

**REPORT
OF
MASTER PLAN STUDY
ON
PADDY/RICE HANDLING AND PROCESSING
IMPROVEMENT PROJECT
IN
THE ISLAMIC REPUBLIC OF PAKISTAN**

MAIN REPORT

AUGUST 1986

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PREFACE

It is with great pleasure that I present this report entitled "Master Plan Study on the Paddy/Rice Handling and Processing Improvement Project" to the Government of the Islamic Republic of Pakistan.

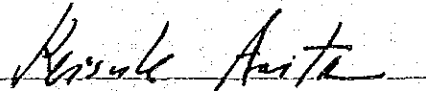
This report embodies the result of a Master Plan Study which was carried out mainly in the provinces of Punjab and Sind of Pakistan from July, 1985 to January, 1986 by a Japanese survey team commissioned by the Japan International Cooperation Agency following the request of the Government of Pakistan to the Government of Japan.

The survey team, headed by Mr. Hidekazu Komuro, had a series of close discussions on the Project with the officials concerned of the Government of Pakistan and conducted a wide-ranging field survey. After the survey team returned to Japan, further studies were conducted and the present report has been prepared.

I hope that this report will be useful as a basic reference for development of the project.

I wish to express my deep appreciation to the officials concerned of the Government of the Islamic Republic of Pakistan for their close cooperation extended to the Japanese team.

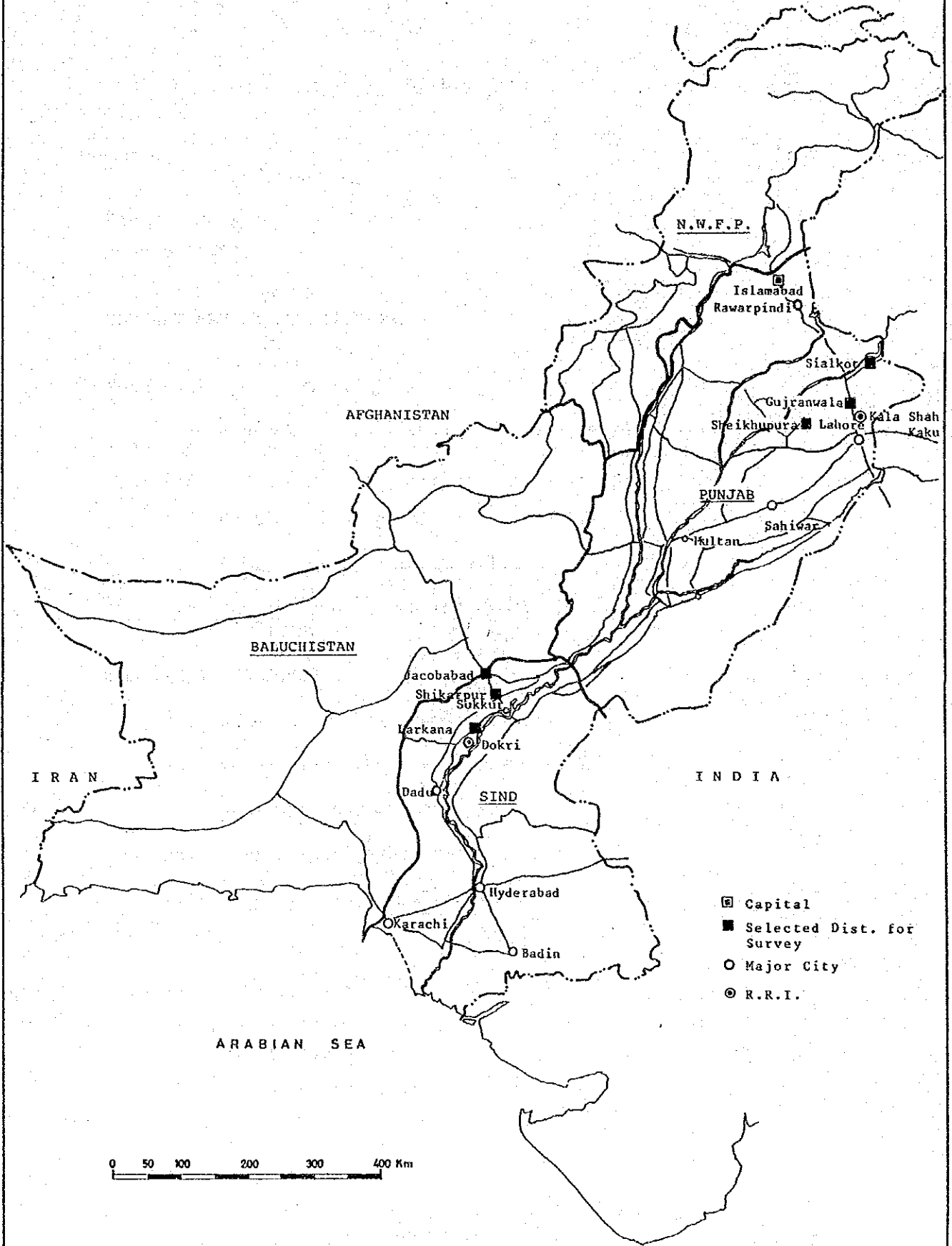
August, 1986



Keisuke Arita
President

Japan International Cooperation Agency

MAP OF PAKISTAN



MASTER PLAN STUDY
FOR
PADDY/RICE HANDLING AND PROCESSING IMPROVEMENT PROJECT
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

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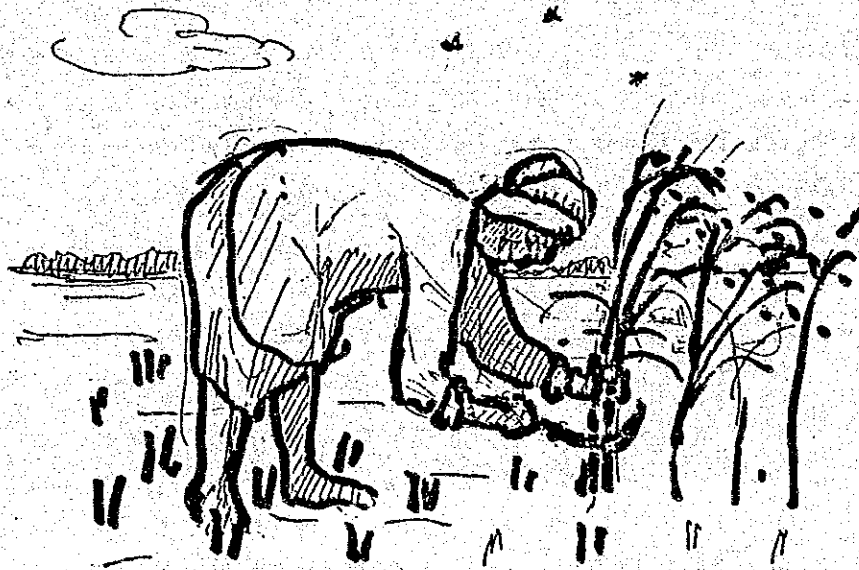
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ABBREVIATION

ADBP	Agricultural Development Bank of Pakistan
ADP	Annual Development Program
APCOM	Agricultural Prices Commission
FAO	Food and Agriculture Organization
F.A.Q.	Fair Average Quality
FMI	Farm Machinery Institute
GDP	Gross Domestic Product
JICA	Japan International Cooperation Agency
NLC	National Logistic Cell
PAD & SC	Punjab Agricultural Development and Supplies Corporation
PARC	Pakistan Agricultural Research Council
PASSCO	Pakistan Agricultural Storage & Service Corporation
P.C.S.I.R.	Pakistan Council for Scientific and Industries Research
PNP	Pakistan National Produce
PR	Pakistan Railways
PSC	Punjab Seed Corporation
P.T.	Private Truck
RECP	Rice Export Corporation of Pakistan
R.R.I.	Rice Research Institute
SASO	Sind Agricultural Supplies Organization Corporation
SSC	Sind Seed Corporation
UNDP	United Nations Development Programme

SUMMARY AND RECOMMENDATIONS



MASTER PLAN STUDY FOR
PADDY/RICE HANDLING AND PROCESSING IMPROVEMENT PROJECT
IN THE ISLAMIC REPUBLIC OF PAKISTAN

SUMMARY AND RECOMMENDATIONS

I. SUMMARY

1. Background

Rice is one of Pakistan's major agricultural products together with cotton and wheat. 3,320,000 tons of milled rice was produced in 1984/85 from nearly 10% of the total cultivated area. The crop is also an important source of food for domestic consumption and foreign currency revenue by export. The country currently holds third position in the international market after Thailand and the U.S.A., with over one million tons of rice exportation.

The Sixth Five-Year Plan (1983/84-1987/88) envisages an annual growth rate of 4.9% with an increase in production of 890,000 tons at the end of the Plan, and also envisages 3% annual growth in quantity and 9% in value for rice exports by intensifying production facilities, reinforcing production materials and improving farming practices.

To achieve these goals in the country proper measures need to be put into action for minimizing quantity loss and quality deterioration in prevailing postharvest practices. This would effectively improve farmers' postharvest practices and income, as well as secure rice exports, which have been under severe price and quality competition in the international markets. In this context, it is urgently required to improve conventional ways of harvesting, rice milling and marketing practices such as storage, transportation and grading.

Against this background, the Government of Pakistan requested the Government of Japan to extend assistance in the improvement of the existing postharvest practices. The Government of Japan entrusted the Japan International Cooperation Agency (JICA), an official body for providing technical cooperation, to undertake the study.

The objectives of the study were to ascertain the actual conditions of prevailing postharvest practices for rice; to assess the extent of quantitative and qualitative losses; to analyze the causes of these losses; to clarify the current status of marketing arrangements such as storage, transportation and grading systems; and to identify the status of the socio-economy, the roles and activities of the relevant organizations, and policy measures of the Government of Pakistan. The objectives also included the formulation of a comprehensive plan to improve postharvest practices for rice based on the above findings.

This report details the findings of the study and also presents ideas, possible measures and implementation plans for improvement, together with a comparative study from practical viewpoints of technology, economy and implementation.

2. Actual Conditions of Postharvest Operations

(1) Harvesting practice

1) Reaping

Reaping is usually done by manual labor with sickles. The labor shortage during the paddy harvesting season is a major concern of harvesting, as it means that reaping is done regardless of the crop's maturity, and may be carried out either too early or too late. In Sind, some of the crop is reaped before maturity due to a shortage of green animal fodder, and in Punjab a large part of Basmati rice is reaped under lodged conditions and this means more shattered grains in the paddy fields.

2) Threshing

Threshing is done by primitive methods, either by laborers or with bullocks. In Punjab, threshing is done manually by beating small bundles of stalk paddy against a raised mud-mound, steel drum or log. In Sind, stalk paddy after reaping is stacked and left for 4 to 6 weeks while the field is being prepared for the next rabi crops. Threshing is then done mostly by bullock trampling.

3) Cleaning and drying

Paddy is usually cleaned using simple implements, and is dried under the sun. Farmers usually clean and dry paddy for home consumption and not for sale.

(2) Rice milling

There are three types of rice mills: Hullers, village millers for home consumption by farmers; Shellers, mostly commercial mills for marketing rice for domestic use and export; Modern mills, related to the Rice Export Corporation of Pakistan (RECP), equipped with rubber-roll huskers and other modern machinery. There are 20,000, 1,000 and 9 of these types of mills respectively. The ratios for quantity of rice processed is about 25%, 65% and 10%. Most hullers and shellers are quite outmoded and inefficient in terms of milling recovery.

(3) Marketing

The majority of farmers sell their surplus paddy to markets or directly to rice mills immediately after harvesting, without cleaning and drying. The average annual production volume of paddy during the past 5 years was 5,169,000 tons. The volume of paddy marketed by farmers is estimated at about 4,000,000 tons and the volume of milled rice at about 2,600,000 tons. The government procures 1,150,000 tons of milled rice for export. The remaining 1,450,000 tons is directed to domestic markets.

Paddy quality is actually determined by buyers who are generally rice dealers and rice millers licensed to deal in markets. The grading of milled rice is conducted by official inspectors who are authorized by the provincial government and belong to the RECP. However, the accuracy of these inspections is not very high because proper inspection equipment is not presently available.

(4) Utilization of by-products

By-products derived from the various postharvest operations are not effectively utilized. The volume of straw is estimated to

be as high as 10,000,000 tons, and most of it is used for animal feed, with the exception of small quantities used as pulping material. The remainder is not used effectively. About 800,000 tons of paddy husks remain after rice milling in modern and sheller type mills, but they are merely used as fuel for the production of bricks. About 240,000 tons of rice bran are derived from rice milling in modern and sheller type rice mills. Although rice bran is a useful raw materials in the production of edible oil, there is no production technology available in Pakistan at the moment, and rice bran is merely used as animal feed and as raw materials for industrial processes including the manufacture of soap and detergent. Broken rice estimated to be available in markets is about 400,000 tons. Most of this is directed for food and animal feed, but not in highly processed forms.

(5) Organization and system

The policy of agricultural development in Pakistan comprises (1) assistance in procurement of input materials such as fertilizer and seed, (2) setting support prices for major agricultural products and (3) providing loans to farmers. Support prices are set for paddy and milled rice. Regarding administration of rice marketing, the federal government generally undertakes policy-making and its adjustment, and the provincial government undertakes daily activities.

The Ministry of Foods, Agricultural and Cooperatives is in charge of this study. The Pakistan Agricultural Storage Service Corporation (PASSCO), affiliated to the Ministry, has a number of branches and representative offices throughout the nation, and is one of the counterparts of this study. This corporation procures wheat, paddy and other agricultural products at supporting prices, and leases agricultural machines directly to farmers.

The Provincial Agricultural Department in Punjab and Sind consists of directorates for research, engineering, extension and individual project implementation units. The Rice Research Institutes of both governments of Punjab and Sind are counterparts of the study team. The Foods Department of the

provincial government purchases paddy and milled rice in its capacity as a procurement agency of the RECP. Strict regulations are imposed on the transactions of paddy and milled rice in Punjab, especially for Basmati rice. In both Punjab and Sind rice is dealt only by licensed millers and licensed dealers. A section of the Agricultural Dept. in Punjab and a section of the Directorate of Industry in Sind coordinate control of agricultural products.

The present role of farmers cooperatives is mainly as a loan transfer organization. The Rice Export Corporation affiliated to the Ministry of Commerce is assigned to export milled rice.

3. Loss Assessment

- (1) The study team assessed the extent of loss of rice occurring at each stage of postharvest operations. The assessment for paddy harvesting and for rice milling was made through surveys conducted by expert members of the study team, and the losses at the storage and transportation stages were obtained from existing data since the study team did not have sufficient time to conduct their own survey.

Assessed losses are shown in the following table:

Assessed Losses at Each Stage of
Postharvest Operations

1) Ratio of arithmetic loss (%)

Stage	Province	
	Sind	Punjab
Harvesting	7.1	5.4
Rice milling	3.3	3.3
Storage	1.6	3.1
Transportation	1.6	0.9
Total	15.1	12.7

2) Ratio of cumulative loss

$$\text{Sind} \quad 0.929 \times 0.967 \times 0.967 \times 0.984 = 0.857$$

$$(1 - 0.857) \times 100 = 14.3\%$$

$$\text{Punjab} \quad 0.946 \times 0.967 \times 0.967 \times 0.991 = 0.878$$

$$(1 - 0.878) \times 100 = 12.2\%$$

Note 1:

The above-mentioned ratios of arithmetic loss indicate the total loss of paddy/rice occurring at each stage of postharvest operations. However, the ratio of cumulative loss is calculated from the original quantity of reaped paddy.

Note 2:

Qualitative loss occurring at the milling stage is not included in the above losses. Refer to 4.1.3.

(2) Major causes of loss at each stage are described below;

1) Harvesting

Losses of rice in Sind, where stalk paddy is kept in the paddy field for 7 - 10 days after reaping, are caused mainly by environmental elements, for example, paddy grain becomes cracked and checked due to the temperature and humidity difference between day and night, and also by the primitive methods of threshing used.

Losses in Punjab, where the Basmati variety is dominant, are caused mainly by shattering of paddy grain during harvesting, and losses are higher when paddy is reaped under lodged conditions.

It was also observed that losses are highest at the stage of threshing in both Sind and Punjab.

2) Rice milling

The recovery rate of milled rice is low, and more broken kernels are likely to be found in huller and sheller type mills in comparison with modern rice mills.

3) Storage and transportation

A large proportion of paddy purchased by rice mills is heaped in the open yards of rice mills and is exposed to high temperature, humidity and strong sunshine in the outdoor environment. There might arise a substantial quantitative and qualitative losses due to excessive drying, damage from insects, birds, and rodents.

Losses during transportation are attributed mostly to rough handling and failure to arrange transportation in a timely manner.

4. Problems and Necessity of Improvement

(1) Harvesting

A major problem concerning harvesting is a shortage of seasonal workers causing delays in harvesting. Timely harvesting ensures good rice quality and proper quantity, and ultimately a high market value for paddy. The existing labor intensive practice of harvesting should be improved.

(2) Rice milling

As outmoded husking machines and many other old-fashioned milling facilities are the primary cause of loss, they should be modernized.

(3) Storage and transportation

A large amount of paddy is stored in the open yards of rice mills, and large losses of paddy occur due to exposure to severe sunshine, temperature, birds, rodents, and sometimes untimely rains. Such conditions should be improved.

Losses of rice during transportation are chiefly attributed to the careless handling of rice bags and failure to secure transportation in a timely manner. It is necessary to strengthen transportation services.

(4) Utilization of by-products

Utilization of by-products such as straw, husk, rice bran and broken rice is effective for increasing farmers' revenue as well as for promoting rural industries. Since Pakistan currently imports about 700,000 tons of edible oil per year, the establishment of oil extraction from rice brans should contribute to conserving foreign currency reserves.

5. Formulation of Implementation Plan

The formulation of a plan for improving postharvest operations was based on the following concepts:

- 1) Minimizing qualitative and quantitative losses of rice which occurred at each stage of the postharvest operation,
- 2) Supplying higher quality rice at low cost to both domestic and foreign markets, and
- 3) Increasing the income of farmers by rationalizing their farming practice

The formation of implementation plans are based on the four stages of postharvesting operations giving due consideration to each function:

- 1) Harvesting,
- 2) Rice milling,
- 3) Marketing, and
- 4) Utilization of by-products

As a result of extensive studies on harvesting, rice milling, storage, transportation, grading system and utilization of products, etc., the study team identified 34 items requiring improvement. These were evaluated by the yardsticks of direct effects on reduction of loss, magnitude of synergistic effects, and technological, socio-economic and institutional restrictions which have hindered improvement. Nine items were then selected.

The nine items selected were classified to be covered by four plans which must be implemented to achieve an immediate improvement as outlined in the following chapter.

6. Implementation Plans

Implementation plans for improving postharvest practices are described below:

(1) Rental operation of harvesting machines

Government organization undertakes the leasing of harvesting machines to farmers in order to minimize the loss of paddy occurring during routine operations.

The plan is considered to be a promotional activity by the government organization which undertakes demonstrations and provides machines directly to farmers and other interested parties for the purpose of overcoming restrictive factors existing in the initial stage of mechanization.

(2) Rental operation of rubber-roll huskers

The government organization undertakes to replace existing paddy huskers for the purpose of effectively minimizing quantitative and qualitative losses.

Sheller type husking machines are dominantly used in the country. Despite the significant loss occurring at the husking process, most owners of rice mills are reluctant to make improvements. Leasing rubber roll type husking machines is intended to advance the facilities of existing rice mills so that higher quality rice can be supplied to the markets at home and abroad.

(3) Production of edible oil from rice bran

Rice bran should be more effectively utilized by the introduction of technology and facilities to produce edible oil. The facilities can also be used for extracting oil from other oil seed such as cotton, mustard, rapeseed, groundnuts, and sunflower seeds in out of season of rice milling. New facilities would be more efficient than traditional equipment in terms of oil extraction. This would greatly help conserve foreign currency reserves being currently used for importing edible oil.

The government organization would play a pioneering role for the private sector by equipping oil extracting facilities at rice mills in rice producing areas and refineries at port areas.

(4) Establishment of facilities for improving and developing postharvest technology

The facilities for improving and developing technology for postharvest operations would be established for remodelling and increasing the number of postharvest machines so that they can meet specific local conditions in Pakistan, to promote utilization of by-products, and to train farmers and other related personnel in operation, repair and maintenance.

The facilities would play a central role in implementing various improvements. They would be affiliated to the Rice Research Institutes in Punjab and Sind and closely cooperate with related government agencies, research institutes, academic institutions and the private sector.

7. Conclusion

The government of Pakistan has put into action a number of measures for increasing rice production. A major thrust of current and possible measures is to minimize the losses, to improve the quality of rice and to achieve increased revenue in foreign currencies, and to increase farmers' incomes.

The study team conducted a technical survey and analysis in order to comply with the request from the government of Pakistan, and formulated the following four implementation plans to achieve improvements:

- (1) Rental Operation of Harvesting Machines
- (2) Rental Operation of Rubber-roll Huskers
- (3) Operation of Producing Edible Oil from Rice Bran
- (4) Establishment of Facilities for Improving and Developing Postharvest Technology

It is vital that these plans be implemented as soon as possible.

II. RECOMMENDATIONS

The following is recommended for promoting smooth and effective improvements in postharvest operations of rice.

- (1) Subjective conditions required to improve the situation have been set for the development of the four proposed implementation plans. Thus, the plans could be put into operation by conducting supplemental studies in limited fields. There are also a number of other areas requiring improvement, and these would have to be realized by second-phase or third-phase plans.
- (2) Three plans out of the four are designed to play an initiating role in the achievement of improvements in postharvest operations for rice. Direct participation of government organizations is indispensable for their implementation, but consideration should also be given to the willing participation of the private sector.
- (3) Lack of awareness of the necessity for improvements on the part of farmers and others involved with rice processing and marketing is a factor which hampers improvement, as well as causing an imbalance between quality grade and rice prices. Such negative factors should be gradually removed by activating training facilities for related technology on postharvest operations and integrating business conditions in the market.
- (4) For the smooth and effective implementation of the proposed plans, the executing agency should take necessary measures to carry out the plans with close coordination and cooperation from other relevant authorities in both federal and provincial governments, as well as to obtain support from the private sector.
- (5) Postharvest operations form only a part of rice production. Therefore, efforts to improve only postharvest practices would not have sufficient impact. Broad-ranging and effective

results would be accomplished by efforts to increase utilization of superior seeds, improve soil and water conditions, improve planting operations and control of pests. It is advisable that a Master Plan for improving practices in preharvest stage should be formulated as soon as possible.

CHAPTER 1 INTRODUCTION



CHAPTER I - INTRODUCTION

1.1 General

Herein presented is a Final Report on the Master Plan Study for the Paddy/Rice Handling and Processing Improvement Project prepared in accordance with the Scope of Work which was agreed between the Government of the Islamic Republic of Pakistan (hereinafter referred to as the Government of Pakistan) and the Japan International Cooperation Agency (hereinafter referred to as JICA) in March, 1985.

The Final Report presents results of field work and home office study. It contains present conditions and existing constraints of postharvest operations of paddy/rice in Pakistan, basic concepts and approaches in formulating definitive plans effective for improving the above constraints, framework of a comprehensive plan for the improvement, selection of priority projects, and appraisal of selected projects from technical, economic, institutional and implementing viewpoints.

1.2 Project History

Considerable efforts have been exerted to develop agriculture in Pakistan primarily by increasing crop production through such measures as improvement and extension of irrigation system as well as introduction and spread of high quality seed. With the progress of urbanization in the country, improvement and strengthening agricultural marketing channels linking producing and consuming centers have recently become pressing needs. The Government of Pakistan carried out the planning work in respect to development of an agricultural marketing system with the assistance of UNDP/FAO in 1976/77, but its implementation has not yet been realized due to unsettled conditions.

With such a background, the Government of Pakistan requested the Government of Japan to extend assistance in the development of the agricultural marketing system on the occasion of the annual consultation between Japan and Pakistan held in February, 1984. In response to the request, the Government of Japan, through JICA as the official agency responsible for execution of technical cooperation, sent a contact survey team to Pakistan in November, 1984 for making a series of discussions and to exchange views on the subject with the authorities concerned,

referring to the possibility of technical cooperation. As a result, the Government of Japan committed to conduct THE MASTER PLAN STUDY FOR PADDY/RICE HANDLING AND PROCESSING IMPROVEMENT PROJECT (hereinafter referred to as the Study).

A preliminary survey team dispatched by JICA to Pakistan in March, 1985 for the purpose of site investigation and discussion on the details of the Scope of Work for the Study. After careful discussion, the Scope of Work for the Study was agreed to by both sides, the officials of the Ministry of Finance and Economic Affairs and the JICA Preliminary Survey Team.

In accordance with the Scope of Work, JICA organized a Study Team comprising 10 experts and commenced a preparatory work as a part of home office study from July 14, 1985. The field work was carried out for five months from July 21, 1985 to January 17, 1986. The Study Team submitted a Field Report to the Ministry of Food, Agriculture and Cooperatives (hereinafter referred to as the Ministry) as a counterpart agency of the Government of Pakistan when the field work was completed. After submitting the Field Report, discussion was made with the authorities concerned of the Government of Pakistan to confirm the Study Team's concepts and approaches in formulating a comprehensive improvement plan and selecting priority projects. In line with the discussion results, the home office study was conducted from January to March 1986 to select and appraise priority projects and to prepare the Draft Final Report.

The Draft Final Report was submitted to JICA on March 31, 1986 and distributed to the authorities concerned of the Government of Pakistan in April, 1986. The Study Team was dispatched to Pakistan from May 17 to 24, 1986 for briefing on the conclusions and recommendations presented in the Draft Final Report to the Ministry. In due consideration of comments given through discussions, the Final Report was prepared and submitted to JICA in August, 1986.

1.3 Outline of Scope of Work

The Study is composed of the field work in Pakistan and the home office study in Japan. The field work comprises data collection and field survey on the following items:

- Farm-to market flow and system

- harvesting, threshing, drying, milling, storage and transportation techniques
- Facilities and equipment for harvesting, threshing, drying, milling, storage and transportation
- Quantitative losses and qualitative losses of each stage
- Cause of losses
- Activities of relevant organization excluding RECP (including farmers organizations)
- Preparation of inception and Field Reports

Based on the results of the field work mentioned above, the home office study is conducted on the following items:

- Data analysis and assessment
- Formulation of a general and comprehensive plan for improvement
- Recommendation for improvement
- Preparation of the Final Report

1.4 Activities of the Study Team

The Study Team formed a Plan of Operation for undertaking the Study and prepared an Inception Report in Japan before starting the field work. The Study Team submitted the Inception Report to the Government of Pakistan when the field work was commenced. Then, the Study Team discussed the Plan of Operation with the officials of the Ministry. With the following modifications in regard to selection of study areas, the Plan of Operation was principally agreed upon by both parties.

<u>Province</u>	<u>Original Plan</u>	<u>Revised Plan</u>
Punjab	Sialkot	Sialkot
	Gujranwala	Gujranwara
	Sahival	Sheikhupura
Sind	Larkana	Larkana
	Dadu	Jacobabad
	Badin	Shikarpur

To finalize the detailed schedule of the field work based on the Plan of Operation, the Study Team made a reconnaissance survey to confirm actual growing conditions of paddy in the selected study areas of the Punjab and Sind Provinces. Furthermore, the Study Team discussed technical matters in detail with counterparts from the Rice Research Institutes of both the Provinces appointed by the Ministry. As a result of the technical discussion, it was confirmed that nationwide delay of the paddy growing condition in 1985 was about one month on average due to the late supply of irrigation water from the Indus at the transplanting time and water shortage after transplanting.

Taking into account this situation, the Study Team estimated that the peak time of harvesting would be also delayed for one month and reported its finding to the Ministry. To complete the field work mentioned in the Plan of Operation, the Study Team and the Ministry recognized the necessity for a minimum one-month extension of work period in the field. Based on this recognition, JICA extended the period of field work up to January 16, 1986.

The Study Team started the field survey from September 24, 1985 after a reconnaissance survey and technical discussion with counterparts. The items studied during the field work period are as below;

- Actual conditions and mechanisms of rice marketing
- Socio-economic and agro-economic circumstances of rice cultivation and relevant agricultural policies
- Assessment of losses occurring in each postharvest operation stage and analysis of the causes
- Prevailing practices of postharvest operations
- Present system of transportation and storage of rice
- Institutional and organizational aspects relevant to postharvest operation of rice
- Present grading system and inspection standards

Throughout the field work period, the Study Team made efforts to grasp the prevailing practices and existing constraints of postharvest operations in the study area. Based on the results of the field work, the Study Team prepared the Field Report presenting the basic concepts and strategies for improving the constraints with an approach to formulation of a comprehensive improvement plan and selection of priority projects. To discuss the Study Team's findings, a joint meeting between the Ministry and the Study Team was held on January 13, 1986.

The Study Team selected the priority projects through home office study and made assessment on these selected projects from technical, economic and implementing viewpoints. The results of the home office study were compiled in Draft Final Report. The Ministry's comments on the Draft Final Report were incorporated in preparing the Final Report.

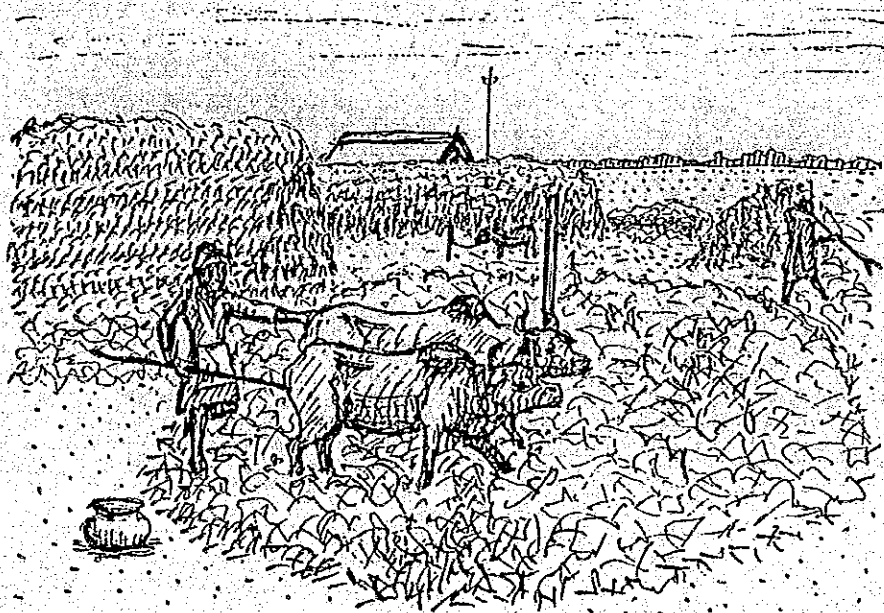
1.5 Advisory Committee and Counterparts

An Advisory Committee was formed by JICA for giving assistance to the Study Team's activities both in Pakistan and Japan. The Advisory Committee was dispatched to Pakistan from July 22 to 27, 1985, from January 11 to 16, 1986 and from May 17 to 24, 1986 in order to hold discussion in joint meetings on the Inception, Field and Draft Final Reports. In addition, the Advisory Committee gave advice on technical matters to the Study Team when necessary.

The Government of Pakistan organized a Counterpart Team and appointed Dr. M.A.H. Qureshi, Sugarcane/Rice Commissioner of the Ministry, as a chief counterpart. The Counterpart Team cooperated with the Study Team for smooth execution of the field work and had discussions for mutual understanding of the work progress based on the Inception Report, Monthly Progress Reports and the Field Report submitted by the Study Team.

The officials concerned, including the counterpart personnel of the Government of Pakistan and members of the Advisory Committee and Study Team, are listed in Appendix 1.

CHAPTER 2 BACKGROUND



CHAPTER 2 BACKGROUND

2.1 Natural Circumstances

Pakistan extends from 23° to 37° north latitude and from 61° to 76° east latitude. The total land area of the Country is 796,000 km² comprising 452,000 km² for areas not for cultivated and not reported, 31,000 km² for forest area and 313,000 km² for cultivable area. Among the cultivable area corresponding to about 40% of the country, a land of 203,000 km² is cultivated and the rest are cultivable waste. Of the cultivated area, a land of about 140,000 km² is located in the Punjab plain which is a gift of the Indus river and its four left-bank tributaries as well as in the Sind plain stretching along the Indus between the Punjab plain and the Arabian Sea.

The both plains are almost a flat and featureless flood plain. These are covered with alluvial soils which are formed of materials transported by the Indus and its tributaries. The alluvial soils extending over recent flood plains along the river stretches are medium to coarse in texture and immature. The old flood plains adjacent to the recent ones are covered with a rather fine textured alluvial soils having poor permeability. Of these alluvial soil areas, a salinity problem of surface soils is acute in low-lying paddy fields due to waterlogging and saline groundwater intrusion.

Climate in the Punjab and Sind plains is generally characterized as a semi-arid to arid climate. The local climatic patterns in the both plains are as shown in Table 2.1. In June, the end of dry season, daily mean air temperature rises as high as 35°C, while it goes down to 10 to 15°C during the winter season.

Table 2.1 Local Climatic Patterns in the Punjab and Sind Plains

<u>Area</u>	<u>Climatic Pattern</u>	<u>Rainfall Season</u>	<u>Annual Rainfall (mm)</u>
Punjab Plain			
Northern most	Cool, Sub-humid	Summer & Winter	500 to 1,000
Northern	Warm, Semi-arid	Winter	250 to 500
Central	Very hot, Arid	-	less than 125
Southern	Hot, Arid	-	125 to 250
Sind Plain			
Northern	Hot, Arid	-	125 to 250
Southern	Very hot, Arid	-	less than 125

Source: Atlas of Pakistan

2.2 Social and Economic Conditions

According to the 1981 Population Census, the total population of Pakistan was 84.25 million. It is estimated to be around 93.3 million in the middle of 1984. The population growth rate between 1976 and 1979 was as high as 3.1% per annum. In the Sixth Five Year Plan, it is estimated to be 2.6% in 1987/88 and the projected population in the middle of 1987/88 would be over 100 million. As of 1981, 23.84 million people or 28% of the total population lived in urban areas, while the remainder or 72% were in rural areas. Compared with the 1972 Population Census, the share of urban population increased by 1.5%.

In Pakistan, population 10 years old and above is defined as a productive-aged population. Activities of such population by sex and by age group are as shown in Table 2.2. Throughout the country as of 1981, 11.96 million or 89% of male population from 25 to 59 years old were working people and 185,000 or 1.4% were people looking for work. Of the young age group of male, 67.23 million or 59.5% were working people, while 30.48 million or 22.3% attended schools and 4.12 million or 1.4% were people looking for work. As a whole, 21.15 million or 70.3% of the productive-aged population were working, while 639,000 or 2.1% were looking for work. Through the social custom, working female people form a small minority in the productive-aged population. The rate of male looking for work among the productive-aged population was 3.2% in urban areas and 1.6% in rural areas and that among the age group from 25 to 59

years old increased to 5.2% in urban areas and 2.3% in rural areas. Male employed in agricultural occupations shared 52.7% of the total working population in the country and 67.8% of that in rural areas. The agricultural sector provides with the largest job opportunities in Pakistan.

Table 2.2 Population by Activity, Sex and Age Group

Unit: 1,000 persons

<u>Age Group and Sex</u>	<u>Working</u>	<u>Unemploy- ment</u>	<u>House- Work</u>	<u>Students</u>	<u>Others</u>	<u>Total</u>
Male						
10 to 24 years	6,723	412	-	3,048	3,137	13,320
25 to 59 years	11,963	185	-	101	1,195	13,444
60 years & above	2,466	42	-	-	806	3,314
Sub-total	21,152	639	-	3,149	5,138	30,078
Female						
10 to 24 years	352	36	9,761	1,324	1	11,474
25 to 59 years	373	17	11,940	33	2	12,365
60 years & above	48	9	2,363	-	2	2,422
Sub-total	773	62	24,064	1,357	5	26,261
Both Sexes	21,925	701	24,064	4,506	5,143	56,339

Source: Pakistan Statistic Yearbook 1985

Economic Development in Pakistan has been implemented, founded on agriculture. Presently, such concept as the well-balanced growth in the both sectors of agriculture and related industries is still followed. In particular, cultivation and processing of commercial crops characterized by cotton and rice are playing an important role in the national economy. According to the Annual Report 1984-85 published by the State Bank of Pakistan, the Gross Domestic Production (GDP) in 1984/85 at constant price of 1959/60 amounted to 69.1 billion Rupees among which the agricultural sector shared 26.3%. The annual growth rate of GDP increased sharply from 3.5% in 1983/84 to 8.4% in 1984/85 owing to recovery of cotton and wheat production in the agricultural sector and favorable growth of natural gas and crude oil in the mining sector. In Table 2.3, GDP during the past five years is as shown. The per capita gross national expenditures at current prices in 1984/85 were 4,914 Rupees, being equivalent to US\$307.

Table 2.3 Gross Domestic Product at Constant Factor Cost of 1959/60

<u>Item</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>
Amount (Million Rupees)					
Agriculture	16,422	17,010	17,609	16,527	18,158
Manufacturing	9,212	10,476	11,445	12,365	13,426
Other commodity producing sectors	4,736	4,925	5,098	5,672	6,031
Service sectors	24,026	25,602	27,448	29,158	31,483
GDP Total	54,396	58,013	61,600	63,723	69,098
Sectoral Share in GDP (%)					
Agriculture	30.2	29.3	28.6	26.3	25.9
Manufacturing	16.9	18.1	18.6	19.4	19.4
Other commodity producing sectors	8.7	8.5	8.2	8.7	8.9
Service sectors	44.2	44.1	44.6	45.6	45.8
Sectoral Growth Rates (%)					
Agriculture	3.7	3.6	3.5	6.1	9.9
Manufacturing	10.6	13.7	9.3	8.1	8.6
Other commodity producing sectors	7.0	4.0	3.5	11.3	6.3
Service sectors	7.0	6.6	7.2	6.2	8.0
GDP Total	6.6	6.7	6.2	3.5	8.4

Source: State Bank of Pakistan Annual Report 1984-85.

The current account balance in 1984/85 recorded a deficit of US\$1,609 million and increased by US\$612 million as compared to a deficit in 1983/84. As shown in Table 2.4, such deficit was usually met to a large extent by net receipts under the private unrequited transfers from abroad up to 1983/84. Due to a sharp decline in the private unrequited transfers from oil producing countries in Arab, however, the balance of payments has become worse drastically after 1983/84.

Table 2.4 Balance of Payment

Unit: Million US\$

Item	1980/81	1981/82	1982/83	1983/84	1984/85
Trade Balance	-2,264	-3,450	-2,989	-3,234	-3,462
(Export f.o.b.)	(2,799)	(2,319)	(2,627)	(2,669)	(2,475)
(Import f.o.b.)	(-5,563)	(-5,769)	(-5,616)	(-5,993)	(-5,937)
Services (Net)	- 515	- 496	- 609	- 717	- 816
Private Unrequited Transfer (Net)	2,242	2,412	3,081	3,044	2,669
Current Account Balance	-1,037	-1,534	- 517	- 997	-1,609

Source: State Bank of Pakistan Annual Report 1984-85

The agricultural sector mostly contributed to the aggregate value of exports with a share of 72.3% in 1984/85, although its share has declined year by year. Next to raw cotton and cotton fabrics, rice is one of main contributors to the export earning of the country. However, the value of exports of rice fell from 5,840 million Rupees in 1983/84 to 3,450 million Rupees in 1984/85 and marked the lowest value during the last five years. The value of exports by major agricultural commodity and processed product for the period from 1980/81 to 1984/85 is as shown in Table 2.5. From this, it can be seen that Pakistan has intended to change its export policy comprising shift of export items from raw materials to processed products with high value added.

Table 2.5 Export Receipts by Commodity in Agricultural Sector

Item	Unit: Current Price, Million Rupees				
	1980/81	1981/82	1982/83	1983/84	1984/85
Rice	5,273.4	3,898.2	3,602.7	4,841.2	3,436.2
Raw Cotton	5,414.3	2,849.9	3,925.2	2,421.9	4,054.9
Textile Yarn	2,072.3	1,866.0	3,224.3	3,447.5	3,616.8
Cotton Fabrics	2,651.9	2,718.6	3,560.7	3,723.6	4,182.6
Fish & Fish Preparation	555.7	664.5	791.8	796.5	1,036.1
Feeding Stuff for Animals	110.2	104.3	118.7	160.6	27.9
Tabacco, Raw & Manufactures	62.1	120.0	117.4	146.8	160.5
Sugar	336.9	225.2	280.7	490.5	441.9
Leather	914.5	1,048.0	1,324.7	1,741.4	2,178.9
Others	5,721.1	5,662.0	10,000.7	9,074.1	7,328.1
Sub-total	23,112.4	19,156.0	26,946.9	27,844.1	26,463.9
Total Receipts	28,290.3	25,275.4	34,220.5	36,882.0	36,587.0
Share (%)	81.7	75.8	78.7	75.5	72.3

Source: State Bank of Pakistan Annual Report 1984-85

The share of agricultural commodities in the value of merchandise imports increased from 14% to 19% during the recent two years as shown in Table 2.6. The main reasons are to rise the values of imports of edible oils and tea because of sharp increase in domestic consumption by improving the standard of living and to import wheat for meeting urgent requirements in domestic markets caused by reduction of domestic wheat production. The value of imports of edible oil has shared about 40% of that of imports of agricultural commodities. Thus, it is a pressing need to produce substitutes of imported edible oils by developing and utilizing domestic oil seed crops.

Table 2.6 Imports by Commodity in Agricultural Sector

Item	Unit: Current Price, Million Rupees				
	1980/81	1981/82	1982/83	1983/84	1984/85
Wheat	632.7	800.3	872.8	858.5	2,750.4
Milk and Cream	332.3	346.1	573.4	450.9	461.4
Vegetables and Fruits	596.1	1,272.5	917.9	707.4	570.9
Tea and Mate	1,183.7	1,090.6	1,675.7	2,566.8	3,506.7
Fixed Vegetable Oils and Fats	2,625.3	3,450.0	3,669.8	6,518.5	6,954.3
Animal Oils and Fats	447.0	494.5	429.4	635.9	850.4
Others	1,435.6	1,040.0	1,336.8	3,065.8	2,005.2
Sector Total	7,282.7	8,494.0	9,475.8	14,803.8	17,099.3
Total Import	53,543.7	59,481.5	68,150.8	76,706.7	89,788.2
Share (%)	13.6	14.3	13.9	19.3	19.0

Source: State Bank of Pakistan Annual Report 1984-85

Pakistan is administratively divided into four Provinces such as Punjab, Sind, North-west Frontier (N.W.F.P.) and Balchistan, and Federal Capital Territory of Islamabad and Federally Administered Tribal Areas. Among these, each Province is further divided into Division and District: seven Divisions with 28 Districts in the Punjab Province, three Divisions with 13 Districts in the Sind Province, five Divisions with 13 Districts in N.W.F.P., and four Divisions with 17 Districts in the Balchistan Province.

2.3 National Development Plan

The Government of Pakistan has promoted the economic development of the country through a series of five-year plans since 1955 when the First Five Year Plan was commenced. The investment for the agricultural sector has been made under the policy to increase agricultural production and to bring up agro-industries for processing agricultural surpluses. As the public sector outlays from the First to Sixth Five Year Plans are as shown in Table 2.7, the actual results of investment to the agricultural

sector shared 8.5 to 10.5% of the total outlays. During the Fifth Five Year Plan, the public sector outlays amounted to 153.2 billion Rupees of which 14.9 billion Rupees or 9.7% were invested to the agricultural sector including the fertilizer subsidy of 8.8 billion Rupees.

Table 2.7 Public Sector Outlays

Unit: Current Price, 100 Million Rupees

<u>Sector</u>	First Plan (<u>'55-60</u>)	Second Plan (<u>'60-65</u>)	Third Plan (<u>'65-70</u>)	Non-Plan Period (<u>'70-78</u>)	Fifth Plan (<u>'78-83</u>)	Sixth Plan (<u>'83-88</u>)
Agriculture	4.6	9.0	13.8	64.9	148.6	153.5
(Agriculture)	(4.6)	(6.9)	(8.2)	(41.4)	(60.6)	(123.5)
(Fertilizer subsidy)	(-)	(2.1)	(5.6)	(23.5)	(88.0)	(30.0)
Water	9.7	46.0	45.1	128.1	157.7	321.0
Energy	6.1	12.9	17.6	138.4	388.3	1,165.0
Industry	7.4	4.8	7.9	113.0	254.0	205.0
Minerals	1.2	0.9	2.7	4.9	4.0	57.5
Transport and Communication	10.8	16.0	25.2	156.5	352.1	575.2
Physical Planning and Housing	5.0	9.6	7.0	56.9	90.0	155.0
Education and Manpower	2.3	4.6	5.6	34.4	56.4	198.5
Health	0.8	1.7	2.8	23.8	45.8	130.0
Population Welfare Programme	-	0.1	1.4	8.2	6.0	23.0
Others/Micellaneous Programmes	0.7	0.5	2.9	26.3	23.2	66.3
Total	48.6	106.1	132.0	755.4	1,526.1	3,050.0
Plus: Special Development Programme	-	-	-	-	6.0	150.0
Less: Operational Shortfall	-	-	-	-	-	300.0
Total (Net)	48.6	106.1	132.0	755.4	1,532.1	2,900.0

Source: The Sixth Five Year Plan 1983-88

In the on-going Sixth Five Year Plan starting from 1983/84, the framework of decentralization of development activities which were firstly introduced into the Fifth Five Year Plan is stressed with the top priority to promote the establishment and growth of service industries in the agricultural sector based on elements of competition and market mechanism. The Government sector will play a promotional role by providing physical infrastructures rather than a regulatory one. And public corporations are also encouraged to expand their investment out of their own profits and efficiency by reducing their financial reliance upon the Government investment. During Fifth Five Year Plan period, the result of private sector investments amounted to 73 billion Rupees being equivalent to less than 50% of the public sector outlays of 153 billion Rupees, while in the Sixth Five Year Plan the private sector investment is expected to be 20 billion Rupees which is equivalent to about 70% of the public sector outlays of 29 billion Rupees. As shown in Tables 2.7 and 2.8, the share of public investment to the agricultural sector in the Sixth Five Year Plan reduces by 4.7% to 5.0%, while that of private sector investment is expected to increase by 3.5% to 22.8%.

Table 2.8 Sectorial Distribution of Public and Private Sector
Development Programme 1983-88

Unit: Current Price, 100 Million Rupees

Sector	Pure Public Sector		Public Corporation		Private Investment	
	Amount	%	Amount	%	Amount	%
Agriculture	151.0	6.3	2.5	0.3	455.0	22.8
Water	321.0	13.4	-	-	-	-
Energy	865.0	36.1	300.0	46.2	-	-
Industry	85.0	3.5	120.0	18.5	619.0	30.9
Minerals	25.0	1.0	32.5	5.0	11.0	0.6
Transport and Communication	401.0	16.7	174.2	26.8	260.0	13.0
Physical Planning and Housing	145.0	6.0	10.0	1.5	436.0	21.8
Education and Manpower	198.5	8.3	-	-	-	-
Health	130.0	5.4	-	-	-	-
Population Welfare Programme	23.0	1.0	-	-	-	-
Others/Miscellaneous Programmes	55.5	2.3	10.8	1.7	219.0	10.9
Total	2,400.0		650.0		2,000.0	
Plus: Special Development Programme	150.0		-		-	
Less: Operational Shortfall	-300.0		-		-	
Total (Net)	2,250.0		650.0		2,000.0	

Source: The Sixth Five Year Plan

As the concrete strategies of economic development in the Sixth Five Year Plan, it is necessary to expand agricultural production, particularly to secure rice and wheat export surpluses as well as to increase in the self-sufficiency rate of edible oil. It is also necessary to increase the production of vegetables, fruits, and dairy products for exporting to the Near and Middle Eastern countries for such products are in strong demand in these countries. In parallel with the development of industry for processing these agricultural products, various industries related to chemical fertilizers and agricultural

mechanization must be fostered and the textile industry must be modernized, too.

In allocating financial budget to the agricultural sector for the Sixth Five Year Plan, the Government accomplished momentous changes in line with the above-mentioned policy. Fertilizer subsidy was reduced to large extent, while priority allocation was made to enlarge supporting facilities for production, particularly strengthening of stock and market facilities of wheat. The financial allocations in the agricultural sector is as shown in Table 2.9.

Table 2.9 Financial Allocations in Agricultural Sector 1983-88

Unit: Million Rupees

<u>Sub-sector</u>	<u>Federal</u>	<u>Punjab</u>	<u>Sind</u>	<u>NWFP</u>	<u>Balu-chistan</u>	<u>Total</u>
Institutional Arrangements and Infrastructure						
Government storages	2,800	400	150	200	100	3,650
Agri. education	227	91	1	6	5	330
Agri. extension	477	320	120	39	63	1,019
Agri. research	1,369	141	20	20	10	1,560
Agri. marketing cooperatives	-	20	10	13	7	50
Agri. credit	-	14	-	-	-	14
Agri. economics and statistics	20	7	8	6	10	51
Crop Production						
Improved seeds	72	200	25	100	100	497
Soils and fertilizer	64	80	11	14	3	172
Plant protection	68	15	14	15	14	126
Mechanization	36	300	145	39	61	581
Soil conservation and land development	10	332	5	8	50	405
Fisheries, Livestock, Forestry and Others						
	1,026	977	586	380	632	3,601
Total	6,187	2,900	1,100	850	1,063	12,350
Subsidy on Fertilizer	3,000	-	-	-	-	3,000

Source: The Sixth Five Year Plan

2.4 Agricultural Production

The cultivable land in the Punjab and Sind Plains has been provided with infrastructures for agricultural production to a good extent. Presently, 14.8 million ha are provided with irrigation facilities, covering 73% of the total cultivable land. Irrigation water resources depend on the Indus and its tributaries, commanding 10.8 million ha, and ground water, benefitting 3.1 million ha. During 1984/85, a total irrigation water of around 132 billion tons was supplied with an increase by 3.1% compared with that in 1983/84. Of these, 77 billion tons were consumed during the summer season (Kharif), while 55 billion tons were supplied in the winter season (Rabi). Under the on-going Sixth Five Year Plan, the principal objectives to improve agricultural infrastructures are (1) to protect fertile lands and infrastructure from waterlogging, salinity and floods and to reduce damages by these, (2) to improve existing irrigation and drainage system with low efficiency, and (3) to extend irrigation and drainage system for increasing cropped area.

The overall quantum index of agricultural production on the production basis in 1975/76 increased by 16.9 in comparison with the preceding year to 138 in 1984/85. This increase is due to the fact that the output of raw cotton at 5.93 million bales or one million tons was the highest achieved so far. As to other major crops, the outputs were 11.7 million tons for wheat and 3.32 million tons for rice both with a slight increase, and 32.14 million tons for sugarcane reducing to a little extent. In Table 2.10, area and production by crop are as shown.

Table 2.10 Area and Production by Crop

<u>Item</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>
Area (10,000 ha)					
Wheat	698	722	740	734	730
Rice	193	198	198	200	200
Bajra	41	56	44	55	61
Jowar	39	39	39	39	39
Maize	77	74	79	80	81
Barley	26	22	26	20	23
Gram	84	90	89	92	100
Sugarcane	83	95	91	90	90
Rapeseed & Mustard	42	39	39	31	35
Cotton	211	221	226	222	224
Production (10,000 ton)					
Wheat	1,148	1,130	1,241	1,088	1,170
Rice	312	343	344	334	332
Bajra	21	27	22	26	28
Jowar	23	23	22	22	23
Maize	97	93	101	101	103
Barley	18	16	19	14	16
Gram	34	29	49	52	57
Sugarcane	3,236	3,658	3,258	3,429	3,214
Rapeseed & Mustard	25	24	25	22	24
Cotton	71	75	82	49	101

Source: Pakistan Economic Survey 1984-85

In 1984/85, the actual consumption of farm inputs was 1.25 million nutrient tons for fertilizer and 10,800 tons for improved seeds increasing by 4.2% and 15.6%, respectively, compared with the results of 1983/84. The plant protection coverage both operations by aerial and by ground for 1984/85 were estimated to be 320,000 spray ha and 3.95 million spray ha, respectively. The total coverage increased by 830,000 spray ha to 4.27 million spray ha in comparison with the results of 1983/84. The application of fertilizer per cropped ha has increased year by year. In 1984/85, it reached to 62.5 kg on an average in the country with an increase by 2.5 kg from the preceding year through the promotion of fertilizer subsidy. The distribution of improved seeds in 1984/85 mainly comprised 56,600 tons for wheat and 46,900 tons for cotton, while paddy seed distributed was only 2,100 tons. The extent of plant protection was cotton, rice and sugarcane, while its highest coverage against the total cropped area was tobacco and vegetables.

Recently tractors have been broadly utilized throughout the country. Not only for land preparatory works but also for riding and transportation of goods, the active demand for large-size tractor with 50 to 60 horse power has continued. During the last 10 years, 15,000 to 25,000 tractors were imported every year. The cumulative number up to 1983/84 was reported to be 204,846. By the effect of such rapid introduction of tractor, farmers have relied their farm operations on animal power to a little extent. In the 1975 agro-machinery census, this tendency was also clarified by the fact that number of work animals reduced by 56% in farms which newly bought a tractor. Among a total of around 29 million cows and buffaloes as of 1983/84, only 6.6 million or 23% were fed as draft animals, while the rest were used for the milking purpose.

2.5 Food Situation

The overall situation of staple food, wheat and rice, for the last three years is as described hereunder. In 1983, the actual procurement for the wheat crop stood at 3.82 million tons. In 1984, the procurement target for the wheat crop was fixed to be 3.50 million tons. As against this, the actual procurement was 2.27 million tons. For the wheat crop harvested in 1985, a procurement target of 3.00 million tons was fixed against which 2.53 million tons of wheat were procured till the first half of procurement period. During the period from July 1984 to June 1985, 3.45 million tons of wheat were released by the Provincial Governments increasing by 570,000 tons against the preceding year. The Federal Government imported 980,000 tons of wheat in 1984/85 and exported a smaller quantity of 48,000 tons of wheat during the same time. In 1983/85, 220,000 tons of wheat were exported.

The actual procurement of rice for 1983/84 was 1.13 million tons exceeding the target of 1.00 million tons. The rice procurement target for 1984/85 was fixed to be 1.25 million tons. The actual procurement till the end of June 1985 was of the order of 1.20 million tons.

2.6 Land Tenure

According to the 1980 Agricultural Census, owner farms shared 26% of 4.07 million private farms in total, while the share of owner-tenants and tenant farms were 19% and 55%, respectively. As compared with the 1960 Agricultural Census, the share of owner farms and owner-tenants

increased by 14% and 2%, respectively. The average size of farm also expanded from 3.4 to 3.9 ha for tenant farms and from 2.5 to 4.5 ha for owner-farms during the same period.

As shown in Table 2.11, however, the number of farms with a farm size of more than 10 ha shared only 9% of the total private farms but these farms occupied 41% of the total farms area. On the other hand, farms having a farm size less than 3.0 ha shared 51% of the total private farms but only 15% of the total farms area. The small-size farms utilized their farms area as cultivated area as high as 91%, while the big-size farms cultivated 57% of their own farms area.

Table 2.11 Number, Area and Distribution of Farms by Size of Farm, 1980

<u>Size of Farm (ha)</u>	<u>Farms (No.)</u>	<u>Farms Area (ha)</u>	<u>Cultivated Area (ha)</u>
Private Farms Total	4,058, 189	18,949,109	15,755,659
Under 0.5	8% (8%)	*% (*%)	*% (*%)
0.5 to 1.0	9 (17)	1 (1)	2 (2)
1.0 to 2.0	17 (34)	5 (6)	5 (7)
2.0 to 3.0	17 (51)	9 (15)	10 (17)
3.0 to 5.0	23 (74)	19 (34)	21 (38)
5.0 to 10.0	27 (91)	25 (59)	26 (64)
10.0 to 20.0	6 (97)	18 (77)	17 (81)
20.0 to 60.0	2 (99)	15 (92)	13 (94)
60.0 and above	1 (100)	8 (100)	6 (100)

Remarks: Figures in parentheses indicate cumulative percentage.

* indicates less than 0.5%

Sources: Pakistan Agricultural Census 1980

2.7 General Situation of Rice Cultivation

2.7.1 Rice Growing Area

During the last five years, rice growing area in the whole country increased by 92,000 ha as shown in Table 2.12.

Table 2.12 Provincial-wise Area under Rice

Province	Unit: 1,000 ha				
	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>
Punjab	1,062	1,089	1,073	1,096	1,121
Sind	764	728	719	722	690
N.W.F.P.	66	69	70	73	76
Baluchistan	41	90	116	108	138
Total	1,933	1,976	1,978	1,999	2,025

Source: Provincial Offices Concerned

Rice cultivation in Pakistan is carried out under such favorable conditions as fertile alluvial soils with thick solum developed in flood plains of the Indus, high air temperature in the vegetative stage of rice plant and rather cool air temperature in the maturing stage, average humidity throughout the growing period ranging from 40% to 60%, and perfection of irrigation facilities with enough capacity to supply water. As illustrated in Fig. 2.1, however, distribution of such favorable area is limited to only a part of the Punjab and Sind Provinces. In these major rice growing areas, the share of paddy field against the cultivated area was 31% in the Punjab Province and 34% in the Sind Province as of 1983/84 as shown in Table 2.13.

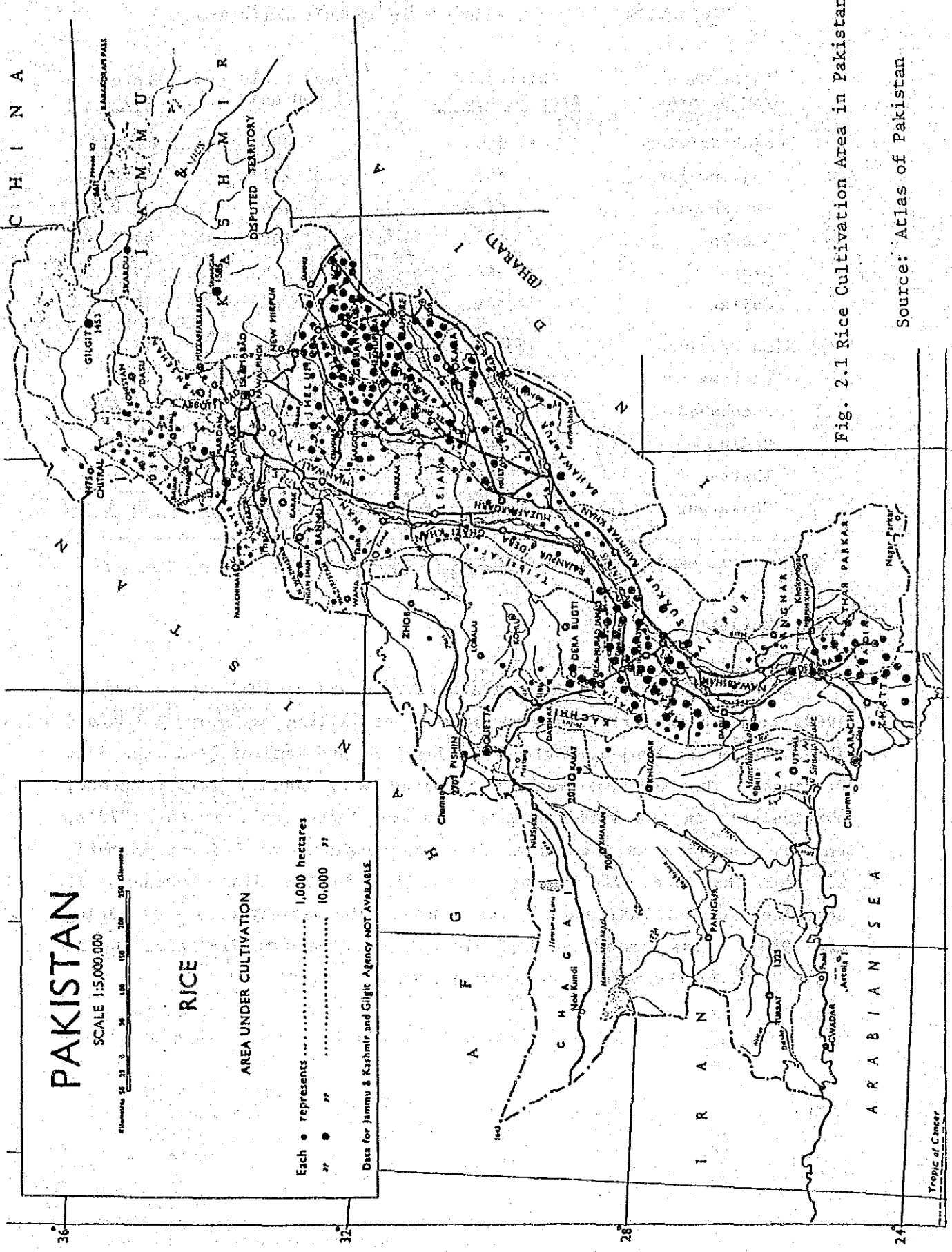


Fig. 2.1 Rice Cultivation Area in Pakistan

Source: Atlas of Pakistan

Table 2.13 Share of Paddy Field in Cultivated Area

<u>Major Rice Growing Area</u>	<u>Cultivated Area (1,000 ha)</u>	<u>Paddy Field (1,000 ha)</u>	<u>Share (%)</u>
Punjab Province	11,640	1,096	9.4
Gujranwala	491	231	47.0
Sheikhupura	472	184	39.0
Sialkot	442	140	31.7
Okara	348	68	19.5
Gujrat	449	64	14.3
Sind Province	5,450	722	13.2
Larkana	390	177	45.4
Jacobabad	359	165	50.0
Badin	500	94	18.8
Thatta	354	89	25.1
Shikarpur	177	80	45.2

Source: Agricultural Statistics of Pakistan 1984

2.7.2 Varieties

Before high-yielding varieties were released as IRRI-Pak variety in 1969, such local varieties were broadly prevailing as Basmati 370 and Jhona 349 in the Punjab Province and Jajai 77 and Kangani 27 in the Sind Province. The IRRI-Pak variety remained very popular for a decade, particularly in the Sind Province. In the latter half of the 1970's, variety-wise area in the Punjab Province consisted of 61% for Basmati, 22% for IRRI and 17% for others, while, in the Sind Province, it comprised 76% for IRRI and 24% for others. The variety-wise area during the 1980's is as summarized in Table 2.14 for the both Provinces and in Table 2.15 for the major rice growing areas.

Table 2.14 Variety-wise Area under Rice

Unit: 1,000 ha

Province & Variety	<u>1979/80</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>
<u>Punjab</u>					
Basmati	770	813	832	822	803
IRRI	316	199	179	202	229
Others	94	50	78	49	64
<u>Sind</u>					
Basmati					
IRRI	613	600	591	586	600
Others	133	164	137	133	122
<u>Pakistan</u>					
Basmati	779	824	844	836	825
IRRI	964	841	873	916	941
Others	292	268	259	226	232

Source: Agricultural Statistics of Pakistan 1984

Table 2.15 Variety-wise Area under Rice in Major Rice Growing Area

Unit: 1,000 ha

Variety & Major Rice Growing Area	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>
<u>IRRI & Others</u>					
<u>Punjab Province</u>					
Gujranwara	55	52	47	57	71
Sheikhupura	29	43	45	57	74
Sialkot	19	16	11	17	25
Okara	-	15	20	20	35
Gujrat	8	5	3	6	7
<u>Sind Province</u>					
Larkana	187	187	177	177	168
Jacobabad	167	172	174	166	122
Badin	118	106	94	94	106
Thatta	94	74	89	89	82
Shikarpur	94	81	84	80	83
<u>Basmati</u>					
<u>Punjab Province</u>					
Gujranwara	179	189	183	178	158
Sheikhupura	155	149	139	131	115
Sialkot	127	138	129	127	132
Okara	-	45	48	48	33
Gujrat	59	63	61	58	59

Source: Provincial Offices Concerned

In the Punjab Province, the area under Basmati with high market values has recently reduced because of low fertilizer responsibility, lodging-susceptible characteristics, low yield, all of which have been well known as the dominant features of Basmati. In order to overcome such weak points, efforts have been directed to select genetically resistant and early maturing varieties capable of escaping the pest in both the Provincial Rice Research Institutes in the Punjab and Sind. Up to date, locally bred varieties KS-282, Basmati 198 and Basmati 6129 were released in the Punjab and three varieties such as DR-82, DR-83 and latefy were released in the Sind.

2.7.3 Cropping Calendar and Pattern

Predominant rice cropping calendar in the major rice growing areas of the Punjab and Sind Provinces are as shown in Table 2.16.

Table 2.16 Rice Cropping Calendar

<u>Variety</u>	<u>Sawing Season</u>	<u>Maturity Period</u>	<u>Harvesting Season</u>
Basmati 198	June	135 days	Mid Oct. to Mid Nov.
Basmati 370	July	115 days	End Oct. to End Nov.
IR-6			
Punjab Province	Mid June to Mid July	110 days	Beginning Oct. to Beginning Nov.
Sind Province	June	125 days	Beginning Oct. to Mid Dec.

Source: Annual Report 1984/85 RRI Punjab
Annual Programme RRI Sind

Based on the 1980 Agricultural Census, cropped area by crop season on irrigated land in the major rice growing areas is summarized as shown in Table 2.17. In the Punjab Province, double cropping which is composed of rice-wheat and rice-gram or - fodder is broadly prevailing. A crop intensity in the major rice growing areas is estimated to be over 150%. On the contrary, single cropping of rice by using IRRI variety is common

in the Sind Province. Usually, paddy fields remain fallow during the Rabi season due to heavy labour force requirements for harvesting and threshing works of paddy as well as waterlogging condition during harvesting time. As a result, the crop intensity in the major rice growing area is about 125%.

Table 2.17 Cropped Area by Crop Season on Irrigated Land in Major Rice Growing Area

Unit: 1,000 ha

Major Rice Growing Area	Irrigated Land	Kharif Season		Rabi Season	
		Total	Rice	Total	Wheat
Punjab Province	8,069	4,764	1,230	4,801	4,342
Gujranwara	422	319	253	346	260
Sheikhupura	394	277	202	316	225
Sialkot	257	182	134	214	173
Okara	310	187	64	251	171
Gujrat	257	142	74	195	141
Sind Province	2,527	1,862	905	1,354	1,000
Larkana	200	180	178	78	41
Jacobabad	205	198	196	76	55
Badin	264	221	162	68	44
Thatta	153	139	127	57	11
Shikarpur	110	108	108	37	19

Source: Pakistan Agricultural Census 1980

2.7.4 Farming Practices

Land preparatory works depending on animal powers have recently been replaced by tractors throughout the major rice growing areas, while transplanting works are still carried out by manpower. Manual harvesting works also predominate. In the Punjab Province, a large size combine harvester originally used for harvesting wheat was tested by a private sector in harvesting paddy during the 1984/85 harvesting season. Trial operation of harvesting on a commercial base has been commenced in some parts of the major rice growing areas in the 1985/86 harvesting season.

As for fertilizer application, only basal dressing is popular with such average amount of fertilizer applied as one bag of urea and half bag of DAP for IRRI variety in the Punjab Province, 1.25 bag of urea and half bag of DAP for IRRI variety in the Sind Province, and half bag of compound fertilizer for Basmati variety in the Punjab Province. In comparison with the officially recommended standard of fertilizer application which consists of nitrogen of 100 kg/ha and phosphate of 50 kg/ha, the prevailing level of fertilizer application is below half. Intercultivation is usually made once throughout the growing season of rice, but no application of herbicide is common in the major rice growing area. A disease injury is not so serious because of the dry weather condition, while an insect injury occurs frequently during the ripening period of rice. Although the necessity of integrated insect control is recognized by rice growers to a large extent, they have a less desire to prevent insect injuries after financial support to the integrated insect control was dropped from the Government subsidy programme.

2.7.5 Rice production

In the official statistics of Pakistan, all the figures on yield and production is expressed on the basis of milled rice. The record of province-wise rice production for the last five years is as shown in Table 2.18. That of variety-wise rice production in the major rice growing areas is as summarized in Table 2.19.

Table 2.18 Province-wise Rice Production

Province	Unit: Milled rice 1,000 ton				
	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>
Punjab	1,362	1,451	1,407	1,410	1,535
Sind	1,550	1,584	1,560	1,479	1,345
N.W.F.P.	105	111	113	116	121
Baluchistan	106	284	365	335	314
Total	3,123	3,430	3,445	3,340	3,315

Source: Provincial Offices Concerned

Table 2.19 Variety-wise Rice Production in Major Rice Growing Area

Unit: Milled rice 1,000 ton

Variety & Major Rice Growing Area	1980/81	1981/82	1982/83	1983/84	1984/85
IRRI & Others					
<u>Punjab Province</u>	397	416	420	484	680
Gujaranwara	95	98	86	101	139
Sheikhupura	48	75	83	105	142
Sialkot	27	22	15	23	33
Okara	-	27	21	37	65
Gujrat	13	8	5	10	16
<u>Sind Province</u>	1,550	1,584	1,560	1,479	1,345
Larkana	464	489	447	484	444
Jacobabad	306	364	353	382	305
Badin	243	229	193	103	104
Thatta	142	131	162	104	85
Shikarpur	176	169	181	204	210
Basmati					
<u>Punjab Province</u>	965	1,035	987	926	855
Gujranwara	205	236	220	214	169
Sheikhupura	191	188	179	141	142
Sialkot	135	151	137	139	149
Okara	-	75	71	62	49
Gujrat	67	72	75	61	68

Source: Provincial Offices Concerned

The average yield of rice in 1984/85 was 1.2 ton/ha for Basmati variety and 1.8 ton/ha for IRRI variety in the Punjab Province, and 2.3 ton/ha for IRRI variety in the Sind Province. In this report, a weighted average of milling rate is estimated to be 63.6%. According to the experimental results in the Punjab Rice research Institute, it is reported that paddy yield is 4.8 ton/ha for IR6, 5.0 ton/ha for KS-282 and 3.0 to 3.5 ton/ha for Basmati varieties. In high-yield culture test fields of the Sind Rice Research Institute, paddy yield attained to a level of 7.1 ton/ha for IR6 and 8.5 ton/ha for DR82.

2.7.6 Production cost

A crop-wise production cost survey was conducted by the Economic Studies Branch of Planning Unit of the Ministry. After completion of the 1983/84 cost survey, this was transferred to the Agricultural Prices Commission of the Ministry. The items surveyed under the former production cost survey consisted of 13 major items in respect to primary

production cost covering from preparatory tillage to threshing works and five major items regarding secondary production cost including taxes, rental charge, interest, etc.

As shown in Table 2.20, the summary of the paddy production cost survey in 1983/84 indicates the variety-wise average cost in the both Provinces of Punjab and Sind.

Table 2.20 Cost of Production of Paddy by Province and by Variety

Item	Unit: Rupee		
	Punjab Basmati	Province IRRI	Sind Province IRRI
Preparatory Tillage	247	148	254
Seed Bed Preparation	568	667	-
Seed	31	15	93
Raising or Nursery	37	35	242
Sowing	247	247	494
Manuring	86	-	-
Fertilizer	449	513	503
Watering	148	148	108
Plant Protection	54	33	-
Water Charges	353	422	74
Interculture	198	148	-
Harvesting	272	247	309
Threshing	198	247	371
(Sub-total)	(2,888)	(2,870)	(2,448)
Taxes	82	47	17
Rent of Land	995	830	1,000
Interest on Investment	66	68	54
Management Charges	473	438	425
Total	4,504	4,253	3,944

Source: A study on Cost of Production of Crops, Paddy (1983-84)

Based on the above summary, a province-wise return of rice cultivation is estimated and its results are as shown in Table 2.21. In the major rice growing areas of the Punjab Province, manufacturing industries have recently advanced and caused conflict concerning labour force requirements between two parties. By this effect, hired labour cost has risen resulting in reduction of net return obtained by cultivating both Basmati and IRRI varieties in the Punjab Province. Although farming practices prevailing in the major rice growing areas of the Sind Province are rather extensive, arrangement of cropping calendar is indispensable taking into account irrigation water supply schedule and thus various farming practices are concentrated at a transplanting time. In consequence, increase in hired labour cost and decline in net return has also become remarkable.

Table 2.21 Province-wise Return of Paddy Per Hectare

<u>Item</u>	<u>Unit</u>	<u>Punjab Basimati</u>	<u>Province IRR</u>	<u>Sind Province IRRI</u>
Total Cost	Rupee	4,261	4,031	3,827
Value of By-product	Rupee	168	83	304
Net cost	Rupee	4,093	3,948	3,523
Yield	ton	2.0	3.5	2.9
Gross Return	Rupee	4,597	4,262	4,037
Net Return	Rupee	336	231	210
Net Cost per 40 kg				
At farmgate	Rupee	80.7	47.6	49.3
At nearby market	Rupee	83.4	49.7	50.7
Price per 40 kg	Rupee	84.0	49.0	50.0

Source: A Study on Cost of Production of Crops, Paddy (1983-84)

2.2.7 Rice consumption and export

The record of procurement of rice by the Government for the period from 1980/81 to 1983/84 is as shown in Table 2.22.

Table 2.22. Procurement of Rice

Unit: 1,000 tons

Province	Variety	1980/81	1981/82	1982/83	1983/84
Punjab	Basmati	320.1	388.2	337.5	264.6
	IRRI	65.1	111.7	145.5	154.3
	Total	385.2	499.9	483.0	418.9
Sind	IRRI	639.5	594.6	744.1	728.9
Pakistan	Basmati	320.1	388.2	337.5	264.6
	IRRI	704.6	706.3	889.6	883.2
	Total	1,024.7	1,094.5	1,227.1	1,147.8

Source: Agricultural Statistics of Pakistan 1984

The Government has procured about 30% of rice produced in the Punjab Province and nearly 50% in the Sind Province. As for Basmati variety, the Government procured 37.5% of production in 1981/82 when the crop was plentiful and 28.9% in 1983/84 when the crop turned out a failure. In addition to the above procurement by the Government, domestic consumption of rice includes private release to markets in rice consuming centers, home consumption and payment in kind by rice growers, and losses occurred during postharvest operations. As statistical data on each item are not available, however, analysis and projection under the Study will be made in the following Chapter. Rice export is an exclusive jurisdiction of the Rice Export Corporation of Pakistan. The quantity and value of rice export for the last five years are as shown in Table 2.23.

Table 2.23 Quantity and Value of Rice Export

Unit: Quantity 1,000 tons
Value Million Rupees

Variety	1980/81	1981/82	1982/83	1983/84	1984/85
Basmati					
Quantity	410	262	238		
Value	2,874	1,956	1,884		
Others					
Quantity	834	689	667		
Value	2,728	2,172	1,799		
Total					
Quantity	1,244	951	905	1,265	719
Value	5,602	4,128	3,683	5,688	3,436

Source: Agricultural Statistics of Pakistan 1984
State Bank of Pakistan Annual Report 1984/85

The exports of rice fell sharply by 43.2% in quantity and by 47.8% in value during 1984/85. The shortfall in rice exports was due mainly to lower stocks of rice at the beginning of the year because of exceptional sales last year and decline in the production of Basmati variety. Other contributory factors were reduction of 8.1% in the average export prices and decline in the market share from 12.5% to 8.8% by the strong export promotion by competitors of Pakistan in the international market.

Among major rice importing countries, Middle East countries are good customers purchasing Basmati variety at higher prices. The market for IRRI variety produced in Pakistan has been built up in Middle East and African countries. However, Pakistan is facing keen competition from Thailand and Burma in these markets. The record of country-wise rice export is as summarized in Table 2.24.

Table 2.24 Country-wise Rice Export

Unit: Quantity ton
Value Million Rupees

Country	1980/81		1981/82		1982/83	
	Q'ty	Value	Q'ty	Value	Q'ty	Value
Iraq	50,000	349.5	43,441	309.9	4,430	11.1
Saudi Arabia	102,926	721.2	107,960	808.5	90,258	748.6
Cameroon	260,326	873.9	209,335	617.3	288,481	730.9
Iran	100,989	711.3	45,104	142.6	93,692	459.7
Ivory, Coast	161,527	633.6	82,306	276.4	86,462	217.0
Dubai	53,984	345.6	33,357	249.5	29,379	184.7
Qatar	10,000	68.9	10,357	73.2	25,602	142.0
Malaysia	-	-	400	3.4	42,767	139.8
Bahrain	10,439	71.9	10,063	69.5	17,901	137.7
Kuwait	48,391	337.1	18,125	142.1	14,359	110.9
Abu Dhabi	24,500	169.2	83,220	20.1	11,500	98.9
Others	420,583	1,419.4	309,358	1,415.4	199,970	701.3
Total	1,243,665	5,601.6	951,028	41,427.9	9,904,801	3,682.6

Source: Foreign Trade

