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THE USE OF A FARM MANAGEMENT APPROACH IN SOLVING AGRICULTURAL PROBLEMS IN PAKISTAN

DISSertation
Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of the Ohio State University

by

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The Ohio State University
1960

Approved by

Richard H. Baker
Adviser
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CHAPTER I

Agriculture in Pakistan

Importance and Need for Its Development

Agriculture, along with its branches of animal husbandry, forestry, fisheries and horticulture, is the largest segment of Pakistan economy. Sixty per cent of national income is derived from agriculture, 75 per cent of the civilian force is engaged in it, 90 per cent of the people in villages (85 per cent of the total population depend on it, and 95 per cent of the foreign exchange earnings are contributed by agriculture. Eighty per cent of the raw material for Pakistan industries comes from agriculture.¹ Thus, agriculture constitutes the base of our national economy; therefore, the stability, strength and growth of agriculture are the prerequisites of the overall national economy. For industrialization, earning foreign exchange and for feeding the fast growing population, agriculture must be developed and progressed. This is essential for an uninterrupted progress of the economy.

Lamentable Conditions of Agriculture

In spite of the fact that 85 per cent of the people are in agriculture, Pakistan has been facing a chronic and ever increasing food shortage. The country has had to import 0.5 million tons of food each year to meet the current needs. Nearly one-third of the foreign exchange is being spent on

¹Faroogui, Keaton and Miller, Agricultural Marketing in Pakistan, pp. 1-18.
food imports. Besides shortage of food, diet of majority of the people is deficient, especially in the nutritive foods such as milk, meat, vegetables, and fruits which are necessary for health and vigor. The position is worse in the rest of Pakistan where daily diet provides only 1700 calories per head per day.\(^2\)

Calories available per capita per day:

<table>
<thead>
<tr>
<th>Source</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food grains</td>
<td>1391</td>
</tr>
<tr>
<td>Pulses</td>
<td>82</td>
</tr>
<tr>
<td>Sugar cane</td>
<td>123</td>
</tr>
<tr>
<td>Oil seeds</td>
<td>33</td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td>70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1699</strong></td>
</tr>
</tbody>
</table>

Productivity of agriculture, in terms of labor employed in it is at present exceedingly low which is reflected in the low levels of income of the farmers and agricultural labor. Income per capita per year is about Rs. 230-240 (\$46-48). This clearly indicates that even those who are engaged in agriculture are not gainfully employed and properly fed. Owing to the rapid growth of population (1.4 per cent annually), 1,000,000 persons are to be fed and 400,000 to be provided with employment each year, essentially in agriculture, as other avenues of employment do no exist. Consequently, problems of underemployment or unemployment, hunger and poverty, disease, and disability get worse and complicated as each year goes by.

Yields of crops per acre and animals per head are the poorest in the world.

\(^2\)First 5-year Plan of Pakistan (1955-60), p. 31.
The production of the principal crops since 1948-49 to 1955 is given in Table 1 and yield per acre in Table 2. This period is too short to permit satisfactory deductions. It, however, appears that in spite of an increase in acreage the

### Table 1

**Production of Principal Crops in Pakistan 1948-55**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(million tons)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>8.41</td>
<td>8.17</td>
<td>8.20</td>
<td>7.76</td>
<td>8.15</td>
<td>9.15</td>
<td>8.41</td>
</tr>
<tr>
<td>Wheat</td>
<td>3.09</td>
<td>3.39</td>
<td>3.95</td>
<td>2.97</td>
<td>2.39</td>
<td>3.08</td>
<td>3.17</td>
</tr>
<tr>
<td>Other food grain</td>
<td>1.2</td>
<td>1.21</td>
<td>1.16</td>
<td>.96</td>
<td>.94</td>
<td>1.33</td>
<td>1.15</td>
</tr>
<tr>
<td>Total</td>
<td>13.60</td>
<td>13.27</td>
<td>13.31</td>
<td>11.69</td>
<td>11.48</td>
<td>14.16</td>
<td>12.73</td>
</tr>
<tr>
<td>Grain</td>
<td>.80</td>
<td>.65</td>
<td>.79</td>
<td>.48</td>
<td>.37</td>
<td>.65</td>
<td>.63</td>
</tr>
<tr>
<td>Sugar Cane</td>
<td>1.03</td>
<td>1.07</td>
<td>.37</td>
<td>.37</td>
<td>1.79</td>
<td>1.26</td>
<td>1.23</td>
</tr>
<tr>
<td>(raw sugar)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil seeds</td>
<td>.31</td>
<td>.27</td>
<td>.33</td>
<td>.35</td>
<td>.27</td>
<td>.32</td>
<td>.37</td>
</tr>
<tr>
<td>Jute</td>
<td>5.48</td>
<td>3.33</td>
<td>4.45</td>
<td>6.33</td>
<td>6.82</td>
<td>3.61</td>
<td>4.66</td>
</tr>
<tr>
<td>Cotton (lint)</td>
<td>.39</td>
<td>1.11</td>
<td>1.52</td>
<td>1.65</td>
<td>1.90</td>
<td>1.41</td>
<td>1.65</td>
</tr>
<tr>
<td>Total (fibre)</td>
<td>6.87</td>
<td>4.64</td>
<td>5.97</td>
<td>7.98</td>
<td>8.72</td>
<td>5.05</td>
<td>6.31</td>
</tr>
<tr>
<td>Tea</td>
<td>33.60</td>
<td>38.98</td>
<td>37.96</td>
<td>53.00</td>
<td>52.00</td>
<td>52.00</td>
<td>54.00</td>
</tr>
<tr>
<td>Tobacco</td>
<td>141.92</td>
<td>143.97</td>
<td>162.40</td>
<td>179.95</td>
<td>167.10</td>
<td>192.01</td>
<td>262.04</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture, First 5-year Plan of Pakistan. Production did not show corresponding increases. There was, on the contrary, a slight fall; acre yields of food grains which form more that 30 per cent of the cropped area
have tended to decline slowly. The possibility of constant or even declining food production presents serious problems, especially when population is increasing at a rapid rate.

Table 2

Yield per Acre of Principal Crops in Pakistan, 1948-55
(Mound per acre)

<table>
<thead>
<tr>
<th>Crop</th>
<th>1948-49</th>
<th>49-50</th>
<th>50-51</th>
<th>51-52</th>
<th>52-53</th>
<th>53-54</th>
<th>54-55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>10.6</td>
<td>10.2</td>
<td>10.0</td>
<td>9.4</td>
<td>9.6</td>
<td>10.2</td>
<td>9.7</td>
</tr>
<tr>
<td>Wheat</td>
<td>10.2</td>
<td>10.1</td>
<td>9.9</td>
<td>7.9</td>
<td>6.8</td>
<td>9.4</td>
<td>9.1</td>
</tr>
<tr>
<td>Barley</td>
<td>7.9</td>
<td>7.6</td>
<td>7.7</td>
<td>6.1</td>
<td>5.2</td>
<td>6.9</td>
<td>6.8</td>
</tr>
<tr>
<td>Corn</td>
<td>10.8</td>
<td>11.0</td>
<td>11.0</td>
<td>10.5</td>
<td>9.7</td>
<td>11.5</td>
<td>11.2</td>
</tr>
<tr>
<td>Bayra</td>
<td>4.6</td>
<td>4.3</td>
<td>4.4</td>
<td>3.6</td>
<td>3.3</td>
<td>4.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Jowar</td>
<td>5.6</td>
<td>5.4</td>
<td>5.3</td>
<td>5.1</td>
<td>4.5</td>
<td>5.1</td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>9.5</td>
<td>9.0</td>
<td>9.4</td>
<td>8.5</td>
<td>8.3</td>
<td>9.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Grain</td>
<td>7.3</td>
<td>6.3</td>
<td>7.3</td>
<td>5.6</td>
<td>4.5</td>
<td>6.3</td>
<td>5.5</td>
</tr>
<tr>
<td>Sugar cane sugar</td>
<td>39.5</td>
<td>37.0</td>
<td>34.1</td>
<td>33.5</td>
<td>34.0</td>
<td>35.7</td>
<td>32.8</td>
</tr>
<tr>
<td>Rape &amp; mustard</td>
<td>4.9</td>
<td>4.5</td>
<td>4.8</td>
<td>4.4</td>
<td>4.0</td>
<td>4.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Linseed</td>
<td>4.4</td>
<td>4.4</td>
<td>4.5</td>
<td>5.1</td>
<td>4.6</td>
<td>4.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Sensamum</td>
<td>4.6</td>
<td>4.4</td>
<td>4.5</td>
<td>5.1</td>
<td>4.6</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Seed cotton</td>
<td>5.3</td>
<td>6.7</td>
<td>7.1</td>
<td>7.0</td>
<td>7.8</td>
<td>7.0</td>
<td>7.4</td>
</tr>
<tr>
<td>Jute</td>
<td>14.2</td>
<td>10.4</td>
<td>17.3</td>
<td>17.3</td>
<td>17.4</td>
<td>18.2</td>
<td>18.2</td>
</tr>
<tr>
<td>Tea</td>
<td>5.6</td>
<td>6.4</td>
<td>6.1</td>
<td>7.9</td>
<td>7.9</td>
<td>8.4</td>
<td>8.9</td>
</tr>
<tr>
<td>Tobacco</td>
<td>10.5</td>
<td>10.7</td>
<td>11.0</td>
<td>11.9</td>
<td>11.6</td>
<td>12.7</td>
<td>13.4</td>
</tr>
</tbody>
</table>

*Mound* = 32 2/7 pounds.

Source: Ministry of Agriculture (Pakistan).
There is one-half H.P. per man in agriculture in Pakistan as compared to 50-80 H.P. per farmer in the advanced countries of the world. From any of the standards one can think of, poverty of agriculture is self-evident.

Causes of Defective Agriculture

The causes for this gloomy state of agriculture in Pakistan are numerous and of various natures. They may be economic, physical and institutional in origin. Generally speaking, they are inter-dependent on and interwoven into each other. Collectively, they form a vicious circle giving rise to poor peasantry and an unproductive and deteriorating agriculture industry. In brief, the defects are as follows:

1. Poor resources and ignorance of farm management principles.
2. Defective land tenure system.
3. Inadequate credit facilities.
4. Insufficient agricultural research and Extension services
5. Inferior marketing system.

Relevance: Poor and Ill-managed resources

The yields of crops and animals as indicated earlier, are poorest in the world. The main cause may be numerated as follows:

Crops

1. Poor Seed of Inferior Varieties

Seed of low yielding and unimproved varieties is sown. Only a small proportion (10 per cent) of the total crop area is sown with improved seed. And, in many cases, even this so-called improved seed is not all of pure quality, as only 5-10
per cent of this seed is produced on the government seed
farms,\(^3\) while the rest of it is supplied by private resources,
so its purity cannot be guaranteed. Agricultural Inquiry
Committee (1951-52) reports the following statistics as to
percentage of improved seed sown for various crops:

<table>
<thead>
<tr>
<th>Province</th>
<th>Crop</th>
<th>Improved seed sown as percentage of total seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punjab</td>
<td>Wheat</td>
<td>5%</td>
</tr>
<tr>
<td>Punjab</td>
<td>Rice</td>
<td>5%</td>
</tr>
<tr>
<td>Punjab</td>
<td>Fodder crops</td>
<td>7%</td>
</tr>
<tr>
<td>Punjab</td>
<td>American cotton</td>
<td>80%</td>
</tr>
<tr>
<td>Punjab</td>
<td>Desi cotton</td>
<td>10%</td>
</tr>
<tr>
<td>Sind</td>
<td>Wheat</td>
<td>1-2%</td>
</tr>
<tr>
<td>Sind</td>
<td>Rice</td>
<td>1-2%</td>
</tr>
<tr>
<td>Sind</td>
<td>Fodder, Cotton</td>
<td>.1%, 5%</td>
</tr>
</tbody>
</table>

These two regions are the most important as far as ag-
griculture is concerned.

The "improved seed" supply for fruits and vegetables,
sugar cane, potatoes, etc., is too insignificant to mention.
The committee listed some of the limiting factors for seed supply.

1. Lack of appreciation of the advantages of good seed
by the farmers.

2. Lack of propaganda.

3. Nonavailability of good seed in villages.

4. High cost of good seed.

At present, the Pakistan Government lacks the adequate facilities for production of even the nucleus seed required for multiplication. The estimated production of seed of all improved varieties of crops in 1953-54 was 11,000 tons compared with the total requirements of 104,000 tons at the minimum rate. Often seed, supplied by the government agencies, is not tested for its purity and germination qualities. It fails to germinate properly and shakes the confidence of the farmers besides shattering their economy.

2. Lack of Scientific Rotation

No definite scientific rotations are followed on majority of the farms. Absence of proper knowledge about rotations and acceedingly tiny and fragmented holdings are rated as the chief causes. Disregard of this important factor is now resulting in declining fertility and impairing structure of soil. Invasion and hold of weed is intensified as time passes by.

3. Inefficient and Primitive Tools and Implements

Inefficient and primitive tools and implements are being used for cultural operations. With the help of these implements, the farmer just scratches the soil. Proper tilth is hard to get; as a result, germination of seed and further growth of seedlings are hampered.

The Department of Agriculture has evolved some good tools and implements, but these have not spread among the cultivators

4 First 5-year Plan of Pakistan (1955-60), p. 32.
to a desired extent because of their low purchasing power, absence of progressive mindedness, lack of proper propaganda, etc. One could not expect their meager pockets to afford expensive machines like reapers, thresher, tractors, bulldozers, and the like. Moreover, such implements can't be used extensively because they are labor saving, and we have already excess labor power in agriculture. This action may worsen the unemployment problem as other avenues of employment are not in sight in the near future.

4. High Prevalence of Insect-Pest, Diseases and Weeds

It has been estimated that at least 5-15 per cent of the crop produce is lost through insect-pest and diseases in the fields. The percentage of loss in case of fruits is much higher. Quite a significant loss also occurs in stores. In year of attacks, locusts also inflict heavy damages to crops. Insufficient plant-protection staff with its meager equipment is unable to deal effectively with epidemics covering large areas or control pests and diseases of frequent occurrence.

It is estimated that if Pakistan could avoid loss incurred due to insect-pest and diseases, it could be self-sufficient in food without any further increase in area and foreign aids and gifts.

Pakistan has also some of the obnoxious weeds which rob the soil of its nutrients, deplete the soil moisture, suppress

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5 Agricultural Inquiry Committee Report (1951-52).
the growth of crops and make the cultural operations ineffective and expensive. Most of the cultural implements the farmer has help spread the weeds rather than eradicating them. The weeds are a country wide problem and need cooperation and simultaneous efforts to check them. But so far, the farmers have failed to show and the government has failed to arouse such a tendency. Efforts to eradicate the weeds on the part of one or two farmers can easily be frustrated as on spread of weeds from the nearby holdings is quick and unchecked.

5. Inadequate Application of Manures and Fertilizers

Artificial fertilizers: The available statistics show that on an average less than 1. pound of fertilizer is being used per acre, whereas in some of the advanced countries, 300 pounds of fertilizers are not uncommon.

The cash crops like cotton, jute, tea, etc., are the main recipients of fertilizers whereas food crops are not taken care of.

Indiscriminate use of fertilizers has inflicted losses in some cases. It is especially important that the soil type and its nutrient deficiencies should be predetermined before applying fertilizers. Complete and accurate soil surveys are not available with the result deficiencies of plant nutrients in various parts of the country are not known. In very general terms, it is thought that soils of East Pakistan are deficient in nitrogen and phosphorous and those of West Pakistan in nitrogen.

6Agricultural Inquiry Committee Report, p. 28.
In view of this information, there has been some indiscriminate use of fertilizers. The application of nitrogenous fertilizers like ammonium sulphate has not given significant results on alkaline soils, and in some cases, the results have been negative. The use of fertilizer is a specific undertaking. The soils vary in their needs for fertilizers even on a farm what to speak of a region depending on their slope, texture, structure, chemical composition, type of farming, intensity of cropping, soil building program, and, over a larger area, on rainfall and temperature. The majority of the farms have no soil tests, consequently the farmers do not know precisely what their soils need.

Organic manures. Data are not available to show the trends in the use of manures like farmyard manure, compost, urban waste, bone meals, oil cakes and fish meals. Methods of preserving farmyard manure (F.Y.M.) are very defective. Almost all urine and good part of dung do not at present find their way into the fields. A large part of the dung is used as fuel and a portion is wasted. Even the remained which is kept for use in the fields is not preserved properly. As a result, useful plant nutrients are either leached away or acidized.7

Green manure. The use of green manure has been encouraged by various concessions but has not been adopted extensively by the cultivators. The practice probably appears to

7First 5-year Plan of Pakistan (1955-60), p. 34.
be uneconomic because the growing of a crop for harvest may have been to be sacrificed in order to produce a green manure crop. Unawareness about the benefits of green manuring, lack of proper equipment and resources, and small holdings are some of the factors limiting a general adoption of green manuring practices.

Practically nothing is known about the sufficiency or deficiency of micro-nutrients or trace elements such as cobalt and boron in the soils. The soils of East Pakistan, subject to heavy rainfall, are likely to be deficient in these elements.

Much of the information as to the optimum time, quantities, methods of application of various manures and fertilizers on different crops and soils is lacking.

6. Deterioration of Soil Productivity Due to

1. Water logging
2. Soil erosion
3. Acidity and alkalinity of soil

Construction of large irrigation works has not proved an unmixed blessing. Water-logging and salt effervescence in areas has led to deterioration of the soil and creation of unhealthy surroundings. In the canal areas of West Pakistan, a good deal of land has been rendered unfit for cultivation due to this reason. And this process is going on. Every year in this province thousands of acres of productive land go out of cultivation. It has become quite a serious problem and is

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8Akhtar, S.M, Economics of Pakistan, p. 122
causing considerable anxiety to the government and the people. Most of the canal colonies now stand water-logged. This area is increasing annually.⁹

Water-logging in these areas has been due to the rise in water-table, the effect of which appears in two forms: (a) saturation of the soils and in worst affected areas the appearance of water on the surface and formation of lakes (jheels) and (b) concentration of salt in upper layers of soils as to retard plant growth.

The present system and method of supply of water which leads to over-irrigation, have much to do with bringing about and speeding up water-logging. This is estimated that loss of water due to over-irrigation in case of wheat alone is 30-50 per cent.¹⁰ Charge of water is made not according to water used but according to crops watered. Moreover, supply of water is uncertain and the cultivator naturally tries to irrigate as heavily as he can.

Erosion In Pakistan, both water and wind erosions are raging. Soil erosion is found in the deforested hill sides, grazed regions, arid plateau lands and the flooded parts of the river valleys. In the barren parts of western Pakistan, in spite of scanty rainfall, the force of the torrents is great. Same is the case with the hilly tracts of East Pakistan, where rainfall is excessive.

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¹⁰ Akhtar, S.M., Economics of Pakistan, p. 122
Wind erosion is common on the wind side of the hills in former Baluchistin areas.

Full information regarding the areas rendered unfit for cultivation is not available. A study conducted in certain regions of West Pakistan revealed that in upper districts of West Pakistan, nearly 2,000,000 acres of productive land has been badly gullied by soil erosion. Southwestern districts of East Punjab and Quetta and Kalat divisions are badly subject to wind erosion.

Soil erosion, in Pakistan, has occurred as a result of the-

1. Cutting of trees or deforestation.
2. Removal of vegetation which exposes land to wind and rain.
3. Uncontrolled grazing, especially of goats.
4. Cultivation on hill sides in a way as to speed up the on-rush of water.

7. Undistributed and Uncertain Rains, High and Frequent Floods and Canal Closures, particularly at the critical period of growth, have also contributed to the low yields of crops. Uneconomic use of canal water is another factor.

9. Livestock Situation in Pakistan

Importance. Livestock plays an important role in the agricultural economy of Pakistan. Farm animals provide almost

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11 Akhter, S.M., Economics of Pakistan, p. 124.
all the draft or motion power for agricultural operations. They supply meat, milk, hides and skins, wool, hair, eggs, manures and number of other minor products.

Livestock population is stationary for the last number of years, while human population is increasing at a rate of 1.4 per cent a year. Therefore, the ratio of animals to human population is decreasing every year, meaning thereby that fewer and fewer calories in human diet will be coming from animal sources. At present, very few calories are from animal products.

The yields and performances of our animals are poor in the world. Some of the most conspicuous causes may be as follows:

1. Poor feeding.
2. Prevalence of disease and high mortality.
3. Indiscriminate breeding.
4. Indiscriminate slaughter.

It is expected in Pakistan that balanced ration alone can increase milk yield by 30 per cent.\(^{12}\) But the farmers are unaware of a balanced ration or feeding requirements of the animals. The empirical knowledge about feeding acquired by the cultivators in course of generations is very defective. Farmers are ignorant of the nutrients in the feeds, are unable to mix the feeds in a proper proportion to make a balanced ration. In other cases the necessary feeds are not

\(^{12}\)First 5-year Plan Pakistan (1955-60), p. 52.
available -- as a result animals are mal-nutritioned and feeds are not properly made use of. The situation of insufficient feeding is reflected in the condition of livestock which are generally under-nourished, undersized, weak, disease-struck and poor yielders.

Animals are mostly kept on roughages and rarely any concentrates are fed. Food shortages are so acute and pressing that there is hardly any scope of replacing food crop by a fodder crop, not to speak of feeding concentrated ration as such.

Research on animal nutrition is proceeding on a very limited scale in both wings of Pakistan.

There is high cattle mortality due to the prevalence of diseases. The research of an institution in East Pakistan has shown that almost all the domestic animals and poultry in that province carry parasites in their digestive tracts and that 75 per cent of cattle and 25 per cent of sheep are infested with fluke.\(^{13}\) Besides these, choking, colic, diarrhoea, food and mouth, haemorrhagic, septicaemia, rinderpest (cattle plague) etc., are also frequent and claim a heavy toll each year. Shortages of veterinary experts, medicine, equipment and transport make this situation even more gloomy. The number of animals that a veterinary surgeon is expected to look after often averages 93,000 in East Pakistan and 97,000 in West Pakistan.

\(^{13}\)First 5-year Plan Pakistan (1955-60), p. 1.
Existing cattle breeding farms produce only a limited number of bulls for distribution in rural areas to upgrade the existing breeds. Indiscriminate mating is the rule, therefore, it is quite rare that one finds clearly defined breeds in the country. Some of the fine breeds of cattle, buffaloes, sheep, etc., now stand merged into a heterogeneous groups of animals with diffused characters and questionable performance.

The livestock situation deteriorated after independence (1947) especially in West Pakistan. On the one hand some good stock was taken away by evacuees and some let loose only to be slaughtered for food by incoming refugees. On the other hand meat requirements increased as a much higher percentage of population after partition (1947) was further increase in the demand for livestock and livestock products is accompanying the growth in population. In urban areas there is an acute problem of supplying meat and dairy products. Milk dealers bring milch animals from rural areas to the town and sell them for slaughter at the end of their location period. There are no statistics, but undoubtedly the number of good milch animals has decreased considerably since independence.

It is quite safe to say that the following fields have never been explored adequately:

1. Nutrition of animals
2. Disease control measures
3. Genetic research and development of animals of good performance

\[^{14}\text{Plan, op. cit., p. 51.}\]
5. Economic use of milk in the rural areas
6. Dairy bacteriology
7. Improving farm methods of making cheese, butter and other dairy products.

Some of the points listed above will be developed in the pages that will follow.

Farmer and His Potentialities

Farmers are Ignorant of Farm Management Principles

Efficient farming is a complicated business involving many basic and applied sciences. But the man behind the plow in Pakistan lacks energy, initiative and knowledge. He is subject to a host of endemic and epidemic diseases. He lacks education in general and agricultural knowledge in particular. He is condemned as ignorant, superstitious, fatalistic, improvident and extravagant. He is conservative and tends to stick to the old ways of life and work.

He does not understand the approved soil management practices; the influence of slope and physical characters of soil on erosion; the availability of plant food elements; the response of soils to the application of manures and fertilizers.

He does not know precisely the varieties of crops most suitable to his area, the best time and method of planting them, and best means of harvesting, storing and marketing them. He lacks the knowledge about the plant and animal diseases,
insect-pest and their control. He is ignorant of the modern methods in animal selection, breeding, feeding and sanitation. He does not know how to select, maintain and use economically his animal and mechanical power at his farm. He does not realize the importance of maintaining farm records and lacks the how-to utilize them in increasing the productivity of his farm. He does not know the significance and required knowledge how to plan the organization of their farm for efficient and productive utilization of the farm resources. He lacks all the essentials for making wise decisions at the farm.

II. Defective Land Tenure System

The land tenure system of Pakistan is oppressive and exploitative. Land is concentrated in the lands of few landlords while majority of agriculture population is tenants — usually tenants — as will — liable of ejection at any time without any scope of recourse to anybody. Such a system has given rise to a score of serious problems -- which are blocking the way of improvements in agriculture. The problems are —

(a) Absentee landlordism.
(b) Exploited and insecure class of tenants with no incentive for better production.
(c) Wasteful use of agricultural resources leading to rapid depletion of soils productivity.
(d) Small and uneconomic holdings.
(e) Scattered and fragmented holdings.
(f) Class friction, hatred, antagonism, social discontent and political instability.
(g) Loss of land and with it economic freedom.
(h) Defective leasing arrangements. Defects of the leases are:

(i) Leases are unwritten and ambiguous.

(ii) Fixation of rent and other terms are not based on the economic principles. Besides rent, the leasee is subject to so many other illegal exactions and cesses.

(iii) Rights of the tenants are not secured. The landlord, due to his superior power, can do whatever he likes. The tenant can be ejected at any time and he is not sure whether he will be compensated for the improvements and services on the farm he could not utilize.

(iv) The fact that leases are for short duration (without any security of renewal) leads to exploitation of agricultural resources. The tenants shun to undertake any permanent improvement, usually extensive agriculture is resorted to.

III. Agricultural Credit

Every productive enterprise, including agriculture, requires finance because the operations have to be started and expenditures undertaken in anticipation of actual production. The more advanced kind of agriculture requires greater investment in farm implements, seed, manure and fertilizers and other essentials of production.

When agriculture is of a primitive kind, as it is in Pakistan, it does not yield enough returns to enable the agriculturalist to meet his normal day to day needs, not to speak of leaving a surplus for heavy productive investment. Under such conditions, the danger of the agriculturalist running into debt is very close, and possibilities of carrying agriculture with little or no capital are frequent as we see in Pakistan.
The inadequacy of the institutional credit agencies and expensiveness of private credit facilities play a significant role to make the condition worse.

The main credit facilities along with their salient features are discussed below:

1. Private money lenders.
2. Friends and relations—not enough data are available in the field to show the extent and trends, and no consistent policy can be effected in this field.
4. Agricultural-cooperative credit societies.

Private credit agencies furnished the loans out of which 80 per cent was for unproductive purposes (marriages, ceremonies, litigations) and at a rate as high as 30-300 per cent. The total debt of peasantry is not all bona fide debts. In many cases, there were comparatively small sums accumulated to huge amounts through compound interests charged over and over again, generation after generation. Due to this fact, it is true that once in debt means ever in debt. Examples are not uncommon to quote that some people born in debt, lived in debt, died in debt and passed the debt to those who followed them.

In some regions, the practice of obtaining loans on security of crops like cotton, jute, wheat, sugar cane and tobacco is widely prevalent, and the cultivator is required to sell the produce to the money lender. Advances are usually taken at a fixed price for the producer and cultivator

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Agricultural Inquiry Committee Report, p. 80.
can't claim any increase over it. This ultimately results more often in the cultivator losing considerably. In other cases, the cultivator is required to sell the produce to the money lender at the time of harvest, when prices are at the lowest ebb.

There are few regulated markets where the cultivator is able to store his crop with the commission agent and hold out till such times as the prices reach a favorable level. He is also able to get advances up to about 75 per cent of the value of produce. The commission agent charges storage costs and interest rates at more or less reasonable rates. This type of credit is of a limited nature and is practiced only in the regulated markets in the Punjab. Whereas unregulated markets are the feature in most areas of Pakistan, dealers, mostly middlemen, do not encourage this practice as thereby they would deprive themselves of excessive profits at the cost of the cultivators.

Public or semi-public agencies provide loans which are not regarded popular with the cultivators due to delays and difficulties in obtaining them. The process being characterized sometimes by corruption and high-headedness on the part of officials. The loans are not planned properly, they do not reach the recipients in time or in full. Usually, they are paid in haste towards the end of the financial year or in condition of distress.

**Agri-Cooperative Credit Societies** The loans provided by these agencies are a small fraction of the total agricultural
credit needs of the country. They have only 5 per cent of the total farm families on their role. Although the average membership per society has increased since partition (1947), it still remains below the optimum size for efficient management, supervision, and effective control.16

The place occupied by cooperative credit in the rural finance of the country is even more insignificant than ordinarily supposed. Although in some societies there has been considerable expansion in the recent past, the central organization still remains weak and largely uncoordinated, but the weakest link of all in the chain, which is weak at almost all points, is the primary cooperative credit society. It satisfies none of the requisites of either good cooperation or sound credit. Its failures to promote thrifts and savings are followed at not too great a distance by its failure to provide in the village a system of credit which is at once adequate, prompt and productive. "It raises inadequate funds in a manner ill-related to demand and supply and usually lends them in a manner uncoordinated with development; acts as if prior debts, and not production, had prior claim on its attention; reaches mainly the large cultivator and reaches him late."17

16 First 5-year Plan Pakistan (1955-60), p. 97.
17 First 5-year Plan Pakistan, p. 98.
In short, the existing credit situation is marked by several features:

(a) Lack of credit.
(b) No organized body to tap whatever meager capital is available and to make it available to the farm.
(c) High interest rates.
(d) Procedures to get loans are long, fraudulent and complicated.
(e) While lending no direction is made between productive and unproductive demands.
(f) Terms of loans are exploitive and not in conformity with the farm conditions.
(g) Neither a planning before hand, nor any subsequent supervision as to the utilization of the funds or the purpose it was sought for.

Such a credit system had led us to:

i. Nigh indebtedness.
ii. Inefficient agriculture.
iii. Concentration of land into few hands and an increase of landless labourers.
iv. Extensive and unprogressive agriculture.
v. Depletion of soil resources.

IV. Inferior Marketing System

The marketing system in Pakistan is also not free from defects. It has also contributed to the distressing situation in Pakistan agriculture. The extent and the quality of facilities now available for marketing agricultural products can hardly be considered fair either to the producer or to the consumer. The producer gets 30-40 per cent\(^\text{18}\) of the

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\(^{18}\)Faroogui, Keaton and Miller, Agricultural Marketing in Pakistan, p. XII.
price paid by the consumer, consumer gets inferior product for his money, while the middleman stands to pocket a large share of the value of the produce.

The marketing system has several main defects:

1. Inadequate marketing information and inability of the farmer to make use of it.
2. In different quality of the produce sold.
3. Inadequate transport facilities.
5. Lack of uniformity of weight and measures.
7. Lack of storage and refrigeration facilities.
8. Absence of regulated markets and cooperation efforts among the producers.

Inadequate information and farmers inability to use it: -- Only few markets are regulated and the government do collect and compile reports. But mostly this sort of information is of general nature which is mostly unrepresentative and not substantiated by adequate research. Majority of the farmers are so illiterate, so inaccessible, so small and so scattered as to make use of this information, particularly due to the means by which it is disseminated. This information is rarely designed to answer to some of the market problems of the farmers, namely:

a. What the demand for food and fibre will be each year and in what quantities.

b. To sell what is produced to the outlets, at a time and place to get the highest net returns.

c. To move the farm products from the producer to the consumer at the lowest costs.
The first job of a successful farmer is to anticipate what his potential consumer wants, next is to plant and produce the product, third is to get the produce to the consumer and finally that the products are liked by the consumer. But the facts about the Pakistani farmers prove the opposite. They have been reluctant to think in terms of consumer's demands. Instead they are inclined to base their future production on what they produced in the past and their fathers produced before them. The farmers rarely produce with reference to market trends and needs, never tries to hit the market at the time when prices are favorable and seldom tries to select the best market channel and best method of selling.

Transportation and communication from the field to the village and from the village to the market are often extremely poor and defective. Bad roads, lanes and tracks connecting villages with the markets not only add to the cost of transportation and aggravate the strain on bullocks and other pack animals, but also lead to the multiplicity of small dealers and intermediaries. They also restrict market by hindering cheap and rapid movement of agricultural produce.

Financial handicaps of the farmers: One of the essentials of good marketing is the staying power of the seller. If he is hard pressed to sell (as in Pakistan) all his produce immediately after the harvest, the selling pressure will depress prices for all the agriculturists and will reduce their sale proceeds. The government demands (revenue, taxes, etc.)
are so arranged and credit obligations are so devised, that the bulk of the cultivators are constrained to sell their produce immediately after harvest and thus get the lowest prices for their produce.

**Indifferent Quality of the Produce and Lack of Grading and Standardizing Facilities**

The agricultural produce neither fetches a good price at home nor enjoys a good reputation in the foreign market, mainly due to its indifferent quality. The low quality is a function of a number of factors.

a. Indifferently selected seed.

b. Natural climates affecting the crops while growing like too much or too little rains, hails, storms, pest diseases.

c. Primitive methods of harvesting which lead to mixing of foreign materials or mixing of different qualities.

d. Lack of proper storage facilities in the villages and cities which result in deterioration through exposure to rain, dirt, insects, and rats.

e. Deliberate deterioration at the various stages of marketing by damping and mixing, etc.

f. Lack of standardization and grading of produce which does not distinguish between good, bad and indifferent qualities.

The present position in Pakistan is that apart from the broad classification of jute and on a comparative very small scale of eggs and ghee (butter) there is no organized grading
of any agricultural commodity. In case of cotton and jute trade names and trade standards do prevail, but these apply only at or after the baling stage. Other commodities such as wheat, rice, wool, hides and skins, etc., have no standards whatsoever, except for trade names in the case of grains. Adulteration thrives under these conditions.

**Disparity in Weights and Measures**

Standardization and uniformity of weights and measures is very essential to ensure reliable trade transactions and to inspire confidence in the minds of the producer as well as the consumer.

At the movement there is considerable disparity in weights and measures used in the country and unscrupulous traders are not slow to exploit the situation.

The standard "maund" is of 40 seers (or 82 2/7 pounds) and a "seers" is 30 "tolas". But it is not uncommon to find a maund of 30, 40, 40½, 41, 42 or 60 seers and a seer may be of 60, 75, 90, 90 or 30 tolas, depending on the locality concerned.20

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19 Agricultural Inquiry Committee Report, p. 81.
20 Agricultural Inquiry Committee Report, p. 53.
Multiplicity of Market Intermediaries

The following typical chain of middlemen is met in the markets.

1. Beopari
2. Kachha Arhtiya (commission agent)
3. Dalal (Broker)
4. Pakka Arhtiya (commission agent)
5. Wholesaler
6. Retailer

There has been difference of opinion as to how far these middlemen are economically justified. Some people regard some of them at any rate as superfluous. They maintain that these market functionaries do not let the farmer conceive the desires or demands of the consumer and claim as far as 70-60 per cent of the total value of the produce. It has been suggested, for instance, that "dalal" is unnecessary. If the cultivator took the produce to the market himself, there "beopari" could also be eliminated. The "kachha sehtiya" could be displaced by the cooperative shop. The Pakka Aehatiya and wholesaler are frequently the same person. By marketing through the village cooperatives-sale-societies, the consumer could be approached directly.

Others label this sort of reasoning as too radical and ill-informed of the economic functions of some of these functionaries.

The fact of the matter is that these middlemen arose as a necessary evil due to the prevailing conditions in the
Bad communications and chaotic conditions of marketing encourage a superfluity of middlemen - and the most effective means of removing unnecessary middlemen are the provision of good roads and the establishment of a sufficient number of well-regulated markets easy to access to the cultivators. The Pakistan Agriculture Inquiry committee attributes the existence of too many middlemen to various causes. The most prominent among them being inadequate financial resources of the producers and their low standards of education, unsatisfactory communications, absence of properly regulated markets and cooperative efforts among the producers.

Lack of Storage

Another defect in the system of marketing in Pakistan is the lack of proper storage and absence of licensed warehouses. Storage is required:

1. For the produce the agriculturist keeps in his house for his family consumption, for seed, or for later sale.
2. By the trader, in the case of produce waiting for sale.
3. By the government for its reserves.

So far as the agriculturist is concerned, due to the lack of financial resources, he sells his produce within a month or so of harvesting it. The only produce that he stores for any length of time is what he keeps for his family consumption or for seed.

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The large landlords, however, need storage for his surplus produce which he may withhold for certain time for later sale. The types of stores they (farmers and landlords) use are large earthen containers, pots, jute bags or in bulk in underground pits. The produce is exposed to insects, rodents and dampness.

The trader stores his produce in godowns, and consequently a lot of deterioration and wastage occurs. There are no "warehouses" as such as the term is understood in the advanced countries.

Storage facilities with the government are also not sufficient.

Due to inadequate and defective storage facilities the loss of produce in quality and quantity is considerable. In food grain alone this loss has been at 5 per cent of the total production. Saving of this loss alone would make East Pakistan self-sufficient in food grains.\(^{22}\)

Absence of cold storage facilities for fruits and vegetables results in market gluts at the peak of harvest season and thus lowers their prices, and in case of milk, meat, eggs and fish, it considerably restricts their market.

**Unregulated Markets**

Most of the markets are unregulated, i.e. operate without set rules and regulations.\(^{23}\) Generally speaking, they are unorganized and all sorts of fraudulent practices are rampant in them. Some of these have agents acting for buyers and

\(^{22}\)Report, Agricultural Inquiry Committee, p. 53.

\(^{23}\)S. M. Aktar. Economics of Pakistan, p. 253.
and sellers both and getting commission from both parties, mainly to the disadvantage of the seller-cultivator. Settlement of price under cover by the arhtiyas representing the buyer and seller use of incorrect weights, exortion of a variety of charges from the ignorant and illiterate agriculturist seller are some of the abuses. The net result of all these malpractices is that the cultivator-seller is deprived of his due returns from the sale of his produce. 24

Inadequate Research and Extension Services

There is a general lack of factual data and specific information for many of the problems we are subject to. It is in no case to underestimate the impressive achievements of some of the basic investigation but in view of the immense needs, they only touched the fringes of the problem.

The key to increasing agricultural productivity lies in increasing research and spreading information about better farming methods. This means more trained staff, and one of the factors most likely to limit the rate of agricultural development is the scarcity of adequate technical staff. There are only four agricultural colleges at present in Pakistan. Their total capacity to admit fresh students in a year is 170.

24 Akhtar, S. M., Economics of Pakistan, p. 254.
It is estimated that only 60 per cent of the students admitted in these colleges succeed to get a bachelor degree in agriculture. Moreover not all of them find their way to the Department of Agriculture where salaries are unattractive ($40 a month), chances of promotions are scanty, job is hard and unpleasant and devoid of due status and prestige. This is borne out by the fact that during the period 1952-54, 166 students graduated from the Punjab Agricultural College, Lyallpur, but only 62 joined the Department of Agriculture, while 104 sought employment elsewhere. During the same period 40 agriculture graduates resigned from the Department of the Former Punjab for more profitable employments in other fields.

The gap between the useful results of agricultural research and their adoption by the farmers is much too wide. There are many factors which retard progress, but basically the main factor has been the inability of the administration to bring to the doors of the cultivators the goods and services essential for affecting improvements in agriculture. The number of extension workers in agriculture is very small in comparison with the number of villages and cultivators or the

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25 First 5-year Plan Pakistan.

26 First 5-year Plan Pakistan (1955-60), p. 87
cultivated area and the population. In East Pakistan each agriculture extension worker covers theoretically an average 45 villages and 3,000 farmers. In West Pakistan an extension worker has to look after about 153 villages and about 24,000 cultivators.27

The veterinary surgeon who is in charge of dispensary in addition to his clinic duties, has to travel in the rural areas for about 15 days a month where he is expected to carry out both disease control and other extension work. The number of livestock that a veterinary surgeon is expected to look after averages 93,000 in East Pakistan and 37,000 in West Pakistan.28

The position is still worse in forestry - no extension staff exists in the Forest Department.

In short, the extension staff is untrained, ill equipped, low paid and scanty.

Evaluation and Objective

The preceding discussion into the various phases of farm-management depicts an appalling picture of Pakistan agriculture. Population is growing fast, while food production is declining. Food imports hardly leave enough foreign exchange for importing essential capital and consumption goods. The diet of the people is the poorest, and, per capita incomes are lowest and leave very small margin for improving the productive capacity of farm resources. Soil resources are being plagued by water

27 First 5-year Plan, Pakistan, p. 84.
28 First 5-year Plan, Pakistan, p. 85.
logging and impaired by soil erosion. Soil fertility is
deteriorating and yields are declining, but insect-pest and
diseases are flourishing. Peasants are being exploited by
landlords and robbed by market intermediaries. Holdings are
getting smaller and scattered but debts and miseries are
mounting up. The personal knowledge of farmer is scanty and
shallow and his aids are insufficient and inadequate.

To date the farmers have ignored the farm-management
principles to their poverty and the nation to its peril. In­
difference to agriculture has brought our economy to its pre­
sent distressing condition and a further ignorance of these
on our part will bring in its trail a complete breakdown.
All wealth and means to develop any other facet of economy
in Pakistan, rests on agriculture. Agriculture is the
base - it must be made strong and sound organization to hope
for advancement in any other field.

In this precarious atmosphere the economist has a clear
duty to perform. He should provide the guidance which the
country needs, spread knowledge about the desperate urgency
of conserving and maintaining resources and awaken the people
to a sense of hazard which confronts them. To correct these
maladjustments is urgent not merely to conquer poverty, but
mere survival.

The backwardness and poverty which characterize our agri­
culture industry and the obstacles to its development, suggest
in themselves the objectives which we must attempt to achieve.
In a general sense the whole objective is to make the agri­
culture industry viable. The entire discussion in the study
that will be pursued will be oriented to this objective.
This study has the advantage of a vast body of knowledge and a well-developed field of "farm management" in the United States and in some other countries, and particularly the guidance of the well-experienced farm management staff at the Ohio State University. To discuss the use and application of farm management principles that can play a significant role in helping individual farmers and tenants plan their farm organization, make desirable choices and changes with changing conditions, is the main purpose of this study. Although the main object of this study is to show the micro-economic approach of applying good farm management principles to solve problems on individual farms, it is next to impossible to refrain from discussing the additional help that could be had from institutions such as tenancy, credit, market, customs, etc., when they are desirable in improving the climate in which food and fiber are produced. Similarly we could not altogether dispense with the discussion of research and education which add a lot to an understanding of the real causes of the farmer's plight, and help understand what it is they need to do to improve, and begin to follow better farm plans.
CHAPTER II

The Farm Management Approach

Defects and inefficiencies of Pakistan agriculture as outlined above are the products directly or indirectly of defects in economic, social and political frameworks within which it works. To provide genuine and healthy basis for agricultural industry in Pakistan, there is need for substantial changes in the frameworks we are subjected to. It is not the scope of this study to deal with social, religious and political institutions. This study is mainly concerned with economic aspects of the problem in question. However, it is recognized that functioning of economic institutions is greatly influenced by social, religious and political institutions. In this connection some suggestions will be made regarding non-economical factors wherever absolutely necessary. It is quite clear, as explained in the early pages, that fundamental economic principles have been neglected or not employed as a guide in the productive process. It is the job of this study, by using farm management principles as basis, to build a framework in which Pakistani farming should function.

Farm management is a part of economics which is the science of allocating the scarce means in such a way as to attain the maximum ends important to the economic unit. In farm management the unit is the farm family including its farm. Now arises the need of defining farm management
signifying its tools and scope, characterizing the family farm and specifying the goals of the farm family we tend to maximize.

Definitions of Farm Management

The following are some of the definitions given by eminent farm management authorities.

1. "Farm management means the act of judiciously and skillfully managing a farm ........ skillful management of a farm is not a simple, but a complex task involving a wide range of knowledge and skills in many fields of the art and sciences." Boss and Pond.

2. "Farm management is the study of the business principles in farming. It may be defined as the science of organization and the management of the farm enterprise for the purpose of securing the greatest continuous profit." Warren.

3. "As the science which considers the organization and operation of the farm from the point of view of efficiency and continuous profit." Efferson.

4. "Management in farming or in any other business consists chiefly in making correct decisions at the right time and then seeing that these decisions are carried to successful completion." Hudeelson.

5. "Farm management - the subject - is the presentation of business and scientific findings in their application to farming for the purpose of indicating the way to greatest continuous profit."
Farm management - the method - is the utilization of sound principles in the selection, organization and conduct of an individual farm business for the purpose of obtaining the greatest possible profit." Adams.

6. "These questions can best be considered under the heads of organization, operation, buying and selling, and financing. The term farm management is commonly understood to include all four of these." Black.

7. "These earlier pages defined management in functional terms, as the performance of five tasks - observation, analysis, decision making, action, and acceptance of responsibility." Bradford and Johnson.

7. "Farm management may be defined as the field of study which considers the efficient organization and skillful operations of a farm for the purpose of securing maximum continuity of profits consistent with the welfare of the farm family." Cage and Johnson (Principles of Farm Management, p. 3).

From the foregoing definitions it is quite evident that farm management is very broad involving many basic and applied sciences. It goes further and puts to work on the farm the theoretical facts revealed by agricultural sciences. Farm management tends to be more practical and takes facts as instruments to increase the net profit of a farm. Other sciences evolve new varieties of crops, new rations for animals, new fertilizer for soil, new techniques and methods of operations, new designs and brands of traction powers, new types of materials for buildings, etc. But which of these discoveries,
inventions, methods and materials is more profitable? If corn grew better than cotton on your soil, is there still a better use of your soil than sugar cane? An addition of a new piece of land to your existing holding may look very plausible to you, but how can you decide between purchasing the new land, for example, and buying an additional dose of fertilizer for your wheat/cotton crop? These are practical questions, they need to be answered first theoretically within each science they pertain to, and then practically on the farm, considering all the prospects of farming, weighing and comparing one alternative with another, one set of practices with the other. This job of choosing, evaluating, selecting, organizing and executing falls within the field of farm management. Farm management takes into account the findings of each agricultural science in reaching its own conclusions. It takes the place of an individual farmer and considers the farm as a whole. The main object of farm management is to obtain the maximum net profit from the various enterprises of a farm by balancing farm operations, by carefully planning and allocating the limited farm resources, keeping in mind the need to keep the soil and other resources well-maintained. It is not the return from any one enterprise that determines the financial success of a farm, but it is the total return from all enterprises that counts its success or failures. Farm management, as an integrating science of agriculture, enables us to make such judgement.

Farm management can be broken down into parts: a) decision-making or farm organization and b) supervision or farm operation.
Decision-making is very vital for the success and progress of farm enterprises. It requires experienced hand, matured mind and studied judgement. Decision-making is largely a mental activity of studying information, effecting costs and incomes and of deciding on the line of action best suited to prospects and resources of farm. It is a continuous process because world of today is in a constant state of fluctuation, it is changing and uncertain. Input-output relationship is changing every movement, and to keep it in favor is the sole aim of farm management.

Certain characteristics qualify you for this important phase of management.

1. You should be willing to take some risk. People inherit different powers for assuming risks, some are willing to undergo a calculated risk, while others are conservative and look for security, the very thought of loss makes them timid. "Actually successful farm management required balance between risk-taking and conservatism." Farming by its nature, should be remembered, is a risky enterprise more than any other enterprise. An early bird catches the worm, is more true in agriculture, as techniques and procedures are seldom patented. If you are too conservative, you will find that by the time you are willing to act on an opportunity the main profit possibilities have already been exploited. The most successful farmers are those who "stay ahead of the game." They keep close touch with research workers and put new
practices into effect before most other farmers have adopted them and the main profit margin has been wiped out. Getting the right balance between the outright risk and extreme conservatism is not a hit or miss affair. It involves mental effort and the basic process of farm management.

2. You should be mentally alert, imaginative and able to use your head in conceiving plans and narrowing possible outcome down to a range where they are feasible, reasonable and safe. "Balance between 'chance' and 'certainty' comes from the process where information and prospects are brought together, additional evidence is weighed and plans which have a reasonable chance of success are worked out." Unless we follow this procedure we "shoot in the dark" and may either forego large profits or lead ourselves to bankruptcy. The risks which surround decisions become less if sufficient information is made available and studied thoroughly. True management, as a planning and decision-making activity, does not involve physical exertion and strenuous use of arm and back, it involves mental efforts almost entirely. The greatest returns in farming are to be had from brain activity than from brawn activity.

3. Successful farm management requires learning. Good managers spend time in learning and in making decisions on the basis of what they learn. They learn from other farmers, from demonstrations and model farms, from radios, newspapers, and magazines, from bulletins and pamphlets, from extension agents and from other people dealing with agriculture. Learning and mental process must be exercised continuously because the world does change. Managers should continue to observe,
obtain and weigh information, analyse and then make decisions. This process goes on throughout the year and is important especially between years.

A successful farmer should understand the approved soil-management practices, the influence of slope and physical characteristics of soil on erosion, the availability of plant-food elements, and the response of his soil to applications of fertilizers. He should know the varieties of crops most productive for his area, the best time to plant them, and the best means of harvesting, storing and marketing them. He needs to know about plant and animal diseases, insect pests and how to control them. He has to use modern methods in animal selection, breeding, feeding, and sanitation. He should know the farm equipment fully well. He should also need to know and be able to apply the principles and law of economics to his business.

"There is probably no occupation in which experience (should be so diverse and broad) and is so necessary and in which so much time is required to obtain the experience." 29

The worst mistake a farmer can commit is to go to farming when he is ignorant and unbusiness-like. In farming practical experience is much more valuable than theoretical knowledge. The knowledge and skill requisite to the proper management of a farm is not gained without considerable

29 Warren, G. F., Farm Management, p. 4.
experience and education. Experience ripens the judgement which enables the farmer to utilize the farm resources to the best advantage.

A college degree does not guarantee success and is by no means necessary. Education facilitates efficient management, however, in the sense that it provides and develops imagination. Some of the most successful farmers have not had enough education, but they did have that vital mental alertness and became self-educated by reading bulletins and magazines, visiting research stations and model and demonstration farms keeping contact with extension agents and discussing problems and issues with people from various fields of agriculture.

**Typical Management Decisions**

We have seen how each answer to questions about physical factors in agriculture leads to further practical questions involving economic factors. Some of the most typical decisions that farm management has to make are given below.

1. To determine the combination of crops to be grown on the farm along with the crop rotation and land use system to be followed. Soil conservation if it is associated with cropping program needs also to be decided. For such a decision to be made, the farm manager has to take into account climatic conditions, soil type, topography, availability of water for crops, present and future market available, farm resources and the like. This is complex but very fundamental decision, as the success or failure depends on it.
2. To select kinds and combination of livestock on the farm. This decision depends to a great extent on the kinds of crops you selected and factors that effect crop growth. It needs also to be decided as to the degree of specialization or diversification.

3. To determine the amount of resources to be used with each unit of land or animal and level of production to be attained. In other words the farm manager has to decide the degree of intensity of production or scale of operation. Different scales of operations have their own advantages in terms of costs. One must decide how much inputs to use in each enterprise and for the entire unit so as to make it most profitable.

4. To determine the most profitable crop production and livestock raising methods and how one production material can be substituted for another. There are many ways to skin a cat, farm manager often selects the way whereby he could maximize gain at the minimum sacrifice. It is through the application of farm management calculations to the various substitutable practices that one is able to select the most efficient one that will give the least cost combination. One should always be on the look to find out ways and means for increasing the efficiency of farm business through better input-output relationship and proper allocation of resources among different uses.

5. To determine kind, size and construction of buildings. Farm manager has to consider many details to arrive at a conclusion. Some of the important factors are kind and amount
of crops and livestock to be raised at the farm, capital position, terms of tenure, future expectations, taxes to be paid for buildings, incomes from alternative investments.

6. To appraise the value of the farm and facilities associated with it. Farm appraisal and evaluation of resources also fall within the field of farm management. Success in farming depends to a great extent when and for how much you bought the farm. Sometimes this is the first and the most important decision to be made which influences your line of action and pattern of production in the rest of your active farm life.

7. Farm credit is also within the realm of farm management when it relates to farmers' situation. Farm management principles enable us to answer questions about advantages and disadvantages of borrowing, sources of loans, interest rates, time and amount to borrow, security to be offered, type and length of payment scheme.

9. Certain phases of leasing and tenancy also fall within the field of farm management, because the terms of tenure influence the effective use of resources. Farm management can tell the farmer whether he should buy or rent a farm, or whether he should own or rent a piece of equipment. Farm management reveals the advantages and disadvantages of crop-share, cash or livestock leases, and farmer can choose accordingly. Farm management can help chalk out leasing arrangements which are most conducive to efficient farming.
9. Agriculture policy is another field of importance as far as farm management decisions are concerned. Agriculture policy through its effects on prices and incomes either favor or disfavor a particular pattern of production and resource use. Farm management guides the farmer as to how he should make adjustments to take advantage of or avoid the consequences of a particular piece of agriculture policy.

10. Determine the timing of production, selling and buying, so that to hit the market when prices are most favorable. Considering all the forces and prospects that affect the prices and costs at present and in future, one can decide with the help of farm management principles whether to get and sell the produce immediately, in distant future or anywhere in between these two extremes. Farmers may be able to grow three blades of grass where previously only one grew, but if he ignores the marketing aspect of his business, his income may not show any improvement. In the field of marketing elements of time, change and uncertainty are involved which give rise to a special challenge to the farm management. If yields, costs and prices did not vary from year to year, a farm manager's first decision might well be his last. But in the actual world this kind of happy situation is not existing. Change and uncertainty are order, not exception. New techniques and inventions are breaking in every day changing the input-output relationships. National and international forces are shaping prices of tomorrow, next year, the next decade. Weather is behaving like a weather-cock yielding
to every breath of wind that blows. Raids and ruins of crop
diseases and animal plagues are uncertain and unpredictable.
Landlord and tenant relationship may be taking a new turn.

Change places real profit premiums on outstanding man-
agement. The manager's job is one of continual decision-
making, and the judgement and foresight with which he carries
out his task is the true test of his ability as a manager.
A good manager is also known by his ability "to stay ahead of
the pack" in predicting the future. He expands his enter-
prises when prices are on the upswing and while marketings
are still small. He is the first to exploit that opportunity
before everyone else "invades into it and exhausts the source
of profit.

Logical sequence of decision-making and the role of
farm management in a changing and uncertain world is as
follows:

1. It must formulate expectations of cost, prices and
yields for the future. Farming requires time, nature sets
its pace. Although farmer plans today, his results are no
better than the accuracy with which he predicts the future.

2. It must formulate a plan to meet costs, prices and
yields expectations. Correct estimates of future prices and
production means nothing unless they are fitted into a plan.
This plan must not only be in accord with the prices and yield
expectations in future, but it must also fit the goals and the
resources of the particular family farm.
3. It must put the plan into effect. Superior knowledge of predicting future is like any other resources, it is no advantage unless it can be made to produce.

4. It must bear the consequences of plans. The outcome of plans can be either good or bad depending on how efficiently future was predicted.

So far we are discussing the decision-making part of the farm management. Now we take up the other part - supervision.

Supervision includes putting the plan into effect and every day matter of getting things done. It is the "push" which spells the difference between having a 'plan on paper' and having a 'plan in operation.' Even the best plan is useless unless it is put into action.

Unsuccessful farmer "is always fixing when one should be farming; works around the edge of the job; and hurries everything he does but getting home from town." To this we might add "ponders but never progresses," and "meditates but never moves."^30

In other words, the farm manager must have drive and be orderly. After he has made up a general plan of things to be done, he must outline a specific program for getting them done. He must be able to think ahead, plan routines and follow them. In farming things need to be done and they have to be done in time, seasonal nature of operations demands it.

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In short, the object of farm management must be conclusive to tell the farmer as:

a. What to produce?
b. When to produce?
c. How to produce?
d. How much to produce?
e. How to secure higher prices for the produce?
f. How to lower the costs of production per acre, per animal or per unit of produce to enable the farmer to increase his net income from the farm business as a whole?

Definition of a Farm

Since not everyone means quite the same thing when he talks about a "farm," it is desirable to define it clearly and precisely. Broadly speaking, a farm is one or more pieces of land held or operated as a unit for the production of agriculture products. The use of the wide variety of agriculture resources has developed many kinds of farms, varying widely in size, type of products produced, resources used. Different criterions have been employed to specify a farm for example, certain acres of land, certain amount worth of products produced, job done by one person, with or without his family and/or with or without the assistance of hired employees. Such and many other classifications sometimes include such type of farms that are not normally thought of as farms, these are not typical of agricultural units, hence name and terms seem quite misleading.
We in this study are concerned with a farm as an economic unit to which farm management plans and decisions will pertain to. It has its own identity as a competitive and functioning unit and its own goals to be maximized. It is the unit of business in agriculture industry. It is the object of farm management to make this unit vital and wholesome, because it is rightly believed that "what a cell is to a living organism, so is the unit of a farm to the economic body of a country."

The vitality and growth of the organism depends on the sound condition and proper functioning of protoplasm, nucleus and other constituents of a cell. In like manner, the economic prosperity of a country like Pakistan, depends largely on the vitality and soundness of a farm unit; soundness comes through the use of the right amount and proportion of various ingredients such as land, labor, capital and managerial ability.

For our purpose a farm or an agricultural holding is the area cultivated by a farmer with or without the help of his family and hired labor. The legal definition of a farm as given by Adams is as follows: "Legally a farm generally means an area of land under single ownership and devoted to agriculture either to raising crops or for pasturage. It may consist of a number of acres of one field or many fields."

In agriculture industry, home and business are quite unseparable, this is the reason why so much emphasis is placed on family farm. A family farm may be defined as one on which

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31 Adams, Farm Management, p. 604.
the major portion of the labor furnished and decisions are made by the operator and members of his family.

**Goals of Family Farm and Farm Management**

Goals and objectives besides being vast and varied, involve many subjective values and qualitative attributes and often it becomes difficult to give them quantitative magnitudes. Farm management, which is to maximize the farmers' goals, as a result, is left bewildered. Goals of a majority of the farmers may be mentioned. Most farmers have a final goal of a high level of living and maximum satisfaction for the family. "Good family living" is the best goal for the successful manager. To some, leisure living and enjoyment of life are more important than squeezing the last nickel out of the farm.

Most farm-management research and farmers want to maximize the net farm earnings. Their approach for the most part is justified. The economic objective is the only goal which is measurable in economic terms and so is almost the only measure of the quality of management. Even those farmers which are not after monetary goal, can benefit from understanding the principles and practices that will bring the largest net return. They can follow these lines 'insofar as they are interested in the financial aspects of the business and then make the necessary adjustments to attain other objectives they like. Nevertheless, profit is important in bringing about happiness and successful living for the farm family. Over a wide range, increase in profits almost always increase the level of living of the family. In addition to providing capital for reinvestment
in the business, profits provide purchasing power and modern convenience in the home, for medical and health services, for travel, vacations, education, recreation, and for many other things besides food and subsistence which help to develop people and contribute to full life. Income, after all, is the means of obtaining many important things in life.

Since current wants are usually more pressing than anticipated ones, some farmers place a high premium on the type of management which will maximize current earnings even to the deteriment of natural resources and future income. This is often the point of view of the tenant who operated a farm with no assurance of long tenure. It is also true of the farmer whose purchase of a farm has involved him in heavy indebtedness. It may also be the case with the farmer of low credit rating who can't manage sufficient capital for the optimum operation-size. Where the short-run point of view predominates, farms may be operated with a high proportion of the land in cultivated crops; almost no soil-building programs and erosion-control practices on sloping land are adopted; and the most valuable productive top soil may be lost. Often the buildings and fences are allowed to deteriorate.

Agriculture being the basis of our economy, there is a dire need to understand the implications of decisions relative to the use of farm resources. The nation's interested in maintaining agricultural resources that will insure adequate food and fibre for present and future generations. Certain institutional arrangements provoke certain farming practices
which in turn damage the agricultural resources. There is the need to remedy both these causes and effects to eliminate waste. Most economists therefore state as one of the objectives of farm management the procurement of maximum continuous profits, ie to push income levels where farm family can have a full and abundant life for years to come and still maintain or improve the productive capacity of the farm resources. This brings out clearly that good farm management must be defined in terms of the welfare of the nation as well as in terms of the individual operator.

The Approach of Farm Management

Economics

Agriculture
Economics

Farm Management Land Rural Agricultural Economics Sociology Credit

Individual farm with various enterprises within it.

As is indicated in the diagram, farm management is concerned with the best program for the individual farm. It recognizes that no two units are exactly alike in respect to soil and other basic resources, the farmers' capital and debt position, his psychology, family ties and help, and his age and education and managerial abilities, his goals and tenure and sometimes weather and market conditions. Each farm has its own problems and organization. Farm management cannot be considered in
terms of sweeping recommendations for all farms. There is one best plan for each farm. We can set down basic principles for all farms, in other words principles of farm management are of universal application. But when it comes to deciding just what crops and livestock will be produced, how they will be produced, what practices will be followed, each farm must be considered on its own merits. The agronomist may recommend that all farmers with one type of soil should apply one-hundred pounds of fertilizer. The dairy specialist may specify the ration which will give the greatest milk output per cow. Farm management, however, asks questions such as these before it makes recommendations to any farmer. Is the farmer on this soil short of capital? Could he make greater returns by putting his limited funds into protein feed for dairy cows rather than into fertilizer? Would it pay more by renting an additional piece of land rather adding fertilizer in the holding he operates? Farm management is an integrating science and considers all the farm enterprises at a time. Farm management is "custom-built" farming.
As a science, farm management builds foundation for agricultural practices. Maximization of goals with the limited resources involves the use of the principles of economics in connection with those laws which govern the growth of plants and animals and the use of factors of production. These principles are used in making choices and decisions and apply similarly to all phases of farming, crop productions, livestock production, machinery, buildings, labor and farm practices and production generally. There is not a separate principle or rule for each single part of the business, each principle applies to all parts. On the following pages we outline several of these principles. Others will be brought out as we progress to later chapters. By following this procedure we acquire the tools to work with as we go along.

The Principle of Diminishing Physical Output

The level to which we should push yield per acre, milk per cow and marketing weight per animal revolves around the law of diminishing returns. This principle of returns also is important in specifying how large a farm we should operate or how much labor and machinery we should associate or add to our present unit. No principle is more important than this one. Had this principle not been in play, world's food
supplies would have been raised from an acre or even a flower pot. Experience of many farmers and the results from research show that there is a definite number of kernels of corn per hill which will produce the best crop with a particular type of corn, on land of a certain productivity. They have observed that if corn is planted too thin, it produces large ears but a low yield per acre. On the other hand, corn that is planted too thick makes small ears and a low yield also. Somewhere between these two extremes lies the optimal rate of planting. The following data for corn on a soil type of medium productivity at Urbana, Illinois, for the period 1943-46 illustrates the point.

<table>
<thead>
<tr>
<th>Kernels per Hill</th>
<th>Yields per Acre (bu.)</th>
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<tbody>
<tr>
<td>1</td>
<td>47.4</td>
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<tr>
<td>2</td>
<td>55.9</td>
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<tr>
<td>3</td>
<td>66.7</td>
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<td>4</td>
<td>63.6</td>
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</table>

Results of other enterprises on farms also show the same tendency.

The principle of diminishing return has special application when we are considering the level of output or yield from a fixed area of land such as an acre or from a single animal. Higher and higher yields per acre or animal are obtained only as we apply more resources to them. Fertilizer, seed, irrigation water, tractor, fuel, labor and other materials of production are resources which can be added to a fixed acre of land. They are variable resources since they can be applied

32 Case and Johnson, Principles of Farm Management, 1953, p. 42.
in different quantities to a single acre of land; the acre of land is the fixed resource. Feed and labor are the chief variable resources for an animal; they can be used in large or small quantities to attain high or low production from the single animal, which is the fixed resource. Someone has said that nature was "niggardly" when it framed the relationship between variable resources and a single acre or animal. The "niggardly" aspect reveals itself through the law of diminishing or decreasing returns. Nature is said to be "niggardly" because each added quantity of variable resource applied to a fixed acre of land or head of livestock, after a point, adds less and less to yield or output; the amount added to total yield by each successive unit of variable resources diminishes. Hence we have law of the law of diminishing returns which can now be stated as follows: "as increasing inputs of a variable agent of production are added to a fixed agent, the marginal output declines immediately or after an initial stage of increasing marginal returns." That is to say, if fertilizer is added to a fixed area of land in application of 50 pound units, the yield will increase with the first unit, and the added yield for the second unit may be even greater than the first, but a point is soon reached when the added yield per unit of fertilizer eventually declines and if enough units are added, the marginal return becomes zero or perhaps negative. The exact amount of the increase for each added variable resource unit-fertilizer, seed, feed, labor, capital, will vary for different soil, crops and rainfall, but under

Ibid., p. 44.
any given set of conditions the principle will apply. One of the most difficult problems in agricultural research is to determine input-output relationships for enough situations so as to serve as an intelligent guidance for majority of the farmers in planning their farm organizations and their operational procedures. Since there are wide variations among the individual farms, conditions which influence the production of plants and animals - that is, variations in soils, crops, weather, in the kinds, age and productive capacity of animals; and in the quality, character of labor, seed, fertilizer, the task of discovering the outputs which will accompany variations in inputs of an agent of production is tremendous and must be worked out through farm management principles on the merits of each individual farm. Farmers are forced to make their decisions on the basis of their own experiences; the experiences of their neighbors, or on the research results that are available. Unfortunately, too little research is designed to help farmers answer the "how much" questions which is very vital to them and to the nation.

The principle can further be demonstrated diagrammatically. We would take the hypothetical data showing roughly the relationships which may be expected by varying the quantity of labor and capital per acre of land growing corn (Table 3). Let us assume 12 acres of land, located on absolutely uniform soil and receiving the same level of management. One unit of labor and capital is put on the first area, two units on the second, and so on until the last area receives 12 units. The
Table 3
Illustration of Law of Diminishing Returns

<table>
<thead>
<tr>
<th>Inputs of Labor &amp; Capital Units</th>
<th>Total Yield (bu.)</th>
<th>Marginal Yield (bu.)</th>
<th>Value of Crops at $1.50 per bu.</th>
<th>Total Expenses at $5.00 per Unit*</th>
<th>(4-5)</th>
<th>Net Return (Col. 4 - Col. 5)</th>
<th>Value of Marginal Yield at $1.50 per bu.</th>
<th>Net Return from Marginal Unit (7-$5.00)</th>
<th>Value of Marginal Yield at $1.00 per bu. (Col. 6 - No. of units)</th>
<th>Net Returns Per Unit of Labor &amp; Capital</th>
<th>Net Returns</th>
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<tbody>
<tr>
<td>(1)</td>
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<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
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</table>

*Includes a fixed cost of $10 per acre for land and management.
resulting corn yields are shown in Column 2. One unit of labor and capital produces a very small yield, as the land is poorly worked and the weeds choke out the crop. As the rates of input increases, the yield increases and attains a maximum of total yield with the tenth unit. Eleventh unit produced a total yield smaller than 10 units, 12 units push the total yield further low and we will assume that larger inputs would come up even with smaller yields.

In addition to the total yields, which are the basic data determined by research, other concepts are important.

a. Additional yields or marginal yields. Marginal yield is the amount added to the total product by the addition of one more unit of input; in this illustration it is the amount of added yield which results from an additional unit of labor and capital. The second unit added four bushels (6-2) to the yield; the third unit added six bushels, (12-6) etc.

b. Average yield per unit of input. This is arrived at for any level of input, by dividing the total yield for that level of input by number of units used. When two units were added, the average yield was three bushels (6/2); for three units (12/3) = 4 and for 10 units, the average yield was was 53/10 = 5.3 bushels. The point of highest average return in this illustration comes with the seventh variable input unit.

Figure 1 is drawn on the basis of data in Table 3. In this figure the total yield is represented by the light of each bar, whereas the marginal yield is shown by the shaded area. The marginal output increases with each added unit of
labor and capital up to and including fifth unit, after which it decreases. It becomes negative with the twelfth unit.

The concepts of total, average and marginal physical product are often symbolized by the letters TPP, APP and MPP respectively. These concepts may be depicted graphically as in Figure 1. As this diagram indicates, the changes in total production associated with the use of each successive variable input unit suggest a series of steps which go up to a peak level and then starts down again. For analytical purposes, these steps are usually smoothed out and depicted by production curves. The TPP curve in Figure 1 shows the cumulative increase in total physical product (measured on the vertical axis) that comes with the addition of each successive unit of variable factor (measured on the horizontal axis) whenever an input-output relationship can be described by a continuous curve of this type, it may be described as a production function.

Three Stages

In Figure 1 are shown total, marginal and average yield. (Every production function involves three points of diminishing returns). There are certain basic relationships between these three values which apply universally (to all production functions). They may be enumerated as follows:

1. The average yield is increasing when the marginal yield is greater than the average yield.

2. The average yield is decreasing when the marginal yield is less than the average yield.

3. The marginal yield is equal to the average yield when the average yield is at a maximum (at the point of intersection of the two lines).
Fig. 1 - Total and Marginal Yields Resulting from Variations in Inputs of Labor and Capital.

Source: Table 3.
4. The marginal yield becomes zero when the total yield is at a maximum.

The foregoing concepts make possible the division of the process of increasing and diminishing output into three stages which are important from the farm management point of view. The stages are shown in Figure 2 and may be described as follows:

Stage 1. The first stage extends from the origin to the point where the average yield is maximized. At this point the marginal curves crosses the average curve.

Stage 2. The second extends from the point where the average yield is maximum to the point where the marginal yield becomes zero. The marginal yield is zero when the total yield is at a maximum.

Stage 3. The third stage extends beyond the point where the marginal yield becomes zero. The total stage in declining in this stage.

Certain facts about the three stages of increasing and decreasing returns should be noted. First, no farmer should wish to operate in the third stage, for there the total product is decreasing and the operator could maximize returns by withdrawing the variable inputs even if they may be free. It is believed that majority of the Pakistani farmers have pushed their labor inputs in the third stage. They may increase their outputs, simply by withdrawing the hands from farming, which though seem busy, but in fact, are unemployed in disguise.
Fig. 2 - Stages of Physical Output.

Source: Table 3.
This labor, which is unemployed in disguise, is a great potential for economic development if carefully handled and productively employed in the off-farm employments.

Second, no one should operate, if possible, below the end of first stage, because the output can be increased by the increase of inputs for at this point the average return per unit of variable agent is greatest.

Third, the farmer should operate in the second stage in which the marginal yield is less than the average yield but still positive.

For these reasons the Stages I and III are called irrational and the Stage II as rational.

From the physical relationships, we have determined that the farmer must operate somewhere within the second stage. But where in this stage shall he operate? The most profitable level of application of variable to the fixed factor of production depends on the cost of the factors of production and the price of the product. In the discussion of the principle of diminishing physical output, the agents of production and the resulting products are measured in physical quantities such as acres, pounds, pecks, bushels, hours, units or gallons. The combination of land, labor, capital and management which will maximize the net return per acre of land or per unit of labor and capital can't be determined until the cost of the inputs and the value of produce are known. This leads us to a discussion of the "principle of diminishing economic returns."
Diminishing Economic Returns

Different terms are frequently used in discussion of this concept. Some authors describe the physical concept as the "law of diminishing productivity" or as the "law of diminishing physical output." The economic concept is often referred to simply as the "law of diminishing returns," the "law of variable proportions" or as the "law of proportionality."

The transition from the physical to the economic concept of diminishing returns can be achieved simply by assigning a cost to each of the input factor and a market value or price to each unit of product produced. With this adjustment one can speak of the total, average, and marginal returns secured in the production process and of the total, average and marginal costs associated with these respective measures of return.

Since from the farm management point of view we are dealing with land, labor and capital and management, let us continue with the example in which varying units of labor and capital are applied to a fixed area of land employed in the growing of corn (Table 3). The labor and capital include the total expenses for seed, fertilizer, machinery, labor as well as the share of the buildings and land improvements which should be charged to the corn crop. A fixed cost of $10 an acre is assumed as the charge for land and management.

Now let us consider prices and costs by assuming that the
Now let us consider prices and costs by assuming that the price of corn is $1.50 per bushel and that each unit of labor and capital costs $5. The value of the product is shown in Column 4 and cost of the inputs in Column 5. From these data it is possible to calculate the net return per acre which is shown in Column 6. The first two units of input show a loss rather than a gain. There is a net of $15.50 per acre for the sixth unit and an increase with each additional unit until the net is maximized with the 3th unit. Then there is a decline for the additional units.

If the object is to maximize the net return per acre, eight units of labor and capital should be added to each acre of land.

The value of marginal yields is shown in Column 7. The value of marginal yield may be compared with the cost per unit of input to measure the point where inputs should stop. Each unit on input costs $5, therefore, it will be profitable to add inputs of the variable agents as long as the value of the marginal returns is greater than the cost.

The net returns from the marginal units of inputs are shown in Column 8. The returns above cost declines after the fifth unit and becomes negative with the ninth unit. It is profitable to add additional units of the variable factors as long as the net marginal return is positive; therefore, it will pay to add the eighth unit and not the rest of them.

Three measures are indicated for determining the most profitable input of a variable agent of production with a fixed
input of a second agent. These measures give answers which maximize the return per unit of the fixed agent (in this example, net returns per acre of land). These involve the use of:

1. Net return per acre (Column 6).
2. Value of marginal yield (Column 7).
3. Net return from the marginal input (Column 8).

Each measure indicates an application of eight units of labor and capital. At this point the net return per acre is maximized. The net marginal return from each unit of input is positive for the eighth unit but negative for the units from ninth onward.

The net return per acre must increase as long as the marginal return to each unit of variable input is greater than the cost; therefore these two methods of determining the optimum input of the variable agent will always agree. There are some farmers who do not think in terms of diminishing returns and speak as if the greatest yield per acre, the highest yield per animal, and so forth, always is best in terms of profit. But they think only in terms of physical yields and not in terms of cost and prices. Costs and prices are the best to locate the most profitable levels of production.

Under diminishing returns it is profitable if the resources are available, to increase level of production as long as the added return is greater than the added cost.
This is the principle: add variable resources to fixed resources as long as the added return is greater than the added cost. 32b

Influence of Changing Prices and Costs

It should be apparent that the optimum input of the variable factor, for any given scheme of physical input-output relationships will shift with a change in either the price of the produce or the cost of the input. With the cost remaining at $5 per unit, let us change the price of corn to $1.00 per bushel. The values of the marginal yields are shown in Column 9, Table 3. In this case it would pay to add the seventh unit but not the eighth. At $1.50 a bushel for corn it was most profitable to add the eighth unit.

Let us assume that the cost per unit of labor and capital goes up to $10.00. At $1.00 per bushel for corn, it would pay to add the fourth unit, but not the fifth one. At $1.50 a bushel for corn, the last unit added profitably would be the seventh. Plainly then, the most profitable level of capital and labor depends on the relationship between input cost and output prices. We must compare the added-cost to the added-return; the level of application which is best in a year may not be best in another year when prices fluctuate. Similarly the level of input application which is best on one farm may not be best on another farm where yields are different. The same principle applies wherever decisions must be made in the farm business. The task of the farmer, then, is always to ask

32b Ibid., p. 56.
himself: Will I add more to costs than to returns by making this investment or using this quantity of resource? This question can be applied to a large number of farm decisions.

These examples demonstrate clearly that the successful farm manager must be price and cost conscious if he is to get a proper combination of his factors of production. They also equally emphasize the need to improve marketing system so that the farmer should get the proper share in the dollars paid by the consumer, because it acts as the stimulus to add more units of input to make available more products, both food as well as non-food. He can (often) contract for his major costs before the crop is planted or the feeder stock is bought, but the anticipated price of the product must often be estimated a year or more in advance. This means that he must also be a student of economic conditions in general, if his estimates of the prices for his products are to be reasonably accurate.

This emphasis on prices and costs is not intended to detract attention from the very obvious fact that the optimum combination of the agents of production is also based on those physical input-output relationships which prevail for any set of conditions. In estimating as well as producing products from a given unit of input, the experienced manager has an advantage over the inexperienced one and the man with farm records has an advantage over the one who has none.

**Decision as to the Agent of Production to be Considered.**
The input of labor and capital which maximizes the net return per unit of the fixed agent of production may not maximize the

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320Ibid., p. 57.
return per unit of the variable agent. Column 6, Table 3 shows that the net return per unit of land (the fixed agent) is maximized with an input of eight units of labor and capital. Column 10 shows that the net returns per unit of labor and capital is maximized with an output of seven units.

In general, the management will wish to conserve the agent of production which is scarce or the most expensive. Land in our example was the most scarce one.

Acres Not All Same. The optimum input of labor and capital per acre of land assuming a fixed cost-price relationship, will vary with the quality of land. More labor and capital will usually be applied to land with a high productivity than to land with a low capacity. There will be a difference in the physical production schedules, with added units of labor and capital since yield increases will cease at lower yield levels on the poor soil than on the good ones. It will, therefore, be profitable to apply more labor and capital on the good soils. If, for example, a good land sells at $300 and a poor one for $100 per acre, at 5 per cent interest, the value of the annual land input would be $15 an acre for the good land but only $5 per acre for the poor land. A greater value of product must be secured from the good soil to cover these added fixed cost. By the same token, lands which have a high drainage tax, a high cost for irrigation water, or a high value per acre because of their location near a large city, bear a high annual charge and must be cultivated intensively for crops which have a high acre value.32d

32dCase and Johnston, Principles of Farm Management, p. 52.
Conflict of Interests Between Landlords and Tenants.

Under a leasing arrangement by which the product is shared by tenants and landlords, there may be a divergence of interests. Each party will wish to maximize the returns to the agents of production which he furnishes. With a crop share lease, when no fertilizer is added, the landlord wish to secure the maximum return per acre of land, since the tenant furnishes the labor and the capital, except perhaps a share of the seed. The tenant, assuming an adequate area of land, will wish to maximize the net return per unit of capital and labor.

It may be profitable to the landlord for the corn to be cultivated four times. Since extra cultivations cost him nothing, but the fourth cultivation may be unprofitable for the tenant since the cost of this input must be paid for out of his share of the crop. If the fourth cultivation costs him $2.00 per acre and adds a yield of three bushels of corn per acre worth $1.00 a bushel, this input would show a profit of $1.50 an acre to the landlord, who receives one-half of the crop, but would show a loss of 50 cents to the tenant. An owner-operator would make $1.00 profit, since he would receive an added return of $3.00 to cover an input of $2.00. Hence, an inequitable distribution of added costs and returns, can lead to distorted system of farming.33

33Case and Johnson, Principles of Farm Management, 1953, p. 52.
More Than One Resource. Quite frequently the resources used in farming are complementary. By complementary is meant that if you use more of one, you must also use more of another to add anything to yield or production. When several resources are complementary, we calculate the profitability of their use by considering them together. We simply figure the added cost from all of them. Sometimes only one has a cost; sometimes all of them have a cost. For example, tractor, labor and fertilizer are complementary materials of production since all three are used together in applying fertilizers. However, one farmer may use his own labor and not have any out-of-product cost for it. He may even side dress the nitrogen at cultivation without adding anything to power costs; he would have gone over the corn anyway. In a case such as this, it is only necessary that we consider the added costs of fertilizer to calculate profitably.

Some farmers will need to calculate profitability in still another way. In many instances about the same labor and tractor services are required to apply first quality of fertilizer as to apply any other quantity. For example, it may take 50 cents per acre for the machine and labor costs to apply 10 pounds of nitrogen; the cost is still 50 cents if 20, 30, or 40 pounds are applied. In one way, we can say that the 50 cents for labor and machine services is fixed cost. It remains the same whether we apply 10, 20, 30 or 40 pounds per acre. The marginal costs above the first 10 pounds of fertilizer will be just the price of fertilizer.
The considerations outlined here apply elsewhere on the farm. Labor and feed are complementary in livestock production, generally both must be increased at the same time. If labor is available and does not require out-of-pocket costs, only added costs of feed need be figured in putting more weight on beef or getting more milk from cows. Labor is a fixed or overhead item and its costs do not vary with production. The principle is similar in all cases: Compare only the marginal cost of the input or expense items with the marginal return from the addition to production.

**Constant Productivity of Resources**

Law of diminishing productivity is a universal one where one or two resources are fixed. In many places on the farm, however, we find variable resources not with diminishing productivity but with constant productivity. Constant productivity, where it exists, is found under two situations.

1. No resources is fixed and all are increased together, if one acre of wheat requires five hours of labor, one-half bushel of seed and $6.00 in machine and harvesting costs, and yields 30 bushels of wheat. The second acre requires an additional five hours of labor, one-half bushel of seed and $6.00 for machine and harvesting costs, it also yields 30 bushels. Therefore, the second acre is just as productive as the first. We doubled the inputs and output is also doubled. If we increase to 100 acres, with 500 hours of labor, 50 bushels of seed and $600 of machine and harvesting costs and get 3000
bushels of wheat, resource productivity is constant as the marginal product from each increase in resource input is the same. It should be noted that all resources are varied at the same time; none is held fixed.

2. One or more resources may be fixed but have surplus capacity. A farm may have a barn capable of housing 20 dairy cows. The first cow with a unit of labor and feed may produce 1200 pounds of milk, but two cows can be handled just as easily giving 2400 pounds of milk with two units of labor and feed. We still have constant productivity if the twentieth cow requires one unit of labor and feed and returns 1200 pounds of milk. The added production does not decline as successive units of cows, labor and feed are added, we have 20 times as much milk and also have to use 20 units of labor and feed. This outcome is possible only because the barn has unused or surplus capacity up to 20 cows. Beyond 20 cows the barn may get crowded and over taxed and diminishing returns may begin.

Under diminishing productivity some units of inputs are profitable while others are not. Under constant productivity, however, one increase in resource is just as profitable as another; the last input gives just as much return as the first. The following is true for constant productivity; it either does or does not pay to use the resources. Irrespective of farmers capital position, it is just as profitable to use all units of resources as to use one. If he has funds to operate only
20 acres, the twentieth acre will be just as profitable as the first, if he has capital for 640 acres, the last acre will be just as profitable as the first if the constant returns hold true.

Limits on constant returns are usually reached because management or some other resource becomes fixed. In the dairy cow example it was the final capacity of the barn. If it is not the final capacity of the barn, chicken house or machine, the management capacity puts an end to constant returns and limits how far the use of resources and production should be extended. Management can't be as efficient in supervision and making decisions when it is spread too thin. The extent to which diminishing or constant returns is encountered also depends on how many resources are held fixed and how many are variable.

The productivity of one resource almost always depends on the amount of others with which it is fixed. If capital is fixed at a low level for the farm as a whole, labor productivity will be lower than if it is "fixed" at a higher level. The following table will illustrate the point. Here we see that the added return of the sixth month of labor in northern Iowa was only \( \frac{1}{2} \) when it was used with \( \frac{1}{2},073 \) of capital, a small amount; it was \( \frac{1}{2},215 \) when used with \( \frac{1}{2},215 \) of capital, a large amount.

These figures are important for farm management, how much of one resource (such as labor, fertilizer, feed, seed, or
Table 4

Effect of Different Amounts of Capital on Labor Productivity and Income for Crops, 1950

<table>
<thead>
<tr>
<th>Amount of Labor</th>
<th>Alabama Capital</th>
<th>Northern Iowa Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low ($365)</td>
<td>Medium ($1,217)</td>
</tr>
<tr>
<td>6th month</td>
<td>31</td>
<td>57</td>
</tr>
<tr>
<td>8th month</td>
<td>26</td>
<td>45</td>
</tr>
<tr>
<td>10th month</td>
<td>22</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Southern Iowa Capital</th>
<th>Montana Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>($2,051)</td>
<td>($5,667)</td>
</tr>
<tr>
<td>6th month</td>
<td>40</td>
</tr>
<tr>
<td>8th month</td>
<td>35</td>
</tr>
<tr>
<td>10th month</td>
<td>27</td>
</tr>
</tbody>
</table>

Figures show amount in dollars added to income by one more month of labor when capital per farm is held constant at indicated amounts.

Source: Heady and Jensen, Farm Management Economics, Tables 2-4, p. 27.
capital in general), you can use profitably will depend on the quantities of other resources (land, capital, etc.) which you have or can combine with it. The productivity of one resource depends on the amount of others with which it is combined. Since farmers have different quantities of capital, land, labor and management, the program which is best for one farm is seldom best for another. Each farmer must get the right balance of resources and the best farm organization in terms of the resources he has.

Possibilities of increasing returns may also exist sometimes mainly when several of the resources are increased together. Eventually limited management capacity or other resources bring in diminishing returns. They seldom or never hold true when everything is held fixed down to an acre or cow, and seed alone or feed alone is varied.

The profit rule is same under increasing as under constant or decreasing returns. Add to resources and production as long as the added-income is greater than the added-cost.

**Cost Principles**

We have already outlined an important principle of costs, the "added" or "marginal" costs principle. Other cost principles need also to be mentioned. Nothing is more important in farming than the relationship of costs to income. Costs in farming fall under two main categories.

1) Fixed costs and 2) variable costs. Fixed costs represent farming expenses of an overhead nature and do not change with output. They are expenses which must be paid even if nothing is produced, they are no greater under bumper yield
or crop failures. Taxes, building depreciation, insurance, cash rent, interest payments for a farm, wages of labor hired on annual basis are fixed costs.

Variable costs refer to farming expenses which do vary with output; they do not occur if we produce nothing; their amount depends on what and how much we produce. Fertilizer, seed, feed, fuel, repairs and similar items represent variable costs.

Only variable costs are important in determining whether we should produce or how much we should produce. Fixed costs are unimportant in formulating decisions on different practices and different amounts of production. Gross farm returns only need to be greater than variable costs to allow profitable production. If returns are more than variable plus fixed costs we use the principles outlined above; use more resources, if capital is available, as long as the added returns are greater than the added costs. If returns are less than total costs, variable costs plus fixed costs, but are still greater than variable costs, use the same principle; add to production as long as marginal or added returns are greater than marginal or added costs. In the first case we shoot at the greatest profit, in the second, we aim at the smallest loss.

Marginal Cost and Not Average Cost Tells Us How Far to Go

In short-run the selling price must be greater than the variable cost of producing each unit of product if farming is to be carried on. In the long-run however, selling price must
be greater than the variable and fixed costs. Together these make up the total costs of producing each unit of crop or livestock and determine whether farming will be profitable. But once these costs are incurred, they become fixed costs; and we are little interested in the average or per unit cost of production. The marginal cost of each increase in yield or production is important in determining how far we should go; we go on adding resources to increase yields and production as long as the added return is greater than the added costs. Where principle of diminishing returns holds, we aren't concerned about fluctuations in the average cost of production per unit, we only need to know that the marginal returns is greater than marginal cost. As we expand production from zero onward, the fixed cost get spread thinly and thinly over per cent of output. Eventually we run into diminishing returns to the extent that increases in the variable cost more than offset the spreading of overhead costs. But we do not hold production to the level which will give us the lowest per unit cost. We are willing to increase per unit costs if added return is greater than added cost to maximize our profit. For farm practices, however, we do try to attain the low cost method of production.

**Principle of Substitution in Choice of Practices**

The principle of diminishing returns tells what quantity of resources to use on a single acre, animals or on the whole farm. But we also have to answer the question of which one of two or more competing practices is better. Here we actually are considering two types of resources which can be used to
to produce a given output. We must first decide, in terms of the returns principle, whether or not it is profitable to add either. Having decided this question and knowing that production will be carried on by one of the practices, we now ask which one gives the lower costs. This question of substitute practices or resources is one which we use in deciding bullock versus tractor power, machine versus labor harvesting, well irrigation versus canal irrigation. We are interested in knowing whether, with output at a given level or with a specified acreage or number of animals, one practice costs less than another.

Resources can substitute each other at constant rate or diminishing rates and there can be different combinations of the resources involved to produce a given output and our task is to locate the lowest cost combination. The answer to the question of the best substitute practice depends partly on the costs or prices of the resources which make up the practice. If labor is high in price relative to machines, costs may be lessened by substituting machinery for labor, if machinery prices are high relative to labor, costs may be lowered by using more labor and less machinery. But prices and costs for the substitute resources represent only one side of the picture. We also must know the number of units of one type of resource which are replaced by the substitute resource.

The method of figuring out the least cost combination will be explained by the type of substitution involved.
1. Simple substitution which involves only one unit of each type of resource. To arrive at the least cost combination, we need figure only the cost of resource or practice being added and compare it with the price of the one being replaced.

2. Practices involving many resource combinations.

a. Resources which substitute at constant rates to produce a given output.

b. Resources which substitute at diminishing rates to produce a given output. (The rate of substitution changes with each combination of the two production elements.)

While the principle is about the same, the task of figuring the least-cost practice or resource combination is more difficult where the resources in question can be put together in many combinations.

With substitution of two resources at a constant rate, the particular combination which gives the lowest cost for the given output falls at either one of extremes. Lowest production costs are attained when all of one production elements or all of the other is used alone. When the price ratio (of B to A) is exactly equal to a constant substitution ratio (of A to B), anyone of the several combinations gives the same cost for a given production.

With substitution at a diminishing rate, the least cost combination is less often realized by using only one of the production elements. Costs are minimum when the substitution ratio is equal to the reverse of the price ratio for the two
production elements; the price ratio is always turned upside down to compare with the substitution ratio. We can summarize these conditions by examining the two ratios below.

First, we compute the substitution ratio by dividing the number of units of the "replaced" resources (say A) by the number of units of the added resource (say B). Next we compute the price ratio by dividing the price of the added resource (B) by the price of the replaced resource (A). Least cost combination is reached when

\[
\frac{- \text{Unit } A}{\text{Unit } B} = \frac{\text{Price } B}{\text{Price } A}
\]

If the substitution ratio, \( \frac{\text{amount of resource replaced}}{\text{amount of resource added}} \), is greater than the price ratio, \( \frac{\text{price of resource added}}{\text{price of resource replaced}} \), then we can lower costs by using more of the "added" resource. If the substitution ratio, \( \frac{\text{amount of resource replaced}}{\text{amount of resource added}} \), is smaller than the price ratio, \( \frac{\text{price of resource added}}{\text{price of resource replaced}} \), then we will reduce costs by reversing the procedure, i.e. substitute the first resource for the second one. As nearly as possible, we would like to get the two ratios equal.

If we remember our rules for fractions, we know the statement \( \frac{\text{amount of resource replaced}}{\text{amount of resource added}} \) is greater than \( \frac{\text{price of resource added}}{\text{price of resource replaced}} \) is the same as saying that "amount of resource being replaced times its price," is greater than the "amount of the added resource times its price." In other words, we will be lowering costs if we are certain that the value of the resource replaced is greater than the value of the resource added.
Obviously then, the best ration or resource combination will differ with each change in price relationship. As in all other areas of farm management, the physical performance of practices or resource combination does not indicate which one is most profitable or least costly. Farm management considers both physical performance and price relationships or costs and then it is able to say which practice or farming method is the economic one.

So far we were considering for a given output. Now we have a type of substitution practices or replaceable resources, which not only substitute for each other but also add to production. (The examples are kinds or varieties of seed, such as hybrid corn new kinds of fertilizers). Hybrid corn, which not only replaces open pollinated corn but also increases yield. The economy of the substitute practice then is represented by the reduction in costs about not only the new practice, but also by the value added by added yields. Many practices which substitute for others and also add to yields require detailed calculations in estimating them profitably. The budgeting or planning procedures outlined in a later chapter are useful in figuring the profitability of these.

**Limited Capital and Opportunity Cost or Equal Marginal Return Principle**

Most farmers have limited capital and other resources. Therefore, their task in organizing the enterprises of the farm is one of dividing or allocating their limited capital funds, land and labor among different enterprises to produce the greatest income or profit.
Most farmers can't consider the number and sizes of enterprises in this manner because their resources are limited. Since their resources are limited, enterprises must be considered together, expansion of one enterprise or practice generally requires an equivalent contraction in another and the question is one of which enterprise will give the greatest income. The problem of enterprise combination is also one of diversification and specialization.

Only a few localities have soil and climatic conditions which call for complete specialization for maximum profit. More frequently, specialization is in terms of one major enterprise and one or more minor enterprises. Given the need for some combination of enterprises and the fact that farmer has limited capital, we must decide where each unit of labor, capital and land will bring the greatest return. The answer is given by the principle of opportunity costs, also known as the equal marginal return principle.

The principle of opportunity costs states that profits will be greatest if each unit of labor, capital and land is used where it will add the most to return. It does not say that resources should always be used where they bring in the greatest average return but where they bring in the greatest marginal return, these two are not the same.

If we examine average returns in the Table 5, our advice to the farmer would be to produce only hogs; the average return here, for a $4,000 investment is $1.25 as compared to $1.23 for poultry and $1.15 for milk cows. But this guide gives the wrong combination of enterprises. It gives him $1,000 profit ($5,000-4,000).
Table 5

Added or Marginal Returns From Using Different Amount of Capital for Three Livestock Enterprises
Principle of Opportunity Costs

<table>
<thead>
<tr>
<th>Amount of Capital Used</th>
<th>Hogs</th>
<th>Chickens</th>
<th>Milk Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,000</td>
<td>$1,300</td>
<td>$1,500</td>
<td>$1,400</td>
</tr>
<tr>
<td>2,000</td>
<td>1,300</td>
<td>1,250</td>
<td>1,100</td>
</tr>
<tr>
<td>3,000</td>
<td>1,200</td>
<td>1,090</td>
<td>1,050</td>
</tr>
<tr>
<td>4,000</td>
<td>1,200</td>
<td>1,090</td>
<td>1,050</td>
</tr>
<tr>
<td>Total returns from</td>
<td>5,000</td>
<td>4,930</td>
<td>4,600</td>
</tr>
<tr>
<td>$1,400 capital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average returns per</td>
<td>1.25</td>
<td>1.23</td>
<td>1.15</td>
</tr>
<tr>
<td>dollar invested at</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$4,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Heady and Jensen, Farm Management Economics, Tables 4-10, p. 78.

Now let us apply the principle of opportunity costs. We compare average but marginal returns for each addition of resource. If he spends the first $1,000 on chickens, second on milk cows, third and fourth on hogs. Under the opportunity cost principle we have used $4,000 and added $5,500 to gross income, the profit is $1,500 as compared to $1,000 under the average method. A farmer with only $2,000 would make greater returns from limited capital with one-half of his resources in dairying and one-half in poultry. A farmer with $6,000 would invest $4,000 in hogs and $1,000 each in poultry and dairying.
The principle of opportunity cost says that we have the best combination of enterprises or practices from our limited resources when they are so arranged that we can't change the use of a single dollar or a day's labor without reducing income. It is called opportunity cost because it considers the value of one enterprise sacrificed as a cost in producing another enterprise. The best combination of enterprises is attained not when we select profitable crops but when we select the most profitable enterprises. The combination which is more profitable will depend on the prices we receive for the different products, the direct costs attached to each enterprise and the amount of production we sacrifice as we replace one enterprise partly or entirely with another one.

The opportunity cost principle also can be used for comparing practices and enterprises on the farm as a whole. It applies to all investment opportunities in the business.

**Principles in Combining Enterprises**

The third major problem of the farm manager is that of combining crop and livestock enterprises to net the greatest profit. How far we can or should go in combining one enterprise with another, or in replacing one enterprise with another, depends partly on the interrelationships between enterprises. Enterprises have the following relationships to each other.34

1. Independent
2. Competitive
3. Supplementary
4. Complementary

34 Heady and Jensen, *Farm Management Economics*, p. 235
Independent enterprises are those which have no direct bearing on each other. The few farmers who are concerned with independent enterprises are those with practically unlimited amounts of capital.

Competitive enterprises are those which compete for the use of farmers' resources. Most farmers have limited resources and, therefore, all crop and livestock enterprises become competitive at some point. With two competing enterprises, use of resources to produce more of one necessitates a sacrifice in the amount of the other produced. If the farmer uses all of his land for sugar cane, he can't grow any cotton. When enterprises are competitive three things determine the exact combination which is most profitable.

1. The rate at which one enterprise substitute for another; this means the amount of one enterprise displaced when we add another.

2. The prices of the products.

3. The costs of producing the products.

If two enterprises have the same per acre costs, only the substitution rates and the prices of the products are important in deciding the best combination of the two. If the crops have different costs per acre, then the ratio on net prices must be compared with substitution ratio. The net price is the market price per unit less the cost per unit.

Competing products may substitute for each other at either constant or increasing rates. Two crops substitute for each
at a constant rate if an increase in one necessitates the same decrease in quantity of the other.35

If, for example, wheat and oats substitute at a constant rate of one bushel of wheat with two bushels of oats and cost per acre is same, and the prices are $1.40 and .30 cents per bushel for wheat and oats respectively, which one is most profitable to grow. We need to compare the substitution and price ratios.

Substitution ratio \[ \frac{1 \text{ bushel wheat}}{1 \text{ bushel oats}} = .50 \]

Price ratio \[ \frac{\text{Price of oats}}{\text{Price of wheat}} = \frac{.30}{1.40} = .21 \]

As price ratio is greater than substitution ratio, oats are more profitable than wheat. Arithmetic proves this. We gain two bushels of oats priced at $.30 and worth $1.50 for each one bushel of sacrificed in wheat worth $1.40.

Now suppose that wheat remains at $1.40 while oats drop to $.50. The price ratio becomes \[ \frac{.50}{1.40} \] or .36 and is less than the substitution ratio of \[ \frac{1 \text{ bushel wheat}}{2 \text{ bushel oats}} \] or .50. Wheat is then more profitable than oats. Under constant substitution or sacrifice rate it is possible for profits to be greatest by specialization in one enterprise alone.

Consecutive enterprises substitute at increasing rates with an increase in one requires greater and greater sacrifice in the quantity of another which can be produced. The exact combination which is most profitable depends on the ratio of prices for the products, the substitution rates and the per cent of cost of production. The combination which is

35 Ibid., pp. 81-82.
most profitable in one year need not be the most profitable the next year because of changes in price relationship.

Supplementary enterprises - Some enterprises supplement each other in the sense that they do not compete with each other and yet do not add directly to the production of each other. A small poultry farm, a scavenger sheep flock, a few milk cows, or a small garden may serve as supplementary enterprises on many farms. Up to some limits in size, it uses family labor, shelter already at hand and perhaps even some feeds which will go to waste.

An expansion in such enterprises up to a size or a contraction below a certain limit does not necessitate a change in other enterprises. A supplementary enterprise, however, becomes competitive if it is expanded too far.

True supplementary enterprises are independent, in that the relation of prices has no bearing on the amount to be produced if the prices for it fall too far and production of it is ceased, it will not realize any resources devotable to other enterprises. For supplementary enterprises, it is only necessary that the returns added by each enterprise be greater than its costs; relative prices or returns are unimportant.

Sometimes enterprises are supplementary for one resource but competitive for another. But it should be remembered, whenever the enterprises compete for one important resource, even though they are supplementary for another, the final relationship is one of competition.

Complementary enterprises - Some enterprises complement
each other when resources are limited in amount. One enterprise does not, as in the case of competitive products, cause a sacrifice in another. Neither does it, as with supplementary enterprises seem independently of the other. Instead production of more of a true complementary enterprise will add to the production of a second enterprise, even though we take away resources from the second product and use them for the first one. Forage seems in a complementary capacity to grain in many areas. The hay crop adds nitrogen and organic matter to the soil and increases per acre grain yields far enough to give a greater total grain crop from fewer acres; within limits, both grain and forage crops can be increased together as we shift land and labor from grains to hay.

It is true that two enterprises are never complementary over all possible combinations of the two. The complementary relationship always gives way to competition (and then be treated as competitive). If we extend forage farm enough in the rotation, grain production must eventually decline. However, as long as they remain complementary we should rearrange our resources in the direction of the one which provides this relationship. By doing so, we have more of both to sell and we need not make price or returns comparisons, as is necessary with competing enterprises.

**Time Comparison**

The final principle of interest to us deals with decisions over time. Two aspects of decisions are important in respect to time.

1. Differences in profitability growing out of time alone.
2. Differences in the desirability of investments
which relate to the risks or uncertainties which are attached to time.

Time decisions come into farm management in many ways. Should the operator produce field crops, starting returns immediately, or should he plant his field to apply trees which will not give a return for 10 years or so? Should he buy dairy cows which will produce immediately or should he buy heifers, grow them and begin production in two or three years? Should he follow a cash-grain cropping system which gives high returns now and declining returns in the future, or should he grow more hay and follow a soil building program which gives lower returns at the present but increasing returns in the future? These and all other questions relating to time can be solved satisfactorily if we have sufficiently reliable information about the future and know the operators capital position. Our first task is to figure the present value of future returns and costs in order to make comparison between alternative overtures.

Present value of a future return or cost - This is done by a process known as discounting. We simply use interest calculations to "discount" or reduce future amounts to a present day level by using a simple equation:

\[
PV = \frac{q}{(1+r)^n}
\]

where

PV refers to the present value of the future amount, \( q \) is the future amount, \( r \) is the rate of interest and \( n \) refers to the number of years into the future with which we are concerned.

Suppose we make an investment which will bring $127.63 at the
end of five years. What is the present value of this income of the future when the interest rate is 5 per cent. Substituting these quantities in the equation we get:

\[ PV = \frac{127.53}{(1.05)^2} = $100 \text{ of the present value.} \]

What interest rate to use? The relevant interest rate for discounting by a farmer with unlimited capital is the market interest rate. It represents his opportunity cost in using his investment funds. We suppose that the term unlimited capital means that the farmer has fully exploited present investment opportunities in his own business. If he were not to invest in his own business, he could lend his money out at interest.

The same rate for discounting or reducing future income should not be used by all farmers. The appropriate discounting rate should depend on the capital position of the individual and hence the opportunity returns, of using his capital elsewhere. If a farmer is so short of capital that he has not gone as far as possible with beef, if he were to invest more in beef he could make a return of 10 per cent within the year. Therefore, his next best opportunity is not as with the farmers with unlimited capital, in lending money at the market interest rate, it is investing in beef, where capital returns 10 per cent. In appraising his cropping plans, therefore, the farmers' appropriate discounting rate is the 10 per cent opportunity cost of not using the money for beef within the year.

Present amount of two costs overtime. We can compare
two costs just as we can compare two incomes in time. An example will explain the procedure. Suppose a farmer has to make a decision between building a barn costing $5,000 which will last 60 years and a barn costing $4,000 which will last 30 years, after which he will have to build a new barn costing another $4,000, thus his total costs on the short-lived barn will be $9,000. Which represents the least-cost method of building a barn? If he has ample capital and discounting at a market interest rate of 4 per cent, his comparison is as follows: He can (1) put $5,000 into the long-lived barn and not have to replace it or (2) put $4,000 in the short-lived one and lay aside $1,235 at 4 per cent interest for 30 years; the $1,235 put away at 4 per cent interest will provide him with exactly $4,000 to replace the first short-lived barn at the end of 30 years. His comparison then is between $5,000 for the long-lived barn and $4,000 plus $1,235 or a total of $5,235 for the short-lived barn. The long-lived barn is least costly and most profitable for this farmer with unlimited capital.

Now, however, suppose that we have the farmer with limited capital who can earn 15 per cent elsewhere in his business. He must compare (1) the $5,000 of the long-lived barn with (2) the $4,000 for the first short-lived barn plus the amount, invested at possible current earning rates of 15 per cent in his own business, which will replace the short-lived barn in 30 years. The equation of the present value then becomes

\[ PV = \frac{54,000}{(1.15)^{30}} = 60.42, \text{ the amount which if invested now} \]
at 15 per cent will provide $4,000 for the new barn in 30 years. The $4,000 for the one short-lived barn now plus the $60,42 to replace the second one in 30 years, is less than the $5,000 for the 60 year barn. The farmer with a shortage capital often should build a barn different from that of the farmer with unlimited capital. He can then invest more of his money in beef, fertilizer, seed, implements and other things which give a high return in the present and do not tie up so much of his capital for the future.

We have presented the basic principles which underlie farm management decisions. All questions of practices, resource combinations and substitution, size and combination of crop and livestock enterprises and investment decisions can be answered in terms of these principles. The principles explain why of profitable farm management. Use of these principles saves time and labor to make decisions and narrows down actual budgeting or planning to a few major alternatives. However, it should be born in mind that this discussion of principles has always assumed that the future was known with certainty. What our thinking must be in the face of uncertainty is an important topic of later discussions.

Much information lacking - Unfortunately, much of the basic data needed by farmers in order to make the type of decisions outlined above is not available. For the individual farmer much of it can never be made available in detail. The farming business is a complicated one involving many variables. There is so much variations in the resources of the farm and
the market they sell their products in. It is an impossible task for research institutions to develop input-output data for every possible combination of resources and products, even for a limited area. However, it must be acknowledged that there are successful farmers. The logical question follows: How do successful farmers decide on the optimum input of resources and the most profitable combinations of products. First of all, they understand the economic principles, explained above, even though they are not familiar with the term used. Second, they make themselves familiar with the research which sheds light on their problems. In addition, they study the practices of their neighbors and they also analyze carefully the experiences on their own farms. They become associated with progressive farm cooperatives or other associations, county agents, market specialists. They adopt recommended practices and get tested their soils to apply fertilizers. The more nearly a farmer succeeds in applying the principles set forth above, the greater will be his financial success.36

36Case and Johnston, Principles of Farm Management, pp. 56-58.
CHAPTER IV

SELECTION, ACQUISITION, SIZE AND MEASURES OF FARMS

In Pakistan there are all kinds of immobilities, but occupational immobility is outstanding, particularly in lower ranks. One remains, his whole life, barring few exceptional individuals who moved out of their original environments, what he is born. Farmers' son farms, barbers' son cuts hair, and so on. Explanation for this state of affairs is simple though disappointing. There are no avenues of employments to go to if one abandons his present one. In particular the chances to become owner-operators are very few and far between. Land seldom changes hands, market for land is nearly non-existent. Land is the means of livelihood, place of employment and the only asset the farmer can't buy whenever, wherever, and whatever he likes. The sons and daughters alike, no matter how many there are, on the death of their parents, rush to share each and every tiny bit of land their fathers and forefathers tussled out for themselves. There is not, therefore, much choice where to farm, a tiny and fragmented farm is given to a farmer. Everyone is in need of buying a farm, but fewer has the ability to pay for it, and still fewer has the opportunity to sell a farm.

There is also tendency among the Pakistani farmers to farm where they grew up; friends, relatives, and knowledge of
local conditions usually favor to be sticky. The land in "Nile Bar" canal colony, for example, was allotted to the farmers of the older districts in 1928, but still there are some families who have not moved to their new lands, even though those who moved now have a much better life. Also, many people lack information, initiative, and funds for moving to new locations. The main problem in this situation is the ability to adjust the farming types and practices to the environments to the best advantages.

The foregoing describes the situation in the old and already settled areas of Pakistan. The Government is very active and serious about bringing under plow the $27,400,000^{37}$ acres of culturable waste in Pakistan. The classification for culturable waste is not very scientific. It is very difficult to tell how much of this culturable waste is really potential productive land, when due irrigation facilities will be provided. A clue to this is afforded by the irrigation and hydroelectric projects in various phases of completion. As shown in the Table 6 below, at least 10,819,000 of 27,400,000 acres will be put under crops. The land in question is disposed of as follows: Some of it is given to the farmers of the older districts whose land is either water-logged, rendered acidic or alkalinized, or eroded. Another share goes to refugees who left their lands in India, and some of it is allotted to military personnel.

Here again the government decides the size and the location of

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37 Explanatory Memorandum on the Budget of the Central Government for 1955-56, p. 100.
the farms. But some portion of this land is sold in the open market and those who can afford can buy it, but they can also invest their funds elsewhere, farming to them is an alternative source of investment. It is perhaps more important that before they start farming in new areas, they should give deep consideration to shifting his resources between different industries, different regions and different enterprises or types of farming. They have flexibility at this time. Movement of ones resources to another location may earn him more than he can make during his life in refining his decisions on a particular farm at a particular spot, but his move also can result in permanent setbacks if he acts with incorrect information or insufficient knowledge. One can go to farm, and after a year or so may pull stakes, but only at a high cost. One should remember that soil, climatic, biological, transport and market conditions are very much different in these new areas than in the old settled areas. Different crop varieties, irrigation, manurial and cultural treatments are suited here. On account of this fact, the farmers who moved to Thal project area, suffered heavy losses because they tried to stick to their previous crops, modes and methods of cultivation. Some of them were so embarrassed that they quit and went back to their original holdings.
### TABLE 6

Irrigation and Hydro-Electric Projects, Their Probable Cost, Area to be covered and Probable Date of Completion

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Estimated Cost 0,000,000 Rupees</th>
<th>Area to be Covered 100 Acres</th>
<th>Probable Date of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangla Dam</td>
<td>73.0</td>
<td>3,000</td>
<td>1961-62</td>
</tr>
<tr>
<td>Gudu Barrage</td>
<td>28.3</td>
<td>2,294</td>
<td>1958-59</td>
</tr>
<tr>
<td>G. Mohammed Barrage</td>
<td>24.0</td>
<td>2,750</td>
<td>1900</td>
</tr>
<tr>
<td>Thal Project</td>
<td>15.4</td>
<td>1,167</td>
<td>1956-57</td>
</tr>
<tr>
<td>Taunsa Project</td>
<td>10.1</td>
<td>710</td>
<td>1957-58</td>
</tr>
<tr>
<td>Marala Ravi Link</td>
<td>6.5</td>
<td>200</td>
<td>1956-57</td>
</tr>
<tr>
<td>Kurramgarhi Weir</td>
<td>2.7</td>
<td>270</td>
<td>1957</td>
</tr>
<tr>
<td>Makhi Dhand Reclamation</td>
<td>1.0</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Extension of Sollable Cultivation</td>
<td>.9</td>
<td>81</td>
<td>1900</td>
</tr>
<tr>
<td>Warsak Canal</td>
<td>.7</td>
<td>3</td>
<td>1958-59</td>
</tr>
<tr>
<td>Targi Tongi</td>
<td>.5</td>
<td>1</td>
<td>Completed</td>
</tr>
<tr>
<td>Nari Bolan</td>
<td>.3</td>
<td>34</td>
<td>Completed</td>
</tr>
<tr>
<td>Anamber Weir</td>
<td>.1</td>
<td>9</td>
<td>Completed</td>
</tr>
</tbody>
</table>

Source: Akhtar, S. M., Economics of Pakistan, Volume 1, 1956, p. 121.

Deciding where to farm is a part of the farm management questions, it deals with how resources will be used just as do decisions on how to allocate the farm resources between cotton and sugar cane or wheat and oats, on a given farm. Be sure you are right on this once-in-a-life decision, be certain that the location and type of farming you pick are in line with your capital, labour, land, and managerial ability, market, and your likes and your family's enjoyment. The superior managers have an opportunity, as has been displayed by the farmers of older districts of the Punjabs in the "Kile Bar" and "Gangi Bar", Sind and Thal areas, to move from more favorable locations to less
favorable ones, where, with larger funds, hard work, and managerial ability they built the soil and run efficient and productive farms. Many of their neighbors who lacked initiative, managerial ability, funds and aggressiveness that they were left with old, exhausted and fragmented holdings which gave them small but immediate returns.

The farmers who moved to new areas as well as those who are left on the old farms should follow the management steps outlined earlier and also discussed below, get together all the pertinent information, work out plans on the basis of this information and the alternative that face them, and then select the plan most suited to your circumstances and be prepared to shoulder the consequences once you have made your decision.

Type of Farming Areas

There are some localities in which one can raise a number of products, some of which may yield the same returns. But not all products are equally suited to each locality. While it may be possible to produce the product of your interest, you may find yourself swimming upstream to do so, with price, soil, and climate against you. If you are determined to try a particular type of farming, you can swim with the current if you move where the product is favored by prices, soil, and other considerations.38

38 Heady and Jensen, Farm Management Economics, 1954, p. 33.
The location of different types of farming in various regions has not come about accidentally or through the whims of the producers. It is mainly manifestation of an attempt by farmers to devote their resources to products which will bring them the greatest net returns. Some do not pay heed to these considerations, while majority of farmers, within the limitations of their capital, adhere to types of farming according to those forces which give advantage to one or few products over others. Here below we will discuss the important forces which provide framework within which profitable and efficient farming system must be built on a farm, in a state or in the entire nation.

1. Forces that effect the prices received by farmers for different products. They include transportation and handling costs to markets.

2. Factors affecting the per unit of production of different products. They include climate and weather, soil and topography. Cost of farm supplies, labour and capital investments may also cause costs to differ.

Factors Affecting Prices:

The satisfaction or utility provided by the various farm products creates the demand for those prices, such a demand is reflected through the prices paid for the products. In order to make good profits the farmer must know the demand and the price conditions. Prices are important in determining which products should be produced in a state, region or on a farm.
Distance from the market is one of the important factors effecting prices. Prices tend to be highest near the consumption centres. Prices tend to decline as we move away from the consuming market, the decline mainly reflecting the transportation and handling costs for moving the products to the market. Producers near the market often benefit from their ability to move products to market in less time and at less cost. They can compete with the outside producers to such an extent that the distant producers may have to stop producing or supplying that particular product. The rate of decline in price with distance is different for different products. For milk and fresh vegetables it is high, therefore, their production is tended to be concentrated near the consuming markets. The long hauls would push the distant-farmers' price down to or close to zero.

The rate of decline of price due to transportation costs are affected by the following.

1. The bulkiness and value of the commodity. Bulky and low value commodities lose a greater percentage of its value for transportation and handling costs than does a high value concentrated product. Therefore, its price to farmers falls more rapidly with distance from the market than does the price for a concentrated commodity. For example, wheat selling at Rs. 10 per maund (82 lbs.), with transportation cost at 8 anas per 100 mile, decline in its price by 5 per cent, while wheat straw (bhosa) selling at Rs. 2½ per maund and also costing 8 anas per maund per 100 miles, will decline 20 per cent in its price. This explains in a way why wheat is sent to the market while wheat straw is fed to animals and sold through their
concentrated high-priced products.

On the very intensively cultivated and high-rent land just adjoining the cities, one finds quick maize or shorgam being cultivated as inter crops for fodder. The reason is that the fodder they yield is bulky and low-priced. The distant producers can only supply them at a high cost although they can produce at a lower cost, the local producers raise them at high cost but can supply them at a much lower cost so as even to make a profit over their distant competitors.

Transportation costs and geographic price differentials are not so important in specifying the location of productions for wool, tobacco, cotton and other products which are not bulky relative to their price per unit, climate soil, irrigational facilities and labor are more important in determining where they should be produced.

2. Perishability of products - Perishable products spoil or deteriorate in quality if not handled properly. Prevention of spoilage usually involves extra cost through the use of expensive equipment. Long distances add to risk of spoilage. Transportation costs tend to be high for these products and often represent a high percentage of their final market price. Milk and fresh green vegetables are in this category of products and tend to be concentrated near the points where they are consumed.

3. Losses in weight through processing - Products which lose much weight in the process of conversion to edible form can be produced at locations away from the market, those which lose
little are produced close to market. Whole milk and fresh vegetables lose none of their weight before use, are produced near the market, while milk for cheese may lose about 50 per cent, (beef about 30 per cent), milk for butterfat 80 per cent and milk for "ghee" 90 per cent of the weight, and therefore, are produced away from the market. It seems that Pakistan has so far overlooked this phase of its productive potentialities.

Factors Affecting Local Costs

Natural forces including soil types, topography and climate are among the important factors affecting yields and the cost of producing different commodities at different locations. These establish the basic level of yields on the yield potential. If they favor high yield in one location the cost per unit will be low, if the yield is low, cost will be high. Of course it is cost and price together which determine profitable production and the system of farming in every farming region. If the yield is high and cost per unit is low, profitable production is not guaranteed; a low price for the product can mean a low profit margin even if yield is high and cost is small.39

The factors that affect yield and costs are discussed below:

1. Soil - The soil along with its texture structure, nutrients, depth, topography and drainage is of prime importance.

39 Heady and Jensen, Farm Management Economics, 1954, p. 39
in determining the yields, costs per unit, and range of crops which can be grown in a locality. Crops raised on a land in turn specify the kind of livestock that can be raised to advantage. High yields for cotton, sugar cane, wheat, tobacco, most vegetables, maize, etc., are to be found on soils where natural fertility is high. In certain instances these crops were grown on inferior soils improved through the use of fertilizers and other soil building practices. On the other hand, when the fertile tracts in old settled regions lost their productivity due to continuous cropping, water-logging acidity or alkalinity, and the like, rotations included the crops but mentioned above. There are some crops like millets, some oil seeds (Tara Mera), barley, shaftal (clover), that do well on soil of low fertility. Watermelons, guar, gram, and other pulses, do well on a light sandy soil.

The Department of Agriculture, West Pakistan, have evolved a number of varieties of crops like cotton, sugar cane, rice and wheat, that now can very successfully be grown on soil where previously they were not profitable propositions.

In most regions a wide range of crops can be grown, soil conditions only define this range, they do not specify which of the possible crops should be grown; prices, costs and other economic forces determine the final choice.\(^4\)

2. Topography - Topography is somewhat related with climate and soil in its effect on system or type of farming.

\(^4\)Ibid, p. 40.
Changes in elevation usually result in changes in climate. At higher elevations there is a shorter growing season and lower temperatures than at lower levels in the same general locality. This means that a different cropping system and livestock program must be maintained for such areas in contrast with nearby lower regions. For some producers this may be an advantage although it means a variation in the type of farming between the valley and the hillside. Fruits growing can be an economical proposition there.

Similarly, different kinds of soil occur at different elevations. The more fertile soils are usually found at the lower elevations and the infertile shallow soils at higher elevations. When this is true, the type of farming must vary because of the soil rather than because of topography.

Apart from these interrelationships, topography has a definite effect on types of farming. Rough and rolling land is less adapted to intensive corps. Farm machinery can’t be used to advantage on steep rough land. Intensive crops requiring large application of labor for cultivating and harvesting may be produced advantageously as labor is abundant and cheap if there is no competition from the products on the level land.

Topography is an important factor in the effective distance to market and in types of farming as determined by marketing cost. A distance of five miles to market over a level well-drained road is much less than the same distance over a steep hillside road and requires less power and time. This difference is even more intensified if the area has snow and ice in winter.
For farm products which must be delivered to the market daily or more frequently this issue is important.41

Topography can also serve as a barrier to the continuation of diseases in certain crops. The example can be cited of potatoes, which if grown on plains in West Pakistan for 3-5 consecutive years become very susceptible to a disease. But, if within this span they are raised once on the hills for seed, the disease does not appear.

3. Climate - Climate is the most important single factor determining the limits of farming areas. Climate includes rainfall, the length of the growing season, the temperature, the amount of sunshine, the severity of winters, and the frequency of storms, hails, hurricanes, and similar dangers. Rainfall considerations involve the total annual precipitation, the distribution of the total rainfall especially during the growing season, the variation from year to year, and the evaporation ratio. The length of the growing season involves the average number of days between the last killing frost in the Spring and the first killing frost in the Fall and the variation of these climatic factors may cause major differences in the kind or type of farming between two regions.42 Climate molds the type of farming through its effect on yields and costs. Climate is an important determinant of profitable fruit production.

42Efferson, Principles of Farm Management, 1953, p. 131.
Below freezing temperature of only a few days will kill tomatoes, potatoes, and some of the fruit plants especially of the citrus family. The crops and plants of this category should be restricted where such temperatures never occur.

Cotton, sugar cane, corn, tobacco, soybeans, peanuts, besides fertile soils, require a long growing season with ample moisture (rainfall or irrigation) and long and warm growing days. High yields and low costs for wheat, potatoes, turnips, clovers, (bersem, lucerne, shaftal,) oats, are favored by somewhat cool, stable temperature and high rainfall during the growing season.

4. Biological forces - Biological factors like insect-pest, diseases, weeds, parasites, etc., sometimes cause yields to drop, thus favoring the other regions free from them. These can be controlled and held in check, therefore, they are less fundamental than soil, climate and topography as factors determining the types of farming regions.

The Principle of Comparative Advantage

There are two types of advantages in the production of a product. One is absolute advantage which refers to the arithmetic magnitude of the margin between costs and returns from the resources. The bigger the margin for one product in one area than in another, the bigger the absolute advantage the first area has over the other one. The other advantage is comparative or percentage advantage, stated in another way, this means that producers tend to produce those products which can be produced at the lowest relative cost. Comparative advantage is basic, not the absolute advantage which looks at the yields alone, in
determining the establishment and continuance of the types of farming areas. We shall illustrate this with the help of figures given below.

<table>
<thead>
<tr>
<th>Region</th>
<th>Crop</th>
<th>Costs (per acre)</th>
<th>Returns (per acre)</th>
<th>Net Returns Per Rupee Invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nile Bar</td>
<td>Cotton</td>
<td>Rs.150</td>
<td>Rs.290</td>
<td>Rs.93</td>
</tr>
<tr>
<td></td>
<td>Sugar-cane</td>
<td>400</td>
<td>700</td>
<td>300</td>
</tr>
<tr>
<td>Sandal Bar</td>
<td>Cotton</td>
<td>160</td>
<td>270</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>Sugar-cane</td>
<td>420</td>
<td>800</td>
<td>380</td>
</tr>
</tbody>
</table>

Soil and climate of the "Nile bar" are favorable to cotton and sugar cane. Looking only at the absolute returns, the recommendation to the farmers in this region will be to produce alone i.e., specialize in sugar cane. But that advice will be faulty; the reason is found in the comparative advantage. This region has a high percentage advantage in cotton production, because a rupee invested in cotton will return rupee .93 back while a rupee that goes into sugar cane production only returns rupee .75. They will make more profit by raising cotton than sugar-cane. It is not that they can't make profit on sugar cane, but on cotton they make the greatest profit. Similarly, the farmers in the "Sandal Bar" can make some profit by producing cotton, but they make more profit by producing sugar cane where the comparative advantage is greatest or comparative disadvantage is least. Successful farmers do comply with this law, reward for which is the highest profits.
This is all there is to the law of comparative advantage. It simply states that if farmers want the greatest profit, they should produce those things considering yields, costs and prices, in which the relative or percentage returns are greatest; it does not dictate production in line only with absolute or arithmetic advantages. It is the part of opportunity cost principles which says use each rupee of capital, acre of land, and day of labor where it gives the greatest return. Comparative advantage extends a greater distance for some products than others. Develop the main enterprise as long as it has a comparative advantage and gives a greater return than any other enterprise. As soon as another competing enterprise will give a greater return for labor, capital and land, adopt it.

Size of Farm and Enterprise

From the point of view of agriculture efficiency what is important is the size of the farm as a cultivation unit and the degree of coherence or contiguity of the land comprising it. If the holding in the sense of a cultivation unit is too small, the resources of the farmer, of family man power and of animals and equipment, are inefficiently utilized thereby causing the cost of production to rise, and reducing the net profit of the farm operation. Poverty in agriculture is as much a problem of farm size as of any other single factor. The great majority of farm families with low incomes live on undersized and inadequate units. This statement applies not only to Pakistan, but

even to the United States agriculture. Even in the fertile, newly settled and irrigated canal colony regions, the bulk of the farmers with low incomes are those with little capital who operate small units.

Mechanical cultivation and such improvement as sinking of wells and construction of drains requiring large areas for the feasibility and economic operation become impossible. Moreover, unprogressive agriculture and uneconomic farm size are cause and effect of each. For capital formation to occur, it is necessary that farming should produce a marketable surplus of agriculture commodities. Under the existing conditions, farming leaves too small a margin for the small peasant proprietor, the tenant and the agriculture laborer to allow for savings and the net capital formation on their part is almost negligible, hence they are unable to invest. Therefore, the agriculture is unprogressive. There is a vicious circle of poverty and stagnation all around. Disadvantages of small farms can be summarized as follows:

1. There is no proper coordination of land, labor, capital, and management to get the maximum possible returns per unit of input.

2. The scope for more economical use of labor is limited. More productive work per man is not accomplished.

3. Overhead charges such as depreciation, interest, maintenance, storage, watching, etc., per acre or per unit are high.

4. The scope for unproved agricultural practices is limited.
5. The possibilities of diversified farming is limited on an economic ground.

6. In marketing of agricultural produce, the small farms have smaller advantages than large ones and stand a greater chance of being exploited.

Small farms afford the following advantages:

1. In periods of low prices the losses are smaller. On such farms total costs are relatively small and per unit cost is comparatively less than on a large farm.

2. The farmer can devote personal attention to every detail of farm business, especially to vegetables and fruit crop cultivation.

3. Intensive cultivation can easily be practiced with manural and irrigation facilities.

4. A social advantage is that a small farm implies a wider diversion of landed property while the political advantage is that there is a large class of peasant proprietors.

5. The farmers of a small farm can withstand the period of economic depression or adverse weather conditions with relatively less loss.

The following are the advantages of a large farm:

1. There is a proper utilization of land, capital and management with the result that the farms provide lower costs per unit and larger net returns.

2. Labor saving machinery and implements can be employed with profit.

3. There is a greater advantage in buying in bulk necessary supplies and services and selling farm products. In
this way great economics are affected in marketing.

4. There is a better balance in the organization of the farm. It is possible to have diversity of business. Subsidiary industries can profitably be taken up and by-products well utilized.

5. The overhead cost and investments per acre and per head of livestock are lower, because full use is made of farm equipment and implements.

6. There are facilities for conducting research and experiments in relation to farm business. As a result, there is a wider scope for effecting improvements.

On some farms, however, more capital and larger farms could not increase income, because operation and organization is inefficient; a greater volume of business might even mean losses. They have mostly organizational problems. The reason they can't eliminate small farms is that in agriculture there are economics of linear nature, after a certain stage, there are no economies of scale, to attain those economics one has to double the unit of business. The disadvantages of the large farm are as follows:

1. There are greater losses during depression or adverse weather period, because the total cash are relatively large.

2. There is an increasing difficulty of supervision over a wider area leading to some slackness on the part of labor force. The inefficient use of labor reduces the advantage of large farms.
The general relationship of size and production rates under different price and climatic conditions is as follows:

### Income Expectations of Different-Sized Family Type Farm

<table>
<thead>
<tr>
<th>Price and Weather Conditions</th>
<th>Lowest</th>
<th>Low</th>
<th>High</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Extremely favorable year</td>
<td>Small low yield farm</td>
<td>Small high yield farm</td>
<td>Large high yield farm</td>
<td>Large high yield farm</td>
</tr>
<tr>
<td>b. Average year</td>
<td>Small low yield farm</td>
<td>Large low yield farm</td>
<td>Small high yield farm</td>
<td>Large high yield farm</td>
</tr>
<tr>
<td>c. Extremely unfavorable year</td>
<td>Large low yield farm</td>
<td>Large high yield farm</td>
<td>Small low yield farm</td>
<td>Small high yield farm</td>
</tr>
</tbody>
</table>

**The Most Preferable Size of the Farm Business**

As we have seen, different sizes have advantages and disadvantages in terms of cost and prices, stability and progressiveness. But one question remains unanswered. What is the most preferable size of farm business?

Choosing the correct size of farm is more important to a farmer than to most other businessmen because of the slow turnover in agriculture and the long-time permanency of the farm business. The most serious weakness of agriculture in Pakistan is that many of the farms are not sufficiently large to utilize fully the available family labor. Therefore, they fail to achieve economic efficiency which results from the optimum combination of land, labor, capital and management. The

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optimum size of a farm business is one which give full scope to the application of the latest and most efficient techniques of farming evolved by science for the environment concerned. In other words, it should lead to the most economical and productive use of the resources of the country.

According to Keating, the economic size of the farm is one which allows a man chance of producing sufficient to support him and his family in reasonable comfort after paying his necessary expenses. 45

Dr. Mann writes, "It should be enough to maintain a family at the minimum standards of life." Others define it in relation to the standard of comfort to which a cultivator is accustomed. Some people maintain that the economic size of the farm should provide full employment to the family of a normal size by affording it a reasonable standard of living and should be in relation to the factors of the agricultural economy of the region.

It costs less to the landlords and middlemen but they sell at high prices due to their advantageous positions. On the other hand, it costs more to the tenant farmer, but he sells at lower prices. In addition to this price-cost disadvantage, pressure of population on land and lack of non-farm employments, the cultivator sticks to farming but more unprogressively. Thus, there is a talent pressure in the country to extend the size of the operation units to make a more effective use of

45Keatings: Rural Economy in the Bombay Deccan, 1912.
46Mann, Land and Labor in Deccan Village, 1917.
both labor and capital on farm. Many have incomes which return little to their labor, they have small farms and little capital per worker. They should either expand or quit, but can't quit. For their survival and growth they must shift to somewhat larger farms using more capital per worker and realizing more of the economies associated with modern farming techniques.

Several obstacles serve to retard and maintain the low income in efficient farms - lack of information, education, efficient market, lack of credit facilities, lack of employment, immobility of people, political and provincial barriers to the people to move out in areas where land is available. Due to self-sufficient nature of industry, large family labor with no opportunity costs, or few out-of-pocket costs, can linger on longer. Land values have remained at peak levels or have crept upwards even while farm income have been declining. This firmness, or even upward pressure in land prices can be attributed to the fact that there are cost economies of scale. There is a hunger for land, while everyone needs, only few who are already rich, can pay for it. A farmer with under employed resources realizes larger marginal profit on an acreage added to his original holding. Seldom a farm is "vacated" but if there is one, frequently it is annexed by farms which already are large in acreage and in amount of capital per worker. Farmers with a small equity are more often prevented from expanding even though it is here that capital per worker is smallest and effective employment of labor is least.
The major adjustment required in Pakistan agriculture is obviously that of farm size. It is through larger farms that the labor force will be effectively utilized; the amount of capital per worker will be increased, modern techniques will be adopted; the margin between product prices and costs will be widened. There is a dire need through detailed investigation to determine and lay down the size of such farms for which costs are lowest, beyond which there are slight economies in terms of profit per unit of crop product. Such a size should be the minimum size, below which it should not fall. Such a farm will be economically sound, wholesome, self-sustaining and self-supporting. Due to large labor inputs and linear relationship of cost in Pakistan agriculture, a farm bigger than this size would have to be doubled in every respect to reattain the least-cost combination. Super sized farms will not engulf it. Such a family farm can and will continue as foundation of Pakistan agriculture. A strong progressive system of family farming is unlikely to survive/persist overtime, unless it can get hold of such a size. Oft-spoken and long overdue agrarian reform in Pakistan which aim at high production through distributing land to owner-operators will defeat its purpose if it fails to take this point into account. Proprietorship will, no doubt, restore the incentive for higher production, but final results is the function of the proper mix of factors - land, labor and capital - manifesting through cost and prices. To attain such a cost-price relationship without proper size is next to impossible. The nature of cost economics
land is the fixed factor, which can't be increased, equipment used must be of a kind and amount which would give best results when combined with the given piece of land. But there is a certain minimum below which even the most primitive equipment can't be reduced. The result will be an uneconomic holding if the area is too small. If an average rural family is the indivisible factor, land and equipment must be adjusted to its labor and financial resources. Again, paucity of land, rapid population growth, nature of law of inheritance, absence of non-farm employment, may render an economic unit uneconomic, within a short span of time. But as said before, acreage, as a measure, is not sufficient. It is inadequate as a measure of farm size because it considers only one resource input - land.

Labor and capital, as is clear from the table below, are equally important to influence the size of farm business in terms of income or the amount of product produced.

<table>
<thead>
<tr>
<th>Farm Acreage</th>
<th>Bu./Acre</th>
<th>Capital</th>
<th>Labor Month</th>
<th>Total Bushel of Corn Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>480</td>
<td>40</td>
<td>x</td>
<td>13</td>
<td>19,200</td>
</tr>
<tr>
<td>240</td>
<td>40</td>
<td>82</td>
<td>16</td>
<td>19,680</td>
</tr>
</tbody>
</table>

Farmers which use large amounts of capital and a small acreage of land are said to be intensive units; size or volume of output has been increased by intensification on a given area. Farms which use large acreages relative to labor and capital are said to be extensive units; size or volume of business has been increased by extensification. From a practical farm management standpoint, problems of farm size pose these questions.

Should I expand my farming operations by intensification or extensification? If the farmer has unlimited capital, he may well follow both routes; he may add more acres and operate more intensively on those he already has. The principle to be used in the one of added cost - added return. As long as annual marginal costs are less than annual marginal returns for intensification, he should intensify, he should follow the same principle for extensification. If the farmer has limited capital, he should set down a partial budget and see how much he can add to income (considering the capital and the funds to be available for annual expenses), by adding fertilizer, irrigation equipment, livestock and their equipment. Then he can set down another partial budget for operating more acres and estimate how much he can add to income. He will then apply the opportunity cost principle.

Input of labor is just as meaningful as input of land in measuring farm size. As in case of land, however, not all labor is of the same quality; and productiveness, labor input need not give a true measure of size because of this, and also because machine capital may be substituted for labor without changing production materially. Care must be exercised to see that labor is gainfully employed, because in a country like Pakistan, lot of labor on the farm is unemployed in disguise, it does not add a bit to the farm output. Some people "standardize" labor units to measure size by computing the number of days of labor which would be used if all farms used the same method or techniques - an obvious unreality where large and
small farms are adapted to different techniques. These standard labor inputs are called productive man work units (sometimes abbreviated as PWU or MWU) and are worked out as below:

1. Acreage under each crop X calculated rate of labor.
2. Number of productive animals, in beef, dairy, or on any other livestock enterprise X calculated labor requirements.

In this way the size of different type of farming can be compared in terms of man-work units.

Others use the farm's total capital investment as a measure of size, land, buildings and equipment are included along with all other capital. This is a fair general measure but does not eliminate all of the problem of measurement.

No single category of resource seems to measure farm size. The best measure would be one which combines input of capital, labor and land. Acres, month and dollars can't be added easily. Therefore, an aggregate or overall index of inputs must come from putting a dollar value on resources used during the year, and adding these. If we compute the rental value of land, the wage value of all labor productively used and the interest value of all non-land capital and add these to the annual expenses (excluding taxes and interest payments) we have an acceptable measure of scale, it reflects the value of all resource services used per year. 48

Volume or value of output gives aside from fluctuation due to extremely favorable or unfavorable weather, a pretty good single measure of size. The volume of output is closely

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48 Ibid, p. 452.
associated to the quantity of resources used, whether the proportions are high in the direction of capital, labor or land. Where farms produce several products, output must be measured in terms of dollar sales (or sales plus or minus inventory changes of crops and livestock), in order to convert them to common denominator. Some people subtract the value of purchased items from this gross sales or products, since this part of the volume is not produced on the farm.\footnote{Ibid, p. 452.}

We may increase size by means other than land, but we must remember that there is a certain minimum acreage below which even the most primitive equipment cannot be reduced. Besides this lack of capital and credit facilities, inferior managerial abilities to combine resources, risk and uncertainties, the economic holding must be conceived of in terms of an area which would give a reasonable standard of living to an average family. This concept is useful when taking measure to forbid sub-division of holding below a specified limit. It is obvious, however, that this minimum would vary with the type of soil, irrigation facilities, crop rotations, marketing facilities, prices of the farm produce as against price of the goods purchased by farm families. It will vary over space as will over time. No mathematical decisions are possible and only rough estimations can be made at a particular point of time and geographical location, such as 12½ acres of irrigated and 20-25 acres of rain-fed areas. When we are thinking in terms of maximum (for instance, while fixing ceiling to ownerships) it
is convenient to visualize the economic holding as an area which could be best exploited with the use of the most up-to-date techniques of production, a best indication of which will be where the cost advantages cease to increase or cost disadvantages are at their minimum. There should be left the scope for the co-existence of both kinds of economic holdings (minimum and maximum) though in the main they will have to be of the smaller size, in order to install proprietorship to restore incentive for high production and absorb maximum of labor power which is plentiful in the country. But such a size, in no case, be smaller than the size permitting least-cost combination.

**Ways of Increasing the Size of Farm Business**

To develop a real effective answer to the problem of un-economic farms, one has to understand what brings them about. The danger of small, scattered and uneconomic holdings arises mainly from the absence of non-farm jobs, rapid population growth, lack of capital and managerial abilities, attachment to landed property and the working of the law of inheritance on ownerships which get reduced as generations pass. Each of the heirs tries to establish an independent farm taking from each type of soil a bit, however small it may be and however apart they fall. The holdings are not only uneconomical, they are fragmented and scattered over a wide area. As long as these causes are at work, the effect must persist.

The problem of adjusting the undersized farms is, therefore many fold, it involves:
1. How to turn ownerships below the economic level into economic holdings?

2. How to insure that through the working of the law of inheritance, which is given on religious grounds, these and other economic holdings will not again get sub-divided into economic units?

As to the creation of economic holdings these are the possibilities:

1. An important method of increasing the size of the family-farm type is by adding to the land area of the farm. This can be accomplished, theoretically, in a number of ways.
   a. By renting additional land.
   b. By purchasing additional land.

Now, let us see what there is in these possibilities as far as Pakistan is concerned. The renting possibilities has the disadvantage that suitable land may not be available which could economically be operated from the original farmstead. Renting is also unstable, the owner may sell the property, cancel the lease or make the lease uneconomical by raising the rent. Moreover, the cry for agrarian reforms in Pakistan is, in fact, protest against defects in renting and leasing. Tenancy has killed the incentive for higher production, led to explosive farm resources, created class friction and bred political instability (the disease can't be its own remedy). Let us be realistic and should not resort to remedy the disease by the very disease itself, unless the farm leases are made equitable, a subject of later discussion.
Possibility of purchasing additional land looks also remote. All the purchasable land is already purchased and is under plough. Those who need to purchase have nothing to pay for it. There are practically no farmers willing or able to relinquish their units so that others can annex these to increase their holdings, the reason being that non-farm jobs are non-existent. Selling of land is equivalent to buying starvation or serfdom (what a choice?). The government should give preference to the holders of uneconomic holdings in the allotment of vacant land in the Village.

We have to look somewhere else to make the holdings economical.

2. Supplementing uneconomic units by newly reclaimed lands. This in effect would take the form of moving the excess agricultural families from the congested areas to the newly opened up areas through colonization. There is some arid, marshy and submerged under-water and elevated areas which may be brought under plough by canal irrigation, pumping water, digging tube wells and running with hydro-electricity and/or through the development of new techniques which could make it economically possible to operate it. As mentioned at the beginning of the chapter, there are a number of irrigation and hydro-electric projects under the various stages of development for these purposes. But it should be remembered that in the old districts a significant area each year is rendered unfit for cultivation due to water-logging, salinity and alkalinity of soils and soil erosion. Against which, so far, no effective measures have been evolved which a farmer could adopt
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economically. The scope of reclamation, thus, does not seem large enough to solve the problem of land shortage.

3. Releasing areas from large estates through fixing ceilings on ownerships. This has been the biggest hope and drive behind the agrarian reforms movement in Pakistan. The hope here too has been deceptive and unrealistic because no excess land will be available since these areas are already under cultivation in small units by tenant families on whom property rights will be conferred, if land reforms came through.

4. Encouraging owners of uneconomic units to adopt joint or co-operative farming. For this purpose it will be necessary, as a first step, to define in terms of areas of different kinds what will constitute an economic holding in the sense of a minimum area necessary to maintain a rural family in a reasonable comfort. Cultivators who are cultivating areas below this level may then be asked to combine among themselves in order to create an economic size farm. Lack of co-operative spirit among the uneducated rural masses should have to be corrected before embarking upon such a scheme.

5. Consolidation of holdings. As explained earlier, one of the worst features of our agricultural system is the fragmentation and scatteredness of holdings. This feature gives rise to a lot of dis-economies and inconveniences. The answer can be sought through the consolidation of holdings. It is in reality the substitution - by exchange of land - of a compact block for a number of scattered fragments. By this process, all the land of one holder may be formed into one plot only, or in a few plots of different kinds of soils.
Some consolidation work is going on in the country, but it is very, very slow. People, somehow, have developed a deep attachment with the holdings and are very reluctant to exchange them for a consolidated block. When the consolidation was done on voluntary basis, only 800,000 acres were consolidated in 60 years.\(^5^0\)

Now the law permits consolidation if two-thirds of the land owners owning not less than three-fourths of the cultivated area agree to do so. Progress even now is slow, in spite of the fact that government participates in the work and bears the cost of staff required for the purpose. More recently trends are to make certain provisions for compulsory consolidation of a village if the government thinks it necessary. The main difficulty is said to be the lack of trained personnel and finance to undertake the work. Slow progress is also attributed to the tedious procedure of defining property claims to areas equating different types of soils and other conditions of different fragments. There is a lot of scope for bribe, suspicion and dissatisfaction which kills the response and cooperation. To please everyone is a problem. One way would be to start by consolidation of cultivation, leaving consolidation of ownership to the slow process needed for them.

For this purpose Professor Otto Schiller (an F.A.O. expert) scheme is worth consideration. In its bare outlines the scheme involves the acquisition of cultivation rights from the owners on the part of a co-operative society, formed for the purpose

\(^5^0\)Akhtar, S. M., Economics of Pakistan, Volume 1, 1956, p. 229.
of improving farming methods. The owners will receive rents from the cultivators, not directly but through the medium of the co-operative society. The land is then pooled and divided into economic units. Specified for the village concerned. If the number of cultivators is more than the number of cultivated units, joint farming may be resorted to. Individual farmers are then assisted by the society in the matters of purchase of seed, implements and other requisite of husbandry and also in the matter of finance and marketing of produce.

Such a scheme has a number of advantages.

1. It avoids the political and social complications inherent in disturbing the existing property rights in land and allows consolidation of fragmented and uneconomical plots into economic sized units.

2. It opens up possibilities of collective efforts in certain farming processes and common rotations.

3. It makes it possible to supply the latest techniques to the agriculturists through the medium of and under the direction, supervision and guidance of a co-operative society, which has access to these techniques and possesses resources for implementing them.

4. It breaks the landlord-tenant link, thus freeing the tenant from the social and political pressures exercised by the landlord, thus promoting incentive for cultivation.

(It appears to offer a workable solution of an extremely basic problem which so far has remained untraceable).

The scheme, however, assumes a minimum of the co-operative spirits among the people. It assumes that land owners as a
class will favor being deprived of certain privileges of ownership to which they have got so used. Fragmented properties of different persons when come under consolidated cultivation units of different farmers will be given the same care to preserve their fertility and conserve their resources. The cultivator is assured that the tenure is long enough to undertake a permanent improvement and reap its benefits.

We may suggest that if property rights in land are also conferred on the cultivator, the significance of the scheme will be improved enormously. Instead of putting the entire country under the scheme at a time, if the start is made on a modest scale to refine the scheme through the establishment of pilot or model villages to serve as centers of experiments, avenues of demonstrations and media of public education, the outcome will be more sound, sure and safe.

**Increasing Farm Size by Intensification.**

The effective size of most farms can be increased by producing more intensive crops and livestock on the same land area. This method provides for size enlargement without the necessity of buying or renting additional land or moving to a larger farm, but does necessitate capital ability, good management and a change in the system of farming to some extent.

1. Size of the farm business can be increased by increasing the fertility of the soil by following green manuring, fertilization, good rotations and other improved methods of cultivation. Steps to achieve this end have been incorporated in the laws of some countries, for example in the United Kingdom, the Agricultural Act, 1947 empowers the county council to enforce
reasonable standard of good husbandry. In Pakistan there are legislations for the protection of land and vegetation for soil conservation. Cotton Control Act, 1949, make it incumbent on the cultivators to use improved seed specified for the area. There is a great need to force and guide the farmers on the similar lines which will increase the effective size of the farm business.

2. The expansion in the size of the farm business by intensification can be accomplished by substitutions or additions to existing crop and livestock enterprises. With crops this can be done by replacing current crops with more intensive crops that require more labor and capital per acre and return higher total receipts per acre. An acre of most vegetable crops requires three to five times as much labor as an acre of corn and brings in a much higher gross income per acre. Thus, an acre of cabbage or peas is equivalent to 3-5 acres of corn and the replacement, acre for acre of corn with vegetable crops results in the enlargement of the farm business.\(^{51}\)

With livestock, the replacement of an addition to existing livestock with more intensive ones will produce the same result. The addition of a chick-raising enterprise to the existing laying-hen flock and/or replacing beef herd with dairy cows, enlarge the size of the farm business.

Similar results can be achieved by increasing the intensity

of cropping. Instead of raising one or less crops in a year, three or four crops can be raised on a piece of land. The instances can be found where some farmers are raising four crops in a year, i.e., maize - potatoes - potatoes and tobacco, even five crops can be grown in a year with the rotation; cabbage, cauliflower, onion, cucurbits and maize as fodder. There are tremendous possibilities in this phase of farming. Out of the total cultivated area in Pakistan, less than 10 per cent bears crops more than one. Nearly 12,607,000 acres of "current fallow" in Pakistan is left without crops during a particular year in order to allow it to recuperate its productive powers through the action of the sun and the air. It forms a high proportion of the total cultivated area in West Pakistan. These nearly 13 million acres of yearly "waste" could be saved if other means of maintaining fertility of soil could be devised. And this should not be difficult in this modern world. It is a matter of more water and manuring and more scientific plowing.

Mixed farming or diversification also offers some ways out. A score of supplementary and complementary crops and/or livestock enterprises can be carried on along with the main enterprise. In Pakistan along with crops, dairy farming, poultry farming, bee keeping and "lac" culture can be adopted with profit. The farmer can run industries subsidiary to agriculture, e.g., sugar making, spinning, weaving, rope making, basket making, oil crushing, etc.

52Milne and others, Handy Notes for Agriculturists and Horticulturists, p. 126.

53Akhtar, S. M., Economics of Pakistan, Volume 1, p. 118.
Expanding the size of the business by intensification is suitable when marketed for additional products are readily available. Also, this method is adaptable and preferable in types of farming areas where natural conditions favor the enterprises to be adopted or permit a wide selection in the crop and livestock enterprises which can be maintained. (Principle for selection of intense or extensification as already outlined may help make decisions). Intensification is desirable only when the farmer has considerable experience in farming in the area and is aware of the necessary and specific methods and practices in the production of each added enterprise. It is also desirable that intensification be attempted only when the producer has sufficient capital to take the necessary risks without losing his capital or changing entire line of action of his life if one or more of the enterprises fail.

The Impartible Holding

So far we have been dealing with the problem of making an uneconomic holding an economic one. But what about their future? The forces which bring about uneconomic holdings still remain at work, they can easily undo what you do at a point of time. It is better to stop the emergence of such holdings than to patch them up after sub-division has taken place. As already noted, we are not in a position to interfere with our laws of inheritance which are sacrosanct for us. The system of primogeniture which involves conferring of property rights only on the eldest male of the family is thus ruled out. Property must be divided according to the law of Islam among the males and the
females alike. But is it necessary that property should be physically cut-up to conform to the religious law? There is no provision in Islam requiring such physical division. In the modern world assets take various forms and paper titles to real assets are a common way of holding property. Bonds and shares of many enterprises are divided among the heirs on paper, while they remain employed in the enterprise and the shareholders share the income. Why not then, the title to land and a claim to a share of its income be treated like that?

It is suggested that physical partition of a landed property be declared illegal after the unit has reached a minimum size as determined for an area by the state. If the owner of such a unit dies, his heirs should inherit rights of property in the area concerned but not the right of physical partition. Such holdings should become impartible.

Under such conditions the following alternatives are open to the heirs of such a farm, according to some economist in Pakistan:

1. To continue working it as an individual farm and share its produce among themselves as members of one family or as joint partners on some equitable bases.

2. One of the heirs to take the responsibilities of cultivating the farm. The others to receive a rent corresponding to their share. They may receive wages if they are employed as workers on their brothers' farm.

3. The share holders may agree to sell their share to one
of themselves and receive the price of their respective shares in installments or as lump sum whichever is regarded convenient by agreement.

If the partners fail to reach agreement as to who shall cultivate the land, the state may decide for them on the basis of the resources possessed by each partner or lots may be drawn if all other factors are equal.

What will the heirs, who fail to get land for cultivation do? What will they do in any case? We are assuming that the individual shares to each heir are not economic unit. Uneconomic unit would not carry them anywhere but to poverty. There is however, a choice of joint farming which means under employment of labor but full use of the equipment, cattle and other economies of scale. The ultimate solution of population pressure on land, is population control or the development of the non-agricultural sector or both. Land reform as such is no solution of population pressure. We are stepping out of economic sphere to solve this problem. It is rightly so, because a problem like this entails all institutions, economic, social, religious and political. You can't tackle while confining yourselves in one or two of them. There should be a comprehensive approach stemming from all of the institutions involved.55

55 Akhtar, S. M., Economics of Pakistan, Volume 1, 1956, p. 229.
CHAPTER V

PLANNING AND BUDGETING

Farming, as any other business, requires careful planning for successful operation. Whenever a new technique comes in and prices or costs require major adjustments in farming operations, we got to have some mechanics whereby we would take advantage of, or avoid the consequences of the new change. How can we estimate the plan which will be most profitable? This and many other questions like this bother every beginner and even a large number of experienced operators. The answer is the "budget" or "farm plan" - formal or informal device for setting down the different enterprises of both crops and livestock, stating how much of them, when and how to be produced, making the best use of farm resources, in order to maximize the goal. This is an aid, like a blueprint of a building to an architect, which is designed to help farmers apply the principles of economics to their problems of farm organization and operation. A farm plan can be defined as a completely organized schedule of a farm program providing for a system of operation and management. It is the process by which a farmer decides what resources to use and how to use them. It shows what is to be done and how to do it. If setting up a budget or plan, we set down the prospective acres of each crop and the number of each livestock, we evaluate farming practices.
and estimate the yields and production; income and costs are computed and finally an estimate of net income is made.

Every good farmer should make up a plan of this sort, he should budget his use of resources—land, capital and labor—to get the most profit. An operator who does not plan can tie up so much of his capital in land that he has difficulty in providing enough power to get his crops in on time. Or, he can over buy on equipment and tools and lack funds for productive livestock with which to convert the forage grown into meat and other animal products.

A farm operated on an unbalanced plan is like a tub with staves of unequal length. No matter how much expense and hard work you pump into the tub, the profits will not rise above the height of the shortest stave.56

Farm planning helps you cut your coat according to your cloth. A well-developed plan of organization, based on past results and current facts and future expectations will aid the farmer in adjusting his farm business more accurately and in rapidly meeting changing economic conditions. It will also assist him in the more efficient management of the individual farm enterprises.

Complete and Partial Budgets

There are two steps or methods in budgeting, complete budgeting and partial budgeting.

Complete budgeting refers to making out a plan for the whole farm or for all decisions of one enterprise. For example, we do complete budgeting when we estimate all crops, livestock, producing methods, costs, and returns for the farm as a whole. We may make out complete budgets for a plan that included sugar cane. We may fertilize sugar cane at four different levels. This means we have to make four different complete budgets which is rather length process. Partial budgeting is very convenient in such cases, we estimate the returns for a small part of the business, such as sugar cane fertilization. We will set down the four levels of fertilization, estimate the yield increases from each, compute the added cost and added returns as is done in Table 7 in Chapter VI page 193. And we will decide the most profitable level of fertilization, 4 units in this example. Our partial budgeting is complete. And, then we will incorporate sugar cane fertilization level into the overall farm enterprises. Similar procedure can be followed for all other crops, livestock, or techniques of production.

You will use both complete and partial budgeting when you first plan your farm operations. You will also need to use both whenever prices, new techniques, the accumulation of capital, farm size and other changes raise a question as to whether a new system of farming will be more profitable than the present one. A renter moving to a new farm will need to do both complete and partial budgeting each time he moves. However, once you have a farm plan under way and no major
change comes along to upset it, you will rely mostly on the partial budgeting. For the smaller problems that come up, you will need to reappraise your plans, perhaps sugar making may be more profitable than "gur" making, as sugar prices have gone up, or due to a drop in corn prices, you may decide to sell maize as fodder. These things can be appraised during the year with a partial budget. When some of the major items - machinery, building, labor, management, remain the same and the only changes that are to be made are in resources to be combined with them, the partial budgeting is the quickest and easiest way to handle. Often the formers need partial budgeting because they seldom change their entire line of action.

Complete budget is a long-run budget by which we refer to one set up for a long period or several years into future. Long-run budget specifies our goals in making our investment in farming. It is an estimate of the overall farm plan which is likely to give greatest returns over a period of years. While prices and yields will change from year to year and the best plans for two years may not be the same. We will need to make up a short-run or partial budget each year. This will be made to fit the individual year. Quite often a partial budget is needed for an annual or short-run change in plans. Just as frequently, however, a complete farm plan is needed for the years ahead. Also, we need annual or short-run budgets to plan the transition from our present farming system to the new one
(we have a short-run budget or plan for each year in the transition to our complete plan). 57

**The Goal of Budgeting**

The major objective of budgeting is to compare alternative plans for prospective profitability. The goal is not one of setting down a single plan to be followed without deviation. The real purpose is to figure out two or more systems of farm organization, compare incomes and select the most profitable one. A large number of alternative organizations may be possible for most farms. But considering the managerial ability, psychology, likes, family characteristics, capital, etc., the budget choice usually gets narrowed down to three or four major alternatives and only these need be compared in detail. Quite often you may find two plans which give about the same return. Your choice may then be the one which involves the smallest risk, or the one which gives you the most enjoyment in farming. 58

Your first plan may not be perfect in all details but it will be better than no plans. You can improve it later. It should utilize the farm management principles outlined earlier.

Planning is done to locate the weak points in the present set-up.

a. Is the business large enough to provide satisfactory living?

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58 Heady and Jensen, *Farm Management Economics*, 1954, p. 97
b. Is the cropping system such as to yield maximum quality and quantity for use and sale?

c. Are the most economical practices being used in the production of crops and livestock?

d. Do the livestock fit the feed supply, labor supply, buildings and equipment?

e. Are the livestock being handled and fed properly? Is their output optimum?

f. Is the farm properly financed?

These are just a few of the considerations to be weighed in setting up a farm plan.

To find the weaknesses, analysis of past and current records or performance is necessary and desirable. A good set of farm account records is an invaluable source of information, especially if similar information from other farms in the same general area is available for comparisons. Sometimes an element of judgement is involved in making necessary adjustments. The final plan can be no better than the judgement used in selecting the basic information.

**Type of Data Needed for Budgeting**

Basic data, showing the input-output relationship is needed for any sort of planning. It includes facts about soil, labor, power, materials, practices used, livestock and crop production and also seasonal sequences or distribution of various operations through the year. Likewise, information is needed about quantity of labor, feed for livestock and their seasonal demand. In other words, the information necessary to
develop a plan for a farm includes: (a) the characteristics and quantities of available resources, and (b) the productivity of those resources when employed in alternative uses.

Important sources of this type of data anywhere are:
1. Accounting records kept on the farm.
2. Accounting records kept on other farms operating under similar conditions.
3. Results of experiment stations.

It is an unfortunate fact that at this time very little opportunities exist to yield the data needed for planning and budgeting. Records are kept on very few farms. Results of experiments are seldom representative. The majority of farmers are illiterate, their memories about the past outcomes of farms is faulty and unreliable. The scope of the budgeting approach being outlined here is limited, therefore, to a great extent. But, this should not undermine the fact that there are some very smart farmers in Pakistan who can make use of planning and budgeting techniques as anybody elsewhere in the developed countries.

Steps in Budgeting

There is a logical sequence of decisions which facilitates the formation of an efficient farm plan. This sequence is determined by the physical and economic principles involved, and it functions for the same reasons that there is a logical sequence of operations employed in building a house. The basement of foundation comes first, the walls and rafters are put up before the roof is added, and the plumbing and wiring are roughed in ahead of the plastering. An orderly approach for farm planning is as follows.
First, you should make an inventory of your resources. Set down the amount of capital you have available and find out how much you can borrow, or will wish to borrow if credit is available. Then decide how much labor, besides hired help, is available. This will include your own time and the time the members of your family can put in. You may show how much labor is available in each month. Now you take a stock of yourself as a manager; this is one of the most important resources on the farm. You assess your experience with the farm enterprises adapted to this farm; likes and dislikes; your attitude to mix and cooperate with other people, command and control them; your attitude to take risks; your ability to foresee future rightly; evaluate market precisely; make good decisions quickly. The things you have set down so far indicate what you have to work with. Then you need to follow steps outlined below.59

1. Map the fields and land use. Make a map, drawn to scale and large enough to show field arrangement, notes on soil types, and drainage. Get an aerial photograph of the farm if you can. Total acreage of crop land, permanent pasture, woods and waste may be figured out.

2. Land resources. Walk over the farm and trace on the map, as accurately as possible, the principle soil types, using soil color and the topography or lay of the land as indicator. At the same time, take soil samples to determine

59Heady and Jensen, Farm Management Economics, p. 97.
lime and fertilizer needs. You can get help from county extension service.

**Topography:** The topography of the land should be noted and the direction of the slope marked. The slopes will not determine the exact rotations which are most profitable, but they will define the limits of different crops and will help decide how many acres of grain or cash crop and forage you will grow. They will also help determine the soil conservation and soil management practices you will employ, the machinery you will use and whether you can irrigate at a reasonable cost. You will also need to note gullies and similar hazards. Make notes on the farm map of areas which should be kept in sod crops, permanent pasture or meadow and woods.

**Drainage:** Note on the map all wet spots that limit in any way normal farm operations. Record any failure in existing tile lines, such as faulty outlets, broken tile, and evidence of clogged lines and drains.

**Climate:** Get from local weather records (a) average annual rainfall and normal monthly distribution of rainfall, (b) dates of first killing frost in autumn and last killing freeze in spring to figure average length of growing season and (c) mean temperature by month and extreme variation in temperature by months.

**Water supply:** Water supply determines crops and the intensity of cropping. You should note the type whether it is
annual, bi-annual or annudation canal along with duty and
turn or priority of water and frequency and extent of canal
closures. Map the location of wells, type of water and depth
of water tables. Hauling water for people and livestock re­
duces time for productive work and affects the kinds of live­
stock that can be kept.

**Soil management:** Even on the same type of soils,
yields may differ significantly because of the difference
in past soil management. In order to get a true picture
of your soil and its productivity, for each field make a
history of past treatment. Include the sequence and kinds
of crops grown or rotations followed on it, the amount and
kind of fertilizer, gypsum, or lime and manure used. Note
the years when green manure crops were plowed under, the
times the land was idle, fallow or under water. If you were
on the farm, you will know these things. If you are the new
occupant, you can get information from the last operator and
the neighboring farmers. Obtain any other useful information
on your fields including location of water-logged, acidic or
alkali spots, floods, insect pest and diseases, weeds, birds,
rodents and wild animals and similar things.

**Yield history:** To have a basis for your planning,
you should now determine what the yields have been in the past.
If you have been working on the farm for a few years, you can
estimate pretty closely what yields will be with average weather.
The neighbors or one who has observed the present plan of
farming and knows the average crop yields on the similar soil types for the community can estimate output of a given farm fairly well.

Other guides to soil productivity in absence of more definite yield dates are the size of cornstalks, thickness of small grain stubble and the kind of plants and thickness of the stand of plants, including the colon feel or texture of the soil.

**Buildings and fences:** List all farm service buildings along with their age, type and condition. Estimate the storage capacity of silo, mows and grain bins. Figure the barn space available for livestock and indicate type of livestock the buildings are adapted to. Check the machinery storage space. List the important building repairs needed. Make notes on the farm map on the condition of line and internal fences and indicate where major repairs or new fences are needed.

3. **Capital Resources:** Different types of farming require different kinds and amounts of capital. Make out a detailed financial statement, showing all assets including cash on hand, all debts owed, and determine your net worth. The net worth figure will assist in obtaining credit.

If the operator has been farming, his list of assets will include real estate, livestock, crops, supplies and machinery, his bank balance, bonds, cash value of life insurance and personal chattels. In case of machinery and equipment, size, kind, age and condition should be clearly specified, sometimes the machinery and equipment makes it binding upon the farmer to follow a particular type of farming.
Value assets at prices at which a sale may be made readily. The kinds, number and quality of all animals and poultry should be listed. The liabilities consist of real estate mortgages, accounts due at feed and farm supply dealers, the amounts due on charge accounts for personal items.

4. **Labor Supply:** The operator and members of his family furnish all or most of the labor on many farms. The age, physical development, and skill of the adult workers, as well as the number of children in the family who will be engaged in a share of the farm work, have a definite bearing on the farm plan. The labor of the operator and his family constitutes a fixed supply which sets a lower limit to the size of the business if his resources are to be fully used. If the quality of management is sufficiently high, it is often desirable to hire workers to supplement the family labor and to increase the size of the business.

The possibilities of getting the hired help should also be explored. The amount and kind of labor needed, however, will be determined by the crop and livestock programs developed during the planning process. Better balance can usually be achieved if labor is a variable agent of production and can be adjusted to the amount of work to be done. Abundance of farm labor in Pakistan is a potential to achieve such a balance. The problem is not of a labor shortage, but to provide productive work, in the slack labor demand periods.
For certain jobs, a special kind of skilled labor is needed, the source, kind and scope of its availability should be determined.

5. Managers' Experience and Ability: Management is the most important agent of production, but most difficult to evaluate and mistakes in appraising this resource account for many of the failures in farming. At this moment, there is no improved technique as such for rating the quality of management. The only logical alternative, then, is to use records of past performances that indicate his ability to use land, labor and capital and his skill to convert farm resources into outputs. The following are some of the measures that can be utilized to indicate the ability of a manager to convert inputs into outputs. Crop yields as a percentage of average yields from similar soils; returns per $100 of feed fed to each class of livestock, per cent of normal power and machinery cost, and per cent of normal labor cost. In each instance, it is necessary to compare the individual farmer with others using comparable resources. In most instances, the operator will be evaluating his own qualifications, the more objective and realistic he is, the more sound his organization will be. It will help in making his appraisal to list the farm enterprises in which he has had experience and some success.

Location and Kinds of Market Outlets

Set down the locations of and distances from the farm to consuming centers, assembly points for grain, livestock,
truck crops, fruits, poultry and dairy products. Find out the transportation facilities, their rates, routes and reliability. Transportation costs are important in shaping the types of farming in a locality.

New Plan

Now you are ready to set down different plans on the farm. Analyze the present organization carefully and compare with other farms in the area to determine strong and weak points. On the basis of above information, draw up several alternative crop and livestock combinations that emphasize the strong points and minimize the weak points in the business as now conducted. Keep in mind the preferences and capabilities of the farm family and the reserves they have available.

Planning the Cropping System

A good cropping system will: 60

1. Not deplete the soil, if its income producing ability is to continue unimpaired.

2. Include a large acreage of crops that produce high income without excessive soil depletion.

3. Provide ample feed for adapted livestock.

4. Include about the same acreage each year of each crop.

5. Use labor, capital and machinery in balance with demands of other enterprises.

6. Hold to a minimum the acreage to be ploughed each rotation.
7. Reduce to a minimum competition between crops for labor and equipment.
8. Adjust to rainfall limitation irrigation facilities and moisture needs.
9. Allow soil building crops frequently on each field.
10. Select the crop best adapted to each soil.
11. Lessen risk and uncertainties and fit to the capital position of the farmer.
12. Control weeds, diseases and pests.

A rotation specifies the cropping program for a farm since it determines the crops that will be grown on each field over time. Therefore, it determines how much will be produced of different kinds of crops. Rotations are used because crops have different requirements for moisture, organic matter and fertility elements, different crops have different root-systems and, therefore, draw food nutrients from different states of the soil. Yields usually differ when crops are grown in sequence rather than when one is grown continuously.

The rotation must consider all of the points mentioned for a good cropping system. The main question is: How far should we go in trying to attain each of these goals? To find the answers we must consider a number of points.

The basic forces which determine crop production possibilities on any one farm are the soil and climate. These
natural forces determine the limits of crop production; they specify the range of crops, but they do not determine which crop or cropping program is most profitable. Other considerations equally important is determining the most profitable rotation are:

1. The enterprise relationship for different crops.
2. Relative prices for different crops.
3. Per acre costs.
4. Labor and capital requirements.
5. Seasonal distribution of labor and power.
6. Livestock program.
7. Risk and uncertainties which can be undertaken by the operator.
8. The leasing arrangement under which the farm is operated.
9. The need for cash income.
10. The farmers' capital position and soil building program adopted and capital invested.
11. Personal preferences of the operator.

In other words, the rotation must fit the circumstances of the individual farm not only in terms of soil types, but also in respect to livestock capital, lease, managerial ability and many other things. Taking all the things into account, a new cropping system will be selected. To many farmers, the only alternative may be produce food for the family. But even

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among the food crops, there are crops which yield more than others. The estimate of yields under the new or the alternative systems will be predictions or expectations. How good they are as expectations will depend on how well your experience and performance is, or how well you have collected information and predicted them. Partial budget provides a method for deciding how expenses and yields should be increased; the answer is found in the added cost – added return principle. You should not increase yields or income by the stroke of the pencil, be consistent and realistic in your assumptions and carry them through all the planning process.

Several cropping systems may fit the same farm. The one currently in use may be as good as any other. On many farms, a rotation contains two kinds of crops: (1) main purpose crops and (2) rotation purpose crops. Main purpose crops are such crops as cotton, wheat, sugar cane, rice, tobacco, or potatoes, which is grown particularly for its income; there may be two or more such crops. On dairy or other livestock farm fodder crops, such as corn, berseem or turnips, might be main purpose crops. The rotation purpose crop is one grown because of its effect (as complementary or supplementary crop) on the yield or the production of the main purpose crops. On large farms, a major and a minor rotation provide greater flexibility in acreage allotted to each crop and in variety of crops to be grown. The two
rotation system simplifies control of livestock diseases by making shifts of animals to clean fields easier.

A well worked out cropping system includes a list of crops to be used in rotation, sequence followed, the average annual acreage and probable production of each crop, the fertilizer treatment, type and amount of seed, and the tillage and harvesting methods to be followed.

Planning the rotation is the first step in developing a cropping system. List the adopted crops in order of income production and classify them as soil building and soil depleting. Choose the order in which these crops will be grown and acreage of each to be planted and years each will occupy each field.

Appraising a Cropping System

1. How does it effect soil productivity? To determine whether the proposed crop rotation will deplete the soil or whether it will maintain and build up the available soil resources, Form 4303, "The Soil Productivity Balance of Crop-land," can be used. This form was devised by the Agronomy Department of Ohio State University. In this form, soil productivity index for a given crop is employed. This index is an approximate measure of the balance between favorable and unfavorable effects of a crop on soil nutrients, with


biological activity and organic matter of the soil. It is evident that these indexes may be either positive or negative, depending on whether the crop has a deteriorating or an improving effect upon soil. It may be noted in the map, that legumes have positive while grains have negative indexes. Corn, potatoes, tobacco and sugar beets are given the highest negative factors because it is necessary to prepare a seed bed, for these crops, and it is also necessary to cultivate them a number of times each season. Experiments have shown that each time these crops are grown there is a loss of about 2 per cent in the productive capacity of the soil. Other experiments show that each time alfalfa is grown, there is a net increase of 2.5 per cent in the productive capacity of soil at the end of the first year and an additional increase of .5 per cent at the end of the second year. The figures in this form may not be applicable to Pakistan at all due to differences in the soil and climate conditions. But it does indicate the tendencies and the need of such type of research and its usefulness.

In addition to the type of crops grown in a rotation, there are other factors inept in determining whether the proposed rotation will deteriorate or improve the soil. They include the amount of crop-residue left on the ground, the erosion control measures practiced, the amount of manure and fertilizer applied and green manuring practiced each year. Inasmuch as these factors are important, they are given positive indexes according to the degree to which they are practical.
Employing this or any other procedure like this, you determine how your crop rotation will effect the soil productivity.

2. Another measure of appraising the crop rotation is whether it contains as large an acreage as possible of the crops with high income producing ability. Cotton, sugar cane, wheat, rice, tobacco and vegetables are well up on the list of crops producing high income. Good legumes, meadows, particularly those with a large percentage of alfalfa, yield high income indirectly. The effect is two-fold: (1) producing more and better feed for livestock and (2) stepping up yields of crops following the legumes, because they have the quality to fix atmospheric nitrogen in the soil and add organic matter.

The total gross income from a rotation may be calculated by multiplying average yields by the expected or long-time average of farm prices. Costs as well as gross value must be considered. The rotation with the highest gross value does not always give the largest net return.

3. A third factor necessary for a good rotation is that the crop and livestock programs must be fairly well balanced. If the land limits the type and amount of feed that can be raised, the livestock program must be adjusted to the crops produced.

On a livestock farm, the rotation should produce most of the feed for animals. However, if this is to be done,
the kinds of livestock kept must be governed by crops that
can be grown economically without subjecting the soil to
depletion.

When making a farm organization plan, prepare one or
more tentative crop plans using to good advantage the land,
labor, and capital available. The second step is selecting
types of livestock to make best use of the feed grown. If
limits in labor, capital or markets call for modifying the
livestock plans, the operator packs up and refires his
crop plan.

4. A fourth factor which makes for a good rotation,
where livestock production is important, is to have approxi-
mately the same area of each individual crop in the rotation
each year. A crooping system with large cash crops and less
forage crops in one year and opposite in the next year will
cause extreme variation in the labor power, seed, fertilizer
required. The amount and kind of livestock that can be fed
and the volume of products for sale will vary greatly from
year to year.

Even the best combination of crops, if fitted to a field
layout that results in great variation in acreage will be un-
satisfactory. The return from a good crop system will more
than pay for the trouble of arranging the fields to fit the
rotation.

5. A fifth factor which may be considered in determining
whether the rotation is a good one is the sequence in which
the crops follow one another in the rotation. This is im-
portant because the fewer times the land must be ploughed
during the course of the rotation, the cheaper will be the cost of operation. Ploughing is not only a costly operation, but is also conducive to excessive erosion. Arranging crops so that the land is in use practically all the time is efficient management.

6. A sixth factor which indicates a good rotation is to have a rotation which does not make excessive demands on the land, labor and power resources, especially all at one time. Demands of crop for land, labor and power should be well spread out over the year. The operator must strike a balance at this point between providing more power, equipment and labor, and changing the rotation to a less competitive one. Over-stocking with machinery or bullock power to take care of peak loads puts heavy costs on the crops. Often these costs are greater than the advantages of a particular rotation, making it desirable to design a more workable rotation. 65

Crops compete for land. A low intensity of cropping means inefficiency and lower income. A very high intensity of cropping leads to lower soil productivity. When either of these two extremes exists, it will be better to reorganize the rotation so as to let the land fallow long enough to recoup its productivity (erosion problem must be kept in mind).

65 Ibid., p. 7.
Adjusting the Field Layout to the New Crop System\textsuperscript{66}

Some modification of the field layout is essential on most farms for efficient operations. This is especially true, if changes are made in the length of the crop rotation. Some of the features of a field layout worth trying to incorporate insofar as the physical makeup of the individual farm will permit are:

1. At least one field for each year in the rotation.
2. Fields nearly uniform in size to give about the same acreage of each crop from year to year.
3. Fields as large as size of farm and number and length of rotations permit.
4. Fields at least twice as long as wide to reduce turning.
5. Fields with parallel sides to avoid point rows.
6. The entrance to fields as near the farm as possible to reduce travel.
7. The long way of the field across the slope to reduce erosion.
8. A nearly uniform soil type and drainage in each field as possible for easy tillage and uniform fertilization application.
9. If erosion is a factor, strips or fields laid out on contour.
10. Minimum acreage in land, but lane should be wide enough to encourage a \textit{sod} cover and make easy and safe travel for livestock and farm equipment.

\textsuperscript{66}\textit{Ibid.}, p. 7.
The actual drafting of a new plan is a trial and error method on paper. However, there are a few basic tools that help.

The first is a scale map of the farmland showing (a) the farmstead and other fixed barriers like open ditches, ponds, swamps, railroads, public roads and (b) the location of woods, permanent pasture, and the rotated cropland under the revised land-use set-up. The second is the replanned cropping system giving the total acres of land to be occupied by each crop. The third tool is the above list of desirable features to use as a guide; and the fourth is a good imagination and plenty of outline maps for experimenting.

The small, fragmented and scattered nature of holdings is a big limitation to such an adjustment. Consolidation of holdings according to the points mentioned above is in order. Big and consolidated farms can utilize this procedure without any delay.

Planning the Livestock Program

The chronic and ever-increasing food shortages hardly leave any scope to divert resources from food crops to crops needed for the livestock. The grow-more-food campaigns and inducements and propaganda that go with them stem from the fact that present agricultural resources are hardly enough to fill the hungry bellies with cereals and other bulky foods; substitution of livestock products for them will mean that millions will starve to death. The nation's immediate concern is quantity, quality being a far cry.
The Soil Productivity

An engineering “yardstick” by which to measure the rate of rise or fall in the producing capacity reduced to a single over-all figure. The procedure is in terms of the individual farm’s own conditions.

<table>
<thead>
<tr>
<th>Sod Crop GRAZED or MOVED for Hay</th>
<th>ACRES</th>
<th>FACTOR</th>
<th>POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Alfalfa, seeded 1 yr. before</td>
<td>+2.5</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>2 Alfalfa, seeded 2 yrs. before</td>
<td>+0.5</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>3 Alfalfa, seeded 5 yrs. before</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4 Common Clovers, seeded 1 yr. before</td>
<td>+2.0</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>5 Clov-tim. Mix., seeded 1 yr. before</td>
<td>+1.25</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>6 Tim-clov. Mix., seeded 2 yrs. before</td>
<td>+0.25</td>
<td>+</td>
<td></td>
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<tr>
<td>7 Timothy, seeded 1 yr. before</td>
<td>+0.25</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>8 Timothy, seeded 2 yrs. before</td>
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<td>0</td>
<td></td>
</tr>
<tr>
<td>9 Sweet Clover, seeded 1 yr. before</td>
<td>+3.0</td>
<td>+</td>
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</tr>
<tr>
<td>(See Schedule A)</td>
<td></td>
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<tr>
<td>11 For RESTORATIVE CROPS Harvested</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Material NOT REMOVED from the Land

<table>
<thead>
<tr>
<th>Material NOT REMOVED from the Land</th>
<th>ACRES</th>
<th>FACTOR</th>
<th>POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Sweet Clover, MATURED, ungrazed this year</td>
<td>+3.5</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>13 Sweet Clover, GREEN, plowed this year</td>
<td>+2.5</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>(See Schedule A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 RESIDUES left on land from one year’s crop: Corn stalk, soy and grain straw (Schedule A)</td>
<td>+0.25</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

16 Sum of CREDITS for Crop MANURE and RESIDUE

<table>
<thead>
<tr>
<th>CONTROLS and PROTECTIONS on Cropland</th>
<th>ACRES</th>
<th>SLOPE</th>
<th>FACTOR</th>
<th>POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>In SOD over winter and summer:</td>
<td></td>
<td></td>
<td>1/10</td>
<td>+</td>
</tr>
<tr>
<td>(Items 11 plus 12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In LIVE CROPS over winter only:</td>
<td></td>
<td></td>
<td>1/20</td>
<td>+</td>
</tr>
<tr>
<td>(Items 25, 13 &amp; 14 if applicable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In ROW &amp; SPRING DRILLED CROPS on</td>
<td></td>
<td></td>
<td>1/20</td>
<td>+</td>
</tr>
<tr>
<td>CONTOUR and/or STRIPPED and/or</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TERRACCED land (Items 25, 27, 28, 29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20 Credits for CONTROLS in operation against EROSION

<table>
<thead>
<tr>
<th>ADDED to SOIL during Crop Year</th>
<th>TONS</th>
<th>FACTOR</th>
<th>POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer in terms of SINGLE Strength: (Item 21, Schedule C)</td>
<td></td>
<td>1.5</td>
<td>+</td>
</tr>
<tr>
<td>Manure produced on CROPLAND during GRAZING: (Item 22, Schedule B)</td>
<td></td>
<td>0.15</td>
<td>+</td>
</tr>
<tr>
<td>Manure produced in BARN and OPEN-LOT: (Item 25, Schedule B)</td>
<td></td>
<td>0.15</td>
<td>+</td>
</tr>
</tbody>
</table>

24 Sum of Credits for MANURE AND FERTILIZER

* Either straight stands or mixtures in which this legume constitutes 80 per cent or more (by weight) of the forage.
Balance of Cropland

Accuracy of a farm's cropland. By it, all forces—good and bad—making up soil productivity, are known; the answer, arithmetic, its meaning usable, rendering the fate of cropland predictable.

<table>
<thead>
<tr>
<th>Crop and Drill Crops Harvested</th>
<th>Acres</th>
<th>Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn, beet, tobacco, potato</td>
<td>-2.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Winter wheat, winter barley</td>
<td>-1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Barley, spring wheat, spring barley</td>
<td>-1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Oats, as seed and/or hay</td>
<td>-0.5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(See Schedule A)

For DEGRADING CROPS Harvested, enter -

<table>
<thead>
<tr>
<th>Acres of all Cropland on Farm (Items 11, 12, 14, 30)</th>
<th>Estimated Slope of all Cropland Pt. fall in 100 Pts.</th>
<th>Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a x b x c</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1/10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Debits for EROSION assuming no controls

<table>
<thead>
<tr>
<th>WASTE of Manure</th>
<th>Tons</th>
<th>Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re produced in OPEN-LOT, subject growing (Item 33, Schedule B)</td>
<td>-0.07</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Debits for WASTE of Manure

SUMMARY

<table>
<thead>
<tr>
<th>IRRIGATION PATTERN (Items 11, 30)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P RESIDUE (Item 16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FERTILIZER &amp; EROSION (Items 20, 32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FERTILIZER &amp; FERTILIZER (Items 24, 34)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GRAND TOTALS

NET of Totals

Divided by Cropland (Item 81b) equals 1% of 1%

THE BALANCE SCALE

Desirable Range
A balance above zero means a rising yield level, since credits overtop the debits.

Zero Balance
True conservation exists (degrading forces just matched by uplifting forces).

Unfavorable Range
A balance below zero means a falling productivity, since debits outrun credits.

Supporting Schedules appear on reverse side.
SCHEDULE A—Productivity
Factors for Cropland

1 1 f tN M t f t t A H B B D

N
m
»«tM M t l u H f c ppsMtMolw u tlM
M  tap-...».*,ee»tasv u  ti*fSq
HMl... « 0 » *
• ' l e ®
a m
n o *  man*
wm  c a r u  c h o p
1 tlMfk, t a p  c r « H l
Ut%  m
lui,......
C l N S n ,  m w ,  tip p w t h  |«A ■  taa4*».
rii>u tap i*n
m
m
m
m<
t a int, tap i l w H  lift «  Mta,
tar lta, tap c r t a t  U f 

Method I - Based on Estimated Loads Hauled (less accurate)

<table>
<thead>
<tr>
<th>Item 22</th>
<th>Tonnage of MANURE directly on GRAZED Cropland (above acres x months x ½ ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 33</td>
<td>Estimated tonnage hauled from BARN or SHED.</td>
</tr>
<tr>
<td>Item 23</td>
<td>Combined Tonnage from BARN and LOT (Sum of above)</td>
</tr>
</tbody>
</table>

Method II - Based on Numbers of Livestock (more accurate)

<table>
<thead>
<tr>
<th>GRAZED on Cropland SOD</th>
<th>HEAD</th>
<th>MONTHS IN FIELD</th>
<th>TONS per Mo. per Hd.</th>
<th>TONNAGE of MANURE a x b x c</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>KIND</th>
<th>0.9</th>
<th>0.7</th>
<th>0.3</th>
<th>0.6</th>
<th>0.3</th>
<th>0.06</th>
<th>0.09</th>
<th>0.03</th>
<th>0.09</th>
</tr>
</thead>
</table>

On GRAZED Cropland...

The Ohio State University and
United States Dept. of Agriculture,
Cooperating

Agricultural College Extension Service,
H. C. Ramsower, Director,
Columbus, Ohio

* Standard spreader = 1 ton; large size 1 ½ tons.
** Amounts (no bedding) have been adjusted to the equivalent of cattle manure.
*** Amounts (including bedding) have been adjusted to the equivalent of cattle manure as measured by crop-producing effect.

The Ohio State University and
United States Dept. of Agriculture,
Cooperating

Agricultural College Extension Service,
H. C. Ramsower, Director,
Columbus, Ohio

* Standard spreader = 1 ton; large size 1 ½ tons.
** Amounts (no bedding) have been adjusted to the equivalent of cattle manure.
*** Amounts (including bedding) have been adjusted to the equivalent of cattle manure as measured by crop-producing effect.
# SCHEDULE C—Fertilizer Tonnage Applied to Cropland within a Single Crop Year

<table>
<thead>
<tr>
<th>Fertilizer Type</th>
<th>Acre Treated</th>
<th>With 4-10-0</th>
<th>With 0-16-0</th>
<th>With 0-21-0</th>
<th>With 0-24-0</th>
<th>With 0-28-0</th>
<th>With 0-36-12</th>
<th>Total Amount for Single Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats, barley</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beets, tobacco</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total on Cropland Yearly (in terms of Single Strength)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Item 21: Expressed as tons of Single Strength goods (lbs. x 2000)...

Days...

# SCHEDULE D—Residue from Crops and Bedding Needs

<table>
<thead>
<tr>
<th>Material</th>
<th>Acres Harvested</th>
<th>Normal Yields of Grain</th>
<th>Organic Matter</th>
<th>Estimated Residue Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean straw</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat straw</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats straw</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn straw</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Estimated Residue Material Produced (sum = 2000).....

BEDDING WANTED by Livestock (Item 22 x 125),

Item 16: NOT USED for bedding (balance)...

# SCHEDULE E—Performance in Some Soil Practices

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Actual</th>
<th>Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Rate of Manuring Each Acre Yearly</td>
<td></td>
<td>3 to 4</td>
</tr>
<tr>
<td>(Item 28 plus 23 x Item 3a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Rate of Fertilizing Each Acre Yearly</td>
<td></td>
<td>100 or up</td>
</tr>
<tr>
<td>(Item 21 x 2000 + Item 3a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of Cropland Receiving Residue Yearly</td>
<td></td>
<td>20 to 60</td>
</tr>
<tr>
<td>(Item 18 + Item 3a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal of Soil Tillage, % of Cropland in Soil Yearly</td>
<td></td>
<td>40 to 60</td>
</tr>
<tr>
<td>(Item 17 + Item 3a)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
But there are certain reasons for including livestock in the farm organization. The first and more important is that draft power comes almost from animals, particularly the bullocks. The number of bullock and the breeding stock that is necessary for Pakistan agriculture may be calculated as follows:

1. Total cultivated land = 70,080,000 acres
   
   (Area sown, 12607,000; current fallow, 67,654,000; area to be reclaimed by 1900-51, 10,019,000)

2. Number of Bullock = 28,032,000 heads
   (One pair of bullock for every 5 acres, this is also an arbitrary figure, as average holding is of 3.8-4 acres and each holding has its own bullock power. But considering that in canal colonies and rain-fed area, there are bigger holdings that can be commanded by each pair)

3. Replacement stock = 8,409,600 heads
   (Average productive life of a bullock being 10 years, this means that each year 1/10 of the bullock will be replaced, and it takes 3 years on an average to a calf to become a full-fledged bullock--so
   Calves under 1 year age 2,803,200
   Calves under 2 years age 2,803,200
   Calves under 3 years age 2,803,200
4. Breeding stock (cows and bulls) = 8,409,500 heads

(Average lactation period of cows is 2-2½ years. There will also be say 50 per cent female calves and also mortality percentage is very high.)

Total 44,951,200

Nearly 45 million heads of cattle are, therefore, absolutely necessary for the type of agriculture prevalent in Pakistan. Such a need will persist and possibly increase for decades to come as tractor power does not seem practical and feasible under Pakistan conditions.

Similarly, animals for transportation purposes e.g., donkeys, camels, mules, horses, bullocks, etc., are also a must as roads and rail tracks are poor to non-existent, at least between villages and towns. This feature of transport by animals will also be there for years to come.

Thus, there is a social and economic pressure to keep buffaloes. In many "tribes" to sell milk is socially condemned. But even if some people wish to sell milk, the transportation facilities do not favor it, milk being bulky and perishable, involves high risk of spoilage. But there is nothing against selling of "chee" which can also be stored for a few months. In Pakistan those breeds of cows which produce good bullocks are poor milk yielders and the breeds which are high milk yielders, produce poor and sluggish bullocks. Fat percentage in either breeds' milk is low, thus, yielding a small quantity of "chee". Therefore, there is a tendency, stemming both from social and economic forces, to maintain
buffaloes which yield more milk of high fat percentage, manufacturing ghee and selling it in the nearby market in economic quantities or whenever desired.

The livestock of a common farm will consist of a pair of bullocks, as one bullock can't pull the plow, one or two buffaloes or one buffalo and one cow, and a donkey for hauling forage for the animals.

The other reasons for maintaining livestock on the farm are that livestock can convert low value and waste products such as wheat, straw, grain straw, oats straw, sugar cane tops and trash, sorghum, millets and maize stocks, leaves of certain trees, etc., into saleable products and thus add to the net farm income. The crop products listed above are mostly by-products, nearly all of them are bulky and low value and thus uneconomical to haul over distances and for others there is no market.

Livestock also help to maintain the productivity of soil. Some farmers maintain that less fertility is hauled off the farm when farm products are fed to the animals than where cash crop farming is practiced. Many farmers in Pakistan could seldom decide livestock enterprise on such considerations. They keep livestock on economic as well as non-economic considerations, and it helps them to maintain fertility to some extent as they are not maintaining soil fertility by following

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non-depleting rotations, by liberal fertilizer applications, green manuring or plowing down crop residues.

One of the biggest opportunities that livestock provides to Pakistan farmers is that it provides a continuous employment to the labor which is abundant, cheap and un- or under-employed during most parts of the year. Crops mostly are seasonal and at times in the year most of the labor is laid off. Livestock may also help make use of surplus family labor that would otherwise yield no return.

Livestock products supplied to the farm family is another reason why livestock may be kept. At this time, very low proportion of food comes from animals. Nobody likes to sell milk in the villages in Pakistan, which means that if a farmer does not keep his own milk animals he and his family will go without milk. If these products are purchased, usually they cost more than home produced products even if later are produced inefficiently.

Although livestock adds to the net income of the farmer, out far less than it does in some of the countries like the U.S.A., some of the important reasons for this may be mentioned again: (1) breeds are inferior, (2) animals are fed on low-quality feeds on unbalanced rations, (3) overstocking and underfeeding or overfeeding with costly food, (4) insufficient care at crucial periods, (5) high prevalence of diseases and high-death rate, (6) poor timing of production and marketing, and (7) type of livestock poorly adopted to farm resources.
Livestock will not show up in the income as they should unless the causes mentioned above are corrected. Proper planning is essential to make the livestock enterprises pay. Some of the important considerations may be noted.

Types and Amounts of Livestock to Keep

The types and amounts of livestock that will give the maximum net return will depend on the experience and ability of the farmer, it includes more than just the eye of the master that fattens the cow; on his capital position; the transportation facilities and markets available; the labor and its skill; and the kind and supply of feeds. These factors, therefore, determine the size or level of the stock. The levels of livestock for Pakistan will be as follows:

Level I: The livestock, mainly bullocks are needed, to supply the animal power for the farm. The number will depend on the size of the holding, the type of irrigation, the mode of transportation, etc. But irrespective of the size of holding, this number can't be less than a pair as one bullock can't pull the plow, and Pakistani farmers seldom, if ever, cooperate to own a pair of bullocks jointly. So, for every farmer, the lower limit of two bullocks is given; and from here onward, he can start piling up livestock according to the factors mentioned above.

Level II: To a pair of bullocks, some livestock may be

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68 Ibid., p. 9.
added that will supply some of the needs of the family, e.g., milk, meat and eggs. Few sheep/goats or a cow, and poultry comprise this category. These can largely be fed on feed that might go to waste and the labor required to take care of them has also no opportunity cost. Even if the animals and poultry are fed poor and indifferently cared for, their contribution to the family living will probably cost less than purchased products at retail prices. Some of these products are not sold in the villages at all.

**Level III:** Livestock for family needs and to consume low value and waste products but little and no saleable feed.

Add to first two levels enough livestock to use the roughages (straws of wheat, barley, oats and gram, sugar cane tops and trash), edible weeds, idle buildings and surplus labor. For most of these products, there is no market, bulkiness and low value of others make it uneconomical to haul them to the market for sale. This level provides an excellent opportunity for the utilization of the surplus farm labor, which otherwise will go to waste. The actual costs for this level of livestock are low, as most of the items do not have an opportunity cost (added costs are few).

**Level IV:** Livestock to consume all the rotational fodders and some of the feed grains (grain, barley, etc.) and some oil-seed cakes, raised on the farm. Very few farmers in Pakistan tend to exceed this limit. Over this level the livestock tend to compete with human beings for food products. Government has also passed law to restrict the land to be
devoted to forage and animal feed crops. Some out-of-pocket costs enter into the cost of animals and their products. To make profit, good livestock, above average management and good market outlets are essential.

**Level V:** Livestock in excess of the feed produced on the farm. Very little of it is done out in the countryside as transportation and marketing costs do not favor it. On farms inside or just near the cities, dairy animals are kept in excess of the feed produced on the farm. The following factors make it possible:

1. Milk can be sold instantaneously without any risk of spoilage and with little or without any transportation costs. These dairymen realize a higher price, as they sell at competitive prices, which include the transportation and handling costs and octroi charges. None of these are to be incurred by the city dairymen.

2. The concentrates fed by the city dairymen are cheaper and more conducive to high milk yields. Practically all the grain mills, starch and oil-crushing mills, and husking mills are located in the cities. The by-products of these mills are wheat-bran, maize-cake, and oil-cakes (of cotton, linseed, "taremara" and "toria") and pulse husks. Most of these have a high percentage of nitrogen and help increase the milk yield. They are bulky, low-value and often are wet when they leave the mills. They can also be fed by the country farmers but they increase the feeding cost by a greater percentage due to high per unit transportation cost. The farmers away from
the cities thus tend to feed the milk animal on whole grain and the like, which is mostly starchy or oily and add little to milk in comparison to their cost. Dairy industry, as a consequence, tend to be located near the cities, and the dairy farms tend to be overstocked than their capacity to produce feed and forage crops.

3. The forage requirements of these farms can also be supplemented by the waste products and complementary forage crops raised on the city vegetable farms.

One can also find "dairy farms" near cities which have no land to raise fodders at all. They buy all of their feeds and fodders of the kind mentioned above. Their existence is entirely due to the location advantages, and the ability of the dairymen to time the production. (Levels II to Level V are adopted from Sitterley's "Planning the Farm Business, 1953" Extension Bulletin SB8 [211 revised].

In selecting the types of livestock the major factors to consider are type of feed that will be produced, the labor supply and its skill, building facilities, capital available and market outlets. The market considerations should weigh heavy in selecting the type of livestock as there are several and unsurmountable market problems that face the livestock producers in Pakistan, some of the major problems may be listed below.

1. Prices for livestock products are low and controlled.
2. Transportation facilities are limited. There are no cooling and refrigeration facilities. Meat must be
consumed immediately after slaughter. Main meat markets are in towns. Meat that will be sold in the cities must be prepared at the licensed slaughter houses located only in the cities. The meat animals are brought to the cities mainly on hoof, and thus occurs a loss in weight. Facilities and risks for milk are even worse.

3. There is no premium for good quality livestock and livestock products. Measures to check adulteration are ineffective and scanty.

4. Market information is inadequate for determining best place and time to sell. Livestock industry is highly unorganized. Buyers, commission men and speculators take advantage of the farmers.

5. Low productivity of animals.

6. Supply of fodders and feeds is uncertain, and they can't be had throughout the year at reasonable rates.  

After selecting the type of types of livestock, the problem that arises next is of determining the size of the herd. Besides capital, risk-bearing ability and market, it depends upon the amount of feed available. Experienced farmers can make reasonable estimates of the amount of feed required by various kinds of livestock. Accordingly, they suggest that an adult unit of animal, on an average, requires one acre of green fodder per year, bullock, bull or buffalo represents one adult unit of animal, while a cow and animals between 1 and 2 years

of age are $\frac{3}{4}$ and $\frac{1}{2}$ unit, respectively. Following this procedure one can estimate the number of various kinds of livestock by dividing the total amount of feeds and fodders available in a year by the amount of feed required per an adult unit of animal and then breaking down the units thus arrived at into various animals of different classes and ages.

Some eminent economists from the U.S.A. suggest that it is not wise on most farms to keep all the livestock that these estimates indicate might be fed. Some surplus feed is good insurance against a poor growing season. A good manager balances the various types of animals in such a combination that can make use of the farm resources to the best advantage over a long pull. He does not drop one livestock enterprise and take on other kinds of livestock because of short-run changes in prices of livestock and livestock products. But he will not hesitate to do so, if long-run future expectations demand it.

In planning the livestock program to fit your resources, you may start with the feeds produced in the rotation. Crops and livestock should be tied together so that the roughages and other farm products are disposed of economically. Don't hesitate to change your crops to fit the livestock program if profits can be increased by this procedure. (Market limitations should be borne in mind). For highest returns

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from crops and livestock combinations, some of the adjustments usually made are:

1. Increasing more forage in the rotations and vice versa.
2. Sowing high yielding varieties of crops.
3. Increasing yields by building soil productivity through farm-year-manure, green manuring and heavier application of fertilizer.
4. Selling one kind of feeds and buying another.
5. Increasing or decreasing or eliminating one or more kinds of livestock.71

These are the procedures you must go through in finding the most profitable livestock program. Consider the costs and prices of each item you make the change in and make a comparison to see if you are better off than before. Remember, this is the opportunity cost principle, while livestock may be profitable, use of your labor and other limited resources for crops may be more profitable. The reverse may also hold true.72

Planning to Get the Work Done

Labor and capital substitute for each other to a very great extent. Proportions in which they will be combined depends on this rate of substitution and cost per unit of each. If labor is limited and costly, it increases the need

71Ibid., p. 10
for more and large units of machinery and power. An organization which has sharp peaks in distribution of work, calls for more and larger units of power and machinery than one with uniform labor requirements.

When capital is scarce, using more time and more labor may be better management than equipping the farm with all the power and equipment that it takes to plant, cultivate and harvest the crops. Proper planning is necessary to decide the type and amount of resources needed to do the job.

Type and Size of Equipment

Make a list of the operations to be performed on crops and in connection with the livestock. Set down the acreage to be blowed, fitted, planted and harvested. Estimate the number of days of good weather in which these operations can be performed.

The size of farm power, the equipment and labor will be determined largely by the time available in which the work must be done and the acres to be covered and livestock to be taken care of.

Man Labor Required to Produce Crops and Livestock

After operating a farm for a number of years with the same power and machinery, a farmer can estimate how many days of man labor will be needed for the important jobs in crop production. He may not be able to accurately forecast the effect of unfavorable weather on the man labor requirements. While soil conditions and weather will vary, the
hours required for fitting fields for planting, or the days required to harvest wheat, clean water channel, and cut fodder may be accurately forecast for an average season but not for any given year.

When the cropping system or livestock enterprise is changed, or the operator changes farm unit, data collected at the farms of the late Punjab Agriculture Department on time required for common farm operations will be useful. These data are taken from average work records on a large number of farms are as follows:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Labor Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Plowing an acre with Desi plow.</td>
<td>1 man and 1 pair of bullocks for 8 hours</td>
</tr>
<tr>
<td>2. Plowing with Raja plow</td>
<td>- do -</td>
</tr>
<tr>
<td>3. Hoeing an acre with khurpa</td>
<td>6 men for 8 hours</td>
</tr>
<tr>
<td>4. Hoeing an acre with spade</td>
<td>- do -</td>
</tr>
<tr>
<td>5. Hoeing 4 acres with barharrow</td>
<td>1 man and 1 pair of bullocks for 8 hours</td>
</tr>
<tr>
<td>6. Hoeing 3 acres with disc harrow</td>
<td>- do -</td>
</tr>
<tr>
<td>7. Cleaning water channel of an acre</td>
<td>1 man for 8 hours</td>
</tr>
<tr>
<td>8. Hoeing of fruit trees</td>
<td>40 plants per man for 8 hours</td>
</tr>
<tr>
<td>9. Carting of manure in the field</td>
<td>It depends upon the distance of field from the manure pits. In case of adjoining fields, 10 cart loads by two men and a pair of bullocks in 8 hours.</td>
</tr>
<tr>
<td>10. Harvesting of wheat</td>
<td>4 men per acre for 8 hours</td>
</tr>
<tr>
<td>11. Harvesting of grain and oil seed crop</td>
<td>2 men per acre for 8 hours</td>
</tr>
</tbody>
</table>
12. Threshing one acre of wheat 3 men and 2 pair of bullocks for 8 hours

13. Bring fodder from field, caff it and feed 10 bullocks their feed needs for one day.

14. 8-10 mounds of sugar cane to be stripped 1 man for 8 hours

For the farmer who organizes his work well and is skillful, the average labor requirements mentioned above will be too high. In addition to skill of the operator, soil, type, field size, shape, distance from the farmstead, the condition and amount of the equipment, building arrangement, watering and feeding facilities, and the planning of chore routine will increase or decrease the man hours required.

The standards mentioned above may be used to locate the inefficiency in the organization and to identify the labor unemployed in disguise. This will make it explicit and will help you make best use of your labor resources, which are ample in Pakistan.

Even though there appears to be good balance between the total labor required and the available labor supply there is still the question whether all jobs can be done on time. At this time one needs a time schedule of jobs to be done on crops and livestock. Each farmer knows the normal dates when jobs connected with crops and livestock should be done,

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according to his present plan of operation. Such a schedule of jobs will indicate the peaks and slacks in labor requirements and will show up where some of the maintenance and miscellaneous jobs will interfere least with work on crops and livestock. Some of these maintenance and miscellaneous can be moved about in the schedule to a greater degree. Not all of these jobs can be done in off-peak times for crops and livestock work. Some time must be available for maintenance work, otherwise the crops and livestock will suffer.\textsuperscript{74}

Adjusting the Plan

It is difficult, if not impossible, to work out a farm organization that requires a uniform amount of labor each month or each half month period. There will be some peaks and some slack periods in the plan. The more nearly uniform labor requirements can be made the more efficient will be the use of labor.

The peak labor points can be evened out by the use of large units of equipment and power, by hiring extra labor, by changing the shape, size, arrangement, distance of fields, elimination of some livestock enterprises and expansion in others, and by changing the number of productive capacity or type of livestock. The principle involved is the opportunity cost principle. Weighing the cost and returns of each alternative, we will select the most profitable one.

\textsuperscript{74}\textit{ibid.}, p. 13.
Using some surplus labor may be arranged by applying more fertilizer and giving better care to crops. The extra feed produced will support more livestock requiring more labor. Or additional feed might be purchased to step up livestock numbers. The program may be revised to substitute more intensive crops for those requiring less labor. Another way to strike a balance on farms with excess labor is to seek part-time employment off the farm (which are not existing) or start some industries allied to agriculture, such as bee keeping, lac culture, etc.

Make the best estimate you can of prices that you think more likely to prevail in the years ahead. Calculate, on the basis of these prices, the value of all sales in the normal and proposed organizations and the cost of all items of expense that vary with the organization.

Compare the returns over cost that vary with the organization and select the one that promises the largest and most stable return and that best fits the personal skills and preferences of the farm family.

Do not assume that the plan selected should necessarily be followed unchanged through the years. From time to time, as conditions change, try out additional alternatives by the substitution method covering either the whole farm business or certain crops or livestock. No one plan is likely to prove best over the years without occasional adjustments as farm techniques, prices, family labor and other factors change.
CHAPTER VI

FARM LEASES AND RENTAL ARRANGEMENTS

Farm management approach cannot be treated adequately without reference to farm tenancy. Farm tenancy is one phase, but an important one, of a much larger subject - land tenure. Land tenure has been defined as all the relations established among men determining their varying rights in the use of land. Broadly speaking, land tenure involves the holding or use of all or any portion of the "rights" represented by landed property, thus giving the right to control or use the land resources, and the time and capacity in which these are held. Tenancy, being a part of land tenure, applies only to the leasing or sharing by a tenant of a portion of the rights in land held by the landlord.

Extent of Tenancy in Pakistan

Tenancy is the dominant feature of the cultivating class. This mainly stems from the fact that land is concentrated in few hands. Adequate and up-to-date statistics of the degree of such concentrations are not available. But

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enough data is available to establish the existence of large landed estates. As a specimen, the land-ownership figures for the former Punjab is given below.

Punjab Land-ownership Distribution

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Area Owned (00,000)</th>
<th>Percentage of Total</th>
<th>Number of Owners</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10 acres</td>
<td>70.92</td>
<td>31.7</td>
<td>18.09</td>
<td>79.0</td>
</tr>
<tr>
<td>10 - 100 acres</td>
<td>102.28</td>
<td>46.3</td>
<td>4.76</td>
<td>20.7</td>
</tr>
<tr>
<td>100 - 500 acres</td>
<td>25.02</td>
<td>11.5</td>
<td>.12</td>
<td>.3</td>
</tr>
<tr>
<td>Above 500 acres</td>
<td>22.95</td>
<td>10.5</td>
<td>.01</td>
<td>.3</td>
</tr>
<tr>
<td>Total</td>
<td>221.17</td>
<td>100.0</td>
<td>22.98</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Tenancy Enquiry Committees' Report, Paragraph 6, App. VI.

Thus, in the Punjab, the so-called land of owner-operators, nearly 20 per cent total cultivated area is owned by less than one half per cent of the owners, and about 60 per cent of them own less than 33 per cent of land. Now let us see the position in other provinces.

In former Sind 70 per cent of the total farm area was owned by only 7 per cent of the total owners. In the former N.W.F.P., 47 per cent of the total area is in the hands of big landlords not cultivating themselves. In East Bengal there are large estates owned by absentee landlords.76

As a result of this kind of distribution of ownership a high proportion of the area in West Pakistan is being cultivated by tenants. In the former Punjab according to the Tenancy Enquiry Committee (1942), 93 per cent of the total area is

76 Akhtar, S. M., Economics of Pakistan, Volume 1, p. 157.
cultivated by tenants-at-will and another 6.7 per cent by occupancy tenants. In former Sind 80 per cent of the total area is cultivated by "Haris," the tenants-at-will of that province. In the N.W.F.P., the tenants cultivate about half of the total arable land.77

What type of land tenure is the best for Pakistan and how can it be brought about is a long and tedious venture and we will not delve into it at this moment. Here, our immediate concern is how should a farm lease be arranged so that the defects that go with defective leases, such as exploitation of tenants, depletion of soil resources, killing of incentive for higher production, class friction and antagonism, etc., should be eliminated. Tenancy is bound to persist in one form or another in the agriculture industry, even if we succeed in creating peasant proprietorship at a given time. There will be some owners who will be disabled, sick, too old or too young to cultivate, widows, people who will find off-farm jobs, etc., thus creating need for tenants to operate their holdings. We should, then, look for farm lease and rental arrangement that should permit:

1. An equitable distribution of farm income among all groups concerned according to the contributions of each in the output.

2. Greater efficiency and progress in the farm production process.

3. To promote the conservation and development of agricultural resource base.

4. Stabilization and welfare of rural institutions and to encourage good landlord-tenant relationships.

5. To provide the tenant with a feeling of security and dignity in his tenure and work.

6. To leave the tenant with considerable freedom of choice and personal action as is consistent with the general welfare.

Farm Leases Defined -

"Legally a farm lease is a contract under which the owner of the land transfers the use and possession of his land to another for a definite term in consideration of the payment of rent." In simple words, when a farm is rented it is said to be operated under a lease. The lease portrays the understanding between the landlord and tenant in either oral or written form. It tells the position of landlord and tenant in respect to:

1. Share of each in the production and income.

2. The resources and expenses which each has to furnish. It will also specify the price of rental, together with the designation of the time and the place at which payment is to be made.

3. The period over which lease will extend and conditions for termination of the lease.

78 Hannah, H. W., Professor Agricultural Law, College of Agriculture, University of Illinois, unpublished manuscript, Case: p. 3389
4. Practices to be followed, compensation for unexhausted treatments and penalty for the damages done to the farm resources.

Preparing a Lease

Before renting a farm, one has to prepare a lease in either oral or written form. A written lease is desirable not only that it can be reproduced in the court if landlord or tenant has put any provision in it which may be contrary to the law, but also it gives a good chance to both of the parties to think thoroughly the terms they are to live by. With oral leases, usually too little attention is given to many of the details and each problem is considered one at a time as they arise. A written lease is definitely recommended, it claims the following advantages:

1. A written lease prevents unintended interpretations being placed upon the agreement between the landlord and the tenant - interpretations which might penalize one of the partners.

2. A written lease serves as a memorandum to which either party may refer in case of doubt as to the terms of the lease.

3. A written lease affords a good basis for changing minor provisions when conditions arise which make such adjustments desirable.

4. A written lease afford protection to both parties and to their heirs and assigns in case one party should die.
5. A written lease, since it provides proof of the agreement, serves as a means of preventing dispute.

6. A well-prepared written lease provides assurance that both parties will consider all phases of the contract before a tenant moves to the farm, thus both parties have a clearer concept of the provisions.

What really matters is not whether it is written or not, but what is written. Not even a written lease makes for greater landlord and tenant profits if it provides or permits arrangements which discourage good farming practices. A written lease may help prevent arguments over what the agreement is, but it, like an oral lease, can include sharing arrangements which discourage the use of fertilizer, a new practice, or the optimum quantity and combination of resources. More important than the question of whether the lease should be written or oral is the sharing arrangements which it includes and the ability of the two persons to work together and trust each other. The individuals themselves, more than any other factor, determine harmony on a rented farm. A written lease may contain a clause which penalizes the tenant severely. It will bring continuous friction even if the agreement is in writing. If nothing else, it will result in a new tenant on the farm each year, with tenant and landlord parting enemies.\(^7^9\)

\(^7^9\)Heady and Jensen, Farm Management Economics, 1954, p. 553.
The major types of farm leases may be classed as cash lease, crop share lease and livestock share lease. A tenant of the landlord needs to consider the advantages and disadvantages of the various kinds of leases before renting a farm.

**Cash lease.** The cash lease is a rental agreement in which the tenant pays cash for the use of the land and improvements. A cash lease may be regarded as a high risk-lease for a tenant in that he guarantees a fiscal cash payment for the use of the property and therefore carries the entire risk of poor weather, insect-pest and diseases or an unfavorable market. Because of the high risk involved for the tenant, the average cash rental provides less income to the landlord than that received from other forms of leasing. Rental rates vary greatly depending upon the productivity. The landowner stands the expense of land and fixed improvements and general care of the property (insurance and taxes), but he is relieved of most of the managerial responsibilities and receives an assured fixed monetary income. The tenant furnishes labor, machinery, livestock, seed, fertilizer and all other operating capital and expenses. Cash rent tends to be sticky and lag behind share returns as prices move up or down. Some cash rental leases provide for such price variations and for serious crop failure.

Cash leases are found particularly where: (a) crop production is fairly stable and yield or price risks are not great, (b) land inputs represent a small proportion of total inputs
or expenses such as in vegetable or total production where labor and fertilizer are most important and (c) land is devoted mainly to pasture which can't be shared easily except through a livestock-share lease.

The cash lease has the following advantages for tenants and landlords.

A. Advantages of cash lease from the tenants standpoint.

1. Tenant is his own boss under a cash lease. Landlord does not expect to take part in decisions, or in specifying practices, marketing, quantities of resources used, and crop or livestock systems as he does under share contracts.

2. Rental rate is lower as an average over time (but not in years of quick price decline) when compared to a share lease, if the tenant's capital position allows him to assume greater risk.

3. Tenant gets all returns from superior management; he shares them with landlord under share lease.

4. Tenant can use more of his capital in equipment and livestock and can add to his income.

5. He makes higher returns in periods of price increase since cash rents lag behind share rents.

6. He has all the feeds for his own livestock, whereas landlords' position of crop may move off the farm under crop share lease.

B. Advantages of cash lease from landlords' standpoint.

1. He knows income for the year ahead with certainty and can plan accordingly; less risk for the landlord.

2. Cash lease requires less knowledge of farming than share lease.
3. Cash lease requires less capital, aside from farm investment, than crop or livestock share leases.

4. Farm is less bother and can be handled even from a distance; the lease depends less on tenant honesty for income; landlord does not have to decide whether to store or sell crops or when to sell.

5. Landlord realizes high returns than under crop-share lease in periods when prices fall rapidly.

6. Landlord is not penalized when tenant is a poor manager, if rental rates are at the community level.

**Crop share lease.** A crop share lease is a rental contract wherein the entire rental consists of a share of the crop produced. Under it the landlord usually furnishes the land and buildings and pays the taxes or other expenses relating to these resources. The tenant furnishes all the machinery, labor and power for general crop work, he also furnishes all resources, except permanent buildings, for his own livestock. Some expenses such as seed, fertilizer, and special treatment or harvesting costs may be shared. The production from the farm is then shared in the manner agreed upon.

The relative advantages or disadvantages of the crop-share lease are:

A. Advantages of a crop-share lease from a tenant's standpoint.

1. It involves less risk than a cash lease since amount paid depends only on the yield of the year. Rent payments varies with yield and price since the landlord gets rent
only in physical form. It is not a fixed cost as in cash rent, which must be paid regardless of economic returns. Also, the landlord may pay part of seed, fertilizer or similar costs.

2. It gives higher returns than a cash lease when prices are falling rapidly. Rent payment will fall with prices in contrast, cash rent is fixed.

3. It requires less capital than
   a) a livestock-share lease where the tenant must produce livestock and furnish half of the capital,
   or
   b) a cash lease where one must have enough funds to stand the greater risk of a fixed payment.

4. A good landlord may help in management decisions and boost income for both parties; the tenant is on his own under a cash lease. (Practice patron by the landlord in management decisions may be an advantage if he knows little about farming or just wants to experiment.

3. Advantages of a crop-share lease from a landlords standpoint.

1. It requires less capital than a livestock-share lease where the landlord provides half the investment in animals.

2. For the landlord who lives some distance from his farm or knows little about agriculture, it requires less knowledge, supervision and decision-making than a livestock share lease.
3. A good landlord can help to manage the farm and boost returns for both himself and the tenant. The landlord also benefits from the superior management ability of a good tenant, although he sacrifices if the tenant is a poor manager.

4. He can look after his farm, help specify the crops and keep the tenant from 'sinking the land.'

5. It gives a higher return in periods of rising prices since the landlord can sell his share at higher prices; cash rents lag behind at lower levels as prices move upward.

6. As an average over a long period of time, the landlord gets a higher return under crop-share than under cash, even though returns may be lower in some years. Returns are higher under crop-share because the landlord is rewarded for standing more of the price and yield risk.

**Livestock-share leases.** The livestock-share lease is a partnership super-imposed on a crop-share lease. Under this arrangement the landlord generally furnishes the land, buildings and other improvements and pays the costs relating directly to these, such as taxes, insurance and repairs. The tenant usually furnishes the machinery, power and labor, at least his own, and pays the taxes, insurance and repairs attached to these items. There is a great variation in the items to be furnished by the tenant so much so that sometimes the tenant furnishes only his labor. Under the most common arrangement, the tenant and landlord jointly own the livestock and pay the annual expenses of production, except for the resources furnished
Independently. Commonly the livestock and expenses are shared 50-50 and the income is divided in the same proportions. 80

The livestock-share leases are practically non-existent in Pakistan, except in case of sheep and goats.

What is a Fair Lease?

The fairness of a farm lease depends mainly on whether or not the income from the farm is divided in about the same proportion as the expenses and other contributions of the landlord and tenant. The major defects in agriculture, and poverty of the masses stems from the fact that income from the farm has not been divided in about the same proportion as the contribution of landlord and tenant. According to an investigation the landlord furnishes only land and pockets sometimes as high as 75-90 per cent of the returns. 81 Due to pressure of population on the soil there is land hunger in the country, and the tenants bargaining power is weak even if he were to be a free economic agent, which he seldom is. The tenant is at the mercy of the landlord because of his poverty, ignorance and lack of alternative avenues of employment. The landlord is a man of substance economically, of high status socially and of influence in the field of politics


81Muslin League Agrarian Reform Committee Report, p. 15.
and administration. Exploitation of the tenant takes many forms and its degree varies from place to place according to circumstances. High rents, illegal exactions, like "abwabs" and other taxes and contributions, personal services without payment, and other forms of exploitation are quite common. In certain parts of the country there are other taxes which the landlord exacts from the tenant, e.g., tax per hearth, widow and even for every domestic animal or chicken. Landlords in backward areas are even known to charge a dower on the marriage of the tenant or his children.\(^2\) One is struck with the similarity of these conditions to those which prevailed in Europe during the worst days of feudalism.

The present system of dividing the returns from the farm takes away incentive for capital investment and sustained work on the part of the tenant. The principle underlying this absence of incentive can be explained by taking an example of fertilizer application. In this case the tenant pays all of the fertilizer expenses and gets one-half of the product. Unless a practice covers its cost, either in the short run or long run, it will not be adapted under any system of farming no matter whether it is owner-operatorship, cash-lease or crop-share lease. However, cash and share leases effect the case in altogether different manner. Cash rent acts as a fixed cost; when paid as a given amount per acre or as a lump sum for the entire farm, the payment does not vary with yield or

\(^2\) Ibid., p. 15.
farm output once the contract has been drawn. In contrast, a share-rent does vary with yield or output, and hence, is more nearly a variable cost. On the other hand, share rent can be looked upon as a cost item which the tenant pays for the use of real estate furnished by the landlord. On the other hand, it can be viewed as the share of the product which is imputed to the land and the building furnished by the non-operating partner. In any case, it may have effects on the intensity of production which are profitable to the tenant or landlord. By intensity of production is meant the amount of variable resources such as fertilizer, seed, labor, fuel and other input or cost items which may be applied to a fixed factor unit such as an acre of land. Both the landlord and tenant will try to maximize profit to the agent of production which he furnishes.

The possible effect of share and cost rent on the level of intensity which is profitable to a tenant is illustrated in Table 7. Column 1 shows five rates of fertilizer application on sugarcane, while Column 2 shows the marginal dose of fertilizer. Column 3 shows the cost of the added fertilizer with a price of 12 anans per pound. Column 4 shows one-half of the added cost. Column 7 shows the value of the added raw sugar ("gur") yield indicated in Column 6. Under cash renting, it is profitable for the tenant if he has sufficient capital and long tenure, to add the 4 units. The marginal cost (Rs. 15 in Column 3) of the fourth fertilizer increment is equal to the added return (Rs. 15 in the 8th column) from the one and half mound increment in yield (Column 6), since the cash
tenant pays the entire cost, will receive the entire yield. The situation is quite different for a tenant who gives a one-half of produce as rent, but pays all the fertilizer cost. Under this arrangement his added return is indicated in Column 9. It is profitable for him to add only the third increment of fertilizer. The fourth increment is not profitable since its cost is Rs. 15 (Column 3) and the return is Rs. 7 and 8 anas (Column 9). Thus, the share tenant would use less fertilizer per acre than the cash tenant, were both to maximize profits. If the landlord gets 75 per cent of the return, it is only first dose that is profitable for the tenant to apply: when the landlord gets 90 per cent of the return, there is a net loss of Rs. 9 if the tenant will apply even the first dose (added cost - added return = Rs. 15 - 6 = 9). This in a way will explain why in Pakistan on an average only one pound of fertilizer is added per acre, though it has been established that nitrogenous fertilizers can increase the crop yield by 20-40 per cent.83 (Remember that it is an average application level, it is probable that millions of acres go without fertilizer altogether.)

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Table 7

Effects of Cash and Share Rents on Tenants Profits and Intensity

<table>
<thead>
<tr>
<th>Units of Fertilizer Applied</th>
<th>Added Units of Fertilizer</th>
<th>Cost of Added Fertilizer at 12 Anas per lb.</th>
<th>Total Yield of Sugarcane &quot;gur&quot;</th>
<th>Added Yield of Gur</th>
<th>Value of Added Gur at Rs 10/mound</th>
<th>Value Added for Tenant When Lease is</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(mound)</td>
<td>(mound)</td>
<td></td>
<td></td>
<td>Cash</td>
</tr>
<tr>
<td>(1) 0</td>
<td>0</td>
<td>Rs 15-0</td>
<td>Rs 7-3</td>
<td>25-0</td>
<td>Rs 0</td>
<td>Rs 0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>15-0</td>
<td>7-3</td>
<td>31-0</td>
<td>6-0</td>
<td>60-0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>15-0</td>
<td>7-3</td>
<td>35-20</td>
<td>4-20</td>
<td>45-0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>15-0</td>
<td>7-3</td>
<td>33-20</td>
<td>3-0</td>
<td>30-0</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>15-0</td>
<td>7-3</td>
<td>40-0</td>
<td>1-20</td>
<td>15-0</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>15-0</td>
<td>7-3</td>
<td>40-30</td>
<td>0-30</td>
<td>7-3</td>
</tr>
</tbody>
</table>

Source: Hypothetical data.
The same is true for other items of costs such as labor, ploughing, improved seed, irrigation, etc. When the returns to the tenant are not enough to cover the cost involved, it will not be in his interest to apply any dose. That is why "the tenants generally take less care in preparing the land, plough it less often, manure it less and use fewer implements upon it than owners. They grow less valuable crops, especially avoiding those requiring the sinking of capital in the land. They make little or no efforts for improving their fields; they often keep a lower type of cattle, they avoid perennials and bestow no care on trees."

Under appropriate share arrangements the same level of fertilizer application can be made profitable to both the share and cash tenant or owner operator. For example, if the landlord and tenant share the fertilizer cost in the same proportion as they share the product, the same level of fertilizer application is profitable to a tenant under share as under cash rent. This fact can be illustrated by referring to Column 4, in Table 7, which represents the value of one-half of the cost. A share tenant realizing these costs and returns (Column 4 and 9) could profitably apply the fourth unit of fertilizer, the added return to the tenant of Rs. 7 and 8 anas (which is one-half the total in Column 7) is equal to the added cost of Rs. 7 and 8 anas (which is one-half the total fertilizer cost in Column 3). The same principle may be applied to any other single practice or resource.

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input, while examples have been cited for tenants. The same relationship applies to inputs or investments which are normally provided by the landlord alone. For example, if the landowner invests in drains and gets back only half share of the crop, it is not profitable to him to make as great a drainage investment as would be profitable if (a) the tenant paid one-half the cost or (b) he were an owner-operator. The share and intensity problems does not bear upon the tenant in any unique manner but equally effects the profitability of the landlord investment. Thus, we have seen that when the cost is not shared but the income is shared, there is always the tendency to use less than the most profitable quantity of these items, and the crops requiring these items may not be planted at all.

The same underlying forces can alter the cropping program. If the sharing of returns from each crop is not in proportion to the costs of the crops paid by tenant, he may find a different cropping more profitable than the one an owner-operator or a cash tenant uses.

Due to the complementary effect of crops like 'berseem', shaftal, quara, sengi, moth, etc., on the yields of wheat, cotton, sugar cane, etc., rotations like (a) wheat-gram-cotton, (b) chari, guara and gram-cotton and sengi-wheat, and (c) wheat-maize, and berseem sugar cane-cotton, yield more grain, cotton and sugar cane (cane or sugar) than continuous cash crops alone. Owner-operators usually have soil-building crops in their rotations. Some landlords and tenants
resort to rotations containing only cash crops. The tenants do it because soil-building crops take time to show their effects, when the tenant may not be at the farm. The landlord thinks that gram, berseem, guar, etc., are not as paying as wheat, cotton or sugar cane, therefore, they discourage the inclusion of those in the rotations. They never stop to think that these leguminous crops are complementary or competitive with the cash crops. To a point they are complementary, i.e., to this point yields of both cash and leguminous crops will be more than when wheat, cotton or sugar cane is grown alone continuously. The landlord should not object to the inclusion of soil-building crops in the rotations, because with these in the rotation there will be more both for the landlord and tenant to share.

In many localities, where tenants' competing position is not very weak "batai" system (share-basis) is prevalent. The landlord, under this system gets 50 per cent of the produce raised less half the charges such as land revenue, irrigation charges, seed, manure, and casual labor charges (for harvesting of wheat, picking of cotton, weeding, hoeing, etc.). In addition to this payment, in certain areas the payments like, certain personal services, hearth tax, marriage tax, 'dara' tax are pretty deeply inbedded in customs

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since generations. If a farm is going to be rented, it will be rented only on whatever share the custom follows. Many of these arrangements are out of date, reflect the weak bargaining power of the tenants, and are among the factors that cause inefficient farming. Wherever and howsoever possible a new evaluation should be made on rental share and should be made to conform to the contributions of each party. Some possible methods for making this new evaluation are discussed here. They can be applied to any kind of lease.

Equitable tenants' and landlords' returns under a lease should be worked out for the farm as a whole. In economics it is known that the return to each party should equal the marginal productivity, the contribution to production, of the resources furnished by each party. We have already shown that for simple practices such as fertilization, best results are obtained when returned and costs are shared in the same proportions. The same procedure can be applied in an overall manner to the farm. This task of taking the total income of the farm and specifying the portion or amount that was earned by the tenants' resources or landlords resources, is not easy. However, some approximation can be made with simply calculations. We can compute these quantities and if we find that the tenant is furnishing four-fifths of the total expenses or inputs but is getting only one-half of the return, rental rates are undoubtedly out of line, and to make it a "fair lease" the tenant should get four-fifths of the returns. A simple table
such as Form I can be used by tenants and landlords in estimating the proportion of expenses or inputs furnished by each and in setting up 'reasonable' rental shares.

The annual expenses or inputs shown in Form I includes not only cash operating expenses but also the value of unpaid family labor or other items that do not have a price attached to them and the estimated interest cost on land, building, machinery and other durable and semi-durable capital furnished by the tenant or landlord. We figure the interest value of the land because this is the annual input of land services by the landlord. The same applies to buildings and machinery. Also, operators' labor is an input of the tenant, just as is hired labor. In computing these contributions present values or prices should be used on all items. In other words, we should use today's land values in computing the interest contribution of land by the landlord; we use the current value of labor in figuring the contribution of tenant labor just as we use present values of feed and annual expense items.

After these contributions have been computed we total them at the bottom of the last two columns. We then figure them as percentages of the total contributions and divide the income among the tenant and the landlord according to these percentages. Form I can be used for estimating contributions on both crop-share and livestock-share farms. For crop-share lease, any capital, expenses and labor relating to livestock are left out and contributions are calculated for crops alone.
Form I
Estimating the Contributions of the Parties in a Farm Lease

<table>
<thead>
<tr>
<th>Items of Cost</th>
<th>Value</th>
<th>Rate of Interest</th>
<th>Total Contribution</th>
<th>Contributed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest on investment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buildings &amp; improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery &amp; equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash operating expenses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed purchased</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop expenses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed (a) legumes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) field crops</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) permanent pasture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilizers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other crop expenses (twine, chemicals, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock expenses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vet fees, serums, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breeding fees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing expenses for livestock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other livestock expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel, oil and grease for farm work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine work hired</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery repairs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary hired labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled labor necessary on improvements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material necessary for improvements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxes:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Real estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Machinery and equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Livestock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Feeds and supplies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance on improvements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other non-cash expenses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operator's labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family's labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciations:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Buildings and improvements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Machinery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Breeding and dairy stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total contribution or cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per cent contributed by each</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Having a "fair" rent is the primary concern of many landlords and tenants. A fair rent is probably attained when the income of each party is in line with the quantity of the resources he furnishes. Those who are interested in size of the income should know that the method of dividing income and costs may effect the size of the income to be divided. One of the methods of deciding a "fair" rent is described in Form I.

Utilizing Form I, we will calculate a fair-rent for a tenant renting 12 acres of land in the can¬ti colony. According to custom, the landlord gets 50 per cent of the produce less half of the charges, such as land revenue, irrigation charges, seed, casual labor charges. The cropping scheme of the tenant will be as follows:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>5</td>
</tr>
<tr>
<td>Berseem</td>
<td>1.5</td>
</tr>
<tr>
<td>Turnips</td>
<td>1</td>
</tr>
<tr>
<td>Cotton</td>
<td>4</td>
</tr>
<tr>
<td>Sugar cane</td>
<td>1</td>
</tr>
<tr>
<td>Maize</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13.5</strong></td>
</tr>
</tbody>
</table>

The charges for bullocks were charged at Rs. 500 per pair, per year, the standard charges of the Department of West Pakistan. The operators' labour was renumerated at an imputed rate at which a hired laborer could be employed. The wages for hired labour are Rs. 20 per month, plus meals or
12 mounds of *j′ain*, one pair of shoes, clothes which consisted of two shirts, two sheets and one turbas or in monetary form Rs. 400 per year.

Items of costs and contributions of both landlord and tenant are as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Total Contribution</th>
<th>Landlord</th>
<th>Tenant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land: 12½ acres @ Rs. 1000</td>
<td>Rs As Ps</td>
<td>Rs As Ps</td>
<td>Rs As Ps</td>
</tr>
<tr>
<td>per acre @ 5 per cent interest rate</td>
<td>625-0-0</td>
<td>625-0-0</td>
<td>--</td>
</tr>
<tr>
<td>Crop expenses - Seed</td>
<td></td>
<td>200-0-0</td>
<td>100-0-0</td>
</tr>
<tr>
<td>Bullock labor - one pair (feed and depreciation, veterinary, shoeing)</td>
<td>500-0-0</td>
<td>--</td>
<td>500-0-0</td>
</tr>
<tr>
<td>Implements (a) Depreciation -</td>
<td></td>
<td>100-0-0</td>
<td>--</td>
</tr>
<tr>
<td>(plows, yokes, cart, cane-crusher, karah, shaga, spade, jandra, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Repairs - (Menial charges)</td>
<td>37-0-0</td>
<td>18-8-0</td>
<td>18-8-0</td>
</tr>
<tr>
<td>Casual labor - (Picking cotton, harvesting and winnowing wheat, stripping cane, &quot;sugar&quot; or &quot;gur&quot; making)</td>
<td>300-0-0</td>
<td>150-0-0</td>
<td>150-0-0</td>
</tr>
<tr>
<td>Taxes and Land Revenue</td>
<td>Wheat 13/3,</td>
<td>160-0-0</td>
<td>80-0-0</td>
</tr>
<tr>
<td>Water rates</td>
<td>Cotton 14/3,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sugar cane 20/-,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>other crop 8/-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>per acre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operators labor</td>
<td>1½ men</td>
<td>600-0-0</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2522-0-0</td>
<td>973-8-0</td>
</tr>
<tr>
<td>Percentage</td>
<td>100</td>
<td>38.6</td>
<td>61.4</td>
</tr>
</tbody>
</table>
The "fair rent" that the landlord should charge, according to these calculations, is 38.5 per cent of the produce. It may be noted that personal services, which are often binding, have not been included in the contributions of the tenant, if we do so, the leases will be more out of line and unfair than needed for progressive agriculture.

The other method is:
Share divided first, the costs should be divided accordingly.

A third way is for the tenant and landlord to furnish between them the necessary resources, such as land and buildings by the owner, and operator labor and machinery by the renter. Then, as many expenses as possible should be shared. At the end of the year, net income for the farm as a whole should be computed without regard to the income of tenant or landlord. Using acceptable wages and interest rates each party should have some income imputed to him for the resources he furnishes; the quantity of capital he furnishes is multiplied by the interest rate, and his labor is multiplied by the wage rate. After these two shares are computed, they are totalled and subtracted from the net farm income. The remainder leaves a "profit" to be divided equally between the two if they have shared expenses on a 50-50 basis. 88

Length of the Lease

One problem which plagues farm productivity is the length

of the lease. The majority of the tenants are tenants-at-will, liable to be ejected at any moment. Their tenure is unsecured and their future uncertain.

Because of this ever-present insecurity of tenure, the tenant hesitates to make investments on the farm which extends beyond one year. (The other reason for lack of incentive to invest, as discussed earlier, is that cost and income are not divided equitably.) Investments in green manure crops, farm yard manure, fertilizer, and the labor and machine costs for soil building rotations are not favored by the tenant. The returns from these things come only over time as legumes add nitrogen to the soil and build up productivity for high crops yields. Work and capital expended on irrigation channels and leveling on terracing and dam construction, on clearing trees and bushes or on improving soil conditions have little attraction for the tenant with one year lease and no certainty about the future. Even a simple practice such as nitrogen fertilizer, the carryover effect and returns in the second year may be almost as great as for the first year.89 Residual effects of farmyard manure remain for a longer period, for practical purposes, three to four years, but it has been observed that after 40 years of application, its residual effects were in the soil.90


Hence, a tenant with only one year on the farm will get back only a fraction of the return that an owner or the tenant with a long lease can get. Even if investments on one farm promise a return of 500 per cent in two or three years, the actual return is zero for the tenant who will be on another farm by then.

The landlord can, of course, invest in these things and realize a good return if he continues to own the farm and has a tenant who can apply them effectively. But even he must look upon some investments with disfavor where the tenant is certain of moving off every year. The next tenant may not be able to utilize that improvement effectively.

Insecurity of tenure causes many undesirable farming practices. Modern farming can't be conducted on a short-term or annual plan. Where tenure is insecure, emphasis is placed on annual crops which can be planted and harvested within the term of the lease. The tenant is not likely to invest his money or labor in long-lived crops such as lucern, sodan-grass or alfalfa, or other improvements when he is not sure that he will be allowed to remain on the farm long enough to secure the benefit from such investments.

To help encourage investments which extend over more than one year and good farming, a compensation clause can be included in the lease. It provides some return to the tenant for unexhausted investments if he must move before their full return has been realized. An unexhausted investment is any resource or practice which is not fully transformed into
product and returns in one year. Many resources fall in this category, such as farmyard manure, lime, fertilizer and other soil improvements. The exact amount of the time required for a resource to give its full returns varies with the soil, climate, cropping system and such. However, a good estimate of the time required, even though it does not just hit the nail on the head, is better than no estimate and no planning for improvement and compensation.

After the landlord and tenant have decided on the rate at which the improvement or investment will be depreciated, they then decide on the payment to be made to the tenant by the landlord if the tenant moves before the investment is fully used.

Generally, however, the tenant should receive the unexhausted portion of his investment plus interest on it for the time it has already been tied up. Few people are expected to make investments without getting back some small return. Compensation equal only to the unexhausted portion of the investment with no return on the capital does not always invite investment. Why invest in a soil building improvement which just returns your capital when you can invest in feed, or seed which will return the investment plus some earnings within the years? This is the question that many tenants will pose to the landlords. In answer to it, the landlords should allow return of the unexhausted portion of the investment plus interest on it. The interest should be equal to the market interest rate if
the tenant has an unlimited capital or equal to the possible rate of return which the tenant can earn by investing the same capital in seeds, fertilizer or feed.

If by his sheer negligence, the tenant damages some of the improvements, he should pay the damage to the landlord.

Under compensation schemes, the landlord is justified in charging the incoming tenant the amount paid to the outgoing tenant. Finally, it is possible for the landlord to stand the costs of all simple soil improvements such as terracing, ditches, and dams. In turn, he is justified in charging higher returns to match any increases in farm productivity and returns.91

Hearing Tenure to More Efficient Farming

The important farm management problem in tenure is to change leasing for better farming. Since use of an important portion of farm resources is obtained in the market through leasing arrangements, emphasis should be placed on leasing arrangements which encourage farming efficiency. It is entirely possible that farming efficiency on rented farms can be at a level which approaches or surpasses that of owner-operated farms. There is an important place for rented farms in the nation's economy. They are the cause of nations' poverty and it is from them that economic prosperity, social harmony and political stability will emanate. Without improving

91Ibid., p. 581.
them the nation can't get anywhere. Imperfect leasing arrangements exist primarily because people have not made a farm management study of their problems and tried to improve them. Rental rates and leasing systems should always be adjusted towards better farming and more income. Leased farms represent one of those unique economic organizations where things can usually be rearranged to make all parties "better of."  

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CHAPTER VII

FINANCING THE FARM BUSINESS

High farm income levels are based on the right combination of land, labor, capital and management. Credit gives control of capital. When capital is limited, relative to other resources, the addition of capital increases the economic efficiency of all the resources. Instead of borrowing capital, Pakistan farmers substituted labor for capital and pushed it too far to the point of negative marginal returns. Land is scarce and is available in very, very small and scattered holdings. Under such a situation, capital or credit acquires an added importance and significance. It is hoped, the addition of capital will increase the size of the farm business, will help increase yields of crops and livestock, lower costs and result in higher net returns. The purpose of credit is to increase resource efficiency.

The Credit Needs of the Farmer

"The lesson of universal history from Rome to Scotland is that an essential of agriculture is credit. Neither the condition of the country, nor the nature of land tenure, nor the position of agriculture affects
the one great fact that the agriculturalist must
borrow."—93

The fact is that every modern business worth the name
is run on credit. Agriculture in Pakistan is not strictly
run on business lines; still it can't dispense with
borrowing. The agriculturist requires three types of
credit to carry on his operations successfully.

a. Long-term credit (say for a period of over five
years) for expenditure on permanent improvements. These
involve investment of capital in the sinking of wells,
water channels, construction of bunds and embankments,
terracing of hill sides, clearing of jungles, drainage and
fencing of his plots, etc. The finance required on items
of this category of expenditure is either provided by the
cultivator himself from his own savings or through the
government loans in the form of "taccari" loans.

b. Intermediate credit (from two to five years) the
cultivator requires for purchase of more expensive imple­
ments, cattle and sometimes for the erection of buildings.
For these in the past he had mainly to resort to the pri­
ivate money lender.

c. Short-term credit (from three months to two years).
This the agriculturist requires for financing his current

93Nicholson, F., Report Regarding the Possibility of
Introducing Land and Agricultural Bank in the Madras
Presidency, (1895).
requirements like the purchase of seed, fertilizers, feeding stuff for cattle, for seasonal production, processing or marketing, and to pay for consumption between harvest.

Till today, nobody knows with reasonable certainty the aggregate need for these three types of credits. In the First Five-Year Plan it is clearly admitted that it is extremely difficult to make estimates of credit needs with any claim even to rough approximation. The State Bank of Pakistan has recently estimated the need for short-term credit to be 3,000 million rupees. The magnitude of requirements will increase as development gets underway and supplies of improved seeds, fertilizers, improved breeds of cattle, etc., become available and are brought into greater use in the country....It is sufficient to appreciate the fact that needs are large....and with utmost efforts only a small proportion will be met in the plan period. 94

Extent of Indebtedness - Certain peculiarities of agriculture industry, such as small and scattered holdings, small unit of production, uncertainties due to insect-pest, diseases and weather, and primitive nature of operations result in low productivity of resources, constrain the farmer to borrow. The farmers' qualities such as illiteracy,

94 The First Five-Year Plan, 1955-60, p. 93.
conservation, thoughtlessness, extravagance and improvidence, and his passion for litigation are also conducive for his going under debt. The fraudulent practices of money-lenders, high rates of interest, heavy burden of land and irrigation taxes, and inadequate marketing facilities add to his poverty and loan burden. These leave so small income as to make it impossible for him to have most of the necessities of life. He is underfed, under-clad, under-nurtured and often he lives from hand to mouth. The physical deficiency which results from these conditions make him easy prey to diseases, which sap his stamina and vitality. He has a great potential need for funds. He can't resist the temptation to relieve present necessities by even mortgaging his future income and freedom. His needs and distress circumstances are seemed to assume an important role in adding to his total debt.

What was the magnitude of the debt thus created?

Several estimates were made from time to time as to the amount of debt owned by the peasantry in pre-partition India. In chronological order they are given as under:
<table>
<thead>
<tr>
<th>Year</th>
<th>Conducted by</th>
<th>Percentage of Families in Debt</th>
<th>Total Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875</td>
<td>The Deccan Riots Commission</td>
<td>33.3</td>
<td>Rs. Eighteen times the revenue assessment</td>
</tr>
<tr>
<td>1880</td>
<td>The Famine Commission</td>
<td>33.3 - 33.3</td>
<td>Deeply in debt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In debt, but not beyond the power of recovering them-</td>
</tr>
<tr>
<td>1895</td>
<td>Sir Edward Maclagan</td>
<td>--</td>
<td>selves</td>
</tr>
<tr>
<td>1925</td>
<td>Mr. Darling</td>
<td>--</td>
<td>30 billion</td>
</tr>
<tr>
<td>1930</td>
<td>Provincial Banking Enquiry Committees</td>
<td></td>
<td>60 billion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>80.3 billion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(The annual production of chief agricultural prod-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ucts at this time was Rs. 95.5 billion)</td>
</tr>
<tr>
<td>1935</td>
<td>Dr. R. K. Mukherjie</td>
<td></td>
<td>120 billion</td>
</tr>
<tr>
<td>1935</td>
<td>Dr. R. K. Mukherjie</td>
<td></td>
<td>230 billion</td>
</tr>
</tbody>
</table>


No inquiry has been made since the partition into the overall debt position of the peasantry in Pakistan. In the Punjab, however, an inquiry (by the Board of Economics Enquiry) has estimated the rural debt of the Punjab at Rs. 280,000,000, which works out at about Rs. 414 per indebted family. About 34 per cent of the total number of families are considered to be in debt. Seventy per cent
of the loans were seeked for unproductive purposes. The Government of Pakistan during the period 1955-60 set aside only Rs. 95.2 million for credit improvement in the entire country, which amounts to a mere drop in the ocean. Even in the past the government played a very small part in agricultural financing. In addition to the inadequacy, the method of distribution and collection are very defective and have given rise to many serious complaints. The delay in granting loans and levy of illegal gratification of petty government officials, coupled with extreme strictness in realizations, inelasticity of administration and difficulty of supervision have rendered the government loans very unpopular, so that the agriculturist is driven to the money-lender who is always ready to lend but at a high cost to the farmer.

Functional, structural and administrative defects, dearth of suitable personnel, lack of training, a background of illiteracy and uncooperative mindedness, the grave and chronic deficiency in roads, storage and other vital economic requirements—all these are relevant as part of explanation of failure of cooperatives in the field of agricultural finance.

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95 Ibid., p. 285.
The commercial banks do not consider agricultural finance as part of their ordinary business because they are not organized to supply rural long-term credit or short-term credit needs. The unsuitability of the agricultural security, the peculiarities of agricultural finance, the seasonal fluctuations, and the economic nature of the industry, illiteracy and the imperative necessity of keeping their funds liquid prevent them from undertaking the agricultural finance. They, however, indirectly finance agriculture through financing the dealers and merchants of the agricultural products.

So far the Government in the main has tried to pass litigation to relieve the distressed debtors. The laws were passed which included the provisions for declaration of insolvency under certain conditions. They also provided for:

a. Moratorium - Staying of proceedings with regard to recovery of debt.

b. Liquidation - Compulsory scaling down of debts was necessitated also by the unbearable burden.

c. Conciliation - Voluntary settlement between the debtor and the creditor with the help of specially constituted Conciliation Boards.

The other acts provided for fixing the rates of interest, the total amount to be repaid (the amount of interest paid should not exceed double the principle). They also
provided for investigations into the history of debts and the transactions between the farmers and their creditors in order to determine the amount of interest to be paid. The other laws were to control the money-lenders. He was required to have a license to lend the money, to keep regular accounts, to keep the debtors informed of the correct amounts owed by him, and to charge a certain rate of interest. The most important of the restrictions affecting the borrower were those placed on the transfer of land to creditors. Later on these restrictions were extended to agricultural tools, implements and cattle necessary for tillage and the material of the agriculturist's house. The farmer-debtor was exempted from arrest for a decree of the court. He was also given concession of repayment of his debt by installments. These in effect were restrictions on the powers of the lender to realize his debts than on those of the borrower to incur them.  

These measures could only result in the contraction of credit. Farmers did not have any security to offer, therefore, was also handicapped to seek new credit and to pay the old debts. Debtor to pay the adjusted debt, have to raise crops, but before that, raise money for crops, which was not coming forth. No substitutes were provided for

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the agencies which were restricted by law to lend. There was no source for funds for the farmers. The situation was very conducive for the money-lenders to apply their fraudulent practices in secrecy.

Agricultural credit is a problem when it can’t be obtained; but it is also a problem when it can be had but in such form that on the whole does more harm than good. In Pakistan, it is this two-fold problem of inadequacy and unsuitability (or unproductivity) of credit that is perennially bothering the farmers and perplexing the credit authorities. It is high time that we look at this problem from these two angles.

How can the credit agencies supply the farmers with adequate finance? - The main problem facing at the moment is lack of credit and inefficient credit agencies. A special survey is needed for determining the extent of credit requirements of different kinds and in different regions of the country. This is a necessary first step for a proper planning of rural credit. Then, to overcome the paucity of funds needs steps like educating the farmers to be thrifty; devising means to channelize the meager savings of rural and urban people, and making substantial appropriations by the government. The credit is so short that various agencies backed by such financial resources as the total national assets of the country can provide, may be capable of solving the immediate problem.
The credit agencies need a radical reorientation. They can be made effective and efficient by building up an integrated system of rural credit, government being at the apex, sponsoring, controlling, guiding, and if necessary, financing the various agencies serving the farmers. The research and information that is needed to build such a credit system is discussed in the chapter dealing with the State role in agricultural development.

Here, we may review some of the most common measures suggested to remove the impediments and improve the functioning of the various credit agencies. High cost of credit to farmers is a big complaint since years. It may be due to monopolistic power or the result of a too small business of the agency. To bring about an effective competition into plan is the remedy for the former and for the later consolidation work may be in order.

Suggestions for improving the co-operatives - The co-operatives should be radically reorganized by making changes in (a) the area of operation, (b) function and (c) the nature of liability.

To increase the volume of business the co-operative should extend its services to a number of villages and it should also gradually transform itself into a multi-purpose society - covering all aspects and needs of the farming community. Unlimited liability should be substituted by limited liability. The co-operative management should be
duey trained and well paid. It should be made democratic and business-like than it is now.

Suggestions for improving government role in the field of credit - There is a difference of opinion as to the function of the government regarding agricultural credit. Some maintain that the government machinery is not suited to serve as agricultural credit agency. It should simply supervise, train, and finance the other agencies. On the other hand, some economists suggest the opening of the State Agricultural Banks in every "tehsil" (county) and provide particularly the long-term credit on the security of land by issuing bonds and debentures. The government agencies, thus, will provide an effective competition to other agencies in the field. In underdeveloped countries these opportunities should receive a more serious attention. In either case, the government cannot dispense with the responsibilities like providing training and guiding facilities and financing the other agencies.

The government should also make its present "taccari" loans to play a useful role. The government can use these loans to popularize agricultural development, to mitigate the difficulties of the famine and other hazards, and to finance the uncreditworthy farmers or backward tacts where co-operative credit societies can't be successful. If the "taccari" loans are to be of any use to the petty cultivators, it is necessary that the administration of the
"taccari" loans should be made less rigid and delay in granting of loans and strictness in realization should be remedied. The facilities for borrowing from the government and the conditions under which loans are advanced should be made simpler and more widely known to public than at present.

Suggestions for improving the role of Commercial Banks - For commercial banks to operate efficiently, the conditions are more favorable in the field of marketing finance. The volume of finance supplied by commercial banks could be considerably increased by improving the arrangement for marketing of crops by (a) the grading and standardization of crops and contracts, (b) proper storage facilities and (c) the creation of properly regulated markets. The regulation of markets will not only reduce the cost of marketing to the grower and ensure him of a fairer price, but will also encourage the commercial banks to take a greater part in financing the sale of agricultural products. In order to help the commercial banks to start their branches in rural areas the existing impediments to banking expansion should be removed by building roads and developing rural communications. These banks should be given indirect stimuli, such as cheaper and freer remittance facilities from the State Bank of Pakistan and its agencies, facilities for keeping their safe and
cheats in safe custody in the strong rooms of Treasuries and sub-treasuries and warehouse facilities.

Suggestions for improving money-lenders - In order to protect both the borrowers and the lenders, to ensure the maintenance of fair and equitable relations between them, to encourage the supply of credit for productive purposes and to cut the supply of credit for unproductive purposes, it is necessary that the following steps should be taken up immediately.

a. The money-lender's business should be licensed, the rate of interest fixed, and usurious practices stopped. They should be required to maintain accounts auditable by the state. They should give receipts for all the payments made. (Education of the farmer is also necessary).

b. The reciprocal obligation of lender and borrower should be regulated by law in such matters as the interest chargeable on different types of transactions, the maintenance of proper account and the periodical settlement of accounts.

c. Adequate machinery should be established for administrating the licensing system and reviewing the affect of regulation with a view to a continuous improvement in rural credit facilities.

d. A system of control of crops and compulsory marketing through societies to recover the loans promptly and save the cultivator from his own improvidence, should be introduced.
e. The farmers' liberty to borrow to lenders' ability to lend for unproductive purposes should be curtailed.99

Productive Loans?

There is a world of difference between productive and unproductive credit. The one fertilizes, the other wastelogs the soil. From one springs the crop by which debt can be paid, from the other, the ills that shackle body and mind.100

It should be stated emphatically that borrowing as such is neither good or bad. There are times or situations when money should be borrowed, there are other occasions when money should not be borrowed. Borrowing only as a last resort when one's back is to the wall is negative and is not likely to result in high income. The need for credit and resulting profit from it should be assessed before and not after the credit is sought. The positive approach embodies a critical analysis of farm business to determine the avenues for profitable uses of capital.

100 Darling, Punjab Peasant in Prosperity and Debt, p. 32.
Usefulness of credit is enhanced when farmers and credit agencies use this positive approach, credit agencies should not play a waiting role, they should come forward and cooperate with the farmers to develop plans to determine whether borrowing is productive and profitable. The credit agencies' personnel need a lot of training and education to render this kind of service, same is true for the farmers. If it is profitable, they should decide together where farm capital can be used to the greatest advantage. Working together positively, planning and budgeting logically, both the farmer and the creditor could see in advance the prospective benefits of a certain type of credit. In the past, this phase has never been given due consideration, hence, we find the peasantry under chronic and ever-increasing and pressing debts.

The decision to borrow can mean success or failure. The farmers' ability as a manager, the terms of loans, the farm plans to utilize it, weather, and general economic conditions determine the success or failure. These elements should be incorporated into the financial plans for the farm. Financing a farm with safety to get maximum returns is a difficult task. The decision to borrow capital is one of the most important farm management decisions. Heady and Jensen and other eminent United States economists pointed out the factors to be considered in making sound credit decisions as follows:
1. When to borrow?
2. How much to borrow?
3. What to borrow for?
4. Length of loan and repayment schedule?
5. What to use for security?

When to borrow - When is it wise to borrow? The purpose of borrowing is to gain immediate use of money or capital goods that can be made to earn more than cost of borrowing. A careful analysis of each venture for which borrowed is to be used should be made to determine the probable returns from it. Unless definite gains are in prospect, it may be unwise to seek the loan.

The plans a farmer makes for investing the funds and for financing his operations make up his financial plan which has two parts.

1. One part deals with what to produce and how to produce.

2. The other part is of balancing costs and prices to determine whether or not each part of the program is profitable.

Hence, there is a very close relationship between the farmer's financial plan and his production program. Well managed financial and production programs require advance planning and clearly spell out when to borrow the funds.
Another credit guide is to borrow during periods of rising prices. During these periods use of credit is especially profitable. Prices received by farmers rise faster than costs, including interest rates. Profit margins are usually wide on both borrowed and owned capital. Borrowing risks are smallest when the general price level is just beginning to move upward. On the other hand, borrowing risks are high near the close of a rising period, especially on long-term loans. Short-time credit carries less risk than loans extending for more than a year. The longer the future period, the more difficult it is to foresee events correctly. If prices fall unexpectedly, repaying a loan from lower incomes can present grave difficulties. (With short-time credit a farmer can more easily contract his borrowings if an unfavorable turn of events occurs). Much of the failures in farming have been due to borrowing at the wrong time.

How much to borrow - The farmer should borrow enough funds to effect financially safe resource combination that nets the highest returns. Do farmers use as much capital as is profitable? If not, why don't they use more? The answer to the first question is "no," although many a farmer can say that he lost his farm because he borrowed "too much at the wrong time," to which we will add "for the wrong purpose." But normally the average farmer does not use credit up to the point where its cost about equals its
return. Some farmers do not want to be in debt. Many subsistence farms restrict their borrowing short of profitable level, of course, the tenants simply can't get more credit even though it is here that credit is needed most and earns the highest.

If more capital will return more than its cost and increase the productiveness of resources including labor, why do not farmers use more? The answer with most of the farmers is non-availability of credit at reasonable rates, increase in risk, uncertain yields and prices, lack of the nerve to borrow, lack of reputation, ambition, knowledge, farm experience, credit experience, and lack of security and surety of loans. Risk, in its various forms, is the primary reason why the farmers decline to increase their production through borrowed capital. Many farmers lost their farm, reputation, social or status, due to risk, mis-use or ill-planning of credit, that is why it is socially condemned to borrow the funds.

**Equity principle in relation to borrowing** - On any one farm, the condition of buildings, the amount of capital owned, the health and age of the operation, and the level of management determine the amount that can be safely borrowed. In addition, uncertainty in varying degrees faces all farmers. The amount which can safely be borrowed varies from farm to farm, or area to area, at any given time. The safe amount to borrow also varies from
one period to another as the level of cost and prices vary. Is there then any one answer to the questions? How much can I safely borrow? Some say that a safe amount to borrow is up to 50 per cent of the total farm assets. Lending agencies usually prescribe the upper limit. The limits which are safe now may not be so when prices decline and vice versa. As long-run averages, the upper limit benchmarks for borrowing set by reputable lending agencies are helpful. However, as safe borrowing limits for any one farmer at a given time, they are not very useful. There is no answer to the question of how much a farmer can safely borrow. However, one principle threads through the many varying conditions and factors and serves as a useful guide; the equity or increasing risk principle which suggests that as a farm business expands through borrowed capital, the chance of losing its own capital increases. When the rate earned on farm capital is less than the interest rate, the size of the loss mushroom or widens as borrowing increases and equity declines. In other words, your chances of going bankrupt increase as you borrow more and your equity declines. It is an important business gauge for farmers. Those who borrow money must, through self-examination and careful analysis of outlook, choose the finance plan and the farm organization which will result in an acceptable combination of future profit
and losses. The principle of increasing risk, help you in making this choice by suggesting how much you can safely borrow. 101

The added return - added cost principle helps you decide how much capital you can profitably use. (Although security sets the absolute limit to borrowing). Farmers with limited capital have many alternative investment opportunities which under favorable conditions will return more than costs.

What to borrow for? - A vital problem is to determine where in the farm business to invest the scarce funds. To solve this problem the farmer uses budgeting and the opportunity cost principle. Farmers at times do not know how to go about it, the credit agencies should assist them. Profits are maximized when each successive investment is placed where returns are highest. This principle applies equally to the borrowed as well as to the farmers' own capital (and to all other resources). However, risk must be considered along with profitability in making investments. When capital position is weak and risks are too high, it is advisable to invest where returns are somewhat lower but more certain, allowing an appropriate safety margin for risk is a sound financial planning.

One of the first things a farmer short on capital can do is to invest his funds to broaden his security base as quickly as possible. Some of the farmers get most of their capital tied up in real estate. Unless a period of rising prices are insight, such investments may severely curb operating efficiency. Funds are insufficient to buy the necessary power and machinery, tools and equipment. Livestock production is retarded. Fertilizer use is restricted, soil building practices are ignored. Feed, seed and other supplies are bought in small quantities and the size of saleable quantities is also small, thus, excluding the opportunity for economies in large scale buying and selling. A farmer in this situation is often unable to obtain short-time credit for working capital. Even though use of such credit is profitable, credit agencies may refuse loans because the farmer lacks security. Farmers who are short on capital usually get ahead faster by using their limited funds plus whatever credit they can get in working capital. Profits are usually higher on capital invested in fertilizer, basic machinery and equipment, livestock, improved seeds, and other working capital (than in land capital). As earnings on operating capital are reinvested in crops and livestock, the farmer with limited funds increases his liquid asset holdings to broaden his security base for obtaining credit.
Another important credit guide to decide what to borrow for is this: The loan should be self-liquidating. A self-liquidating loan is one made for an investment that promises to return more than enough to repay the entire loan plus interest.¹⁰² Using credit for self-liquidating purposes helps assure that funds will be available for repayments of the loan when due. If one severely adheres to this principle, there will be no borrowing for unproductive purposes as is common with the Pakistani farmers.

Length of loans and repayment schedule - Some loans are made for less than a year while others extend over many years. Some loan contracts call for repayment in fixed installments. What helps to determine the length of a loan and the repayment schedule?

Generally, the length of a loan should correspond to the length of time it takes to recover the borrowed capital investment, with some margin for safety, and the repayment schedule should fit the flow of income from the invested loan. Accordingly, if you borrow money to buy seed corn, do not arrange for repayment until the corn is harvested and sold. Similarly, if you borrow money to buy milk cows, do not arrange to repay the loan in one lump sum at the end of six months or a year; returns from milk

¹⁰²Ibid., p. 597.
cows come in small amounts over time instead of in a lump sum as when feed livestock are sold. Hence, a loan contract on milk cows logically calls for repayment in monthly installments over two or three years. Loan contracts made on the above basis permit repayment of an invested loan from its earnings, sometimes a loan can be repaid before due with other earnings and it may pay to retire the loan. However, a farmer should not overlook the possibility of reinvesting these other earnings at a return higher than the cost of credit. 103

The due date of a loan must not force premature sale of a product. When a loan falls due before the most profitable time of sale, income is lowered either by marketing an inferior product or by the cost of refinancing the loan. For this reason, the farmer should allow for some margin of safety when arranging the length of the loan to parallel the time it takes to recover the borrowed capital investment. If the income comes in lump sum so should be the repayment, on the other hand, if the income comes in bit by bit, the repayment schedule should accordingly be in installments. The repayment schedule should fit the flow of income. Returns on some investments (eg. in land) are fully realized only over long time, hence,

103 Ibid., p. 598.
such loan should be scheduled for a period long enough for the loan to pay out and the repayment schedule should be in line with the rate of return on investment with some margin of safety. The longer the term of the loan, the wider should be the safety margin. Wide margin of safety is necessary because the longer the period required to recover the investment the greater is the risk from loss of markets and business depressions. 104

Loans for purchase of land should be amortized over many years. Amortized loans are paid in semi-annual or annual installments, which include interest on the balance of the loan outstanding plus a payment on the principal. Surplus accumulated from farm income should not be used to retire the loan if they can be used to greater income advantages elsewhere in the farm business. However, risks must be considered along with profits. If the outlook is for declining prices, using surpluses to reduce or repay the loan may be more important than investing them elsewhere in the farm business. Short-run profits may be less, but loss of farm may be prevented.

Annual farm earnings fluctuate widely because of variable prices and weather conditions. Under unfavorable price and weather conditions, fixed annual payments on

104 Ibid., p. 599.
long-term loans are difficult to make. The result may be delinquent payments and perhaps foreclosure. To prevent delinquencies and foreclosures, annual payments on long-term loans should be adjusted to the fluctuating incomes which follow from price and yield variability. One way to adjust payments to variable earnings is through prepayment provisions, in which the borrower makes advance payments on future installments, and reduce or pays the principal in full. When loan contracts permit prepayments to apply on regular future installments, prepayments are held in reserve accounts where they usually draw interest. The variable payment plan is another way to adjust interest and principal payments to fluctuations in farm incomes. Under the variable payment plan either or both principal and interest payments may vary with income; the length of a loan may be extended and both interest and principal payments may be deferred and added to the unpaid balance of the loan.

What to use for security? - The security may be physical or non-physical, accordingly, loan can be obtained with or without pledging property as security. In Pakistan, by law, the farmer can't pledge his tools, equipment, draft animals, and land as security. Risk, there being very high, the cost of loans is high in Pakistan. The farmer, when hard pressed for his credit needs, is very vulnerable to yield to the fraudulent practices of money-lenders -
such as promise to sell his produce at a pre-arranged low price, to write more in his name than the money loaned, to sign on a blank paper on which money-lenders later on can pick any amount, etc. Land can only be offered as security for the long-term loans from the government. Even if a farmer could produce some security, he may not be worthy of a loan, because he may lack the essentials to seek the loan. These essentials are:

1. Credit-rating. Honesty, responsibility for personal acts, promptness in fulfilling obligations underlie a good credit rating and help assure that credit will be available when needed. If a farmer can't repay a loan when due, he should not impair his credit rating by failing to discuss the problem with his credit agency before the due date. Chances for renewal of the loan are greater then than if the farmer waits for the credit agency to contact him when the loan is delinquent. A farmer's credit rating is based upon honesty, his promptness in paying obligations in full, his managerial ability and his net worth. Building up a strong credit rating takes time, but can be destroyed very quickly. The credit rating largely determines whether a farmer can get credit and how much.

2. Ambition. Most young men, regardless of employment, early establish with acquaintances some indication of their aggressiveness and desire to advance themselves.
3. Credit experience. Borrowing experience helps to establish basis of future credit transactions.

4. Income producing capacity. It has many ingredients in it. It may be exhibited through knowledge and training one has, farm experience, productive farm resources, a good and promising farm plan. These can convince the lender that the loan requested will be invested wisely and productively and the borrower will be able to repay the loan.

5. Surety or indorsement. It is a sort of one's credit rating among his friends and relatives, who believe in his integrity and ability, and will sign notes as a guarantee that the money will be repaid and show their willingness to make good the payment of the note if for any reason the borrower defaults. 105

We may conclude this chapter by saying that the problem of agricultural indebtedness is intimately linked with the larger question of economic development. Poverty, ignorance, or absence of industrialization, a static social organization, deep-rooted religious traditions, unstable government, the uncertainties and insecurity resulting from fluctuations in world prices, all these are

105 Case and Johnston, Principles of Farm Management, p. 375.
elements in a situation in which indebtedness, low agricultural productivity, and unproductivity of loans also enter. No solution of any one of these problems is possible, apart from a many-sided and comprehensive reconstruction of the corporate life of the country which will include all these elements. 106

CHAPTER VIII
Marketing Problems of the Farmer

Farm marketing problems are due to the commercialization of the family-type units. In a self-sufficient farm economy, marketing problems are not important; there is little to sell or purchase. Most of the items, such as approved seeds, chemicals, artificial fertilizers, and 'grow' implements and tools, necessary for progressive farming have to be purchased. Besides this, many items of household conveniences of life are to be bought as they are not produced on the farm. At present, there is a general scarcity of these items on the farms. Marketing practices became of tremendous importance as a major factor affecting farm returns which is the source for purchasing the necessary items and furnishing capital on the farm. An efficient marketing system is essential for progress at the farm and development in an agricultural country like Pakistan. There is no other way to make the farm more productive than through net returns to the farmers whereby he could maintain and improve his factor of production. If the farmer gets less than what he puts in, the coming years would witness a gradual decline in the inputs resulting in smaller and smaller outputs correspondingly, the end product being unproductive farms, primitive methods of production, disgusted peasantry,
hungry masses, unstable government and underdeveloped country. Chronic food shortages and declining foreign exchange reserves can easily be traced down to the defective marketing system in Pakistan. A large portion of the consumer rupee spent on food, for example, does not find its way to the farmer. The farmer sells just after the harvest time, when prices are at the lowest ebb. The middlemen between the farmer and the consumer, through various tactics such as hoarding, faulty weighments, releasing in smaller amounts, adulterations, stand to pocket large profits and charge a high price to the consumer. The consumer mostly government servant, industrial and factory workers, shopkeepers, add high food prices to the price of the product they produce, which the farmer needs. The farmer, thus, gets low prices for his products and pays a high price for what he buys. The farmers who can meet their both ends are lucky, while millions subsistence farmers live on their inventories, resort to mining their farm resources, turned out to be delinquent borrowers, tax evaders, thus barring their opportunity to seek credit and eliminating the possibility of accumulating funds to invest in the farm business. The stimulation for higher production that originates from higher prices paid by the consumer, does not reach the farmer. It is absorbed somewhere on its way to the farmer. The consumer is compelled to pay higher prices, but the lower farm prices dampen the farmers' incentive to produce more through improving the productivity of its resources.
The defective marketing system is, thus, a challenge not only to the farmer but to the nation as well, to keep its head above the water.

Our concern here is to discuss the marketing problems faced by the individual farmer. The marketing problems of the individual farmer differ from area to area and farm to farm. The differences arise due to several basic factors affecting agricultural marketing. These include (1) the relative distance between producing and consuming centers, (2) the characteristic seasonal production of the products as compared with continuous demand for consumer, (3) the different grades and qualities produced or required by consumers and (4) the many services required between the time and place the product is produced and the time, place and type of consumption. Because no two problems are alike, they can be solved only on the individual farm. The individual farmer must make careful studies of each individual product offered for sale and relate these products to the local or regional marketing facilities. Finally, he must develop a detailed plan for the movement of his products to market, based on his observations and studies, and check this plan from day to day as the marketing functions are performed. As inefficient practices are indicated or more desirable methods appear possible, the long-time plan must be modified to meet these changing conditions.
Marketing practices are not stable over any long period of time. Functions, processes, and demands change, and the more successful producers are those who keep up with new developments and adjust their marketing programs accordingly.

The major marketing problems of farmers are (1) where to sell, (2) when to sell, (3) how to gear decisions to changing price levels and (4) where and what information to obtain which will aid in marketing farm products.

Where to Sell

Most farmers have several outlets for their farm products. There are three main types of markets in the country.

A. Primary or village markets.
B. Secondary or town markets.
C. Terminal or port markets. These are not of immediate concern to the farmers.

A. Primary markets. This class of market is called "primary" market because it is the principal periodical center of trade in a commodity in the rural areas which may function as a produce assembling and a general retail distribution center. Such markets include mostly "painths," "huts," "shandies" and fairs in Indo-Pakistan. These also refer to village markets, roadside markets and small-town markets. In isolated rural areas or where the means of
communications are defective, the farm products pass through small markets located close to the point of production. The primary marketing agencies in the usual farm community include (1) local buyers, (2) wholesale outlets through commission merchants, or brokers in large cities, (3) nearby or distant farmers' markets, (4) nearby or semi-distant retail outlets, and (5) cooperatives.

Local buyers supply an outlet for farm products which is very important in many areas. These businessmen purchase different commodities in small units from many farmers in the community, assemble, sort or perform other functions before they resell the accumulated volume to buyers in large central markets. The farmer using this type of market has the advantage of receiving a cash payment for his product at the farm or the nearby marketing center. He has no problem as to collection, shipment, packing, and the like. He has no risks once the product is delivered to the buyer. However, because most of the functions of marketing are done by the buyer or other agencies and the risks are assumed by them, the prices received by the producer is somewhat lower than that possible from the other market outlets. The farmer has to see whether the labor, time and other resources thus saved were utilized for the purpose yielding more than the difference in the prices of the primary and secondary markets. If the return is less, it may be profitable for the farmer
to take the product to the secondary market. Applying the opportunity cost principle, the farmer would utilize his resources where the net profit is the highest.

B. Secondary markets. These markets include the regular wholesale markets which in producing centers function as assembling markets and in consuming centers as distributing markets. These are generally situated near railway stations. These may be regular or irregular in shape. Most of these markets in the West Pakistan are rectangular or square, though this is by no means the rule. There are generally four main gates, one on each side. The shops of the dealers or commission agents are built on the sides of the enclosure, adjoining each other and are similar in shape. Each shop consists of one or two rooms and a verandah in front of it. There is a pavement 30 to 40 feet in width in front of the rows of the shops for unloading, sampling, cleaning, weighing and bagging the produce. Next to the platform, there is generally a road used by the producers for carrying their produce to the shops of dealers or commission agents and to park their carts or pack animals while unloading their produce. There is usually a big open space in the center of each market and is invariably used for parking carts or pack animals.

All the markets do not resemble each other in their size, layout or buildings and other constructions. In
some markets the shops of commission agents and dealers may be scattered in different parts of the town. These markets are usually owned by local bodies such as Municipal Committees, Notified Area Committees, Small Town Committees. Some are directly owned by the Government. In certain cases these may be the properties of private individuals or a community. Some of these markets are regulated but majority of them are unregulated. The unregulated markets operate without set rules or regulations. Generally speaking, they are unorganized and all sorts of fraudulent practices are rampant in them. Some of these have agents acting for buyers and sellers both and getting commission from both parties mainly to the disadvantage of the producers. Settlement of price under cover, use of incorrect weights, extortion of a variety of charges from the ignorant and illiterate agriculturist sellers, are some of the common abuses. The net result of all these malpractices is that producer is deprived of his due returns from the sale of his produce. Even when the charges are initially paid by some other party, they are ultimately born by the producer.

108 Ibid., p. 254.
Regulated markets - The management of such markets is an elected committee representing the people living in the areas served and of local authorities. "Arhtiyas" (commission agents) are registered and weighmen and "dalals" (brokers) are licensed; unlawful deductions were prohibited and only standard weights were to be used. Penalties were fixed for breach of law. The market committee that is set up in the market area to ensure dealings between buyer and seller and to generally administer the market. The committee represents the various interests - the growers, commission agents, traders, etc. Members are selected by the Government from among the prescribed panel of names submitted by the non-official members of the district board of the district in which the market area is situated and by the traders in the market.

The market committee standardizes the various market practices and charges, keeps standard weights, sees to it that the same broker does not represent both buyer and seller, and performs similar other functions ensuring fair play in dealings. Comparison of market charges after and before the establishment of regulated market at Lahore will show the justification of such regulatory measures.
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<td>0-1-0</td>
</tr>
<tr>
<td>Karta (deductions on the conventional plea of the existence of impurities)</td>
<td>0-10-0</td>
</tr>
<tr>
<td>Total</td>
<td>5-8-0</td>
</tr>
</tbody>
</table>


In case of dispute the Committee provides arbitration facilities.

About 80 regulated markets have been established in the Ex-Punjals\(^{109}\) while the rest of Pakistan is still being served by the unregulated markets.

The producer takes the product to the agent, and the commission merchant sells the product to the wholesale and

\(^{109}\)Ibid., p. 256.
retail outlets and remits to the farmer the sale price minus his commission. The producer pays the transportation, storage, cleaning, weighing, and other selling costs and assumes the price and deterioration risks prior to the time the product is sold. If everything goes fair and square, it has the advantage of providing higher prices and prices in line with current demand conditions than the usual sale to the local buyer. Frequently, however, when prices decline rapidly or weather conditions are such that products deteriorate before being sold, the farmer will receive very low prices. Also, collections are slower and there is always the risk of the merchant defaulting on payments due the farmer. This method of sale is not adapted to small or irregular-volume shipments. It is adapted to large-volume shipments where the producer can establish contacts and confidence in a reputable commission firm.

Farmer owned and controlled marketing cooperatives offer excellent marketing opportunities if properly organized. Cooperative marketing, if efficiently organized, claims advantages as (1) to increase bargaining powers of the growers by pooling the offerings of small individual producers, (2) reduced marketing costs with exceptions of higher prices for farmers, (3) to eliminate alleged trade abuses such as excessive charges, (4) to substitute planned and orderly marketing for unorganized, unregulated or
chaotic dumping of products on the market and (5) to stimulate better handling of products, proper weighing, sorting and grading. The employment of cooperative principles for the organization of marketing, and for the solution of main problems arising out of it, has met with a considerable measure of success in developed countries like the United States and it upholds a new avenue of approach towards the problems in Pakistan, though the history of cooperative marketing of Indo-Pakistan is almost dark. Past attempts did not meet success on account of faulty organization, ignorance of business knowledge, lack of finances and general inefficiency which demonstrated hopeless failures. Those cooperatives which showed some success were not established at the producers' level, but were composed of individuals and merchants engaged in the processing of certain farm products like husking of rice, milling of wheat, ginning of cotton, etc. There is a strong movement, originating at Governmental levels, to establish multi-purpose societies covering all aspects from producer to consumer, including producing, assembling, grading, transporting, financing, processing and distributing the products. The aim being that the farmer does not have to knock at many different doors for articles of production, credit, marketing and so on, as it reduces his incentive and, very often, he stays in the village and purchases whatever comes his way and sells to the local or
itinerant dealers. Secondly, it will provide an adequate volume of business. The economies of large-scale operation are just as important to cooperatives as to private corporations. The possible limitations seem to be management that can handle such a diverse establishment; and the lack of cooperative spirit among the farmers, who are unable to understand that a cooperative stands for or what it can do. The membership is not prepared enough to face the facts of business life. In the initial stages, when a cooperative receives its maximum competitive blows, needs the greatest patronage, but to their bad luck, it is here that many of the farmers desert it. The farm manager we are depicting must realize that the cooperative is no fool-proof marketing system, it has to be operated efficiently as any similar business in the area and it must handle a relatively large volume of farm products if it is to succeed in the long run. It requires that the farmer contribute a varying amount of capital for the facilities and operating of the business and that he participate in its direction and management. The manager should be imaginative enough to foresee what system of marketing is best. The successful cooperatives reveal that the disadvantages suffered in the initial stages are usually more than offset by the higher returns received from the products marketed through them in later stages.
Principles Established by Experience

The cooperative marketing associations have been an important and integral part of the United States’ distributive structure for more than two generations. Some principles have been developed by the experience of these years which may act as a guide for the development of cooperative marketing.

The first principle is that cooperative marketing is best adapted for selling agricultural products for which demand must be wholly or partially created by collective advertising to consumers. Thus, the greatest success has so far been attained in the sale of fruits. Pooled resources of thousands of growers made it possible to conduct advertising campaigns, develop merchandising methods, and provide reliable sales representation in the markets. The result has been a greatly increased demand for the products mentioned. It is unlikely that alternative market agencies would have done it. The validity of this principle is further established by the fact that since the 1920's, cooperative form of organization failed to bring gains for sellers of cotton, wheat, wool and livestock at all comparable to those secured by the producers of specialized and non-stable crops intended for ultimate consumer.110

A second principle taught by experience is that the economic performance of essential marketing functions is the primary avenue to reduce marketing costs. Thus, when cooperative associations take over the functions of assembling, shipping, sorting, storing, grading, financing, risk-bearing and so on, which have previously been performed by private middlemen, they do so only because they believe that they can carry on such functions more economically. The fact has been definitely established that marketing functions are not eliminated when cooperation is substituted for private enterprise. The middleman may be eliminated, but not the functions which he performs. The functions may be simplified, may be handled efficiently, economically, duplication of their performance may be avoided but the various functional jobs must still be done by someone. Much of the reduction in marketing costs came from efficient handling of market functions and not from their elimination.

Third, cooperative marketing tends to reduce certain types of marketing abuses and trade abuses. Before the development of group action it was common to find too many or too few middlemen in numerous local assembling markets. When there were too many independent buyers in a given market, the available business was divided to an uneconomic degree, often at the expense of agricultural producers. Some of the achievements of marketing cooperatives in the
grain trade are attributed to the construction and operation of elevators larger than those formerly operated by numerous independent merchants in the same region, thus permitting a more economical utilization of physical facilities and personnel. When the number of buyers was too small, the farmer was often at the mercy of the purchaser, but the formation of a single cooperative in a community resulted in more reasonable charges throughout a wider area.

A fourth principle is that only certain types of farmers are adapted for membership in cooperative associations. Surrender of individual points of view, merging of personal interests in that of the group, and the necessity of contributing time and labor that planned objectives may be realized constitute a program which does not make a strong appeal to all farmers. It has been said that farmers as a class tend to be individualistic and are not cooperatively minded, especially so when not enough educated. Too often cooperation failed to yield immediate dividends and losses in membership followed. The membership is not a class but collection, some members are like wheel barrow, have to be shouldered, some are like kite, must be kept in hand with string, others are like kittens, respond to tapping, some are like football, nobody knows which way they will toss, some are like light, keep going and some are like sun, who will be with you every day, even
if it is cloudy. The policy should be flexible enough to accommodate varied nature of membership.

Finally, it has become apparent that cooperatives can be operated most successfully in highly specialized producing areas, farmers here have a great homogeneity of interests, growing out of the common problems of producing and marketing one particular type of commodity. This has favored cooperative action to an extent rarely, if ever, encountered in areas of highly diversified farming where individual farmers are concerned with marketing a variety of crops and the marketing problems of different farmers vary considerably.\textsuperscript{111}

It has come to be realized that much can be gained by using the costs of cooperative marketing as a yardstick by which to judge the effectiveness of private agencies. If such agencies seem to be taking too great a portion of the selling price for their services, cooperatives can be set up. Otherwise it may be the part of wisdom to let private initiative thrive. Good business management, supplemented by practical judgment, is just as essential to the success of a cooperative as it is in the operation of a private business enterprise.

When to Sell

The decision as to when to sell a given farm product depends on the type of product. If it is extremely perishable and not subject to economic storage method, such as fluid milk, eggs, fruits and vegetables, it must be sold immediately. If it is semi-perishable or storable, the costs and price and deterioration risks in storage must be compared with the higher prices expected if the product is stored. Consideration should be given to the possibility of quality losses, the prospective increase in prices and the risks of a price decline, as well as to the costs of packing and storing.

There are four types of price changes which are of primary concern to the farmer. It may be a paying proposition for the farmer to take advantage of these changes, if he can afford it. Seasonal price variation interests us here. When the effects of the general price level of farm price cycle and trends are removed, we find that individual farm prices have seasonal patterns of variation - a short-time movement of farm prices within the year.

Why do farm prices vary seasonally? The answer lies in seasonal variations in farm production and marketing. Agricultural production is mostly seasonal; this gives rise to seasonal marketing. Since it costs less to put a product on the market right after production than to place it in storage and sell it later, farm prices run lower in some
months than others. Most farm products come to market right after harvest, because Pakistani farmer does not have good storage facilities, his financial obligations to government and private individuals are so arranged as to sell his produce as soon as harvested, in other words, he lacks the staying power. He is hard-pressed to sell his produce immediately after the harvest, the selling pressure depresses prices for all the agriculturists and reduces their sale proceeds. After the season's heavy sales, prices rise to levels corresponding to storage or production costs at different times of the year, provided no manipulation occurs.

Seasonal price variations for individual farm commodities tend to follow the same pattern from year to year. Nevertheless, there may be variations in the pattern from year to year and over time as well. It must be remembered that seasonal variation explains only a part of farm price changes. All factors that bring about four types of price changes and other influences are at work simultaneously to determine farm prices. From year to year droughts, floods, hails and other weather disasters, insect-pests and diseases, government policies and activities, hoarding, smuggling, black marketing, and international events disrupt the seasonal pattern. The upswings and downswings of farm product cycles and changes in general price level may change the seasonality of prices. Some farm products dis-
play greater seasonal price variation than others. Seasonal price fluctuates most for products which are most difficult to store without deterioration in quality and where, as a result, storage costs are high. Are there any economic principles for the farmer to consider to adjust production and marketing to get the highest seasonal prices?

Adjusting Production and Marketing to Seasonal Prices

To take advantage of seasonal price variations some marketing men recommend timing production to get always the seasonal highest prices. Some production men, on the other hand, recommend timing production to produce and market at lowest costs. What is the answer? Actually, neither the above production or marketing men may be right. Adjusting production to seasonal price variations is part of the overall farm organization problem. To work out a solution to the problem we use two economic principles. Where capital is unlimited the added cost - added return principle applies; but where capital is limited the opportunity cost principle is the correct tool for solving the problem. To illustrate: Should you invest $500 in a crib for storing corn to sell later, plus $500 in corn, or invest $1,000 in dairy cows? If you have unlimited capital, you can profitably invest in crib space and corn if the added costs are less than the added returns; the added costs are the annual costs on the crib plus the interest
on the money in stored grain along with other grain storage costs, such as property taxes, handling, wastage and shrinkage. The added returns from investing in crib space and grain are the gains from selling the grain at the seasonally highest rather than at the seasonally lowest prices. However, if capital is limited you must choose between the crib and grain, the dairy cows, or perhaps some other investment. In this instance choose the most profitable investment. 112

Marketing grains at seasonally highest prices means, therefore, that storage facilities must be available. Where crib and grainary space is already on hand, the fixed costs on these storage facilities should not be included in figuring the cost of storing grains for marketing at seasonally highest prices. Fixed cost on grain storage buildings already available continue whether grain is stored or not. Hence, these costs are not "added costs" of storing grains for marketing at peak seasonal prices. The only costs to figure are property taxes on grain, insurance, interest on the investment in grain plus handling and wastage costs. These are "additional" costs to be weighed against the added returns from selling at seasonally highest prices. But where storage facilities

are not available but are built so that grain can be stored and sold later for highest seasonal prices, cost on these facilities also become "added" costs. If the difference in the seasonally highest and the price at harvest is not enough to pay for the added costs, it may be profitable to sell at the harvest time.

How to Gear Decisions to Changing Price Levels

Farm prices are tied to the general price level. Agriculture is tail and other sectors of economy are dog. Income and expenditure of non-agriculture sectors affect demand for agricultural products and hence prices. For highest farm profits, farmer decisions need to be made with this fact in mind. Two major things affect the general price level: (1) the business cycle, including periods of prosperity or depression (employment or unemployment) and (2) the monetary status of the national economy, either inflationary with full employment or deflationary with unemployment.

Rising Price Level

Business expansion, increased employment and inflation marks the period of rising price level. There may be two types of stimuli that brings it about. Outside stimuli: are wars, inventions, discoveries, changes in money supplies, consumer wants and/or weather. Inside stimuli: may be favorable business expectations and the response based on
these expectations. The affect increased production, capital improvements, fuller employment, need for more raw material, labor, etc. As employment increases, wages rise. Mounting wage payments increase consumer demand which in turn calls for greater business activity when expansion begins with less than full employment of plants and resources, prices ordinarily do not rise in the first phase. Consequently, production is increased without proportionate increase in total costs.

However, as more money is paid out as wages to labor producing capital goods, this money is spent on consumer goods, supply of these goods fail to keep up with total wage payments. This lag, along with rising costs due to growing scarcity of skilled labor plus other production and delivery bottlenecks cause prices to rise. Prices are pushed further up as favorable business expectations and responses result in increased volume of bank credit and rate of money circulation.

Price relationships: During expansion phase of business cycle all prices do not rise uniformly. Wholesale prices rise faster than retail prices. Of wholesale prices those for raw material rise faster than those for semi-finished goods, prices of semi-finished goods rise faster than finished goods. Agricultural products resemble those in raw materials, they rise fast and high. In industries farthest removed from the retail level, such as agriculture
particularly, prices received rise faster than prices paid (costs), making profit margins especially attractive. As costs, here, are assumed in advance than the sale of the products when prices are higher.

Output increases as plans operate closer and closer to capacity and as new plans are added. Depending on the strength of the stimuli giving rise to expansion, the expansion phase may be long or short, mildly or highly inflationary. If it is highly inflationary, the general prices rise sharply to bring booming prosperity and is likely to drive up the prices of things produced in factories and hence farm costs.

Steps for Gearing Decisions to a Rising Price Level

How can a farmer most profitably adjust his business to a rising price level? First, he needs to assess the force of stimuli, and keep his eye on the level of employment and wage payments. Rising wages and employment means more demand for agricultural products. This is the time to expand prices increase faster than costs. Interest rates, wages, taxes, and prices paid for machinery, building materials, fuel and other non-farm furnished resources rise more slowly than prices received. During such periods, farm profits rise faster than selling prices, because price-cost ratios widen.
The farm production process takes time. Costs are assumed in advance of the sale of the product. Most of the costs in many lines of production are incurred at one level. When production begins, while the products are sold at a higher level of prices, when production ends. Thus, during periods of rising prices investments that increase production and yield quick returns should be emphasized. Using more fertilizer, feeding more livestock and adding more land increase output and yield quick returns on investments. This is also a good time to buy a farm and get started in farming, particularly when the forces bringing about the expansion are strong and farm prices remain at high levels for several years. Favorable price-cost ratios in years ahead can mean a debt-free farm in a few years. Success in farming depends more upon when you start than any other single factor. But when you buy land and other capital items and expand output, you must carefully appraise the strength of the forces — underlying expansion. The strength of these forces will eventually be spent. When this occurs, it is best not to have high cash cost commitments that must be paid for out of lower prices and income. Correct appraisal of employment, wage payments, demands and degree of inflation aids in timing
investments, so that such commitments are not carried over into the downswing of the cycle. 113

Livestock, due to their special price cycle, call for a different line of action. For the beef raiser, the beef cattle price cycle helps to decide when to start a herd and how to time herd expansion and contraction. At the top of the price cycle and at the bottom of slaughter, the farmer might best wait a year or two before buying, if he is starting a herd. If he has a herd already, he may want to cull cows more severely then and restore them later. Slaughter peaks and low prices call for reverse action. The same logic applies to any other similar cycle. The farmer has to keep abreast of slaughter movements and changes in cattle numbers and prices.

A declining price level: What worries a farmer most is when and how far will prices fall? The answer depends on the extent of business contraction, unemployment and deflation which, in turn, depends upon how far expansion and inflation have gone.

Business contraction and unemployment: Eventually the strength of the forces making for expansion is overcome by forces generated by the process of expansion itself. The impact of outside stimuli ends, business

expectations turn from optimism to pessimism as costs rise more rapidly than prices received. Higher costs are not offset by higher selling prices because bank credit and consumer buying is cut. Consumption lags behind production. Employment and wage payments fall off. People prefer to hold liquid assets. Business responses are cumulative. Unfavorable expectations lead to canceling order for raw materials and capital improvement cease. Workers are laid off and wage payments decline. In consequence, demand and prices decrease, which in turn brings further contraction of business.

Price relationships: Price relationships change in contraction as they do in expansion. Retail prices fall less than wholesale prices. Raw material prices fall much more than prices of manufactured goods. Decline in agricultural prices resemble those for raw materials, they fall fast. Costs recede more slowly than prices received; hence, profit margins in farming narrow or disappear entirely.

Steps for Gearing Decisions to a Declining Price Level

Here again the farmer needs to watch employment and wage or income payments. Do not spend on investments which must be paid out of future low income; for if depression hits, farm prices and income suffer. The reason is this: when employment falls off and many people are out of work, and those lucky enough to find jobs work for lower
wages, wage and income payments drop sharply. As consumer incomes decline or cease, demand and prices for the farmers' products also drop. A drop in product prices while resource prices (costs) remain unchanged clearly lowers income, especially if the farmer continues to use the same amount of resources. But where the costs stay up or recede less slowly than product prices, it pays the farmer to use less resources. For instance, fertilizer, lime, new machinery and building materials prices do not drop as sharply nor as far as crop and livestock prices. Accordingly, for maximum profits it pays the farmer to use less of these resources if their added costs and returns have been about equal.

Some costs fall as fast as prices: But some of the farmers' resource costs are flexible. During declining price period these costs decrease along with demand. When costs and prices fall in the same proportions, to maximize profits, the farmer should use the same quantity of resources and maintain the same output in depression as in prosperity. Which of the farmers' resource costs are flexible? They are largely farm-derived. The resources of forage, feed grain, land, buildings, farm labor, and second-hand machinery are farm furnished and fixed in supply, especially during depressions. There are also other costs that fall by as much as farm product prices. For the farmer operating a crop-share or livestock lease,
rental costs or costs of land services fall just as far as prices received. The cost of land and building services for the owner-operator also decreases with falling prices. The real service cost of land and buildings to an owner is the rent that could be obtained were these resources rented out. The marginal costs of these resources and farmers' labor fall low enough during depressions to warrant continued use of land and building for production. The same is true of machinery. Opportunity cost of operators and his family's labor approaches zero. Since alternative returns in industry are close to zero. The farmer-operator is satisfied in working his farm at return sufficient to meet food and shelter needs for his family and himself.

Feed grain and hay represent nearly 60-80 per cent of total costs, for livestock production. When the prices of feed grains and hay drop for the farmers who market these feeds directly, they also drop for the farmers who process them through livestock. Thus, when livestock selling prices decline as a result of decreasing business activity and employment, feed cost also decreases. Hence, livestock feeding ratio may be as favorable during depressions as in prosperity. Farmers should pay more attention to price-cost ratios than to level of prices. If price-cost ratios are the same, use the same resources regardless of level of prices. These ratios help the farmer to decide
whether or not to convert feed into livestock product and to determine the allocation of feed among livestock enterprises.

Keep producing if selling price covers variable costs: If a farmer fails to meet all his costs during depressions, should he stop producing? When unit selling prices are above unit variable and when variable and marginal costs of operating 100th acre/cow for example, are the same as for the first, it pays to use all of them. But if prices fail to bring a return equal to the variable cost, the farmer should cease production entirely. Thus, it pays farmers either to farm all acres/cows or none at all.

Fixed costs require only that production be maintained at a level where the selling price times the quantity is above total variable costs. So keep on producing as long as selling price is greater than variable costs but produce only up to the point where marginal or added cost approaches selling price. 114

Use of Market Information

In no part of human activity is the element of information so important as in economics and particularly in the most sensitive of all economic organizations, the

market. Market news is a great power as it is the essence of all price which is the pivot and axis of business.

The modern farmer operates in a complex economic system. He sells his products in a market where not only national but international farmers also compete. It is not surprising that many farmers have only a vague idea of the conditions of the markets, for that reason sometimes produce too much of a commodity and at other times too little. In Pakistan, farmers have been reluctant to think in terms of consumers' demands. Instead they are inclined to base their future production on what they produced in the past and their fathers produced before them. Besides erratic weather conditions, the farmers' indifference to consider demand and supply forces makes the agriculture a high-risk industry.

The turnover in the production of agricultural products is relatively slow, nature sets its pace; therefore, farmers must make their production plan several months or several years ahead of the period of marketing. Sugarcane plant in March becomes ready for harvesting near the end of the year. Wheat is planted in October-November and harvested in March-April. Dairy calves raised as replacement for the milking herd, do not come into production for 2½ to 3 years. Apple orchards come into bearing 8 to 10 years after the trees are planted. Costs once incurred are bygone, neither the production can be stopped nor
changed into another enterprise, whatever may happen to the prices. There is, therefore, ample opportunity for prices to change between the time the production process is started and the time products are ready for market. This situation creates a need for economic information to help the farmer plan sound production and marketing programs and keep his farm organization adjusted to changing economic conditions.

Outlook information helps farmers to:

1. Choose the most profitable kinds and amounts of crops and livestock.
2. Decide how to time production and sales for highest returns.
3. Determine the most profitable level and combination of resource inputs.
4. Reduce farming risks.

In general, use of economic information increases efficiency in farm planning with the result that farming is more profitable and more secure than when plans are based on a "toss of the coin."115

The use of economic information and the need to make changes in the production plan do not in anyway conflict with a long-time farm plan. There are certain phases of a

long-run plan which will persist through high and low prices alike. Some decision relative to the farm organization are made on the basis of a longtime outlook, whereas others are subject to frequent change. Certainly every farmer should recognize new developments which influence the efficiency of various production and marketing processes and keep his farm plan up to date; he should, however, have a basic plan for properly using the agents of production available to him.

The way in which the use of economic information can be correlated with various phases of farm planning, centers around this question: What general price level will hold in the future? This question is of the greatest importance to farmers. They are particularly interested in the future price level because the general price level is the point around with the price of each farm commodity fluctuates with changes in demand and supply. To date, no one has been able to predict with extreme accuracy the long-run changes in the general price level. Outlook information, however, is very useful in appraising the short-run changes in demand and supply and pointing out the likely effects on levels of farm prices, price and price-cost relationships. The farmers can utilize such information in deciding whether or not to feed cattle, the kind of cattle feeding program, number of dairy cows to keep or chicks to raise, whether to produce milk or butterfat,
kinds of crops to raise, amounts and kinds of protein feeds to buy, quantity of fertilizer to use, when to sell or buy and other short-run problems.

While appraising the changes in demand and supply conditions, one should assess the strength of domestic and foreign economic conditions. The factors which need attention are level of employment, personal incomes and personal disposable incomes, industrial production, business expenditures for new capital and equipment, domestic and international trade, kind and acres of crops sown, weather conditions, insect pest and diseases, roughages and concentrates, number of livestock, their age and kind, government policies, particularly fiscal and monetary policies. Most of these factors have already been discussed.

Sources of Economic Information

There are several sources of economic information which may be tapped by alert farmers who wish to keep their farm plans adjusted to changing conditions and in line with fundamental economic principles.

Sources of outlook information may be grouped as under:

1. Publications and reports prepared by the Government of Pakistan.
   
   (a) Reports published
(i) Crop Wealth of Pakistan

(ii) Livestock Wealth of Pakistan

(iii) Report on the Marketing of Rape Seed and Mustard in Pakistan

(iv) Reports on the Marketing of Dates in Pakistan

(v) Report on the Marketing of Tobacco in Pakistan

(b) Reports compiled

(i) Cotton Seed Report

(ii) Dried Fruits Report

(iii) Cattle Report

(iv) Wool and Hair Report

(v) Honey Report

(vi) Fresh Fruits Report

(vii) Grain and Other Pulses Report

(viii) Wheat Report

(ix) Sugar Report

(x) Rice Report

2. Market News Service. This is an important service of the Provincial Marketing Section. The following weekly statements of prices, etc. are supplied to various quarters.

(i) Important food grains, pulses, "gur" indigenous sugar, "ghee" both graded and ungraded, oil seeds and vegetable oils.

(ii) All types of cotton.

(iii) Chickens, fowls, pigeons, ducks and eggs.
(iv) Wool skins and hides.
(v) Fruits and vegetables.

(vi) Daily market rates of all agricultural commodities including livestock products, fruits and vegetables. Prevailing Lahore, Lyallpur and Okara markets are supplied to Radio Pakistan, Lahore for daily broadcast in the rural program for the general information of the public.

(vii) The Cooperation and Marketing Adviser to Government of Pakistan issues daily market price bulletins of all agricultural commodities at Karachi and it is also broadcast from Radio Pakistan, Karachi. He also publishes a quarterly bulletin showing prices of agricultural products of all important markets in Pakistan.

(viii) General trend of trade conditions is brought to the notice of the Provincial Government through a fortnightly trade condition report.

(ix) The Gazette Weekly of West Pakistan, contains weekly prices of wheat, barley, grain and rice. It is published by the Director of Land Records, Northern Zone, West Pakistan, Lahore.

(x) Weekly Price Bulletin for wholesale and retail prices of agricultural and livestock products by Director of Food, West Pakistan, Lahore.

(xi) Weekly Price Bulletin for wholesale prices of agricultural commodities and livestock products, by Deputy Director of Industries, Peshawar.

(a) Publications of Prices in East Pakistan.

(1) Weekly price bulletin for wholesale and retail prices of agricultural and animal products of East Pakistan. It is published by the Director of Agricultural Marketing, East Pakistan, Dacca.
(b) Economic Survey, a monthly and quarterly statement of prices of important commodities in 4 to 6 important markets in former Punjab, by Board of Economic Inquiry, Punjab.
CHAPTER IX

ADJUSTING TO RISK AND UNCERTAINTY

The farmer is faced with risk and uncertainty because knowledge about the future is imperfect and the farmer can't "hit the nail on the head" in predicting future yields, prices and production outcomes. The farmer, at the most, can guess; he can do a better job if he studies, learns and bases his judgment on his practical experiences, but his predictions always are shrouded in uncertainty. His predictions may come true in a few instances, but there is an equal possibility that prices or production will be different from what he expects. The outcome may be either better or worse than expected; both affect his planning. Had he known before hand that prices or production would be better, he would have borrowed more, used more resources and produced more; if he knew that outcome would be worse, he would produce less and perhaps avoid financial losses.

The presence of risks, that something will turn out to be unpleasant from what we expect, places a premium on good management. Risk and uncertainty often can make or break a farmer. If outcomes could be known with certainty, there would not be much place for superior management ability. Anyone could farm and make good decisions; there would be
no large profits for outstanding decision-making ability.
This world of continuous change, risk and adjustment calls
for continuous management to try to predict the future and
to redirect plans.

Kinds of Uncertainties

There are six important kinds of risks or uncertainties, according to Heady and Jensen, which make the future misty and plans imperfect.

1. Price uncertainty: Price changes more than anything else provides the major uncertainty, although all types of uncertainty are extremely important in planning and budgeting. Price is the product of many a factor not limited within the national boundaries, but spread the world over. Anything can happen anywhere, its effects can be gauged in the local prices. The days of the old, isolated local economies have gone never to return. The world is fast becoming one economic unit. The modern communications have made the world communities as members of one, though disunited, household. Developments in one part of the world have immediate repercussions in every other part exhibited through price changes.

2. Yield uncertainty: The farmer cannot predict yields, which fluctuate because of changes in rainfall, temperature, hail, floods, storms, the intensity of damages of insect-pests and diseases. Agricultural productive process is a biological process, nature sets its pace
and is exposed to all types of vagaries of nature. If one knew the weather outcome, he would not farm in the years of predicted drought; he would take on additional acreage in years of predicted bumper yields. Similarly, he would sell off his bullock the year before if he knew that it were going to get T.B.

3. Techniques uncertainty: A third type of uncertainty is that of new techniques or methods of production. Research may develop a new high yielding crop variety, fertilizer mixture, feed ration, implement or production method. Another risk associated with techniques or methods is of obsolescence. We may take on one new method, but a second and better one may follow close behind, which may render the first one out-dated. The new developments in techniques and methods usually make it possible to reduce cost while maintaining the yields same or more yields at the same costs. In either way there are costs advantages. The pioneers adopt them to increase their profits, while others are compelled to adopt them to reduce losses. The pressure is exerted through price-cost-squeeze force. The improvement in techniques may take place anywhere in the world, its price-cost-squeeze pressure will be felt in Pakistan, because Pakistani farmers compete in the world market. If someone else can supply products at a lower price than Pakistan can do, the result will be loss of market. Consequently, all the supplies will be diverted
to the domestic market, the supply pressure will depress the price and hence bring losses. In the coming years, the technological and innovational uncertainties will be more prominent.

4. A fourth important uncertainty involves government policies and the decisions of legislators. Their decisions on price control, storage programs, agrarian reforms, production policies, foreign aid commitments and international trade policies are unpredictable and effect the prices received for farm products. Their actions and effects may be quite inconsistent when government is instable and changes frequently.

5. A fifth uncertainty involves the action of other people with whom we do business. We cannot always predict the future actions of the landlord from whom we rent land, the neighboring farmer with whom we own a partnership machine, the banker who has lent us money, or the custom operator who is to do our harvesting or even the hired men. While they may seem agreeable and cooperative, they may become the opposite of our expectations. Often their own personal misfortunes force them to follow a different course of action than originally planned.

6. A sixth risk surrounding any individual or family is the uncertainty of sickness, injury or death. Accidental death can wipe away the most important asset of the family - the life of the farm manager.
These things which we cannot predict exactly inflict on us heavy losses and cause us to "draw in our horns" and plan on a conservative basis. 116

Role of Management Restated

With no change and perfect knowledge, management would be needed once to set up the initial plan for the farm. With either lack of change or change which could be predicted exactly, we would know yields and prices for any year in the future, we could make out a plan at the start for each of the future years specifying the crops and livestock to produce, the level of their production, and the most profitable set of techniques. A supervisor could then see that plans were put into effect each year. But this is an imaginary picture of farming; the actual world is in continuous change, it is uncertain and unpredictable and there is an ever-existing need for continuous management for predicting the future and readjusting the plans to meet the new circumstances. A good farm manager gathers information from his farming experiences, contacts with other people, from newspapers, magazines, bulletins, from listening to lectures and the radio. He gets from these some ideas or hunches about the future. Sometimes

the information, thus, got may be in direct conflict, may be insufficient and unreliable. He then taps more resources, gets more knowledge and information until he feels more certain about the future. He then goes through a thinking process and spins out certain plans that will meet the future expectations. Learning, thinking and analyzing processes help direct predictions and increase their accuracy but they do not guarantee that outcome will be exactly as predicted. The management functions outlined previously included (1) forming predictions or expectations about the future, (2) making plans consistent with expectations, (3) putting plans into effect, and (4) bearing the consequences of the outcome, whether good or bad. It is the fourth function, shouldering the consequences, which causes many farmers to use plans different than they would under perfect knowledge. The consequences include not only the possibilities of having "medium good" profits as expected but also of becoming wealthy or going broke which worries most people; they do not mind getting wealthier than they had hoped. One way to prevent going broke is to be a real manager in the sense of learning, thinking and planning. The better a farmer does these things, the better he is able to predict the future accurately and to select plans which make profit.117

Precautions to Meet Uncertainty

Even though he plans as efficiently as he can, the farmer seldom makes perfect predictions. Outcome may be better or worse than what is expected. Since better or worse prices and yields do happen even though thinking and learning have been carried as far as practicable, most farmers use some kind of uncertainty measures or precautions in their planning. Uncertainty precautions are used after one has done his best to glean information and make predictions and plans. It is when one has first done his best in thinking but still feels somewhat uncertain in his own mind that he adopts uncertainty precautions. Precautionary measures are used mainly to help guarantee farming outcomes which will not be too unfavorable or cause bankruptcy; they can also be used to take advantage of high profit prospects which may come along unexpectedly.

The extent to which one needs to use uncertainty precautions depends on his capital position, his liking for chance outcomes and his family responsibilities. The farmer with plenty of capital and no debts may specialize in a single crop and use no uncertainty precautions; since the crop gives highest average return over time, even though poor weather may cause losses in some years, he can borrow funds or draw on reserves to tide over the low return years. The beginning farmer or farmers with less capital may resort to diversification, which will give him
lower returns over a number of years but will not break him in one year. Similarly, the bachelor farmer or single person with no dependents may take more chances. The married man with several dependents tends to play it safe. Finally, the psychological make up of the manager influences his use of certainty precautions. Some managers are adventuresome; they are willing to take long chances; others are conservative and prefer plans with more certain outcomes to those which give extreme profits but also involve more risk.

Several types of precautions can be used to meet uncertainty, but none are certain; none guarantee farming success. Some fit one farmer, while others work out better for another location or type of farming. None should be looked upon as a substitute for the use of good outlook material. Precautionary measures to meet uncertainty can take one or all of the three related but distinct forms: (1) measures to reduce the variability or dispersion of income, (2) measures to prevent profit from falling below some minimum level such as zero, family living plus debt repayment, and so forth; and (3) measures to increase the farmers' ability to withstand unfavorable economic outcomes. The first and second measures are attempts to ward off income variability and uncertainty; the third is more nearly a way to meet uncertainty as it is encountered.
Selecting a More Certain Enterprise

All localities have crops or livestock enterprises which are more certain than others. Some enterprises have returns which vary greatly from year to year, they give large profits in some years and large losses in others. Other enterprises are more stable, which returns may vary from year to year, the ups and downs are not extreme. Potatoes are more risky. Even a mild frost can wipe out the crop and a few days' drought can adversely affect the yield. The cost of seed and intercultures being very high, the losses inflicted are very huge whenever potatoes fail. This explains in a way why potatoes are grown on wells - a sure means of irrigation, and by farmers with ample capital. The same is the case with cotton and early corn. Corn sown earlier is badly attacked by insect-pest, which are very active at this stage, the farmers plant sorghum instead, though inferior but is hardy and drought resistant and yields more fodder. For cotton the period between mid August and late September is very critical. In this period, a few days' drought or too much rain will effect yields very adversely. Drought encourages insects like aphids and juuids and disease like "Tirk" (premature opening of bolls). Too much rain results in killing of plants and retards flower formation and their fertilization. Sorghum, millets, and sugarcane, on the other hand, may not give returns as high as cotton or corn, but they
do have incomes which are less variable. Similar comparisons can be made between vegetables and arable crops. Among the livestock enterprises cows, goats, donkeys and camels have been more stable but less paying than horses, sheep, chickens and buffaloes. Sheep are kept by so many people, not because they are more stable but because they involve no feeding costs except labor, which is negligible. The sheep are grazed either in the common pastures, or on weeds growing on somebody's farm.

Farmers, in picking single crop or livestock to lessen income variability must answer this question: Is greater stability worth the greater returns sacrificed by giving up a crop or livestock with higher profits but involves more risks? The answer, again, depends on the farmers' capital position; family responsibilities and psychology. Some may be aggressive, others may look for safety.

**Diversification to Meet Risk**

A common precaution to meet risk and uncertainty is diversification, the producing of several enterprises. Some diversification, as discussed previously, is carried on solely to make the greatest profits without concern for variability in prices and yields and the risk which goes with it. However, diversification can also be carried on purely to meet risk and to prevent putting all the eggs in
one basket. Sometimes profits will be greatest with specialization in a single crop, but two or three crops may be produced just to lessen the risk of very low incomes in some years.

If the farm was previously organized with the right kinds and sizes of enterprises to maximize profit and making best use of resources (with due consideration to supplementary and complementary relationships, and price and substitution or sacrifice ratios between competing enterprises), further diversification to meet uncertainties and lessen income variability will reduce income. Still many farmers extend diversification to lessen year-to-year variations in income. Diversification to meet uncertainty, like all other precautions to lessen the impact of unknown outcomes, comes at a cost. The cost is the income sacrificed over a period of years by organizing the farm to lessen the variability of income between years. Diversification to meet risks usually means that income never falls as low in bad years and never get as high in good years as it could. It is very hard to find data in Pakistan for the various points we intend to develop here. However, to explain the method such decisions are made, hypothetical figures or data will be utilized. For example, a farmer facing the problem of income variability and diversification, may be in a situation like this:
The decision to be made then is this: Is the greater stability worth $400 per year, a total of $2,000 every five years? Again, the choice must be that of the individual, depending on his financial position, his family responsibilities and his general ability to shoulder risks. If he has a good credit position, he may choose the high returns, variable alternative and carry cash reserves forward from good to poor years, or he may use credit during bad years and repay it in lush years. If his debt load is at maximum and debt payments are due each year, he may select the more stable alternative even though it gives somewhat less income.

Diversification can include attempts to either (1) put a floor under income, or (2) level off the variations in income. To put a floor under income, the manager selects a stable enterprise to give some profit every year. Crops grown on well irrigation serve this purpose. Then he selects the prospectively high return enterprise even though it does involve considerable risks. These crops may
be cotton and wheat in canal colony, barley, grain, "guara" in "barani" areas (rain fed areas), rice and jute in marshy regions as in East Pakistan.

For leveling off the high and low spots and getting a more even income between years the farmer should not emphasize a stable, year-in and year-out enterprise as much as a search for contrasting enterprises. If the income of one is high, the income of the other may be low in the same year. The goal is to get offsetting enterprises. If enterprises are to offset each other for income variations, they must possess certain characteristics. Their prices and yield should have as little positive correlation as possible. We would hardly select two crops where yields and prices move up and down together in the same year, but try to find pairs where the movement is negatively correlated. Wheat and gram fulfill this requirement. They have about the same growing season, but their soil and moisture requirements are opposite. Wheat grows on heavy soil with fairly good supply of water, rains during December and January are welcome, as they help in tilling and attaining a good stand. Gram, a leguminous crop (pulse), flourishes well on loose and sandy and well-drained soils. It requires at the most one irrigation, when grown on irrigated soils. It does well in "barani" areas with few winter showers. A few rainy, humid and cloudy days encourages gram blight, which can wipe out the entire crop. Farmers often grow
gram on upland, which can retain a little water, and devote low lands to wheat. On level lands they grow wheat and gram together, the reason being that if weather turns out to be raining or cloudy, wheat will flourish and will yield income, even though grams have failed. On the other hand, if the weather is dry and clear, gram will outgrow retarded wheat and the farmer will pocket some income. Their uses are somewhat different, therefore, their price changes are not so closely associated. Corn and sorghum can also provide another such opportunity. Early corn is very susceptible to insects and drought. While sorghum can resist them. Corn does well when temperature is mild and rainfall is ample, so does sorghum. Sorghum is not as good feed as is corn, so it can't compete value wise with corn, but a farmer faced with high insect and drought possibilities, can make some income, which can't be had if corn were grown.

Cotton and sugarcane have the same growing season (from June onward), and land, and irrigation requirements, but the effect of humidity and rain is opposite. It is very good for sugar cane. In dry season, it attracts pyrilla and other such insects. If high rains and humidity occur in the period between mid-August and September, flower formation and hence yield of cotton is badly affected. To reduce income variability the farmer can grow both of these crops, one of them will surely do good.
Prices of these two crops has no bearing on each other; their uses are quite different and their insect-pest and diseases are unrelated.

Diversification is not very ineffective in reducing variations in income for major changes in farm prices. Price correlations are usually positive (move in the same direction). If the price movement for any pair of commodities was exactly parallel, the correlation coefficient would be 1.0. Crops which have correlation coefficient negative or nearly so are better for diversification to meet price risk than crops with high correlation coefficient. Because of the generally close association of price movements growing out of cycles of inflation and deflation, the ability of farmers to stabilize income through diversification is limited. Diversification is a more effective means of lessening income variability for price fluctuations growing out of individual commodity cycles, annual variations in yields of individual crops, and other very short-term changes in supply or demand. It is much less effective in lessening income variability resulting from wide swings in national prosperity.118

118Ibid., p. 533.
Limits in Diversification

We can't extend diversification indefinitely and have equal effects in reducing the variability of income. Two kinds of limits exist in lowering income variability through diversification: (1) adding more and more enterprises has less and less effect in reducing variability and (2) when two enterprises alone are used for diversification, adding more of the second may first reduce variability but a point may be reached where still more of the second enterprise may begin to increase income variability. The extent to which the addition of more and more enterprises reduces the variability of income depends on the variability of each enterprise.

If the variability of the enterprises is the same and the association (correlation coefficient) between all products is, for example .6, we can say this about the effectiveness of diversification in reducing income variance: Addition of a second enterprise will reduce income variability (variance) by 20 per cent; addition of a third enterprise will reduce it by 8 per cent over producing one product alone, while addition of a fourth enterprise will reduce it by only 2 per cent. Diminishing returns also is encountered in diversification as a method of adding stability to income.119

119 Ibid., p. 535.
By adding some of a second enterprise while reducing the amount of the first, we often can reduce the variability of income for the farm as a whole. This is true since the variations for the two enterprises offset each other. Eventually, however, we reach a combination of the two which gives the very lowest variation. Addition of more of the second then will cause an increase in income variability. The increase comes about as the effects of the second enterprise as mainly expressed and there is too little of the first crop to offset the year-to-year swings in income of the second crop. The following data will illustrate the point.

Table 8
Crop Combination for Levels of Income and Variability of Income, Fort Hays, Kansas

<table>
<thead>
<tr>
<th>Combination (acres)</th>
<th>Level of Income</th>
<th>Variability of Income as Percentage of Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wheat 0 Sorghum 100</td>
<td>$1,000</td>
<td>62</td>
</tr>
<tr>
<td>2. Wheat 21 Sorghum 79</td>
<td>1,500</td>
<td>50</td>
</tr>
<tr>
<td>3. Wheat 80 Sorghum 20</td>
<td>2,500</td>
<td>150</td>
</tr>
<tr>
<td>4. Wheat 90 Sorghum 10</td>
<td>2,700</td>
<td>175</td>
</tr>
<tr>
<td>1 or wheat 0 Sorghum</td>
<td>3,000</td>
<td>200</td>
</tr>
</tbody>
</table>

Graphically the data can be presented as follows:

![Graph showing the relationship between income in dollars and variability of income as a percentage of average.](image)

(Figures in graph show number of acres out of 100 acres in either crop.)

Starting out with all wheat, income variability is reduced by adding 10 acres of sorghum and contracting wheat by a like amount on 100 acres. Further addition of sorghum reduces variability even further, until only 29 per cent of the land is in wheat and 71 per cent is in sorghum. A further increase in sorghum, however, increases the variability. Although this combination gives the lowest variability of income over time, it need not give the highest income the same period. The farmers have many choices between level of income or stability or sureness
of income. Only he can make the choice; he knows his venturesomeness, his confidence in his expectations, his family responsibilities, and his capital position.

**Flexibilities in Farm Organization and Production Methods**

Flexibility is another uncertainty precaution. By flexibility we refer to the avoidance of rigid production methods which can be used for only one product over a long period. Under flexibility, we keep our farm plans fluid, we can change our direction when the need to produce different products or to use different practices arises. We refrain from specializing our resources to a single use. We keep our plans and equipment "general purpose" so that they could serve a variety of purposes as the need arose. A farmer who gets his funds and resources tied up for a highly specialized use, may find it difficult, when demand decreases for the product, to change. If it gives much lower returns than other alternatives could, he converts his resources to them. Perhaps he could be better off if he builds up a less specialized setup which could be better adopted to different enterprises.

Flexibility in plans is useful to meet uncertainty when we are quite unsure about the future. By keeping our resources and plans flexible, we are able to wait and gain more information over time. We are able to provide "turning points" for the future; if outlook or prices turn in
either direction, we can turn our production in the same direction. Flexibility is needed especially where several close opportunities exist in production and a small change in demand and price will quickly throw the profit advantage from one enterprise to another. Enterprises, demand for which is likely to continue as such, there may be little need for incorporating flexibility into plans.¹²⁰

Kinds of Flexibilities

1. Time flexibility: It can be used to allow us to gain more information about the future over time. Future prices may be uncertain at breeding time of a certain livestock enterprise. The possibility that prices will fall before offsprings can be finished and marketed might be fairly high. Yet few farmers can afford to stop all production in the face of this situation. If they did there would not be very much farming done. Still a farmer does not need to go ahead blindly. He can keep the breeding stock and carry them until he has more information. If prices drop in the meantime, he can market his breeding stock. On the other hand, if prices look favorable, he can get his crop of young ones, and depending on the prices, he gets the flexibility by varying the market weights of the animals. They can be sold at light weights

¹²⁰Ibid., p. 536.
if prices turn unfavorable; they can be carried to heavy weights if prices continue at or move to higher levels than expected. The decision to be made is: Do you prefer (1) to produce or keep fewer young ones and "get out from under" at a lower loss if prices are unfavorable and expand output (with fewer young ones at heavier weights) at a lower profit if prices are favorable or (2) to expand output at a higher profit (with more young ones at a lighter weight) if developments are favorable but with larger losses if "worst comes to worst"?121

The important thing on farms which cannot stand losses is to keep flexibility or turning points throughout the production process. Often it is better to think in terms of the short periods; then reconsider plans and prospects at each turning point. This may be more practical than trying to make all your plans at the start. Enterprises that are completed in a short time ordinarily involve less risks. Grain-for-cash is a shorter term enterprise than grass and fodder which can be marketed through livestock. Raising chickens is shorter than sheep and sheep are shorter than beef and dairy cattle.

Ordinarily it is easier to predict prices a few weeks ahead of time than over a long period. When prices are likely to move in only one direction - downward - the wise

121Ibid., p. 537.
farmer keeps as little feed and other inventory items on hand as possible. You can buy certain items such as protein supplement a few sacks at a time instead in ton lots. You can convert most of the items in cash, and buy them back later, when prices will be low. Cash thus acquired provides liquidity or fluidity in the farm business. If an emergency develops the cash can be used for any purpose; it is not specialized in any way.

2. Cost flexibility: Flexibility also is affected by farm costs. A cost structure which includes a high proportion of fixed costs is less flexible for changing conditions, especially falling prices, than a high proportion of variable costs. It is the fixed costs which weigh heavily when prices drop. Not all fixed costs can be avoided, but if you wish to remain flexible, keep as many costs as possible in the variable, day-to-day form. Feed, hired labor, and custom hire of machinery are paid only when used; fixed costs go on at the same level regardless of price or production levels. Renting may be a better bargain for the beginning farmer than buying a farm. Renting keeps more of the expenses in the variable column. If prices change, share rents are automatically adjusted. While fixed costs may allow more profits than variable costs at one time, variable costs represent the greatest hedge against falling prices and loss of income. Cost flexibility is important where the possibility of using
time flexibility is limited. The fixed costs of the same equipment extend far into the future. Cost flexibility, like time flexibility, may be selected to gain time and allow adaptions in output. It makes contraction of output possible with a smaller sacrifice in overhead costs should prices slide downward. Avoiding building permanent barns and specialized machinery and equipment are steps towards cost flexibility. Use of more labor rather than equipment with high fixed costs, even though the latter gives the lowest cost per unit in years of large acreage, make possible a sharp curtailment in expenses during years of a small acreage. We are back to our choice again: (1) should we select flexible costs which allow us to curtail costs and perhaps to avoid losses if prices drop? This system will give higher costs and less profits if prices are favorable and production is expanded, or (2) should we adopt the system with the greater fixed costs? It will have lower costs and more profits if economic conditions favor a large output; it gives higher costs and even losses if prices decline and acreage is reduced. The man with little capital and large debt will be more interested in the flexible system and in guarding against losses under unfavorable conditions. The farmer with ample capital and able to weather a set-back or two may use the inflexible system and have lower per unit costs and greater profits over the long run.122

122 Ibid., p. 540.
3. Product flexibility: It refers to investing in resources which can be shifted back and forth between different enterprises with greatest ease. In flexibility is represented by investments such as an apple or mango orchard. After the trees have begun to bear, it is hard to switch back to other products if fruit prices fall. The fixed costs going into the plantings and the waiting costs will be very great; we can best forget them and keep on producing fruit if we get a return greater than variable costs. A more flexible arrangement will not include fruit trees. Then the land is adaptable and can be shifted back and forth between annual crops each year, as price relations change or as weather conditions are altered.

Product flexibility can be attained even in the construction of farm buildings and purchase of farm machinery and equipment. Highly permanent and specialized buildings and machinery introduce inflexibility in the farm investment. General purpose buildings and machinery is the best policy when future is uncertain. In the same way, dual purpose animals provide more flexibility than single purpose animals. For example, a dual purpose cow will not produce milk as well as a dairy cow, she will produce beef more advantageously than a dairy breed; she may not always produce beef as well as a beef breed, but she usually will produce more milk than a beef cow. Thus, dual purpose cows provide more flexibility than strictly beef or dairy cows.
Product flexibility is sometimes greater for one crop than another. Hay is a flexible crop. It can be used for pasture, put up as long or chopped hay or cut as ensilage, depending on weather. Of course, the farmer must have the livestock and equipment to utilize it in these various forms if it is to be a truely flexible crop.\textsuperscript{123}

**Contracts for Prices and Costs**

Uncertainty of prices could be eliminated entirely if the farmer could make out a contract for the things he has to sell in the future and things he has to buy. Unfortunately, the opportunities to make contracts for what one buys or sells is limited, although some opportunities do exist.

Contracting for purchases or sales in the future can lessen the uncertainties of the future, but it can also increase it when one makes a contract for what he sells but is not able to contract for what he buys and vice versa. If the farmer has studied outlook very carefully and is certain of a falling market, he should contract his sales into the future but not his costs. When prices do fall he will get the higher contracted prices for the things

\textsuperscript{123}Ibid., p. 543.
he produces, but can purchase labor, feed, fuel, fertilizer and other resources at lower prices. If he is certain that prices will increase he should contract for what he buys but not for what he sells. Of course, if he makes a wrong prediction on the selling side and prices go up when he expects them to go down, he will have less profit by contracting his sales than if he had sold in an open market.

Procurement price and price controls. Lately the Pakistan government in collaboration with the Provincial government in their endeavor to build up food reserves and stabilize prices, have resorted to set prices on certain farm (especially grain) and non-farm commodities. If properly executed this policy can eliminate price uncertainty to a great extent. But there are certain features which make it less effective. First, the price policy is not advertised enough. Many farmers do not get to know which commodities are under control. As discussed earlier, many markets are unregulated and operate under no rules and regulations, they can easily defy the government laws without any fear from anybody. Second, the farmers in advance pledges his produce at a fixed, especially low, price to the landlords or money lenders, irrespective of the control price, the farmer will get the price the landlords or money lenders will give him. Third, the control prices are announced close to the harvest time, while
the entire production was carried on under uncertainty. Therefore, the stimulating effect of price certainty does not show up in the productivity of the farm business. Sometimes the non-farm commodities put under price controls disappear from the open market and farmers have to buy them in the "black market" at much higher prices or go without them, thus the remedy becomes worse than the disease. Price certainty through price controls and other measures can't be overemphasized, but let us not forget that mere passage of laws do not mean a thing unless duly enforced and observed. These regulations change from time to time, depending on the ideas of the party in power, which changes very often. The regulations should be checked carefully to find if they exist or are likely to exist in the future.

**Contracts in Money**

Forward contracts in money can be made to reduce uncertainty in farm business. Cash rent represents a method of introducing certainty into the price to be paid for real estate services. Long-term contracts are also sometimes made for land purchased either on contract or under a mortgage. With fixed and specified interest and principal payments. Forward contracts in money introduce certainty into the price of the resource, it may increase the uncertainty of farm income itself, particularly when deflation hits the economy.
Contracts in Kind

Contracts in kind are another means of reducing income uncertainty where contracts in money have the opposite effect. Share renting and hiring of help on a labor-share basis are illustrative of this possibility. Contracts in kind can be designed to lessen the consequences of both price and yield variability. Forward contracts are effective in reducing uncertainty, but they also stand to restrict incomes below levels otherwise possible.

The degree of uncertainty in the farmers' mind obviously depends on his expectations. If he expects high prices, he frowns upon forward commitments, if he expects low prices he usually rushes to enter into contracts, unless his psychological makeup motivates him to take chances.

Discount for Safety Margins

Discounting or subtracting a safety margin is another precaution against uncertainty. This precaution makes the farmer conservative and thus keeps him from going out on a limb. There is certain degree to which this precaution be adhered to and not on extremes. If it is carried too far, farmers will refrain from investing anything but small amounts, and thus will deprive himself of big profits. If he does not observe it far enough, he will expose himself to wide risks or large losses. Discounts or safety
margins are used mainly to determine the amount of resources such as fertilizer to use on the farm.

From the data in Table 1, we can show how farmers may use this safety margin approach. Table 1 shows the cost of each unit of input and the yield associated with each additional unit. We may also expect a price of $1.50 per bushel to be most likely return. With known costs of inputs and expected yield increases, it would be profitable to use 8 units per acre. However, a farmer may say that to be safe, I will subtract a safety margin. If he does so and the price drops to $1.08 per bushel, he would not have lost any money. Or, if yields are lower due to unfavorable weather, etc., the smaller inputs of capital and labor will keep him from putting out money for capital and labor without getting any return. On the other hand, the discount will not let him get maximum profit if the price does turn out to be $1.50 per bushel and if yields are as high as shown in the example.

The main purpose of safety margin and other uncertainty precautions is to safeguard against big losses if unfavorable prices or yields come about. At the same time, use of these precautions put a ceiling on high profits. Only the farmer as an individual can decide on the extent that he should adapt these measures to lessen the uncertainty or variability of income. They, in no case, are substitutes for good predictions and farm plans.
Insurance as a Risk Safeguard

Another uncertainty precaution is insurance. It involves least complexity. It can be used to meet major risks such as the death of the operator or some member of his family; for sickness and accidents; for fire or other hazards which may wipe out capital investments such as expensive buildings, breeding or fattening stock, bullocks and equipment. By paying in a small cost - premium, one is able to avert an uncertain large loss. Therefore, the insurance comes at a cost, which will not bankrupt him or cause him to suffer great hardship and thus assure him that he or his family will not suffer extreme hardship or financial ruin.

The amounts and kinds of insurance which one should carry should depend particularly on his financial position and his family obligations. The farmer with little capital or under heavy debts especially should inquire into the possibilities of insurance. A man short of capital can usually use the funds paid as insurance premiums in his business, which will give him higher returns than insurance. Still the insurance, even if it pays a low return or none at all, is a safeguard for the man with little capital or large debts. If the hazard comes about and he is not insured, the large loss may cause bankruptcy. Just to be certain of staying in business, he perhaps should carry insurance even though he could invest the premiums
in his business with very great returns. In contrast, the wealthy farmer, with well-established business, is less pressed with the need for insurance. In spite of some losses, his financial position will allow him to continue his operations in later years.

Insurance is not available, however, for crop failures and price fluctuations. Provincial Government of Pakistan do have certain funds to aid farmers in emergency situations such as floods, hails, storms and the like. Among other relief measures are exception from certain taxes. Farmers can't claim them as right, their amount is uncertain and unpredictable, therefore, it is difficult to incorporate them into the farm plan. One must, therefore, depend on his ability to use outlook material and precautions outlined earlier to safeguard against financial ruin from unfavorable yield and price fluctuations.
CHAPTER X

ROLE OF STATE IN THE DEVELOPMENT OF AGRICULTURE

The operation of an economy is no longer independent of the operations of other institutions. Many complexities exist in its structure and a laissez-faire policy of government is no longer true. Even in a free enterprise economy, Government plays more than a passive role, and it certainly occupies an active and dominant role in controlled economies. Based on such contentions the argument may be forwarded that Government constitute the fifth and the dominating factor of production, the other four factors being land, labor, capital and entrepreneurship (management).

Such a contention can easily be justified since Government is actively engaged in many activities influencing the operation of an economy. Some of them are:

1. Control in banking and currency.
2. Control in industries and agriculture.
3. Control on cyclical fluctuations.
4. Price fixing and rationing and procurement.
5. International trade, exchange and tariffs and duties.
6. Control on public finance (taxation).
7. Control of stock-exchange.
8. Legislation and law and order.
11. War.

The fact that the Pakistani farmer is illiterate and devoid of managerial abilities, adds to the responsibilities of the Government, because the uncultivated cannot be competent judge of cultivation. Those who need to be made wiser and better, usually desire it least, and if they desire it, would be incapable of finding the way to it by their own lights. It will continually happen, on the voluntary system, that the end not being desired, the means will not be provided at all, or that, the persons requiring improvement having an imperfect or altogether erroneous conception of what they need, the means sought will be anything but what is really required. It is high time that Government should come up to the needs of the time and provide guidance and leadership, which the peasantry desperately need.

Farm management may make great contributions to the development of agricultural production in a country and little to per capita output because population growth almost matches it. In such a situation farm management's goal of better life will never be realized. Population growth may even retard production through exerting pressure on land and rendering the holdings uneconomic and leaving meager surpluses for investments to improve productive capacity of farm resources. This is Pakistan's great challenge, to achieve such a margin
of production over population and maintain and widen it. More than economics including farm management is involved in this.

Pakistan, like other underdeveloped countries, is in the grip of "the vicious circle of poverty" by which is implied a circular constellation of forces tending to act and react upon one another in such a way as to keep a poor country in a state of poverty. This situation can be summed up in the proposition, "a country is poor because it is poor." Perhaps the most important circular relationships of the kind are those that affect the accumulation of capital in the underdeveloped countries. Supply side of capital is governed by the ability and willingness to save, the demand side of capital is controlled by the incentive to invest. A circular relationship exists on both sides. On supply side it is as follows: There is a small capacity to save, which results from the low level of real income, which is due to the low productivity, which stems from lack of capital, which is the result of the small capacity to save - and the circle is complete. On the demand side the circle runs as follows: There is lack of investment incentive, which is due to small purchasing power (or limited size of the market) which is the result of small real income, which originates from low productivity, which in turn results from less capital used in production. Less capital is used in production because there is no inducement to invest - thus the circle completes itself.
What is it that breaks the deadlock? The difficulty caused by the small size of the market relates to individual investment incentives in any single production enterprise taken by itself. At least in principle, the difficulty vanishes in the case of a more or less synchronized application of capital to a wide range of different industries. Here is an escape from the deadlock; here the result is an overall enlargement of the market. People working with more and better tools in a number of complementary industries become each other's customers - products pay for products and supply creates its own demand. Size of the market is increased and inducement to invest is enhanced. This is the balanced growth process. In Pakistan the individuals lack capital, entrepreneurship and foresight. As individuals they are incapable to selecting and proportioning the right type of industries for balanced growth. Here the central role is assigned to the Government. The State can become great innovator and the industrial pioneer on a wide front. Through the planning process helped by other state agencies, the Government can make informed judgement as to the nature, extent and kinds of industries to be undertaken. This is what one finds in the Five Year Plans. Agriculture being a significant cog in the national economy, needs special attention. Without improving agriculture, Pakistan can get nowhere. We can't afford haphazard movements in developing our agriculture, we are just on the border line of starvation, having no reserves to lean on, and no provisions to count on. In Pakistan, every development
move needs to be analyzed to determine its contributions to economic progress and whether it is the most important move to make next. Such a development is the key to the future of Pakistan. Development should be positive and constructive. It means building brick on brick, or block on block, the structure of a future Pakistan. In their least dimensions, the building blocks for the agricultural part of Pakistan are the individual cultivators and their lands. Next come the villages and then the nation. An economics of agriculture that is practical will help in the shaping and firming up those blocks and fitting them into the structure of a more productive and secure Pakistan society.

For a wholesome and balanced economy it is necessary that economic decisions must be made for the nation as an economic unit - such as whether or not to encourage cotton or jute or sugar cane production by price supports or custom duties, or produce something else, export it and import cotton, jute or sugar cane products. Decision of this kind should take account of the economics of the production of these products on the land, which means on cultivator's units. Therefore, what is called micro-economics needs to be combined with macro-economics in any real surge toward economic development.

The Government first of all should conduct research in the various phases of the economy to discover the facts and relationship to be incorporated into the planning process. Second, it should pass on this information to personnel, educators, students and workers, and third, it should execute
its policies and supervise its programs. Accordingly, we will discuss Government's role under three headings:

I. Research

II. Education
   a. Universities and Colleges.
   b. Extension, short courses, etc.

III. Public Administration

I. RESEARCH

Guidance and leadership will be more genuine, reliable and fruitful if based on research and investigation into the specific problems that confront the farmer or the nation. The economic research, which is to serve as a basis for dealing with the problems at the farm, village, district, division, province or national level should go through certain stages as follows.  

1. Assembling the facts as to the economics situation: This means collecting them by means of surveys and then summarizing them into tables. Such a research is of considerable guidance value in laying out village programs, and in policy and decision at block or higher level. Governmental decisions can be made much more safely with this information in mind than without it. And any analytical description that can be combined with the tabulations makes the result still more helpful.

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2. Analytical description: This means classifying the data on various bases and trying to discover significant differences and relationships. Some of this always accompanies the first stage.

3. Recording and measurement of economic change: Efforts are also made, in this stage, for annual or shorter period reporting of data of current change for purpose of time series analysis. The first contribution of such research is that it provides a measure of the extent and direction of change taking place, and it is important to relate progress to such change. If a program is already under way, the measured change can indicate the effects of the program. To furnish guidance as to the next step in the program, classification and differentiation of rates of change are needed as well as measurement. The much more common form of this type of information is illustrated by the current series compiled on production, prices, marketing, etc. The mere collecting of the current data of course has a small research content. The research part of it is the planning of the collection and the subsequent analysis.

4. Planned purposive research: This is the research planned from the outset to determine the existence or non-existence of specific economic relationships and to measure them, or some economic point or combination, such as point of highest-profit combination or the input factors in a certain production process, or the most advantageous combination of choices of enterprises on a farm or in an area, or the most
advantageous combination of uses of the land of an area, or the set of market grades that moves a crop through the channels of trade most efficiently, or the type of loan that will contribute most to the economic development of an area, or the best use of all the resources of a village, etc. The use of the term "planned" in describing this type of research is not to be taken to mean that no planning is required for the research of the three types mentioned above. What is meant instead that the number (4) type of research is planned with specific economic purposes or ends in view.

As long as the research is mainly in the first three stages, the methodology required is dominantly of a statistical character, and is not usually of a highly technical nature. In Pakistan even this type of statistical information is incomplete and in many cases inaccurate and belated. In the later stages, qualitative analysis must accompany and ordinarily precede the quantitatively. Also, the case method comes into much wider use. This type of research, in Pakistan, mostly has come from Government farms and institutions, where water supply, capital, management, scale and size of production are in no case in conformity with the resources of a common cultivator. Therefore, there is every likelihood that this type of research is unrepresentative.

The first step in planned purposive research is a clearly defined statement of the objective of the undertaking, for example, "to determine the price of wheat that will bring forth

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the volume of domestic output that will meet the domestic demand." The second step is a careful qualitative analysis of the problem that will identify all the factors in it and the variables that must be taken into account. The third is to review all the pertinent data available and find out what additional data are needed. The fourth is to outline a procedure of obtaining these data. If field work is required, this means working out the procedure for this, including the schedules. The sixth is analysing the data to determine the significance of the various factors identified in the qualitative analysis. The final step is inference and statement of conclusions.

This is a very different procedure from collecting all the data on some subject, like rural credits or size of holdings, that one imagines will be useful and then seeing what can be made out of them. What usually happens with this latter procedure is that when one sets about analysing a particular problem, one finds that no data have been obtained for some of the factors important in it, or the data are not in form for such use.

Economic research can be planned that is purposive, however, and still not be significant or useful. A common reason for this is that the qualitative analysis was faulty.

At this time research is needed at least in the following fields. For some of them the individuals lack knowledge and finance and for others competence to conduct research. The fields are:
A. Production and land-use economics of the farm and village.

B. Marketing and prices of farm products.

C. Rural credit.

D. Land Tenure.

E. The Nation as an economic unit.

It will be noted that this outline begins with micro-economics and swings clear over to macro-economics at the end. This is the order in which research needs in general to be developed in the future. But of course there will be needs for research of E type that can't wait for such an evolution.

A. Production and Land-Use Economics of the Farm and Village

The research to be conducted in this field can be broken down into various sub-headings: 126

1. To obtain information needed and make analysis to determine ways and means of increasing returns and income.

2. To obtain basic input-output and other farm planning data by surveys and case studies of farms.

3. To determine the economy of the use of bullock power on farms.

4. To determine the economic size and organization of different types of farming units within or for a village area.

(1) To determine the economic size and organization of farms employing one, two or three hired laborers during much of the year in a village area.

(ii) To determine the economic size and organization of farms employing one, two or more hired laborers during much of the year in a village area.

(iii) To determine the economic possibilities and economic organization of vegetable gardens and orchard for village families.

(iv) To determine the economic possibilities and organization of the small intensive farming units for village families dividing their time between cultivating and working for wages.

(v) To determine the economic possibilities and organization of joint-farming undertakings in village areas.

(vi) To determine the economic possibilities, form of organization and operating procedures of joint-farming in which the whole village is the operating unit.

5. To determine the most advantageous use of the different types of land in an area.
6. To develop a plan for the agriculture and land-use of a village area or larger area unit.

7. To develop effective method and procedure for extension work in farm management.

These, though by no means all, are some of the important areas to investigate into. Space and time does not allow us to develop them here fully.

B. Marketing and Prices of Farm Products^127

The major portion of this research provides a basis for action to be taken by public agencies at the levels of provincial or central governments. It has already been indicated that mostly agriculture is of subsistence type and very little is left to be sold in the market. Commodities are of indifferent qualities (i.e., less standardized), transport and storage facilities are inadequate. Most of the markets are unregulated, communication in and between the markets is poor. Farmers competing position is weak to non-existent. These point out the fact that our markets are imperfect. It should be the objective of the Government, with the help of this research, to remove the impediments and make the markets perfect - that is, markets in which there is full and accurate information by all operators in the markets, so that all know exactly what is being sold at what price and also the state of demand and supply. To do this job, the Government should

^127 Ibid, pp. 81-86
develop better market information services, better grading of farm products, and more regulation of marketing transactions.

This objective of marketing action and research has importance for production as well as for marketing as such. The better the information about supply and demand and the outlook for the same, the better that producer can adjust their production to fit the market.

This information includes not only the amounts of products demanded and supplied but also the types of them. It is important that producers supply the types of any product that the consumers want to use, and they supply it in the condition in which consumers want to buy it. It should be remembered that no market is perfect until the buyer, including especially the final consumer, is fully informed as to the properties of what is being offered for sale. Market grades go only a small way towards serving this need. It is in the retail market that the most misrepresentation of goods takes place. Pakistan surely has her share of this. Laws should be passed and enforced to prevent some of this. "Informative labelling", brand marks (public or private) are some of the ways of dealing with this evil. Supplying consumers with information as to the foods and nutritive values of different foods, wearing and other qualities of different textiles, and the like, is another approach.

Related to the foregoing are outright fraudulent practices such as short-weighing, dilution and adultration.
The second major objective of action and research basic to it in marketing is the getting of the products from producers to consumers efficiently and economically. This includes not only the physical handling of the product - assembling, transport, storage, processing, etc., - but also the selling and buying. The research will reveal whether the spread between what the consumer pays and what the producer gets is due to the multiplicity of market functions, monopolistic power, inefficiency in handling the products, or the like, and this will call for a specific action.

The other avenues of public interests may be (a) assisting in the development of new market facilities, (b) assisting in the organization of buying and/or selling cooperatives, (c) developing new market outlets, (d) enforcing marketing contracts, and (e) regulation of marketing practices.

As understanding of price movements and price differentials and the reason for them is important for purposes other than price control and for private and as well as public action.

Market research which has been done in Indo-Pakistan subcontinent is mainly a description of the existing marketing system for particular products. This description marks out the marketing channels for the product and defines the type of marketing firms that have a part in the movement of the product from the producer to final consumer, and outlines their
methods of doing business. Ordinarily an attempt is made to estimate the division of the marketing spread between the different handlers. Such information is of course absolutely essential as a foundation for any program of action to improve marketing, and of research as a basis for such action. Out of it come some direct suggestions of ways and means to improve marketing functioning that can be tested out in actual operation.

But marketing research needs to go beyond this description stage. One part of it needs to be directed towards improving the marketing information service. This calls for research on such subjects as market grades and accompanying price differentials, price-quoting and inter-market price differentials, methods of estimating market supplies, supply-price relationships, methods of estimating changes in demand, etc. There is dire need for ample research to be done in this phase, before the markets can be brought into that degree of communication with each other than will establish one Pakistani price, except for reasonable inter-market differentials, for most agricultural products and a rational pattern of inter-seasonal prices. Price research has an important contribution to make to this end, most of this on a commodity basis.

Characteristic of such research designed to supply better information about goods bought and sold is the need for close collaboration of natural scientists and economists. If market grades for wheat, for example, are to be significant,
they must relate to the milling qualities of wheat and the baking qualities of flour made from wheat, and the analysis and testing required to determine these call for skills that economists do not have. Parallel statements can be made for rice, cotton, jute, etc. Informative labelling that is really helpful requires similar testing, especially if the danger is to be avoided of setting up definitions and specifications for commodities that stand in the way of improving them.

Research in the efficiency of marketing operation is essentially research in the production economics of marketing. The problem is to combine the right amount and kinds of input factors in a marketing unit of the right size in the right location and handling the right combination of commodities or performing the right combination of processes of services. "Right" in this connection can mean either that which optimize the net incomes of the marketing firms or that which uses the inputs factors at their greatest combined advantage.

Research so far conducted mostly concerns itself with one type of firm at a time, that is, a study might be made of plants processing milk into "ghee" or butter, or buying jute from farmers and baling it, or of caterers hauling farm products to market, or of stores selling groceries to villagers. But there is also need of research which covers the whole series of firms that move a product from producers to final consumers. Research this comprehensive, makes it possible to study the integration of the operation of the different firms in the series. Failures in such integration is
one of major weaknesses in marketing systems in most countries. As a result of it, retail prices reflect only in a minor way sharp rises or falls in prices paid to producers. The result is that prices do not enter into plans for crop production, products do not move into consumption as freely as they should. Also, because of this lack of integration, much of the time many firms somewhere in the series are overstocked or understocked; also some of the marketing functions may not be performed at the points in the marketing chain where they can be performed most economically.

The methodology that is most effective is studies of particular types of marketing firm is first to collect rather full survey data for a considerable group of them - as many as 25-50 or more depending upon circumstances - and to analyse these to get the structure of the ranges and variations in the different inputs and outputs. The second step is to select a smaller number, say 5 to 10, and make a careful case analysis of these. Those selected should be at different points along the ranges, but also represent major differences in ways of operating. For cooperatives, case study is the best, as there are not enough of them that surveys are feasible. The case analysis should test out the effects on costs and earnings of alternative ways of operating, including especially lower margins and higher volumes of business. The final product of the research should ordinarily be the setting up of two or three high-efficiency models.
Out of the analysis of the organization and operations of individual private and co-operative firm and marketing systems as a whole, will come a body of information that may prepare the way for designing a marketing system for a product that is clearly better integrated and more efficient than may exist.

C. Rural Credit

The problem of agricultural finance in many ways is central to considerations of rural economic policy and without a proper solution of this problem a beginning with economic rehabilitation of rural society could not be made. The State could perhaps begin formulation of a newly oriented policy best with organization of agricultural finance.

Scaling down of debts or controlling operation of money-lenders is futile as long as alternative institutional credit was not available to the agricultural producers. The main problem which awaits solution today is the building up on an integrated system of agricultural finance in each province. Action regarding this could be taken chiefly on the initiative of and only with considerable help from the central or provincial Governments. This is the experience of a number of even advanced countries in which state-sponsored apex credit institutions successfully provided finance to agricultural producers.

Pakistan economic progress and political stability are chiefly related to the prevailing system of rural economic
institution - chiefly land tenure, marketing and credit.
There can be no doubt that farm credit institution is singularly unsatisfactory. Reorganization of the structure of agricultural finance on scientific objective lines is, therefore, an imperative necessity.

Time and again the inquiries by credit experts point out to extent of firm conviction that without co-operatives, it is very difficult to undertake credit work, and is also clear from the following passage in the First 5-Year Plan (1955-60), "In the sphere of credit especially we see no wholly satisfactory substitute for co-operatives as the ultimate objective. A rural credit organization has to function in an unfavorable socio-economic environment and has to deal with millions of cultivators, each of whom presents greater problems of technique and supervision than the most difficult client in the urban sector of the economy. Overlooking the claims of cooperation based on its potential in moral and social terms and judging it purely from the point of view of its effectiveness for supplying credit, we can conceive of a satisfactory rural credit organization in which provincial and district cooperative bank do not feature, but it is impossible to think of an effective substitute for primary village co-operative societies. No credit organization can be built except at a prohibitive cost to serve the millions of small men in villages, unless they themselves assist it by forming local associations. For a purely commercial agency
the magnitude of the job is too great and agricultural credit has to be subsidized. For purely Government agency also the job is too great, without the organized support of the local people, doing their best to help themselves. The best form in which they can organize themselves is the co-operative. The problem thus is how the primary village co-operative society can be made effective. 128

As we have indicated earlier, the co-operative organization has weak foundations, and need reform, consolidation and rehabilitation. The Government should undertake such a job with the help of proper research and investigation into the co-operatives. Analysis of individual co-operative in the manner outlined for marketing firms is in order. This can be carried to the point of constructing economic models and pilot operations based on these. These models need to be fitted to different situations. The Government should conduct research:

1. To determine the type and size of local co-operative best fitted to different situations in Pakistan.

Some of the alternatives with respect to this are:

a. A credit co-operative in each village regardless of its size and location.

b. Such a co-operative for the larger villages, these serving adjacent small villages.


c. Larger co-operative serving an area as large as an extension block of village AID program, with a local officer in each village.

This officer may combine this function with other duties, such as village AID program, with panchayat' duties or handle them along with private enterprise, or devote his full-time to them.

The research procedure can include the following:

1. Case study of examples of organizational set-ups of such as they exist.

2. A job analysis of the tasks to be performed by a credit co-operative in different situation and the skill and training needed.

3. Working up economic models of the different types, each designed to fit into a specific situation.

4. Actually setting up credit societies patterned after these models. Supervising these and modifying them as needed to make them fit if this is possible.

5. Training co-operative managers for such type of these as promise to succeed in different types of situations, and analyzing the records of their operations for several years.

2. To determine the level of interest rates that a credit co-operative can best collect on loans to members.

It is desirable to set these rates low for several good reasons. On the other hand, they need to be high enough to cover the costs of the obtaining needed capital plus operating expenses, plus losses on loans. If not, needed share capital
will not be advanced by members, and provincial and central governments will not be able to supplement member share capital. More important is to provide competition in the field of credit to other agencies charging high interest rates, and reach more farmers in amounts, at times, and for the purpose it is needed.

The Government here is to analyze the operation of a diverse group of credit co-operatives in several major types of situations in Pakistan as to costs of operation, losses, operating balances, membership capital and ability to obtain needed capital elsewhere. It probably would be desirable to differentiate the findings according to type of loan.

3. To determine to what extent and under what circumstances credit co-operatives can advantageously combine buying and selling with credit.

There are strong advocates of so-called multi-purpose co-operatives in Pakistan, but also those who seriously question their advantages.

Here again what is needed a careful study of experience in different situations. No doubt, that the business in multi-purpose societies becomes too complex and calls for superior managerial abilities to cope with it. But there is another experience that points to very different conclusions. Certainly the control which buying and selling for members gives over the use of credit and the returns from sales is of large importance.
Such a review of experience, especially if it can be used by extension workers can be of great value in guiding the further moves of the credit co-operatives.

4. To determine the effective ways of using credit in the agriculture of village or larger area units.

The most important agricultural credit research needing to be done in Pakistan generally is the research that will point the way to the most effective use of capital in increasing agricultural output and thus raising the levels of living of rural people.

Over here too we need research of the type required in "production and land-use economics" for determining the most effective use of farm resources. What is needed in addition is a classification of the types of financial or credit situations commonly found on model type farm and developing a financial or credit plan fitted to them. The commonly occurring types of financial situations cover a wide range, from some that will not need to borrow at all, to those needing two to seven years to repay the loan advance, to those who will need to mortgage their farms and real estate to obtain sufficient credit, to those who want credit to enable them to buy a farm. Such analysis will indicate the nature of need for the credit and the terms under which loans needed to be made to fit different farms situations in an area. Given such an analysis, a credit society serving this area is in position to direct its efforts understandingly and plan effectively its operations over the five or ten years.
More important even than this is, once research of this type has been completed, that the credit agency will be in a much better position to judge the potential effectiveness of the loans requested and to adjust the terms of the loan to repayment possibilities.

The full effectiveness of such research will not be realized, however, until extension workers in farm management are able to function properly to help farmers to organize farms with proper farm plans. This final goal is reached when every request for a loan is accompanied by a farm plan and a budget statement showing how the loan funds will effect net farm earnings.

5. To determine how to provide credit for low-income and "non-credit worthy" would-be borrowers in agriculture.

The simple fact is that everywhere in the world there are large numbers of farm families to whom neither commercial bank nor credit co-operatives can make the usual type of loans without increasing seriously the cost of credit to other bor­rowers, because of losses on loans not repaid. Private lenders do loan to part of this group of farmers, but at a high interest rate to all borrowers.

This need has been met in part in the USA by some combination of the following two methods.

(1) "Supervised credit." This is a term that has come into use in the United States to include the following.

a. Analyzing the individual borrowers situation to determine if and how increased capital can be used in such a
way that increased earnings will repay it and something more, and working out a plan for such use of it. This plan is written into the loan contract.

b. Advancing the credit when it is to be used and controlling the use of it.

c. Repaying according to a schedule fitted in timing and amounts to the receipts of additional income. Such loans frequently include a combination of annual loans to help in the production of a single crop and of intermediate term loans to buy needed equipment or work stock or to increase the productivity of the land.

(ii) Government underwriting of such loans so that losses from loans that are not repaid do not cause the bankruptcy of the lending agency, or add too much to necessary interest rates. The usual name for such loan is "insured."

The first of these two methods has meant direct loans from government in nearly all cases. The second method can be used with other lending agencies including co-operatives.

The cultivators needing such credit mostly fall into one or more of the following categories.

(i) Owner cultivators who can't borrow as much as they need to buy seed, fertilizer, and other material to obtain good crop yield in any one year.

(ii) Tenant operators in the same predicament.

(iii) Cultivators who cannot borrow intermediate or long term loans due to insufficient securities.
(iv) Tenant cultivators who cannot borrow due to their insecure tenancy.

(v) Tenants and landless laborers who need credit in order to become owner operators of family sized farms.

(vi) Underemployed landless laborers who want credit to buy small parcels of land to cultivate when employed.

By no means should all of those in these six categories who would like loans for the purposes named be granted loans. On the other hand, many who could use such loans to good advantage will not ask for them because of past experience of cultivators with the kinds of credit terms available in the past. It is not unusual for the wrong cultivators to ask for more loans than the right ones. Accordingly, loan application need to be analyzed and screened very carefully even though the loans are to be made by a co-operative or by a government credit agency.

A program of research relating to credit of this type should include the following.

(1) A review of the experience of other countries with credit of this description. That in the U.S.A. the Farmers' Home Administration and its predecessors is highly significant.

(11) A case analysis of all the cultivators families in a small sample of villages in a division that are unable to obtain credit which they need for farming purpose. The second step will be to determine what makes them "unworthy creditors". The third step will be to analyze the alternatives to uplift them. The most likely alternative should be spelled out in
the farm and the credit plans for each of them. The next step is the provision of credit and to extend supervision needed over the life of the loan.

Still other projects that might be considered are:

a. The various types of securities now being utilized generally unacceptable to commercial banks, and how these can be used by credit co-operatives. The money-lenders accept jewelry as security.

b. How to fit in the private money-lenders usefully as part of a credit system.

c. Determining the benefits which members derive from their credit co-operative.

D. Land Tenure

Land tenure system in Pakistan is not only complex but also oppressive and makes room for the exploitation of the tenants and depletion of soil resources. It kills the incentive for high production and breeds class friction, social discontentment and political instability.

Tenure reform is, therefore, surely one of the paramount needs of Pakistan. It is indeed as pressing a problem in Pakistan as is increasing the output from land. The two problems, however, are so closely inter-related that the programs for the two need to be carefully integrated. It will not be safe for Pakistan to institute land reforms which like so many other countries have reduced agricultural output in the first decade or two following. It is important, therefore, to get a vigorous research program underway, the main
objective of which is to devise tenure systems fitted to the different types of farming, land, people, and institutions in different parts of the country which will realize the two-fold purpose of better distribution of land and increased production. The term "better distribution" is preferred over "equal distribution" of land. Better or best distribution is that in which all the family and workers combined are able to make the land contribute more production and to better living. Providing some families with more land than they will use to good advantage does not meet these tests, even though it is no more land than their neighbors are farming to very good advantage.

The subject under discussion is too complex and vast to be developed fully during the time at our disposal. Each phase of it can be topic of a study bigger than one we are working at. We will limit our discussion not because the subject is not important, but because it is too vast. Only a few lines of research in land tenure and other related problems will be outlined briefly.¹³⁰

1. To determine what land tenure system is the best.

The research of the input-output type is needed here too as a sure basis for a land reforms program that is to cause the land of a farm or village to be used as intensively and productively as it needs to be. This means that this type of research should be pushed vigorously so that it can furnish as much guidance as possible to future land reform legislation

¹³⁰Ibid, pp. 94-97.
and also implementation. It should take the form of a survey of the different leasing arrangements in different parts of a region, selecting a sufficient number of farms plus leasing arrangements and making enough budget analysis of alternative farming organization and operations, and then as a result, selecting the best form of land tenure.

2. To set the size of farming units.

This will include fixing ceiling, bottom and economic size of holdings. If some exemptions are to be provided, these should be clearly spelled out.

3. To set the amount, time and mode of payment of compensation for the resources acquired by the new owners.

(So the new owner-operators may not be rendered short of funds.)

4. To determine the ways and means for consolidation of holdings and management of impartible holdings.

5. To bring about equitable leasing arrangement and security of tenure.

6. To implement the program of land reforms.

It could be undertaken to begin with on a small area, to acquire experience and other pertinent information to refine the approach. This procedure may prove more effective than the one extending over the entire country to start with.

7. If the state has already enacted land reforms measures, the most urgent need is that of assembling the facts village, owner by owner, and farm by farm, and family by family that are needed to do the best possible job of implementing the legislatures.
8. To determine how the land is being used. What the productivity is of the operating units of different sizes that have been transferred to new owners or new tenants, how they are using bullock labor, how intensive is their cultivation. The same information may also be gathered for the tracts of land being retained and operated by former owners. This will help to evaluate the justification of land reforms, if productivity of the farm resources was the objective of such reforms.

9. Research should also be undertaken to find out what facilities the new operators are in need of. It may be necessary to arrange for adequate facilities for new owners in the form of ready credit, improved seed, fertilizer, implements, etc. Previously their sources were landlords, who now are eliminated. The Government itself or through its help to other agencies, will have to fill the gap thus created. It should know in full its nature, extent, and the time it is needed. The Government should prepare itself to meet this need.

E. The Nation as an Economic Unit

The research so far outlined has been for individual operating unit, the farm, the family, the co-operative credit society or the marketing business firm, and next to this for the village as the operating unit. If the economic science is to contribute as it should to human welfare, it should contribute to the functioning of such individual units.
But there are many things needing to be done to improve the functioning of these operating units which require action beyond the reach of the individual farm, firm or village unit. Even more important events do occur external to any one of the individual units that greatly affect it. These may occur in another part of the same province, or nation or in other nations even across the sea. Action to meet these events or changes commonly needs to be united action of the state or nation. An economic analysis is needed as a guide to such united action.

To meet this situation, beside legislative measures, the Pakistan Government has resorted to planning. The First 5-Year Plan was developed to cover the 1955-60 period. It was revised for the period 1955-60. The circumstances in this period made it possible to undertake only some of its provisions, while others were never implemented. Now the Second Five-Year Plan (1960-65) is underway. These plans spell out the programs of economic-adjustment that the planner decide will contribute most to the economic progress and balanced growth of the nation in the midst of a changed and changing environment.

The body of economic research that contributes importantly to the wisdom of the decisions of the Pakistani planners is almost inconceivably large and diverse. Most of the decisions may be based on specific surveys, others may be based on national security or self-sufficiently considerations. We do not have access to the body of information that goes into
planning, accordingly the analysis of decisions is not possible. All that will be done following will be to outline briefly a few examples of important research areas.

1. To determine how much and at what locations export commodities (jute, cotton, tea, etc.) Pakistan can produce to its best advantage.

2. To determine how much and at what locations, Pakistan can produce food grains to its best advantage.

3. To determine how much of livestock industry will be best for Pakistan, where it can best be located and how organized.

4. To determine how much and what chemical fertilizers Pakistan can produce to best advantage.

5. To measure the progress and changing economic conditions of the agriculture of Pakistan by types of farming and regions.

6. To determine the price control and adjustments that will best promote the economic interest of the nation.

7. To determine the way the plan should be organized and complemented at central, provincial, divisional, district, village and farm level, that will help achieve and maximize the objectives set in the plans.\textsuperscript{131}

Free play of forces of supply and demand, adherence to

\textsuperscript{131}Ibid, pp. 98-105
the law of comparative advantage and observance of other economic principles outlined earlier help to arrive at sound decisions.

II. EDUCATION

Another field of importance that will help farm management approach to be successful and Governmental role to be meaningful, is education - designed, arranged, and financed by the Government. The knowledge acquired through research needs to be passed on to the people - right from the farm to the highest level in the central government - if it is to serve the purpose for which it was undertaken.

The nature, ways and means of education of people, need to be fitting to their problems, conditions and circumstances. At this time the level of education in general and standard of agricultural education in particular are lamentable. More than 99 per cent of the students enter into non-agricultural colleges, where some of the degree classes economic theory is taught of an elementary standard. Agriculture and agriculture economics are taught in only four colleges admitting less than one per cent of the students entering colleges. Economics both agriculture and theory is taught to the junior and senior students in the agricultural colleges, but most of the students never get to this stage. Those who graduate from agricultural colleges, not all of them join the department of agriculture. This situation is unsatisfactory from any angle we look at it.
Majority of the high school students never get to know agriculture, agricultural economics and economic theory because these subjects are not included in the high schools' syllabi, and secondly more than half of the high school graduates can never join colleges.

The net result is that number of agriculture graduates available each year for agricultural development purposes is very, very insignificant. The first job of the Government, then, is to extend agricultural education to enough people.

The next important job is to improve the quality of education in the country. In agricultural colleges the basic natural sciences should be emphasized as the students had very little of them in high school. The students should also be given a chance to gain practical experience on the farms attached to colleges, as a part of their college education. Specialization should be postponed till the Masters' degree years. One reason for this is that there is scarcity of agricultural graduates and the students must be ready to handle varied, vast and diverse problems and jobs in agriculture field of the economy. Agriculture, Agricultural Economics and Economic Theory should be emphasized. The body of economic principles with which agriculture students are mostly concerned is the economics of production. Marginal economics, in order to make it meaningful, must be tied down to the particular situations of the sort that arise in agriculture. The last one or two years of the degree students' courses can be devoted to a combination of farm management, land economics,
marketing and prices and credit. There is also a great need to teach the students of agriculture how to combine their economics with the special natural sciences of agronomy, animal husbandry, soils, etc., that they are getting in other courses. In farm management, methods of record-keeping, and planning and budgeting to increase output or net profit should be emphasized. Importance of production economics for a country like Pakistan can't be over-emphasized, but so far it has not been weighed heavily enough in the four-year courses of the Colleges of Agriculture. A casual look at the college courses outlines and reading lists gives evidence of much needed refresher treatment, especially in the matter of textbooks and readings by the foreign authors. As adjudged from the courses of study and syllabuses, the young men who are being graduated from these colleges are probably not qualified to handle the economic problems of Pakistan agriculture as they need to be handled in the years ahead. More intensive and up-to-date courses of the same sort that they are now getting would qualify them better. The agriculture graduates of Pakistan in the decades just ahead need to be men who can take hold of jobs of planning at the individual farm operating unit level and all the village level. They need to be able to analyse in the same specific and down-to-earth ways the organization and operations of local marketing and credit operating units both private and co-operative. Men so trained operating at the village level can do much to put land reforms measures on a successful working basis.
Accordingly, what the colleges of agriculture of Pakistan need in order to help their country realize its goals is a combination of more instruction in agricultural economics and a major reorientation of many of the courses. This may well be cause for a reorganization and reoutlining of them along with their expansion.

Post-graduate studies. It seems that the carrying forward of the Five-Year Plans is going to need a rapidly growing number of men who are specialized to the Masters' degree level especially for planning and administration and carrying out particular programs. There will need be a growing amount of very practical down-to-earth research to carry out programs in particular areas and situations. Then there will have to be teachers to train these workers.

Planning and budgeting. For the successful implementation of the Five-Year Plans along with them their components of consolidation and land tenure measure, marketing and credit provisions, will need the help of men trained at least at the Masters' level. The success of the undertakings named is so vital to Pakistan's future that the central and provincial governments can less afford to economize at this point than at almost any other that can be named.

Some of the courses may be suggested that will help train the men.

1. An advanced course in Farm Management, with a thorough grounding in the basic principles of production economics as they work out in crop and livestock production and farming
generally. The practical work connected with this should be carried to the point of actual budgeting of alternatives and planning of a few of each of several types of family and larger farms and assembling and developing the input-output and other operating-unit data needed for such planning.

2. Land-Use Economics sufficiently realistic and detailed so that those having taken the course of study will be able to map the land of an area into sub-areas according to the most advantageous type of operating unit and system of farming for it.

In both this course and the farm management course, the men must learn to work closely with soil scientists, agronomists, animal husbandry-men, irrigation engineers, agricultural engineers, etc. In the land-use course they may also need to work with silvi culturists, horticulturists and the like.

3. Intensive study of land tenure, leasing systems and land reforms, so that these can give specific and detailed guidance to undertakings in land re-distribution in the block in which they work. Helping to design improved leasing systems and getting them in use could be a very important contribution in many parts of Pakistan.

4. Enough study of money and banking and fiscal policy in general to have a basic understanding of their connection of the public and co-operative credit system of central, provincial and local units, and of the role and functioning of private credit. A close case study of the operation of a few co-operative credit societies. Finally, developing financial
and credit programs for the farms replanned in the farm management course.

5. Enough study of the marketing of farm products to be able to discern what the cultivators in a local block themselves can do to facilitate the marketing of their products to better advantage, acting individually and co-operatively, and similarly for their buying. This means that they must climax their general study of the marketing process and marketing agencies and their operations by studying the actual marketing situation in a few local markets probably in the next market in the line towards the final consumer. They should also make careful case studies of the operations of a few co-operatives doing buying and/or selling.

6. Public Administration, with a foundation in the science of government that is needed for the study of public administration. This is a considerable foundation and the public administration part of it will call for a major effort. This course should represent perhaps a fourth of the two-year program. Case studies of village and block administration should climax this part of the program of study.

7. Agricultural extension-organization, methodology, problem, case study and practice. (More of it later in this chapter.)

8. Additional general economics with special emphasis on public finance, industry, labor, population, and economic development.
Extension, Short Courses, Etc.

There is a great need for an integrated extension program covering central, provincial Governments. A successful extension program will cover at least the following:

1. Expansion of irrigation.
2. Increased-use of manures.
3. Improved seed.
4. Improved agricultural technique.
5. Agricultural implementation.
6. Plant protection.
7. Fruits and vegetable cultivation.
8. Reclamation and land development.
10. Co-operative and model institutions.
11. Maintenance of livestock in good health.
12. Improved feeding, housing and care of livestock.

In the early years of any extension program the first thing to promote should be the ones that will have the most appeal and arouse the most interest, while at the same time promising very tangible results. These considerations should determine the choices largely if not altogether in the years that follow.

But a point is soon reached when other factors need to be weighed. Instead of emphasizing a few points or some particular practice, the extensioner should think of the farm as

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Ibid, pp. 106-121
a whole and arouse the interest of the cultivator to look into the possibilities based on economic principles, to determine where income from the farm as a whole could be maximized. The extension worker can help farmers prepare plans for his existing set-up, a revised plan or plans which could better utilize the farm resources. If similar plans are made available from other farms under similar soil, climate, capital and managerial conditions, it will also help to make a good comparison. The farmer, having in hand all this information would easily realize where he stands and where he could go. The extensioner then could guide him to reach his goal and fit better into national production programs.

Any extensioner who tries to put values on farm resources - bullock, labor, manual labor, land - and says to a cultivator that bullock labor is worth so much per day, and if it can't earn this on some crop, the crop is a losing one and should not be grown, is teaching that cultivator some very bad economics. The true answer is found in another way, namely, will the cultivator have larger income for the year if he grows the crop? These same principles apply to the valuation of hired labor and especially to family labor, to the use of equipment on different crops in a rotation, and above all to land used for different crops in a rotation. It is high time that the extensioner should think straight on economic questions that face the cultivators and villagers and he can do much to raise the level of their thinking.

Extensioner can also help in public agent policy making.
Public policy is done at all levels. Many of the most important policy decisions are made at the village level. Extensioners have an important role in such decision making. But no more important pronouncement can be made than that their role is not to make the decisions for the village people. It is instead to bring about as full as well-rounded discussion of it as they can. It may well be that some important factor in the discussion is being left out of the discussion, in which case it will not only be proper but necessary for the extensioners to bring it in or it may be that the discussion is confused on some points, in which case they need to help clear up the confusion. But they should make clear to the village group that it is the villager's decision and not the extensioners' and that they are not voting on the issue. The same principles apply even more strongly to discussion of policy issue at block and state levels and finally at central government levels. The research outlined earlier also fits into policy making. It fits into it in two ways primarily; first, to assemble the facts that are pertinent to the decision and to analyze them; second, to project on the basis of this analysis how different alternatives in policy will work out. Serving in this way, research can help executives and legislators to make their policy decisions and extensioners can use the result of it in their work at village and block levels.

None of the colleges, except one, is offering instructions in extension. More of them need to do this. Also there is
need for special training programs for extension workers, Village Aid workers and supervisors, co-operative managers, etc., who are not regularly registered college students working for a degree. The number of such training programs is growing rapidly in the United States. The reasons for this is that there may be an abundance of persons who already have enough background education and experience so that a few months of intensive instruction fitted to a particular type of job may qualify them for such a job and this will make possible the developing of the staff needed to get a program going. These may be followed up later with shorter in-service training courses. Another type of short course is designed as a refresher for those who have been on the job for several years. The summer schools for extension workers in the United States are of this description.

III. PUBLIC ADMINISTRATION

Research and teaching are after all only preparation and foundation for economic functioning. This economic functioning is basically private and co-operative. In the complex societies of today, however, there is strong need for supplementing private and co-operative by public economic functioning. A large part of this takes the form only of helping or inducing private and co-operative enterprise to make use of the results of research; another part of it consists of planning, co-ordinating and perhaps actual direction of private action in various types of situation. Another
part of it consists of actually performing certain part of like grading and inspection, that only a public agency is in a position to do. Another part consists of regulation and enforcing the rules of the game. 133

It is the government duty to perform the major role in tenure reform and some of land-use adjustments like consolidation. It will be their aggressiveness in promoting economic development that will largely determine how much headway is made in any division or province. They can also do much to improve credit and marketing facilities and promote co-operation.

The provincial government and colleges and universities are going to need a great deal of assistance from the central government - assistance in three forms: (a) leadership and guidance in choosing and laying out action program, (b) leadership and guidance in research basic to the planning and conduct of these programs and (c) financial assistance.

133Ibid, p. 122.
CHAPTER XI
CONCLUSIONS

Low yields of crops and animals, low farm incomes, chronic and increasing food shortages, dwindling foreign exchange earnings, high and mounting indebtedness, and exploited and discontented peasantry are symptoms of deep-rooted defects plaguing the bases on which Pakistan agriculture functions. These lamentable agriculture conditions have long been looked upon seriously by the government and the people interested in the welfare of agriculture and agriculturalists and the nation. But the measures advocated or adopted were never directed towards the causes but only to the effects. The measures, like scaling down or liquidating the debts, moratorium, debt cancellation, licensing the money-lenders, checking and auditing their accounts, fixing rates of interest, restricting the transference of land, cattle, tools and implements to the money-lender, famine aids, remission and rebates of taxes and land revenue, price control and rationing, fixing the market charges and deductions, putting ceilings on profits, consolidating the holdings, fixing the terms and rents of land leases, conferring the occupancy rights on the tenants and securing the tenure of the tenants-at-will are like ambulance services intended to patch up the cuts on the surface
and wipe off the blood oozing from the deep-seated wounds, without remedying the underlying causes of the disease.

In the foregoing study, an effort was made to correct the fundamentals of agriculture industry, thus aiming at the eradication of the disease itself. This study employed the farm management approach to build a framework essential for progressive Pakistan agriculture.

Farm Management is the science of judiciously and skillfully organizing and managing the farm business for the purpose of securing the greatest continuous profit. Skillful management of a farm is not a simple but a complex task involving a wide range of knowledge and skills in many fields of arts and sciences. Other sciences evolve new varieties of crops, new rations for animals, new fertilizers for soil, new techniques and methods of operation. But which of these discoveries, inventions, methods and materials is more profitable? Farm management answers such questions practically on the farm, considers all the prospects of farming, and weighs and compares one alternative with another, one set of practices with the other. This job of choosing, evaluating, selecting, organizing and executing falls within the field of farm management. Farm management takes into account the findings of each agricultural science in reaching its own conclusions. It takes the place of an individual farmer and considers the farm as a whole. The main object of farm management is to obtain the maximum net profit from the various enterprises of a farm by
balancing farm operations, by carefully planning and allocating the limited farm resources, while keeping in mind the need to keep the soil and other resources well maintained. It is not the return from any one enterprise that determines the financial success of a farm, but it is the total return from all enterprises that counts its success or future. Farm management as an integrating science of agriculture, enables us to make such judgment.

As a science, farm management builds foundations for profitable, agriculture on certain economic principles used in connection with those laws which govern the growth of plants and animals and the use of factors of production. These principles are used in making sound choices and decisions and apply to practically all phases of farming. The principle of diminishing returns helps locate the level of inputs which will yield the maximum profits. In simple words, it tells that profit is maximized where added returns are equal to added costs. There are many examples where the Pakistani farmers have labor and capital not employed according to this principle. Consequently, labor is being rewarded with negative returns while profits on capital are being foregone because they are employed far below the limit where marginal returns on them are equal to the marginal costs. A mere adherence to this law will remove a lot of imbalance agriculture is found in. The level of optimum inputs changes with each change in costs or prices. This necessitates that the farmer should keep abreast with the price levels and
movements and to make the desired changes in the level of inputs. But how many farmers do it? Certainly not many have, and hence, we find millions of poor farmers in Pakistan.

Considering the various costs such as fixed and variable costs of the farm business, the farmers could improve their decisions to a great extent. If returns are more than variable plus fixed costs, use more resources as long as the added returns are greater than the added costs. If returns are less than total costs, variable plus fixed costs, but are still greater than variable costs, use the same principle. In the first place, we shoot at the greatest profit, in the second, we aim at the smallest losses.

The use of the principle of substitution in choice of practices (e.g., bullock versus tractor power) will help achieve the low-cost combination of practices. Taking into account the rate of substitution of the resources and their prices, the least cost combination is attained by equating the substitution ratio to the inverse of price ratio. Here, too, changes in prices and costs may change the ideal practices, unless corresponding adjustments are made to match them.

Very few farmers, if ever, have unlimited resources to expand the possible enterprises to the point where added returns are equal to added costs. A great majority of the farmers have limited resources. If they expand one enterprise, they must contract the other one. Which combination will give them the greatest profit? The answer is given by
the principle of opportunity costs, also known as the equi-
marginal return principle. It states that profit will be
greatest in each unit of labor, capital, land, etc. if used
where it will add most to the returns. It does not say that
resources should always be used where they bring in the
greatest average return but where they bring in the greatest
marginal return.

Finally, the successful farming must follow the law of
comparative advantage. The soil, climate and markets of a
locality favor certain products over others by affecting
their costs and prices. Successful farmers grow those pro-
ducts which have greatest comparative advantage or the least
comparative disadvantage.

The more nearly a farmer succeeds in applying the prin-
ciples of farm management, the greater will be his financial
success. A possible explanation for the poverty of Pakistani
farmers is that they did not adhere to these principles.

The farm management employs the technique of "planning
and budgeting," utilizing the principle mentioned above, in
chalking out the farm plan for the maximization of the goal.
There is a logical sequence of decisions which facilitates
the formation of an efficient farm plan. First, you should
make an inventory of your resources. Evaluate your land
resources and their fertility. Determine which crops that
can be grown on them successfully, estimating their perfor-
mance and future potentialities. Set down the amount of cap-
ital you have and find out how much more you can borrow or
will wish to borrow if credit is available. Then find out
how much labor—of operators, his family and hired—is available in each month. How do you take stock of yourself as a manager? You assess your experience with the farm enterprises adaptable to your farm, your likes and dislikes, your attitude to mix and cooperate with other people, your ability to command and control them, your attitude to take risks, your ability to foresee the future rightly, evaluate market precisely and make good decisions quickly. Then, the farm plan is drawn consistent with the future expectations and promising the best use of the farm resources. A farm plan is a completely organized schedule of farm program providing for a system of operation and management. It is the process by which a farmer decides what resources to use and how to use them. It shows what to be done and how to do it. In the plan is set down the prospective acres of each crop and numbers of each livestock and farming practice to be followed. Finally, income and costs are computed and the most profitable or suitable plan is selected and followed. Farm management is concerned with the best program for the individual farm. It recognizes that no two units are exactly alike in respect to soil and other basic resources, the farmers' capital and debt position, his psychology, family ties and help, his age, education and managerial ability, his goals, tenure and sometimes weather and market conditions. Each farm has its own problems and organization. Farm management cannot be considered in terms of sweeping recommendations for all the farms. There is one best plan for each farm. Farm management principles are
universal, but when it comes to deciding just what crops and livestock will be produced, how they will be produced, and what practices will be followed, each farm must be considered on its own merits.

Do not assume that the farm plan selected should necessarily be followed unchanged through the years. From time to time as conditions change, try out additional alternatives by the substitution method covering either the whole farm business or certain crops and livestock enterprises by means of partial budgets. No one plan is likely to prove best over years without occasional adjustments as farm techniques, prices, family labor and other factors change.

Now some of the broader institutions affecting the farm management approach may be mentioned. The tenancy arrangements in Pakistan have also done a lot of harm to agriculture. They have been conducive for exploitation of tenants, depletion of soil resources, dampening the incentive for higher production, class friction and dissatisfaction of masses. A closer analysis will show that these defects originate from one feature of the leases, namely that the output was not shared according to the resources contributed by the landlord and the tenant. The landlord claimed proportionately more than he put in. This discourages the tenant to invest or affect any improvement and constrains him to mine the farm resources thus impairing their future productivity. An equitable share lease is the answer. Market values should be put on the various resources furnished by each party and
the outcome should be shared in the same proportion. Only this and nothing else will bring harmony on the farm, encourage investment both by the tenant and the landlord, and will bring about greater efficiency and progress in the farm production process. Compensation for unexhausted investments plus agreement upon some appropriate interest rates are also steps to this end.

The problems of marketing of agricultural products and rural credit are in many ways central to the economic progress. Without a proper solution of these problems, a beginning with economic rehabilitation of rural society could not be made. The state could perhaps begin formulation of a newly oriented economic policy best with organization of agricultural markets and rural credit.

In an exchange economy, as Pakistan claims to be, the market is the central institution to guide economic activities. Consumer expresses his demands for various products through putting prices on them, the producer gets the hints from prices and gears his production to the wishes of the consumer. There then occurs few wastages and rare shortages. When certain impediments block the information and do not let the prices convey the consumer's message to the producer, the market becomes imperfect and production gets distorted. Consumer may be suffering from chronic food shortages and paying high prices, desired production may not be coming forth, because the stimulation that springs from higher prices does not reach the producer. The grow-more-food campaigns do not activate his production process. Fertilizer applications look futile
to him. High level talks, conferences and policies fail to stimulate the low-lying farmer who has been deprived of his due share in the consumer rupee. There is a dire need for making the market perfect—the only means to a future healthy, strong, progressive and free Pakistan economy. Bringing into play relatively free competition, desirability regulating the markets and market functionaries, grading and standardization, storage and transport facilities, disseminating market information are some of the means to this end.

The other impediment to higher production has been the defective, expensive and unproductive credit system. It presents two-fold problems of inadequacy and unproductivity of credit. The credit cooperative societies never did arouse the interest of the farmer to join them, inculcate in him cooperative spirit and thrifty feelings, and never did come up to help him when he deserved it. The government, due to its rigidity, unflexibility, apathy and strictness, could never suit the farmers' needs and conditions. The commercial banks, on account of their need for liquid funds and the risks involved in financing agriculture, stayed away from loans to farmers. This lack of competition gave an ample opportunity to the money-lender to profit at the expense of the farmer. He never failed in his mission. Now as a result, the farmer stands buried deep in debts with his freedom and future income mortgaged to the lender. The unproductive credit has plagued his productivity and shackled his body and mind.
A special survey is needed to determine the extent of credit requirements of the peasantry for proper planning of rural credit. To overcome the shortage of funds, measures are needed such as educating the farmer to be thrifty, diversifying means to channelize the meagre savings of the rural and urban people and substantial governmental appropriations.

The credit agencies need a radical reorientation. They can be made effective and efficient by building up an integrated system of rural credit, government being at the apex, training, controlling, guiding, financing and if necessary eradicating, consolidating and competing with the various credit agencies to serve the farmer economically and sufficiently. Survey and case studies are in order to remove the impediments and facilitate the functional of the rural credit agencies.

In the past the credit agencies have played a waiting role and thus constrained the poor and illiterate farmer to borrow when his back was to the wall. This approach has proved beyond any doubt to be a negative one. The positive approach embodies a critical analysis of farm business to determine the avenues for profitable uses of credit. Credit agencies should come forward and cooperate with the farmer to develop farm plans specifying the need and resulting profitability of the credit, its amount, time, and type of credit, the means and schedule for its repayment and if necessary supervision to make the best use of credit. Working together positively, planning and budgeting logically, both the farmer
and the credit agency could make the credit more productive and self-liquidating.

Agricultural prosperity does not only depend on land and favorable climate, but also on education which help rural people apply science to the everyday routine of farming and home-making. Thus a well-planned and well-organized extension service is the most essential part of agricultural organization. It is essential for making available the results of research and help locate problems hindering the program on the farms. Illiteracy of farmers is a special challenge to the extension economists and add to their need and significance.

The poverty of agriculture is intimately linked with the larger question of economic development, low productivity of resources, high indebtedness, small and fragmented holdings, absence of industrialization, rapid population growth, a static social organization, deep-rooted religious traditions, imperfect markets, uncertain and insecurity of income resulting from fluctuation in yield and prices, defective land tenure system, ignorance and illiteracy are the elements giving rise to a vicious circle of poverty. No complete solution of any one of these problems is possible, apart from a many-sided and comprehensive reconstruction of the corporate life of the country which will include all these elements. To cope with these problems, the role of the government cannot be over emphasized because the individuals lack knowledge, finance and competence to deal with them. In this precarious atmosphere, the government should, through proper planning,
chalk out concerted programs to realize the balanced growth. It should provide the guidance and leadership which the country needs. It should conduct research in every phase of the economy, for planning at farm as well as at national level. It should educate the people and spread knowledge about the desperate urgency of conserving and maintaining resources and gearing them to the planned development and progress. This, by no means, suggests that Government should take over. It simply points out the need for supplementing private and cooperative effort by public economic and administrative function. A large part of it may take the form only of helping or inducing private and cooperative enterprise to make use of the results of research. Another part of it may consist of planning, coordinating and perhaps actual direction of private action in various fields. Another part of it may consist of competing or actually performing certain part, like grading, and inspecting that only a public agency is in a position to do. Another part consists of regulating and enforcing the rules of the game.

It will be the sincerity, guidance, and aggressiveness of the Government in promoting economic development that will largely determine how much head way is made towards progress at the farm as well as at the national level.
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AUTOBIOGRAPHY

I, Ali Mohammad Chaudhry, was born in Chak 63/ W.E., Tehsil Vehari district Multan, West Pakistan, May 17, 1933. I received my high school education in the N.A.C. High School, Vehari, Multan. I did the undergraduate and graduate work at the Punjab Agricultural College, Lyallpur and received my B.S. (Agriculture) and M.S. (Agricultural Economics) degrees from the Punjab University, Lahore, in 1953 and 1955, respectively. On May 1957, I took the job of teaching assistant in the Agriculture and Rural Economic Section of the Punjab Agricultural College, Lyallpur. In September 1958, I was selected to receive a two-year training in the field of agricultural economics in the United States on an I.C.A. Inter-College Exchange Program Scholarship. I spent these two years at the Ohio State University completing the requirements for the degree Doctor of Philosophy.