growing agriculture is to provide the capital needed for achieving a sustained rate of growth in income in the economy. The capital requirement for economic development is much higher than the nonagricultural sectors can provide. Estimates for India's Third Five-Year Plan (68, p. 81) indicates that each job in direct employment in small scale industry, such as steel, may require about $35,000 capital investment per job. Though no estimates are available for capital requirements per direct employment in Iran, in all probability it should not be much different than in India.
Aside from foreign investment which is relatively small, the only source of capital for development is saving accrued to domestic resources. Increased productivity in agriculture can make a positive contribution to economic development by providing part of the required capital. This may be done by increased export of agricultural commodities, and more importantly, by creating an agricultural surplus over and above the consumption requirements of rural sector. The agricultural surplus may be directed to meet the capital requirements of the economy in the following four ways. First, the surplus may be extracted by imposing a direct progressive tax on land or on income. Indirect taxation through taxing agricultural exports and taxing non-farm consumer goods can also be used. Second, the existence of food surplus will cause lower prices and thereby favor increased profits and employment in other sectors. Third, the savings realized by generating the food surplus may be directly invested in the agricultural sector and thereby minimize its demand for capital from other sectors. Finally, the individuals receiving the surplus may invest their savings in the other sectors either directly or through financial intermediaries.

Provision of Mutual Market Outlets

A given sector makes a market contribution when it provides opportunities for other sectors to emerge. One reason for the slow emergence of indigenous manufacturing production in the underdeveloped economies is lack of a significant effective demand for industrial products. A large country may still have a small market because of widespread low purchasing power. Scale, efficiency, and profit in the modern industries are often limited by the size of the market which in turn is limited by
the purchasing power. For example, a shoe factory in a country where the
great majority of people are too poor to wear leather shoes (74, p. 7)
has a large potential demand but a small effective demand. In Iran,
despite a large potential market for chemical fertilizer, after
construction of a plant with 80,000 tons annual capacity, it was found
that the effective domestic demand is not sufficient for optimum scale of
production. Thus, an effort is being made to enlarge the market by
exporting the surplus (17, p. 36).

Increased productivity in agriculture can increase that sector's
purchasing power which in turn will increase farm families purchases of
modern farm inputs such as improved seeds, fertilizers, insecticides, and
farm equipment which are industrial outputs. Purchase of non-farm
produced consumer commodities will also rise. This means a higher degree
of agriculture commercialization and expanded markets for industry.

The extent of agriculture's contribution to enlarge the size of the
market can be observed by considering the experience of the United States.
Agricultural production costs were 38 percent of gross farm income in the
United States in 1910, when productivity was low and each farm family
produced food for itself and two non-farm families. By 1960, production
costs amounted to 61 percent of gross farm income when productivity had
risen and each farm family was producing food for itself and 11 non-farm
families (52, P. 286).

The question that might arise is whether there is a conflict between
the need for agriculture to contribute to capital formation, as outlined
above, and the need for increased consumption power of the agriculture
sector. The relative emphasis placed on distribution of agriculture's
surplus between capital formation and family consumption should depend on the availability of investment funds outside of agriculture and the standard of living of the farm families. For the case of Iran, where the rate of saving and investment is relatively high, but the purchasing power of the majority of the people is very low, more emphasis can be placed on increasing the consumption power.

**Agricultural Self-sufficiency**

Another obvious contribution of a growing agriculture is to provide food and fiber needed for an expanding economy with a rapid population growth. As some economists (64, pp. 27-28) have argued, underdeveloped countries cannot achieve a self-sustaining rate of growth by greater productivity in food production for the domestic consumption, while other sectors remain unchanged. This is due to the generally accepted theory of low income elasticity of demand for food. However, the process of development need not slow down, if factors of production, mainly labor and capital, are moved out of the agricultural sector and employed in the other sectors at a rate high enough to keep pace with increased productivity in agriculture.

Meeting an increased demand for food by increased domestic production is only one alternative. The shortage of food can be imported if foreign exchange is available. However, as Iran's experience suggests, it is very unlikely for an underdeveloped country to expand its export of industrial goods in order to be able to import its food requirement. Considering the potential that exists for increasing agricultural productivity it is likely to be more advantageous to obtain the additional food supplies by
increased domestic output rather than by relying on expansion of exports to finance enlarged food imports.

Increased agricultural exports has been identified as one of the most promising means of increasing income and foreign exchange earnings in a developing country (51, p. 575). Increased production and exports of certain crops may provide the needed exchange for importing other crops which a nation cannot produce economically herself. This is particularly true in Iran where without restraint imports are bound to exceed exports.
CHAPTER V. AGRICULTURAL PRODUCTION CONDITIONS

IN IRAN, GILAN AS A CASE STUDY

The primary purpose of this chapter is to examine the nature of agricultural production in Iran and to note the inefficiencies in the agricultural sector. The discussion will explain further the persistent duality in the economy and will suggest some development opportunities in agriculture in the following chapter.

Iran is a large country with an area of 1,648,000 square kilometers, having diverse physical conditions, ranging between arid, semi-arid, and humid rain forest. This has given rise to various types of agricultural production with a multitude of different technologies. It is not possible to discuss all types of agricultural production in Iran. The remainder of this study will focus on the Gilan Province (Diagram 5). Gilan is a good case study because of its large development potential. Further, this student is familiar with the area through a field study undertaken in the summer of 1965. Many of the characteristics of agriculture in Gilan apply to the entire Caspian coast region. In a broader sense, many conditions of Gilan are also true about other parts of the country. Yet, it is not the intention of this study to generalize from Gilan to the rest of Iran. The natural conditions for agricultural production, climate, soil, and transportation, are much more favorable in Gilan than most other regions in Iran. Accordingly, the population density is very high, and the standard of living is somewhat higher than in most other rural regions in Iran. Migrants from other areas come to Gilan.
Diagram 5. Map of Iran and location of Gilan.
Diagram 6. Map of Gilan and its soil types
Economic Characteristics of Gilan

Area and Soil Types

Gilan is located between 26° and 38° northern latitude and 48° and 50° eastern longitude. Gilan borders the Caspian Sea on the north and the Alborz Mountains on the south. The climate is of mild Mediterranean type with the temperature warm and varying little from summer to winter, and small variation between day and night. The moisture arising from the Caspian Sea is locked in by the Alborz, giving the area an ample supply of water. The average rainfall during the year is about 117 centimeters, higher than any other area in Iran.

The total area of Gilan is about 14,000 square kilometers, which can be broadly classified into three types of soils: the mountain soils, the foothill soils, and the plain soils. The mountain soils, which make up for about 68 percent of the total area have little cultivation use. Most of this area is either covered by natural forests or is barren. The foothill soils make up for about 7 percent of the area. Most of the foothill soils are cleared for tea gardens, fallow wheat and oats. Diagram 6 shows Gilan's soil types.

The plain soils, 351,000 hectares in area, are equally divided between coastal sedimentary sands and hydromorphic soils. About 44 percent of the plain soils are either unsuitable for cultivation, or covered by natural grazing lands, towns, rivers, and swamps. Another seven percent of the plain soils are cultivated annually for tea, tobacco, and grains. The remaining 49 percent of the plain soils, 175,000 hectares, is used for rice cultivation annually (3, pp. 91-98). Rice is the most important cash crop in Gilan. Though some livestock is kept for farm power or home use, it is of minor importance in the economy.
There are no precise estimates of the undeveloped land area in Gilan and the cost of reclaiming it. However, it is generally accepted that level, irrigable land for rice cultivation expansion is small in total and costly per hectare to reclaim.

Population and Employment

The population of Gilan is about 900,000. About 77 percent of the population lives in some 2,300 villages. The remaining 23 percent live in urban centers such as Rasht and Pahlavi. Favorable climate and relatively rich land resource has given rise to a high population density. Cultivated land per capita is only 0.28 hectare. Each farm unit has about 1.8 hectares of land. In many instances land is fragmented, lowering the average size of the farm plot to 0.62 hectare (35, pp. 192-193). The population pressure on land should be expected to rise in the future. This is due to a rapid population growth as a result of eradication of epidemic diseases, such as malaria in the warm damp area. Migration into Gilan from other regions also takes place.

The employment opportunities outside of the agricultural sector are very few and are limited to processing of agricultural products such as rice, tea, tobacco, lumber, fisheries, and to consumer services. These industries provided employment for about 32,000 of Gilan's inhabitants in 1963 (35, pp. 204-205). This is about 3.5 percent of the total population or 14 percent of the active labor force. In contrast, about 86 percent of the active labor force is occupied in agriculture.

With population rising at a rate of over 3 percent annually and with limited amounts of additional land to be developed or settled and few employment opportunities outside of agriculture, the immediate problem facing Gilan is not to increase per capita production but how to maintain the present level of per capita production and income.
**Agricultural Production Conditions**

Rice production and processing is the main source of income for the farmers in Gilan. More than 70 percent of the total cultivated land is under irrigated rice annually. Compared with potential yields obtainable with some changes in technology, the rice yield in Gilan is very low. Whereas the average rice yield in Gilan was 2,200 kilograms per hectare in 1960, the experiments carried out by Iran's Ministry of Agriculture during the 1961-1964 period shows that with application of a 60-30-0 fertilizer, yields obtained were 4,250 kilograms per hectare on a commonly grown rice variety in Gilan. The procedures and the results of these experiments will be more fully discussed in the next chapter.

The techniques of agricultural cultivation are primitive in Gilan. Bullock is the only source of power for about 88 percent of all farm units. About 3 percent of all units have some access to machine power, and the remaining 9 percent have to rely on their own muscles (35). Modern agricultural production inputs such as improved seeds and chemical fertilizers have been introduced in some villages. Yet, use of such inputs have not yet reached a significant level. No data is available to show the extent of improved seeds and fertilizer use in Gilan. Data available for Iran as a whole shows that chemical fertilizer consumption per hectare of land is about 0.8 kg. The very low level of fertilizer use in Iran is readily observed when compared with comparable data for India 3.4 kg.; Pakistan, 0.7 kg.; Israel, 85.2.; Egypt, 109.8 kg.; and Japan, 270 kg. per hectare (96, p. 47). Meantime, use of improved seeds in Iran is limited to about 3 percent of the rice crop area and 10 percent of the wheat crop area (96, p. 49).
There are about 165,000 family units in Gilan's agriculture. Most families, about 83 percent, are either tenants or owner-operators. The remaining 17 percent do not have their own land to cultivate, and work as farm laborers during the active seasons.

Rice cultivation is a very labor intensive process. Though per capita land under cultivation is very small compared to the other areas of Iran, all men, women and children must work at the time of transplanting and harvesting. Irrigation requires the constant attention of all men during the summer season. Between the time rice is harvested and the time next year's crop is sown, there is little work to do in the villages. During the winter season, some of the men go to the urban areas, mainly Rasht and Teheran, to find employment in construction or other manual jobs. The men and women remaining in the villages may occupy themselves with handicrafts, such as basket making and rug weaving. It is not possible to ascertain what portion of the labor force in agriculture is surplus with marginal productivity close to zero. It is doubtful that 20 percent of the workers could be spared at planting and harvesting times without reducing total production by about the same proportion. Given the present pattern and technique for production, labor has definitely a high demand during the active seasons. Probably the productivity during these busy seasons is also rather high.

Labor productivity when measured by the amount of rice harvested per hour is very low. Data collected by Plan Organization in 1960 for the number of days of labor required to harvest one hectare of rice is shown in Table 15. Assuming an average of eight working hours per day, and an average yield of 2200 kg. of rice per hectare, labor productivity is
about 112 kg. of rice per 100 labor hours. Data for labor productivity in Japan shows that around 1900, Japanese farmers produced 964 kg. of rice per 100 man hours (6, p. 70). A rough comparison between Iran and Japan shows that labor productivity in terms of rice output in Gilan in 1960 was about 12 percent of the comparable data for Japan in 1900.

Since Gilan's rice cultivators are unable to work a full year, the annual output per worker is barely enough to provide the one to two tons of rice needed for a family of five. Of course, not all of this low labor productivity is attributable to seasonality of the labor use. The level of scientific agriculture practiced is low, and very few modern factors of production such as fertilizer, improved seed, pest control, and improved methods of cultivation are applied. The lack of use of such unconventional inputs are largely responsible for the low labor and land productivity.

Table 15. Gilan. Labor input required to harvest one hectare of rice: 1960

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male labor</th>
<th>Female laborer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivation</td>
<td>89</td>
<td>61</td>
<td>28</td>
</tr>
<tr>
<td>Irrigation</td>
<td>33</td>
<td>33</td>
<td>---</td>
</tr>
<tr>
<td>Sowing and transplanting</td>
<td>40</td>
<td>6</td>
<td>34</td>
</tr>
<tr>
<td>Harvest and delivery</td>
<td>81</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>243</td>
<td>136</td>
<td>108</td>
</tr>
</tbody>
</table>

*Source: (3, p. 113).*
Most of the rice cultivators in Gilan lease their land on the basis of cash or crop-share lease. The rent is equal to one-third of the crop harvested. Some tenants pay a fixed amount of rice each year, on the average equal to 660 kg. of rice per hectare. The period of lease is indefinite, extending as long as the tenant pays the rent. In this respect, tenants in Gilan enjoy security of tenure which is not always the case in other regions of Iran. In most cases the land belongs to a rich "extended" family who owns a whole village, or parts of several villages, and live in the urban areas. The tenant provides all factors of production except the land. This means he has to have his own bullock, or rent it, store some of his crop for the next year's cultivation, and pay for the hired labor, water, and other inputs.

The Land Reform Law of 1962, which limited absentee ownership to one whole village per owner, did not affect tenure conditions in Gilan significantly. Only 70 villages in whole and 287 villages in part were affected by the reform (35, p. 199). No data is available on the area of land involved or the number of farmers affected. The second stage of land reform, which sets the limit on the size of absentee owned land to 30 hectares should affect more tenants in Gilan. However, this provision was not yet being implemented at the time of this study.

Credit is widely used by farmers in Gilan. As the agricultural census of 1960 indicated about 58 percent of all agricultural production units in Gilan borrowed money for productive or consumptive purposes. About 82 percent of the total amounts of the loans was provided by noninstitutional credit sources, such as the money lenders, merchants, and landlords; and the remaining 18 percent by institutional sources, mainly the Agricultural
Bank. The Agricultural Bank loans money to the local farmers through local cooperative credit associations or makes large loans directly to the landlords (35, p. 198). Noninstitutional lenders are very important in Gilan, especially for the tenants.

The rate of interest charged by the institutional sources is about 6 percent per annum. The rate of interest charged by noninstitutional sources is often as high as 100 percent. The bulk of institutional loans and all of the noninstitutional loans are on a short-term basis ranging from 6 months to a year. The loans are usually made in the spring and must be repaid by the time crops are harvested.

Although the economy is poor and barely provides for subsistence, it is a market economy. The peasant sells his crop at the time of harvest and buys whatever he needs from the market. He buys clothes, tea, sugar, bread and other necessities. He is often forced to sell his total output which consists of three to four tons of rice at low prices in the fall, and purchase low-quality rice in the market for his own consumption. The price of rice paid by the cultivators when purchased on credit in the spring is two to three times as high as the price received by him for his own crop in the fall. The tenant is often so much in debt that he cannot avoid selling his total crop at harvest time.

The agricultural economy of Gilan, though traditional, has undergone some changes during the past few decades. However, as Table 16 shows, the change in total output has been achieved by minimum structural changes. The increase in output has been achieved by merely increasing employment of factors of production such as land and labor. It is noteworthy that during the 1926-1960 period, population increased by 145 percent; area under rice
cultivation increased by 92 percent, and the quantity of rice produced increased about proportionately, that is, by 91 percent. This means that in terms of rice output per man there was an efficiency loss equal to 32 percent, and in terms of rice yield per unit of land, no change occurred. The increase in the area cultivated by one pair of oxen (one khish) may not be so much an efficiency gain. A large part of it may be due to supplementary use of farm machinery.

Table 16: Gilan. Some measures of change in the agricultural sector: 1926-30 to 1960\(^{a}\)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1926-30 Average</th>
<th>1960</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population / in 1,000</td>
<td>360.5</td>
<td>884.8</td>
<td>145</td>
</tr>
<tr>
<td>Total area cultivated / in 1,000 ha.</td>
<td>111.7</td>
<td>245.3</td>
<td>120</td>
</tr>
<tr>
<td>Area under rice cultivation / in 1,000 ha.</td>
<td>90.9</td>
<td>175.2</td>
<td>92</td>
</tr>
<tr>
<td>Number of oxen / in 1,000</td>
<td>103.8</td>
<td>126.8</td>
<td>22</td>
</tr>
<tr>
<td>Rice production / in 1,000 tons</td>
<td>203.9</td>
<td>388.8</td>
<td>91</td>
</tr>
<tr>
<td>Cultivated area per capita / in ha.</td>
<td>0.31</td>
<td>0.28</td>
<td>-10</td>
</tr>
<tr>
<td>Rice production per capita / in kg.</td>
<td>566</td>
<td>439</td>
<td>-32</td>
</tr>
<tr>
<td>Area cultivated by one pair of oxen / in ha.</td>
<td>2.1</td>
<td>3.7</td>
<td>76</td>
</tr>
<tr>
<td>Rice yield / in kg. per ha.</td>
<td>2,242.0</td>
<td>2,219.0</td>
<td>-1</td>
</tr>
</tbody>
</table>

\(^{a}\)Source: (3, Table 3, p. 74).
Some Possible Causes of Low Productivity in Gilan's Agriculture

The above description and Table 16 indicates that Gilan's agriculture remains underdeveloped. Yields have made no increase. Labor productivity has fallen due to population growth. In spite of the people's effort to bring more land under cultivation, the presence of a larger labor force, improved health conditions, and the keenness of the people, no growth in productivity has taken place. Obviously, agriculture has contributed a larger output and supported a larger population, but the output per hectare and per worker has not increased. Agriculture in Gilan has been extended over more area with nearly exactly the same techniques and amount of applied science.

Low level of agricultural productivity in Gilan's agriculture may be attributed to one or more of the following causes. It has been said that inefficiencies may arise from (1) unfavorable natural conditions; (2) existence of institutional arrangements unfavorable to economic development; (3) low level of labor capability; (4) low level of capital formation; and (5) technological backwardness. The relevance of each of the above factors for Gilan's economy are examined below.

Natural Conditions

A common belief in Iran is that the low level of productivity in agriculture is mainly due to unfavorable land and climate conditions. Some (69) even maintain that agricultural production in Iran has a comparative disadvantage to industrial production. The natural endowments of land may or may not limit the current productivity and hence the chance for agricultural development. In any case, low productivity does not mean that productivity cannot grow. Theoretically, land of all qualities can yield the same return per unit of labor if techniques of production are
sufficiently different. A view held by contemporary development economists (87, p. 17), is that differences in land productivity do not explain differences in the trend in agricultural development among various countries. Rather, it is the investment in land improvement and maintenance that makes the difference between productive and unproductive land. Chenery's cross-sectional study of 50 countries cited in Chapter II is also in accord with the above view. Chenery finds that no pronounced correlation exists between availability of resources and the present level of per capita income among the countries studied. He concludes that natural resources become progressively less important as determinants of the level of income as income rises (10, p. 49). No doubt rich natural land resources are an important factor in the early stages of economic development. Yet the existence of rich natural resources is not a sufficient condition for a productive agriculture, nor its absence a good excuse for having a low level of productivity. Consequently, the reasons for low productivity in agriculture must be sought beyond the excuse of poor natural resources.

Institutional Arrangements

The institutional arrangements which prevent optimum use of resources are a very important factor causing low level of productivity, the persistence of duality and the stagnant conditions of traditional agriculture. The absence of security, little and inequitable law enforcement, absentee land ownership, absence of properly functioning financial institutions, and absence of marketing channels, storage and transportation facilities are institutional conditions which are very detrimental to economic growth. It is not known exactly what is the state of institutions
in Gilan, nor is it possible to estimate the effects on output or the
effects on economic development of altering each of the institutions in a
particular manner. Much scientific research in the social aspects of
economic development is needed in Gilan before any evaluation of the
existing institutions can be made. Probably the institutional
arrangements are among the major factors causing persistent underdevelop-
ment in Gilan. Proper law enforcement to provide security for all
individuals, provision of incentives, and existence of properly functioning
financial and marketing channels would probably do a good deal to provide
the requisites of economic development.

**Labor Capability**

Low level of labor capability may arise from poor health, inadequate
nutrition, and lack of education and skills. Whether agricultural
development is directly related to the above human welfare measures has
been debated by some economists. The experience of the developed countries
is said to show that illiterate farm people have at times increased
agricultural productivity rapidly. Growth from agriculture during the
early stages of economic development in the developed economies did not
await schooling, training, and better health. These things came afterward
(87, p. 178). On the other hand, some economists (98, p. 103) have
argued that:

> The first requirements for high labor productivity under
> modern economic conditions are that masses of the population
> shall be literate, healthy, and sufficiently well fed to
> be strong and energetic. In many countries if this were
> achieved all else necessary for rapid economic development
> come readily and easily of itself. I also feel sure that
> whenever this has not been accomplished and is not being
> strongly promoted to the utmost limits which national
> resources permit, it is not necessary to look for the
> other factors, although they are certain to exist, to
> explain pervasive poverty and slow economic growth.
The latter view appears to be more relevant to the case of Gilan. Extending the conventional factors of production, such as bringing more land under cultivation, may not require a higher level of labor capability. But if the scientific methods of agricultural production now practiced in the developed economies are to be successfully adapted in Iran, education and other human welfare measures need to be upgraded. This is particularly true in the rural sector of Gilan, where land is relatively scarce, education, health, and nutrition standards are low, and where the economy depends on a single cash crop, rice.

Rice yields have increased significantly by application of fertilizer, improved seeds, and improved cultivation methods in countries with high educational and human welfare standards (6, pp. 40-42). In contrast, the new combination of inputs that has been accounted for the large increase in rice yields in particular countries, such as Japan, have not been adapted by rice growers in those countries where the farm people who grow rice are predominantly illiterate (67, p. 187).

**Capital Formation**

An often cited cause of agriculture's low productivity in economies like Gilan's is low level of capital formation. In contrast to the relatively modern techniques of production in the urban sector, the tools employed in cultivating, sowing, and marketing agricultural products remain primitive and small in quantity. A cultivator's equipment may not go beyond a couple of shovels and hoes, and a wooden plow. Investment in factors of production, particularly land, remain remarkably small. This phenomenon is observable while there exists some surplus over and above the basic subsistence needs. Existence of conspicuous consumption can be
substantiated by what may be called luxury consumption in the peasant's budget. Watches, jewelry for women, village festivities, presents, and not so infrequent religious pilgrimages are some of the more evident cases of "investable surplus" which is not productively invested. The question that arises is why the apparent surplus is not spent for increasing the stock of capital.

The answer to the above question probably does not lie in a basic lack of thriftiness or unwillingness to invest, but may lie in lack of attractive, profitable investment opportunities under the static conditions of traditional agriculture. Traditional agriculture can be visualized as a particular type of economic equilibrium. For this equilibrium condition to persist, first, there must have been no significant change in the level of technology. Second, the state of human preference and ability to acquire and hold assets which are sources of income must have remained constant. Third, both of these states must have remained constant long enough for an equilibrium to have been reached where marginal desire for acquiring agricultural factors as sources of income is balanced with the marginal productivity of these sources viewed as investments to produce permanent income streams. Then savings and investment become near zero (87, pp. 29-30).

The process of economic development may be thought of as identifying investment opportunities which, if undertaken, would result in new "income streams" extending throughout the productive life of the investment. In agriculture many of these income streams involve application of science or use of unconventional inputs. Conceptually, these new income streams have a supply and a demand schedule, which determine their prices.
One hypothesis proposed to explain the cause of low level of investment and capital formation is that the prices of new income streams in traditional agriculture are relatively high. This means the rate of return to investment in traditional inputs, such as more hoes and more land, are relatively low.

To enhance a higher rate of investment and capital accumulation new sources of income streams, which are cheaper than the traditional ones, must be identified. The use of modern inputs, such as chemical fertilizer and improved seeds, are very profitable. However, knowledge about the use and profitability of the new factors of production are often absent, or at best scanty. This gives rise to a high price for risk taking by any individual cultivator. The final result is little or no investment in either the traditional or the new forms of capital.

**Technological Change**

Technological changes which give rise to opportunity for additional profitable investment by farmers and hence lead to greater productivity of resources hold the key to growth in agriculture. Historically, a few countries which have a commercialized agriculture today first expanded their agricultural output by increasing the area under cultivation. These countries were the so called "new frontiers", such as the United States, Canada, Australia, and New Zealand. Abundance of readily available fertile land in these countries made their output expansion distinct from the current situation of the developing countries of Asia, where population pressures on arable land is very high.

Even in the case of the new frontiers the increase in agricultural output achieved during the past three decades from increasing yield per
unit, far surpasses the earlier gains from expanding the area under cultivation. In the United States, total farm output increased by a steady compound rate of 2.2 percent a year from 1870 to 1920. Only one-fourth of the increase came from increased overall productivity or increased output per unit of input. The other three-fourths was achieved by the use of additional inputs. Since 1935, total agricultural output has kept increasing at a compound rate of 2.2 percent per year. However, three-fourths of the increase in output during this period has been attributed to increased productivity per unit of input and only one-fourth to the use of additional production inputs. It is maintained by the United States Department of Agriculture that the absolute increase in total farm output was larger during the 25-year period from 1935 to 1960 than during the 65 years from 1870 to 1935 (97, pp. 3-4).

The agricultural development of Japan during the 1880 to 1940 period may be more relevant to the conditions of other Asian countries such as Iran. As reported by Johnston (50, p. 227) in Japan during the 1880-1940 period the area under cultivation increased by only 18 percent while the total crop output almost doubled. This unusual increase in the total output was mainly due to a 66 percent increase in yields per unit. The more recent experience of a number of developing countries with relatively high rates of increase in crop output during the 1948-1963 period, such as Israel, Yugoslavia, Taiwan, and Greece, also indicates that increases in yields per unit of land accounted for nearly three-fourths of increase in output (96, p. 19).

In most all cases the discovery and exploitation of new "income streams" has been a cooperative venture between government, private
industry, and farmers. The identification of development opportunities is generally the task of government, especially in the early stages of development. Private industry is often needed to produce and distribute unconventional inputs. Finally, farmers must bear some risks and save and invest to adapt the new practices and purchase the new "income streams".

The experience of the countries having a higher rate of growth in agricultural output than Iran, indicates that the prospects for increasing output by identifying and investing in the new inputs are far greater than enlarging the area under cultivation. Whether the experience of the developed countries and rapidly developing countries in regard to the high profitability of modern inputs holds also true in Gilan, Iran calls for a study and comparison of the costs and benefits associated with alternative development opportunities. This task will be undertaken in the final chapter of this study. A comparison between the return from the Sifed Rud Dam and fertilizer on rice will be compared.
CHAPTER VI. ALTERNATIVE INVESTMENT OPPORTUNITIES
IN GILAN'S AGRICULTURE

There exist numerous opportunities to expand agricultural output in Gilan. Since resources are scarce and there is an almost infinite demand for them, choices must be made among alternative investment opportunities. The objectives or goals of the society and availability of resources should determine the types of investments undertaken by the public sector. Theoretically, the criterion to use is to select those investment opportunities which would result in the largest contribution to the society's objectives for any given outlay or cost of scarce resources. For instance, in the agricultural sector, output may be increased by extending the use of traditional factors of production, such as land and labor, or by introducing unconventional inputs to increase yields. The hypothesis proposed above, supported by Gilan's experience suggested that investment in the traditional inputs is an expensive source of new income streams. Alternatively, the experience of rapidly developing countries suggests that investment in research to develop and disseminate modern inputs such as improved seed varieties and chemical fertilizers may hold the key to the development of agriculture.

In this chapter the profitability of the two alternative investment opportunities as they apply to Gilan will be examined. This will be done by evaluating public investment by the Plan Organization in Sefid Rud Dam to increase the area under cultivation as compared to the expected benefits arising from research and extension in developing and promoting the use of chemical fertilizers. These two alternatives may legitimately be looked on as representatives of two classes of investment in agriculture, namely
physical engineering capital and applied biological sciences.

The above two projects are different from each other in physical nature, initial requirement of resources, and pay-off periods. Investment in a dam requires a large initial capital with an extended productive life and a small annual operating cost. It may require large amounts of complementary resources if the project is designed to cultivate large tracts not cultivated before. In contrast, chemical fertilizer application requires small initial investment, relatively small amounts of complementary resources, and large annual operating costs. However, if fertilizer increases yields per hectare significantly, it can be considered as an economic substitute for land. This is the basis for comparing profitability of investment in the two projects. By profitability is meant the net value of products added by each project. To the extent that the net value of agricultural products is increased, it is hoped that a net contribution will be made to the other goals of the society, namely optimum employment, more equitable income distribution, and agricultural self-sufficiency.

The plan of this chapter is (1) to broadly evaluate public investment in the Sefid Rud project, (2) to summarize the four years results of chemical fertilizer experiments on rice in Gilan, and estimate the costs and benefits of fertilizer application, and (3) drawing on some of the data developed in (1) and (2), evaluate the profitability of investment in the Sefid Rud project as compared with the profitability of investment in fertilizer.

The Sefid Rud Irrigation Project

The major development project in terms of the capital investment, undertaken during the Second Plan to develop Gilan's agriculture was the
construction of the Sefid Rud Dam. The dam is built in Menjil, about
260 kilometers northwest of Teheran, at the confluence of Sefid Rud and
Gizil Uzun rivers. Construction of the dam was begun in 1957 and was
completed in 1963. The dam is only a part of the complex irrigation-
power project consisting of the Sefid Rud Dam, Sangar and Tarik diversion
dams, Feuman tunnel and irrigation canals, and a hydroelectric project.
Full benefits from the dam will not be realized until the auxiliary
irrigation projects, scheduled for completion in 1967, are completed.

Prior to the construction of the dam, about 1,700 million cubic
meters of water from Sefid Rud was used annually to irrigate 120,000
hectares of rice fields in Gilan. Another 2,300 million cubic meters of
water flowed to the Caspian Sea, while there was shortage of water and
occasional draughts. The resulting loss to the farmers in the area was
about $4.7 million annually. With the completion of the dam, the water
shortage and irregularity problems have been solved (48, p. 21).

The hydro-electric project consists of five turbines, each having a
capacity of 17,500 kw. Two of the turbines were in operation in 1964,
generating 200 million kw electricity annually. The hydro-electric
installation costs were $17.6 million. However, the expected benefits of
this part of the project for Gilan's agriculture is small. Thus, the cost
and benefit of the power project were excluded from the following
analysis.

The total cost of the Sefid Rud Dam is estimated over $61 million.
The irrigation network, consisting of Sangar and Tarik diversion dams and

*For the sake of convenience all the monetary figures in this chapter
will be shown in U. S. dollars (Rls 75 = $1).
Fouman tunnel and canals, is expected to cost $72.3 million (48, p. 22). Adding the cost of preparing lands now uncultivated or under rain-fed cultivation, total fixed capital investment, excluding the cost of drainage, is expected to reach $160 million. Interest accrued on fixed investment before various parts of the project begin to pay off costs an additional $40 million (69, p. 62). The productive life of the project is expected to last for at least 100 years. However, the capital expenditures are to be amortized over 50 years.

The irrigation project is designed to serve the following three objectives: First, to irrigate about 60,000 hectares of new land suitable for rice cultivation. Second, to provide water for 59,000 hectares of land not suitable for rice cultivation. The productivity of this 59,000 hectares is expected to be equal to 15,000 hectares of rice land. Third, to provide more adequate water on a regular basis for 120,000 hectares formerly under rice cultivation in the Sefid Rud basin. This is expected to result in a 20 percent gain in productivity, or about 24,000 hectares in land equivalent area (69, p. 63). In other words, area under cultivation is expected to increase by about 100,000 hectares, equivalent in productivity to per unit land now under rice cultivation, as a result of investing $200 million in the Sefid Rud irrigation project. On this basis, the fixed capital investment per hectare is about $2000.

The large capital expenditures in total and per hectare can be judged profitable or unprofitable only by comparing it with its expected contribution to total output. Then the rate of return on Sefid Rud project must be compared with alternative methods of expanding Gilan's agricultural output.
The expected contributions of the Sefid Rud project to Gilan’s agriculture is not explicitly stated in the Plan Organization reports used in this study. One report (49, p. 6) states that the value of agricultural output is expected to increase by $21.3 million a year due to increasing rice cultivation by 60,000 hectares and increasing other crop cultivation by 59,000 hectares. It is further stated that this amount should reach $41.3 million per year after completing all irrigation projects. A second report states that the contribution of the project to Iran’s GNP in 1962 was $17.3 million (45, p. 18). The above data suggests a gross capital-output-ratio ranging from 3.5 to 5.0, which is very much in line with the ratio for many other long term investment projects.

The direct contributions of the Sefid Rud project, that is the net value added due to preventing water shortage, improving yields, and employing unused resources, is relatively small. To realize the maximum benefits of the Sefid Rud project, resources other than land and water are needed. In the absence of significant unemployment and underemployment, the complementary resources command a price which is equal to their existing market prices. Thus net capital-output ration, which measures the projects contribution to output after payments for complementary resources are made, is a better criterion. As reported in a Third Plan Organization report (48, p. 22):

On account of the heavy initial capital cost and the 13 years period needed for the complete development of the irrigation and power network the project will not start to show a profit from a strictly commercial point of view until the second half of its life. For its last 33 years, the annual net revenue of the dam is estimated to be about $2.6 million per year.

The size of net capital-output ratio as suggested by the above valuation is about 76:1 during the most productive period of the Sefid
Rud project. As will be shown below, this is a very high capital requirement for increasing output.

Chemical Fertilizer Project

Chemical fertilizer application in the underdeveloped countries has been considered as an "opening wedge" for the more comprehensive and supplementary group of practices necessary to change the traditional agriculture. Fertilizer application can increase the yields of most crops significantly even when other factors of production are unchanged. This is particularly true about the application of fertilizer on rice. As reported in a recent study by the Food and Agriculture Organization of the United Nations, the mean response of rice to nitrogen at a moderate rate of application on a world wide basis is 12 to 13 kilograms of paddy per kilogram of applied nitrogen. This very favorable increase in yield can even be substantially greater if other modern practices are introduced at the same time (16, p. 66).

The experience of Iran with fertilizer application on rice is in accord with the above study. Since 1961, the Soil Fertility Department of Iran's Ministry of Agriculture in cooperation with the United Nations Soil Fertility Program has carried out simple fertilizer trials on the farmers plots under the existing local conditions. During the 1961-1964 period, 133 usable trials on the effects of chemical fertilizers on two common Gilan rice varieties were carried out. The rice varieties grown are Sadri, a long grain, high quality variety, and Champa, a short grain, low quality variety. Each trial contained 14 different combinations of nitrogen, phosphate, and potassium, and a check plot. Table 17 shows the four year average of fertilizer experiments on both rice varieties in
Gilan. Since it was found that potassium is not a deficient nutrient it was omitted. The three levels of nitrogen and phosphate applied were none, 30 and 60 kilograms of pure nutrients alone or in combination per hectare. Ammonium sulphate (N) containing 21 percent pure nitrogen, and triple superphosphate (P), containing 46 percent pure P₂O₅ were used as carriers. Diagrams 7 and 8 are the geometric interpretation of Gilan's rice varieties' response to chemical fertilizers.

As can be observed from Table 17 and Diagrams 7 and 8, both rice varieties grown in Gilan are very responsive to fertilizer application. Even though only nine levels of fertilizers were tried, the following generalizations can be made on the response of rice to fertilizer in Gilan.

1. In all cases, yields increased significantly by applying 30 kg. of nitrogen or phosphate (consider P₁ and N₁).

2. The increase in yield diminished when a second 30 kg. of nutrient was applied in isolation (consider P₂ and N₂).

3. Nitrogen and phosphate have a complementary effect on yields. Application of 30 kg. of both nutrients increased yields on both varieties in Gilan by about 30 percent (consider N₁P₁). Applying 60 kg. of both nutrients increased yields by about 43 percent.

4. Nitrogen has a stronger effect on yields than phosphate (consider N₂P₁ as compared to N₁P₂). Also, Champa variety is more responsive to fertilizer than Sadri variety.

To determine whether fertilizer application on rice is a profitable public investment opportunity, the cost and benefit associated with the research in developing and disseminating information regarding its use must
Table 17. Gilan. Yield response of rice to chemical fertilizers in kilograms per hectare: 1961-1964 averages\(^a\)

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>(P_1)(^b)</th>
<th>(P_2)(^b)</th>
<th>(N_1)</th>
<th>(N_1P_1)</th>
<th>(N_1P_2)</th>
<th>(N_2)</th>
<th>(N_2P_1)</th>
<th>(N_2P_2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sadri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>2625</td>
<td>3055</td>
<td>3185</td>
<td>3190</td>
<td>3410</td>
<td>3420</td>
<td>3125</td>
<td>3490</td>
<td>3745</td>
</tr>
<tr>
<td>Marginal</td>
<td></td>
<td>430</td>
<td>560</td>
<td>565</td>
<td>785</td>
<td>795</td>
<td>500</td>
<td>865</td>
<td>1120</td>
</tr>
</tbody>
</table>

Champa

|       |       |                |                |        |           |           |        |           |           |
| Yield | 3025  | 3610           | 3600           | 3625   | 3955      | 3895      | 3705   | 4250      | 4245      |
| Marginal |     | 585            | 575            | 600    | 930       | 860       | 680    | 1225      | 1220      |

\(^a\)Source: (40)

\(^b\)Subscripts 1 and 2 refer to 30 kg. and 60 kg. of pure nutrients respectively.

be considered. Also, the profitability of fertilizer use and the possibility of its adaptation by the farmers given the existing conditions need to be examined.

The social cost of research in determining the type of fertilizer and the quantity giving rise to maximum production is difficult to calculate. Although it is generally accepted that investment in agricultural research and education yields very high returns, little measured evidence exists. However, it is generally agreed that the social costs of agricultural research is very small when compared to its benefits (12, p. 165).
Diagram 7. Gilan. Production surface for Sadri rice response to chemical fertilizers

\[\text{Source: Table 17.}\]
Diagram 8. Gilan. Production surface for Champa rice response to chemical fertilizers
In Iran, huge sums of money and large numbers of technical personnel are devoted to carrying out engineering projects while resources devoted to agricultural research are very small. Specifically, the Soil Fertility Department of Iran Ministry of Agriculture which initiated and carried out simple fertilizer trials on farms in Iran began its operation in January of 1961 in six field stations, scattered in six provinces. Each field station is staffed with one agronomist assisted by a three member junior field staff. By 1964 the number of field stations was increased to 15 with an additional four field laboratories. The administrative personnel consists of seven persons in Teheran in charge of accounting, supplies, purchasing, maintenance, transportation arrangements, personnel, and other administrative functions. The statistical data is collected, analysed, and made ready for publication by two Iranian and one foreign statistician. (40). A total of less than 100 persons are involved in soil fertilizer research which could yield as much change in output as all the irrigation works.

In terms of financial expenditures for the fertilizer field trials in Iran, about $1,679,000 was appropriated to the project during the 1960-1964 period. About one-third of this amount was contributed by the United Nations and the rest from Iran's government regular budget (42, p. 91). Though no data is available on costs of fertilizer trials in Gilan, considering the number of field stations (only one station in Gilan) and the fact that fertilizer trials were carried out for other crops at the same time, the costs incurred from the fertilizer trials on rice cannot be more than one-tenth of the total expenditures or about $168,000. This means an annual investment in fertilizer research of $42,000 in Gilan.
To disseminate the knowledge gained by research to all farmers, extension workers are needed. The extension service is already in operation in Gilan. It was first organized in 1953, with 13 extension workers. Ten years later the number of extension agents had reached 49 (35, p. 121). Since there are 165,000 family farms in Gilan, this means that there is about one extension agent to every 4,230 farms. To assist the farmers in Gilan in adapting new inputs, the number of extension workers may have to increase. Data from countries with successful extension programs indicates that there are 1,500 farmers to each extension agent in Taiwan, 650 farmers to each agent in Japan, and 540 farmers to each agent in the United States (12, p. 166). To increase Gilan's number of extension workers to one agent for each 1,000 farms would require about 165 extension workers.

Such an extension program will not put a heavy pressure on the available resources. At present the extension workers in Gilan are paid an annual salary ranging from $756 to $876 (35, p. 121). This means an annual expenditure of about $132.00 for hiring 165 additional extension workers. Thus the annual cost of research and extension would be approximately $174,000, or about $1 per hectare of rice cultivated. The social cost of five years of research and extension is about $830,000.

Compared to the relatively small social cost of research and extension, expected benefits from application of fertilizers on rice are very large. As noted above, rice output in Gilan can be increased by 30 to 43 percent if fertilizers are applied over the existing cultivated area. As a result the gross value of rice output also increases by 30 to 43 percent if rice prices remain unchanged.
An important implication of the above discussion on fertilizer application productivity in Gilan is that fertilizer is an economic substitute for land. For example, one ton of a 30-30-0 fertilizer formula when applied on Sadri or Champa rice varieties in Gilan increases yields by about 13 tons. This means that one ton of fertilizer substitutes for the production obtained from 5 hectares of unfertilized land. Higher levels of fertilizer application, such as 60-60-0, substitutes for a larger area of land. The rate of substitution for the latter formula is about one ton of fertilizer to 7 hectares of land. Thus, based on the results of fertilizer field trials in Gilan, it can be concluded that applying fertilizer to all land under rice cultivation at the present has the same effect as increasing the area under cultivation by about 62,000 hectares. Applying fertilizer over total area cultivated, though profitable, is unrealistic. The existing marketing facilities, the local cooperatives and the shop keepers may not be able to handle 10,500 to 21,000 tons of fertilizer needed annually. Also, many farmers will be reluctant to be among the risk takers. However, even if fertilizers are applied over 25 percent of the existing area, the contribution to total output is still substantial. Given the existing price of rice in Gilan, value of output can be increased by about $5 million annually. This means a gross capital-output ratio of 0.16, which is drastically lower than the capital-output ratio of 3.5 to 5.0 for the Sefid Rud project. Obviously, a higher rate of fertilizer adaptation, such as 50 percent, would increase the value of output proportionately.

Chemical fertilizers may not require a large amount of complementary resources beyond the extra labor for handling and harvesting and the cost
of credit. However, the annual cost of nutrients are substantial. Farmers will not adapt fertilizer use unless its value of marginal product is at least twice as much as the marginal cost.

No Iranian data is available on the complementary cost of fertilizer application which is added to the nutrients cost. Comparable data from India is used in Table 18 to estimate the total private cost of fertilizer application in Gilan. Considering the similarity of the techniques of production and the standards of living in Iran and India, this may be a reasonable estimate of the costs involved.

Table 18. Cost of fertilizer application in the United States, India, and Iran in cents per kilogram of pure nutrients

<table>
<thead>
<tr>
<th>Nitrogen</th>
<th>Phosphorous</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>India</td>
</tr>
<tr>
<td>Cost of nutrients</td>
<td>30.6</td>
</tr>
<tr>
<td>Handling</td>
<td>2.4</td>
</tr>
<tr>
<td>Extra harvesting</td>
<td>.7</td>
</tr>
<tr>
<td>Credit</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>36.8</td>
</tr>
</tbody>
</table>

*Source: U.S. and India data from (30, p. 156).*

*Cost of nutrients in Iran from (40, vol. 7, p. 7). Other costs were assumed to be the same as in India.*

The value of marginal product of fertilizer can be calculated given marginal productivity of fertilizers (Table 17) and the price of rice received by the farmers. The four year average price of unpolished Sadri and Champa rice varieties in Gilan were 14¢ (Rls. 14.6) and 10¢ (Rls. 7.6) per kilogram respectively.
As shown in Table 19, fertilizer application under the above conditions of costs and prices is very profitable. Since the value of marginal product surface has the same slope as total output incidental to fertilizer application, the generalizations made about Table 17 are also true here. Theoretically, a farmer operating under competitive market conditions can maximize his net profits by using that level of fertilizer resulting in the greatest difference between the value of marginal product and marginal cost.

Table 19. Gilan. Cost and benefit of fertilizer application on two rice varieties in dollars per hectare and percentages

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Marginal cost</th>
<th>Sadri</th>
<th>Value of marginal product</th>
<th>Net profits</th>
<th>Rate of return</th>
<th>Champas</th>
<th>Value of marginal product</th>
<th>Net profits</th>
<th>Rate of return</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>12.13</td>
<td>60.20</td>
<td>48.07</td>
<td>.395</td>
<td>57.53</td>
<td>45.40</td>
<td>375</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>24.27</td>
<td>78.60</td>
<td>54.33</td>
<td>225</td>
<td>56.53</td>
<td>32.27</td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N1</td>
<td>16.93</td>
<td>75.60</td>
<td>62.67</td>
<td>370</td>
<td>59.40</td>
<td>42.47</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N1P1</td>
<td>29.07</td>
<td>110.80</td>
<td>81.73</td>
<td>280</td>
<td>91.87</td>
<td>62.80</td>
<td>215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N1P2</td>
<td>41.20</td>
<td>112.07</td>
<td>70.87</td>
<td>70</td>
<td>84.87</td>
<td>43.67</td>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N2</td>
<td>33.87</td>
<td>70.40</td>
<td>36.53</td>
<td>110</td>
<td>67.00</td>
<td>33.13</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N2P1</td>
<td>46.00</td>
<td>122.00</td>
<td>76.00</td>
<td>165</td>
<td>120.93</td>
<td>74.93</td>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N2P2</td>
<td>58.13</td>
<td>157.86</td>
<td>99.73</td>
<td>170</td>
<td>120.40</td>
<td>62.27</td>
<td>105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Tables 17 and 18 above.
For the Sadri variety maximum net profits ($100) is reached by using 60 kg. of each nutrient per hectare. For the Champa variety net profit is maximized ($75) by using a 60-30-0 formula. Obviously, fertilizer application on Sadri is more profitable than on Champa.

Farmers in Gilan are usually faced with shortage of funds to purchase inputs. In such cases, they may not be able to apply the most profitable fertilizer level. Benefits from fertilizer application can still be realized by maximizing rate of return per unit of investment. Thus, investing $12 in purchasing 30 kg. of P would result in about four times as much profits. Though this is economically feasible, it may not meet the biological requirements of production year after year. A complete fertilizer such as 30-30-0 may be more profitable in the long run.

Another important factor determining whether the farmers in Gilan would invest in fertilizer use is the system under which they have to share their output with the landlord. Under the cash rent system where the cultivator pays rent equivalent to the value of 660 kg. of rice, full benefits of the fertilizer use is received by the cultivator. However, under the crop-share rent system where one-third of the crop is paid as rent, the cultivator does not have as much incentive in making investment to increase total output. The costs and benefits of investment in fertilizer under alternative rent systems and for both rice varieties and two levels of fertilizer application are shown in Table 20. Whereas investing $29 in a 30-30-0 fertilizer combination on Sadri results in $81 increased income per hectare to the cash renter, the same amount of investment brings only $44 to the share-cropper. This is an example of an institutional arrangement which may have a detrimental effect to economic development.
Table 20. Gilan. Profitability of investment in fertilizer under alternative rent systems in dollar per hectare and percentages: 1961-1964a

<table>
<thead>
<tr>
<th></th>
<th>Sadri</th>
<th></th>
<th>Champa</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>30-30-0</td>
<td>60-60-0</td>
<td>None</td>
</tr>
<tr>
<td>Output - kg. per ha.</td>
<td>2630</td>
<td>3410</td>
<td>3740</td>
<td>3030</td>
</tr>
<tr>
<td>Value of output</td>
<td>367.50</td>
<td>477.40</td>
<td>524.30</td>
<td>302.50</td>
</tr>
<tr>
<td>Marginal value of fertilizer</td>
<td>---</td>
<td>109.90</td>
<td>156.80</td>
<td>---</td>
</tr>
<tr>
<td>Fertilizer costs</td>
<td>---</td>
<td>29.00</td>
<td>58.00</td>
<td>---</td>
</tr>
<tr>
<td>Operating expensesb</td>
<td>106.60</td>
<td>106.60</td>
<td>106.60</td>
<td>106.60</td>
</tr>
<tr>
<td>(excluding labor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rent - cash (value of 660 kg. rice)</td>
<td>92.40</td>
<td>92.40</td>
<td>92.40</td>
<td>66.00</td>
</tr>
<tr>
<td>Return to cultivator</td>
<td>168.50</td>
<td>249.40</td>
<td>267.30</td>
<td>138.00</td>
</tr>
<tr>
<td>Increase in cultivator’s share</td>
<td>---</td>
<td>80.90</td>
<td>98.80</td>
<td>---</td>
</tr>
<tr>
<td>Rate of return on fertilizer investment</td>
<td>---</td>
<td>280</td>
<td>170</td>
<td>---</td>
</tr>
<tr>
<td>Rent - croppshare (value of 1/3 of output)</td>
<td>122.50</td>
<td>159.10</td>
<td>174.80</td>
<td>100.80</td>
</tr>
<tr>
<td>Return to cultivator</td>
<td>138.40</td>
<td>182.70</td>
<td>184.90</td>
<td>95.10</td>
</tr>
<tr>
<td>Increase in cultivator’s share</td>
<td>---</td>
<td>44.30</td>
<td>46.50</td>
<td>---</td>
</tr>
<tr>
<td>Rate of return on fertilizer investment</td>
<td>---</td>
<td>155</td>
<td>80</td>
<td>---</td>
</tr>
</tbody>
</table>

aSource: (Tables 17, 18, 19 above; and 9, p. 44, p. 60).

bIncluding costs per hectare of seed $23.20, water $6.60, power and equipment $76.80.
A Comparison Between Sefid Rud Project and Chemical Fertilizer Project

Table 21 shows a summary of the costs and benefits of the two alternative projects to increase agricultural output in Gilan. The method of calculation and the underlying assumptions are given in the table's footnotes. The costs and benefits of both projects are calculated for a low and a high estimate. The low estimate may be considered as an estimate for the returns expected during the next ten years, while the high estimates represent the expected returns over a longer period.

Several important characteristics of the two projects as noted in the introduction to this chapter are brought out quantitively in Table 21. The most striking distinction between the two projects is the difference in the size of the initial capital investment. The fixed capital requirement of the Sefid Rud project is 140 to 200 times larger than the initial investment required for the fertilizer project. The investment in the fertilizer project consists of monthly payments to a few agronomists, extension agents, and other technical personnel. In carrying out the project major reliance must be placed on the Iranian personnel. No foreign exchange is needed for the initial investment in research and extension.

In contrast, in undertaking Sefid Rud project heavy reliance had to be placed on foreign engineering firms for consultation and construction. Except for the small number of Iranian technicians and manual workers, and some domestically produced materials, all the necessary inputs were imported.

On the output side, Sefid Rud project's contribution to GNP is about four times as much as the fertilizer project. This gap may be narrowed if
Table 21. Gilan. Comparative benefit and cost of investment in Sefid Rud and chemical fertilizer projects in $1,000 and percentages

<table>
<thead>
<tr>
<th></th>
<th>Sefid Rud</th>
<th>Fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low estimate</td>
<td>High estimate</td>
</tr>
<tr>
<td>1. Fixed capital investment</td>
<td>167,300a</td>
<td>200,000b</td>
</tr>
<tr>
<td>2. Increase in cultivable land in ha. e</td>
<td>60,000</td>
<td>101,000</td>
</tr>
<tr>
<td>3. New land reclaimed</td>
<td>38,000</td>
<td>79,000</td>
</tr>
<tr>
<td>4. Gain in productivity</td>
<td>22,000</td>
<td>22,000</td>
</tr>
<tr>
<td>5. Gross value of increase in annual output f</td>
<td>20,100</td>
<td>33,835</td>
</tr>
<tr>
<td>6. Total cost of resources used annually</td>
<td>19,696</td>
<td>31,569</td>
</tr>
<tr>
<td>7. Amortization g</td>
<td>10,614</td>
<td>12,688</td>
</tr>
<tr>
<td>8. Operating costs excluding labor</td>
<td>4,028h</td>
<td>6,374h</td>
</tr>
<tr>
<td>9. Labor cost</td>
<td>5,054j</td>
<td>10,507j</td>
</tr>
<tr>
<td>10. Value of annual output less amortization (5-7)</td>
<td>9,486</td>
<td>21,147</td>
</tr>
<tr>
<td>11. Value of annual output less amortization and annual operating costs (5-7-8)</td>
<td>5,458</td>
<td>12,773</td>
</tr>
<tr>
<td>12. Net value of output annually added (5-6)</td>
<td>404</td>
<td>2,266</td>
</tr>
<tr>
<td>13. Gross incremental fixed capital-output ratio ((1 + 5))</td>
<td>8.3</td>
<td>5.9</td>
</tr>
<tr>
<td>14. Gross annual incremental capital-output ratio ((7 + 5))</td>
<td>0.53</td>
<td>0.38</td>
</tr>
<tr>
<td>15. Net incremental capital-output ratio ((1 + 11)) before deducting for labor costs</td>
<td>30.7</td>
<td>15.7</td>
</tr>
<tr>
<td>16. Net incremental capital-output ratio ((1 + 12))</td>
<td>380</td>
<td>88</td>
</tr>
<tr>
<td>17. Rate of return on total investment (\frac{(7 + 12) + 1}{(1 + 12)})</td>
<td>6.59</td>
<td>7.48</td>
</tr>
<tr>
<td>18. Annual benefit-cost ratio ((5 + 6))</td>
<td>1.02</td>
<td>1.07</td>
</tr>
</tbody>
</table>

aIncludes $61 million cost of dam, $72.3 million cost of irrigation network to be paid over 13 years, and $34 million interest on $72.3 at 3 percent for 13 years.

bIncludes $110.5 million cost of primary irrigation facilities, $49.2 million cost of canals, land preparation for irrigation, etc., and $40 million interest (69, p. 62).
Based on the assumption of fertilizer application over 25 percent of 175,000 ha. land under rice cultivation, equally divided between Sadri and Champa varieties. Included costs are $168,000 research cost, and $660,000 extension cost over 5 years.

Fertilizer adoption over 50 percent of the area cultivated equally divided between Sadri and Champa. Included costs are $168,000 research cost, and $1,320,000 extension cost over 10 years.

Expressed in terms of land equal in productivity to the land under rice cultivation in 1961-1964. Consists of reclaimed land and gains in productivity expressed as rice land.

This is a measure of each project's contribution to GNP that is the increase in output due to productivity of all resources employed. Calculated on the basis of $335 average value of Sadri and Champa rice per hectare (Table 20).

Fixed capital investment amortized over 50 years for the dam and 10 years for the fertilizer project at 6 percent interest rate.

Operating costs on the newly reclaimed land estimated at $106 per ha. or the same as land presently under cultivation (Table 20). The costs incurred due to the gain in productivity of more adequate water on existing land under cultivation assumed negligible.

Based on the average cost of 30-30-0, 60-30-0, and 60-60-0 formulas (Table 18).

On the basis of average return to the cultivator, equally divided between the two varieties, cash rent and crop-share rent systems (Table 20).

Includes extra cost of handling, harvesting, and credit (Table 18).

Calculated by the residual method.
the rate of fertilizer adoption is faster than assumed in Table 21. The major contribution of the Sefid Rud project to GNP is through cultivation of arid lands, while the fertilizer project’s contribution is through increased productivity of the existing area cultivated. To the extent that increased output is due to gains in productivity of the existing resources, a smaller amount of complementary inputs are required. The cost of the complementary or variable resources required annually for full utilization of the Sefid Rud project is about 18 times as much as the fertilizer project’s annual variable resource use. This difference in complementary resource requirement of the two projects has an important implication for the optimum employment goal in Iran. If variable resources needed for full utilization of the Sefid Rud project, such as labor, farm tools, and bullocks, have a small opportunity cost due to unemployment, then the net contribution of the Sefid Rud project would be much higher than shown in Table 21. However, if the existing resources are used to their capacity, and if there are few readily transferable resources, as was the finding of the study in Chapter V, then the net contribution of the Sefid Rud project is between one-tenth and one-fourth of the fertilizer project.

To cultivate the land reclaimed by the Sefid Rud project, it must be leased or sold to individual cultivators. If the present pattern of farming in Gilan is continued, an additional 12,000 to 26,000 farm units will be created. This means resettlement of 60,000 to 130,000 people. To provide the new settlements with factor inputs, consumer products, and services, additional employment is created in both agricultural and other sectors. The “linkage” effect of the Sefid Rud project may prove to be
very large. However, quantification of the overall effect of the project is not possible with the available information. On the other hand, if resources cannot be mobilized effectively, the gross and net value of output expected from the use of the Sefid Rud project will be smaller than shown in Table 21.

The increase in output due to fertilizer application would also create additional employment for handling and processing of rice. Promoting fertilizer use would also enlarge the effective demand and the size of the market for such products. Again, it is not possible to quantify the linkage effect of the fertilizer project.

To compare the profitability of the two projects with respect to their fixed and variable capital requirements, the following criteria were used: the incremental capital-output ratio (ICOR) as discussed in Chapter III, the rate of return on total investment, and the benefit-cost ratio. All these criteria point to the extreme profitability of the fertilizer project as compared with the Sefid Rud project.

Whereas between 6 to 8 units of capital is required to increase gross output by one unit in the irrigation project, only about 0.15 unit of capital per unit of output is required in the fertilizer project. On the gross basis Sefid Rud's ICOR is not unreasonable. The annual ICOR for the Sefid Rud project is between 0.53 to 0.38, or about 26 to 19 times as large as the comparable data for the fertilizer project.

Since the productive life of the Sefid Rud project is long, and the amount of complementary resources required is large, the net ICOR may be a better criterion. This was calculated both with and without the cost of labor. The net ICOR of the Sefid Rud project, excluding the cost of labor, is between 90 to 180 times as large as the comparable data for the
fertilizer project. Accounting for the labor cost increases the size of net ICOR for the Sefid Rud project to between 90 and 380, while net ICOR for the fertilizer project is only 0.17.

Another criterion used to measure the profitability of the two projects is the rate of return on total investment. It is calculated by taking the value of total output less operating costs and less returns to labor as a percentage of total fixed investment. As shown in line 17, Table 21, the rate of return on investment in Sefid Rud project is slightly above 6 percent, which is not an unreasonable rate. However, when this rate is compared with the rate of return on fertilizer investment, 560 to 620 percent, the profitability of the latter project becomes apparent.

A last criterion used is the annual benefit-cost ratio. To the extent that benefit-cost ratio is larger than unity, it may be considered as a more profitable investment. The annual benefits of the Sefid Rud project barely exceeds its annual costs. The comparable annual benefits of the fertilizer project is 8 times as high as its annual costs.

Summing up, by all standards investment in fertilizer research, promotion, and use in Gilan is a much more profitable development opportunity than investment in the Sefid Rud project.

The analysis of this chapter was a postmortem study. By now, the Sefid Rud complex should be near completion. Also, more farmers in Gilan are realizing the profitability of investment in fertilizers. The amount of fertilizer demanded in Gilan is far greater than the amounts of fertilizer supplied through cooperative associations and the shop keepers. The lesson that can be learned from comparison of the two projects is very
valuable in evaluating other investment opportunities in Iran in the future.

In Gilan, even though investment in fertilizer has a very high return by itself, it would result in a greater return when implemented with the Sefid Rud project. Fertilizers should be expected to have a larger effect on yields if other factors such as adequate and timely water is also provided. Also, extending fertilizer use over the reclaimed land area has a multiple effect of increased area and increased yields. Thus, with the completion of the Sefid Rud project, fertilizer production surfaces shown above, may shift upward, making a greater agricultural contribution to the society's goals possible.
CHAPTER VII. CONCLUSIONS

The nature of this study is such that it does not give rise to any single conclusions. During the course of the study some particular characteristics of the Iranian economy in general and the agricultural sector in particular were brought to light. Two most striking characteristics of the Iranian economy observed were extreme under-development and poverty in the agricultural sector, and the existence of rich natural resources, especially oil, and good potentials for economic development. The rate of saving and investment in the total economy is relatively high, however, the rate of growth in the national income has been less than desired.

Agriculture is still the largest sector in the economy, both in terms of providing for employment and in terms of contribution to the gross national product. Though there exists numerous development opportunities in the agricultural sector, so far, the rate of growth in that sector has been insignificant. It is very probable that agriculture has served as a hindrance to the national economic growth. The challenging problem facing Iran is how to transform the traditional rural sector serving as a liability to the total economy, to a profitable source of development opportunities.

With the imperfections in the market institutions and the limitations of the price mechanism in guaranteeing a rate of investment great enough to achieve the society's goals and to guarantee full employment of resources, the government of Iran has resorted to economic planning. Though at the time of concluding this study, the Third Five Year Plan was nearing completion and preparations were being made for the
Fourth Five Year Plan, the analysis of this study did not go beyond the Second Seven Year Plan. This is mainly due to the unavailability of data for the more recent years.

Valuable lessons have been learned in Iran about planning by actually getting involved in planning. By now, some of the shortcomings of development planning in Iran as outlined in Chapter III may have been overcome. Nevertheless, some of the basic questions, such as the implications of the goals and their compatibility, the choice of techniques, and the problem of allocating scarce resources to alternative development opportunities will remain among the most important problems faced by the planners and the policy makers for many years to come.

The goals of economic development in Iran have been broadly stated as achieving a six percent annual rate of growth in gross national product, optimum employment, equitable income distribution, and agricultural self-sufficiency. An attempt was made in this study to outline the implications of each of these goals both for the total economy and the agricultural sector in Chapters III and IV.

With respect to the first goal, it was concluded that Iran has the physical resources and the capital required for achieving a six percent annual rate of growth in income. Capital is not the only important factor of production. Other factors, such as labor, the state of technology, and institutional environment are also important. The effect of factors other than capital on achieving a specified rate of growth in income were not examined in this study due to lack of data and the limited scope of the study.

The ultimate goal of economic development should be to raise the standard of living and welfare of the people especially those with low
levels of income. The optimum employment and equitable distribution of income goals are to insure full employment of labor and to reduce the effects of the unfavorable institutional arrangements on distribution of income. The projects undertaken during the Second Plan did not take these goals into consideration. It was seen that in the short run, there may arise a conflict between these goals and the goal of maximizing the rate of growth of GNP. So far, the effect of public investment and planning has been minimal on optimum employment and equitable income distribution. This has been due to investment in large engineering projects which are practically imported in parts and assembled on location, and minimum change in the institutional arrangements.

The annual rate of growth in demand for agricultural products was calculated at about 5 percent annually. It was seen that agricultural output in Iran has not kept up with the increase in demand. The shortage has been met by lower per capita consumption, higher prices, and larger amounts of food imports. The goal of self-sufficiency in agriculture will not be realized if the supply of agriculture does not increase at least by the same amount as the demand.

In Chapter IV the contributions of a developing agricultural sector to the total economy were outlined. Though average labor productivity in agriculture is low and there may be seasons of unemployment, transferring the surplus labor from agriculture will not lead to higher productivity in that sector. In any case, considering the high rate of population growth, the large size of population inactive, and the existing underemployment conditions in both sectors, unskilled manpower is not the
limiting factor. Instead, the limiting factor appears to be the inability to create continuously an increasing number of new employment opportunities. Thus, an important contribution of agriculture to economic development in Iran is to provide employment for a rapidly growing labor force which has little alternative employment in the short run. Increased productivity and higher income in the agricultural sector also increases the effective demand and broadens the size of the market for non-agricultural goods. It was seen that since income elasticity of demand for food is less than unity, growth in agricultural sector is not self-sustaining. As productivity of agricultural resources are increased, factors of production must be transferred out of agriculture and employed in the other sectors.

Finally, to outline the type of analysis needed for identifying development opportunities in the agricultural sector, a detailed study of the agricultural production conditions in Gilan was undertaken. It was found that in spite of peoples efforts to bring more land under cultivation, the existence of a larger labor force and improved health conditions, no real growth in productivity has taken place during the past four decades. As the calculation of the benefit and cost of investing in fertilizer research and use showed, there still exists cheap sources of new income streams in the agricultural sector. The failure of agriculture to increase total output in the past may be due to investment in the traditional factors of production.
BIBLIOGRAPHY


46. Iran Plan Organization, Division of Economic Affairs. Review of the Second Seven Year Plan program of Iran. Teheran, Iran, author. 1960.

47. Iran Plan Organization, Division of Economic Affairs. Third Five Year Plan Law. Teheran, Iran, author. 1962.


69. Noetsmedi, N. Iran is not an agricultural country, it must industrialize. Teheran, Iran, Teheran Economist Press. 1965.


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