People's Republic of Bangladesh
Ministry of Irrigation, Water Development
and Flood Control

Flood Plan Coordination Organisation

JAMALPUR PRIORITY PROJECT STUDY

Caisse Francaise de Developpement
and
Commission of the European Communities

FAP 3.1

FINAL FEASIBILITY REPORT

Annex 5 Agriculture

January 1993

Consortium

SOGREAH/ HALCROW/ LAHMEYER

in association with
Engineering & Planning Consultants Ltd.
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ANNEX 5

AGRICULTURE

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GLOSSARY

BADC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricltral Research Institute
BARC	Bangladesh Agricltural Research Council
BBS	Bangladesh Bureau of Statistics
BJRI	Bangladesh Jute Research Institute
BRDB	Bangladesh Rural Development Board
BRRI	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
CCCE	Caisse Centrale de Coopération Economique
DANIDA	Danish International Development Agency
DTW	Deep Tube Well
EC	European Community
EIP	Early Implementation Programme
EIRR	Economic Internal Rate of Return
FAO	food and Agriculture Organisation
FAP	Flood Action Plan
FCDI	Flood Control, Drainage and Irrigation
FEC	French Engineering Consortium
FFW	Food for Works
FPCO	Flood Plan Co-Ordination
GO	Government Order/Organization
GOB	Government of Bangladesh
HYV	High Yielding Variety
JPP	Jamalpur Priority Project
JPPS	Jamalpur Priority Project Study
LCS	Labour Contracting Societies
LGEB	Local Government Engineering Bureau
MCC	Mennonite Central Committee
MPO	Master Plan Organisation
N/A	Not applicable
NCA	Net Cultivable Area
NGO	Non Government Organisation
O&M	Operation and Maintenance
PWD	Public Works Datum
RARS	Regional Agricultral Research Station
RESP	Rural Employment Sector Programme
RHD	Roads and Highways Department
RDRS	Rangpur Dinajpur Rural Services
SCI	Service Civil International
SPT	Standard Penetration Test
SRDI	Soil Resources Development Institute
STW	Shallow Tube Well
TAO	Thana Agricultural Offices
UP	Union Parishad
USCS	United States Classification System

SUMMARY

S.1 Introduction

The objective of the agricultural studies was to determine the factors which govern the present and potential agricultural development of the area.

The present agricultural situation has been defined on the basis of information collected during the field surveys and taken from the most recent of the past study reports.

Cultivated land in the project area covers an area of 73,985 ha out of a gross area of 92,242 ha, i.e., 80% with, on average, nearly two crops being grown per year (Cropping intensity is about 191 on the whole Project area).

Rice is the principal crop and staple food and the production is enough for the present population.

A large proportion of the crops is dependent on rainfall but, at present, about 43% of the cultivated land has access to some form of irrigation in the dry season (November - April).

Cattle-rearing is of only limited importance in the study area in view of the lack of pasture land, but the majority of households have poultry.

The development possibilities within the context of proposed works, for which several alternatives were considered, have been analysed and the parameters necessary for the economic analysis of the project have been calculated.

S.2 The Agricultural Environment

S.2.1 Physiography

The project area lies within the Brahmaputra-Jamuna flood plain. There are three physiographic units, namely: active flood plain, young flood plain and old flood plain. They have been differentiated mainly on the basis of relative age, nature of deposits and characteristics of relief within the area. It is difficult to differentiate sharply each of these physiographic units and there are transitional areas, particularly between active and young flood plains. In a few areas the physiographic units are intermixed.

S.2.2 Climate

The Jamalpur area is located between latitude 24°40' and 25.15° north and between longitude 89°30' and 90° east. The area shows fairly homogeneous climatic features.

The climate is dominated by the monsoon. The northeast monsoon, coming from the Siberian anticyclones, blows during the winter months, giving weather that is generally dry and cool: typical temperatures range between 13°C to 28°C from December to February, rainfall in this period amounts to 2% of the 2240 mm mean annual depth, and average wind speed is also at its lowest value. The availability of soil moisture during this period falls short of crop requirements.

The critical aspects of climate in relation to crops are:

- the occurrence and reliability of the pre-monsoon rains and the onset of the monsoon,
- the occurrence of storms that damage standing crops (boro and HYV aus rice),
- the reliability of the monsoon rains, and the rise, duration and recession of floods associated with the monsoon rains; and,
- the reliability, amount and distribution of the end-of-monsoon rains.

S.2.3 Flooding and Drainage

The most striking feature of the hydrology in the project area is the seasonal flooding and drainage. Only about 20% of the area is above normal flood level, located mostly along the north-east border of the project area. About 35% is land subject to shallow flooding, intermixed with highland and medium lowland in the central part of the area; about 40% of the area is moderately to deeply flooded, made up almost entirely of the area located in the western part of the project area. There are small areas of deeply and very deeply flooded land. In general, about 80% of the project area is seasonally flooded.

Drainage in general is slow. Apart from the Brahmaputra and Jamuna at the eastern and western boundaries of the project area respectively, the Chatal and Jhenai and their branches drain most of the floodwater into the Jamuna. Drainage during the peak monsoon season and also towards the end of the monsoon season becomes impeded if there is high rainfall over the project area or in the upper catchment areas.

S.2.4 Land Types

By surveying and analysing soil association maps, topographic maps, flood depth maps and agronomic and climatic data, the soil scientists of SRDI have defined eleven land type classes. These are called SODAPS land types because they are part of the Soil Survey Data Processing System.

The land type classification followed in this report is updated from the SRDI documents and made compatible with the MPO (now WARPO) classification.
The distribution of the four land types, F0 to F3 (F4 group is insignificant) is shown in Table 5.1.4

S.3 Present Situation of Agricultural Development

S.3.1 Cropping Seasons

The tropical monsoon climate favours production of a wide range of crops in the Jamalpur area. There are three distinct climatic seasons which are interrelated with three more or less distinct cropping seasons as listed below:

- a cool, dry winter season (rabi) covers the period from November to February. However crops are restricted to areas with adequate soil moisture or to irrigated areas. Rabi crops are sown in the winter and harvested in the spring or early summer, the principal rabi crop is boro, which is grown in poorly drained soil or where irrigation can be provided and where no flooding will normally occur before its harvest in May-June,

- the pre-monsoon season, or hot spring (kharif-I) runs from end of March to mid June

- the monsoon season or wet season (kharif-II) extends from mid-June through September

The crop environment during the kharif season is less favourable for high yields because of the uneven distribution of rainfall, variable flooding depths, low solar radiation and high temperatures and humidity. Kharif crops are grown in the spring or summer season and harvested in late summer or early winter. Rice is the predominant crop during the kharif season.

The depth and nature of flooding determine the crops that can be grown in a given area during the Kharif-II season.

Figures 5.2.1, 5.2.2 and 5.2.3 show a generalized cropping calendar for the three cropping seasons in relation to floods and the irrigation season.

S.3.2 Crops

As for the rest of the country, agriculture of the Jamalpur area is dominated by the various rice crops. The varieties are generally classified as local, local improved and high yielding. Other relatively important crops are jute, wheat, sugar cane, potato. Minor crops include pulses, vegetables and spices.

i) Rice

Rice is the most important crop and is grown throughout the year. It can be grown on most soil types except on sandy soils. Special adapted varieties have been developed for each growing season under rainfed, irrigated or flooded conditions by the Bangladesh Rice Research Institute (BRRI) in close cooperation with the International Rice Research Institute (IRRI). The varieties are also adapted to the preference of the rice growers and the consumers.

A number of high yielding varieties (HYV) have been recommended by the National Seed Board for cultivation during different rice growing periods. Besides there have been a number of traditional rice varieties for cultivation during different seasonal growing conditions.

The main rice crops Aus, Aman and Boro are grown in early monsoon, late monsoon and dry season respectively. Their cultivation is largely determined by land levels in relation to flooding.

ii) Jute

The Jamalpur region is known for its production of high-quality jute but this production has been declining in recent years because of fibre marketing difficulties, with jute being replaced by synthetic products, not just on export markets but also on the home market.

iii) Wheat

The cultivation of wheat became extremely popular in the 70s with the introduction of HYV seeds, the expansion of irrigation facilities and the use of fertilisers. However, since the early 80s, areas given over to wheat decreased because the farmers preferred HYV boro because of the greater profits they could obtain (on the basis of 1991 prices, the net value of boro is 60% greater than that of wheat).

iv) Sugar Cane

Sugar cane is grown on permeable land, medium highland and highland (F1 and F0 land types). Canes are grown either for supplying Dewanganj sugar mill or for making gur (molasses) by bullock and power crushers.

v) Potatoes

Potatoes are an important vegetable crop in the project area, grown in the rabi season on medium lowland and medium highland. The cultivated areas vary from one year to the next between 1000 and 2000 ha. The average yields are low, around 8 t/ha, owing to the use of local varieties which are often preferred by consumers.

vi) Mustard

Mustard is extensively cltivated in the Project area (between 4,500 and 5,000 ha) as a major oil seed crop. Mustard is grown on low, medium low to high lands.

vii) Other Minor Crops

Pulses, vegetables and spices are also very common in the project area. There is a large demand for pulses in the country and a lot of vegetables and spices are cultivated in open fields and in vegetable gardens around dwellings.

S.3.3 Cropping Patterns

In view of the wide range of possible crops, and in view of the irrigation facilities available, farmers can make best use of the available land by growing two and occasionally three crops per year on the same field.

Since rice is the major crop, it tends to dominate the cropping pattern, especially since the rapid development of irrigation.

Depending on land type, soil permeability and irrigation possibilities, rice cropping may be single or double. Triple cropping which would be possible, only with short-term local varieties does not occur in the project area.

Non-rice crops are grown generally in rotation with rice, except for a few special crops adapted to the silty-sand, permeable soils of the medium lowlands (groundnut, millet, sweet potato, which cover about 5500 ha or 7% of the NCA).

Cropping patterns by land types, including the main crops are shown for the project area in Table 5.2.4 and illustrated by Figure 5.2.4.

S.3.4 Inputs Use

The rapid dissemination of HYVs and the possibilities of obtaining irrigation equipment have also promoted an increasing use of fertilisers and pesticides over the past 15 years.

However, these inputs are for the most part reserved for irrigated crops and, overall, the quantities used are small.

i) Fertilisers

The fertilisers used by the farmers are mainly urea, TSP and MP and some zinc and sulphur. Urea accounts for up to 70% of the total quantity of fertiliser, TSP 20/25% and MP 3/5%. The recent privatisation of fertiliser distribution (March 1989) has given new impetus to their distribution. However, their cost remains excessively high for small farms who not have any cash in hand. Small farmers have difficult access to the purchase of fertiilizers in due times and in the right quantity, which adversely affects productivity.

Most of the farms apply fertilisers to HYV boro. All other rice and jute crops are also fertilised, but minor crops (millet, sweet potatoes, groundnuts) are hardly fertilised. Sugar cane is heavily fertilised.

ii) Pesticides

Most of the farmers are familiar with pesticides. Their application are currently limited, however, to HYVs. The major difficulty encountered in using pesticides is their selection appropriate to the crops affected and the diseases. Farmers are ignorant of the proper doses to be applied, resulting in ineffective use of the pesticides

In the rural markets pesticides, are not generally available, and it is necessary to go to the larger towns to procure them. Major pesticides are Furadan, Dithane, Dimecron, Diaziinon and Malathion.

iii) Irrigation

In the project area modern irrigation with deep tube wells (DTWs) and shallow tube wells (STWs) covers more than 90% of the total irrigated area, leaving only 5 to 6% to low lift pumps (LLPs) and manual irrigation done by hand tube wells, swing baskets and

doons. Modern irrigation has been practised for only two decades.

Almost half (between 46% and 48%) of the cultivated areas in the thanas of Islampur, Madarganj, Melandaha and Jamalpur are irrigated. Irrigated agriculture account for 31000 ha (42%) of the total net cultivated area in the Project area (74,000 ha).

iv) Labour use

Agriculture in Bangladesh is still traditional where human labour and bullock power are widely used. Use of power tillers and tractors by common farmers is a rare phenomenon in the study area. Labour use is greater in the transplanting of aman and boro (HYV) and in weeding jute and boro (HYV). Besides family labour, manpower is hired whenever necessary. Hiring is done mainly in the transplanting and harvesting seasons.

v) Draught power

Animal power is the prevalent forms of draught power in agricultural operations.

S.3.5 Major Constraints for Agricultural Production

The most important factor limiting production in rainfed areas is the lack of control over water. Both moisture deficiency and excesses of rain contribute to instability in agricultural production. The main risks facing crops in the project area are:

- heavy pre-monsoon rains which affect aus/jute yields by damaging the young plants,
- early quick floods which damage not only aus, aman and jute but also the mature boro crop (May-June)
- total submersion of rice for more than 3 to 7 days (depending on the variety) which may occur in flood-prone areas, partially destroys the rice crop
- failure of early rains, delaying sowing of aus and jute, which in turn delays the transplanting of the aman crop
- failure of rain at the end of the monsoon period when aman is flowering affects it adversely.

Normal seasonal floods, which come in July and gradually recede in September, are regarded by the farmers as a blessing, depositing silt and recharging the water table. The depths of the floods vary from year

to year. Occasionally high early floods and late floods from the Jamuna and the old Brahmaputra are damaging to crops in the flood plain.

Uncertainty linked with the risks of flooding limits the intensification of irrigated agriculture, which is only possible in areas that are protected against floods. High cropping infensities with improved technologies are only possible under irrigated agriculture if the land is not constrained by flooding depths.

Drainage difficulties, which prevent the rapid retreat of floods, restrict the availability of land for growing transplanted aman, which could be an attractive replacement for broadcast aman and mixed aus/aman crops.

S.3.6 Crop Damage

Damage to crops, livestock and agriculture generally occur at the beginning of the monsoon season, mainly affecting the newly transplanted Aman fields. The extent of damage is proportional to the severity of floods. T. Aman, B. Aman and HYV Boro are more subject to damages in the Project area.

As a conservative approach for the study, it has been assumed that yield losses as well as affected areas are both in the range of 25%, representing about 6% of global losses.

S.3.7 Livestock

As in other parts of the country, livestock is an integral part of the farming system in the project area, in spite of the fact that land is not available for grazing and scarcity of animal feed. The animals live almost entirely on the by-products of crops grown for human consumption.

Livestock is kept as a supporting activity to crop production and as a secondary source of income.

The most important types of livestock in the area are cattle, goats, chickens and ducks. Buffaloes, horses and sheep are rare.

According to the Agriculture and Livestock census of 1983/84, about 65% of all total households had cattle.

S.4 Potential Agricultural Development

S.4.1 Foreword

Land in the project area is already used intensively, as the cropping intensity is more than 200% except in areas along the Jamuna (Char

lands), which are directly affected by the river's meandering and change of bed.

A large proportion of the land (F2 and F3 lands) is nevertheless subject to excessively deep submersion and risk of damage to be developed by using advanced technologies (irrigation, HYVs), which would require major capital investment, careful land preparation and a higher level of inputs.

Controlled flooding, with protection of agricultural lands from early floods and improved drainage, will provide opportunities for higher production levels per ha through controlled and shorter inundation periods faciliting better farming methods, higher resource investment in inputs, the use of HYVs and the extension of the growing period.

Newly improved varieties released by BARI, BRRI, BJRI have been introduced through the Agricultural Extension services. These varieties are adapted to the local growing conditions. Special emphasis has been laid on the improvement of crops such as rice, wheat, potatoes, oilseeds, sugar cane and vegetables.

S.4.2 Future Yields

Prediction of future yields is the most sensitive factor in the estimation of the agricultural benefits. Studying trends in crop yields is particularly complicated because it is necessary to assess the progress of new varieties, changes in input use, climate influence, and others factors such as pest attacks.

Moreover, yields obtained by research are potential one, which may not be achieved by all farmers owing to the particular conditions prevailing at present in the Project area (flooding, difficulties in drainage, inadequate supply of inputs).

For all these reasons, it has been considered here that the progress of productivity that could be ascribed to the Project implementation would exclusively proceed from the shifting from flood prone conditions to damage-free conditions and from the consequent changes in cropping patterns due to land type redistribution.

On the basis of assumptions made above on crop damages (para S.3.6), two sets of average yields have been estimated for crops subject to flood damages.

With respect to the other crops, it has been assumed that a single yield level, corresponding to a single inputs level, is applicable in both the with [W] and without [WO] Project conditions. These yield levels were finally adopted after consultation and analysis of existing information and after observation of the results of field surveys.

Crop yields in the present and future situation as shown in Table 5.3.1.

S.4.3 Description of Alternatives Situations Studied

i) Without project (WO) situation

The assumptions made with regard to the increase in agricultural development were the following:

- No modification in cropping intensity. It is already close to or above 200% in the main Thanas of the project area,
- No modification in cropping patterns, except for B. Aman which will progressively be replaced by HYV Boro (1,461 ha) during the whole period of the Project,
- No modification in the stock-breeding situation, which is of relatively little importance in the region's agricultural development (the value added of stock-breeding is only about 5% of the value added of agriculture as a whole).

The increase in areas of B. Aman, will enable HYV boro to be extended to about 27,300 ha (about 37% of the NCA).

Irrigated areas, which currently amount to 31200 ha will increase to 32,600 ha.

The change from B. Aman to HYV Boro will result in an increase in rice production of about 4,100 tonnes.

Table 5.3.4 shows the area and production of the main crop in the reference situations [WO], present and future situation.

ii) Option A

In this option, the planned works programme does not provide for any heavy control structures. Only drainage improvement measures will enable a reduction in the period of submersion, which affects mainly type F2 land.

Most of the major and minor natural depressions are located in MELANDAHA and ISLAMPUR Thana (32 000 ha) other minor water-bodies related to a deficient cross drainage along man-made obstacles can be considered as spread over all project's Thana (73,985 ha).

In quantitative terms, the following has been established:

- Grouped beels identified on the 4" to a mile map: 13 (total number of beels 47) with catchments in excess of 100 ha, say 200 ha.

- Individual small beels identified on the 4" to a mile map: 42, with catchments of about 20 ha each.

- Minor water bodies: 300, with a tentatively concerned catchment area of about 2 ha each.

Therefore, the total area concerned by the drainage improvements would be as follows:

Grouped beels		2,600
Individual beels		840
Minor water bodies		600
Total		4,040
	say,	4,000 ha

Drainage improvements alone, without flood control, will have an impact in terms of water depth duration at the end of monsoon season, mainly on account of the accelerated drainage of accumulated water during rainfall events.

For evaluation purpose, it has been assumed that about 75% of the land concerned by the drainage improvement, i.e. 3 000 ha, will be transferred from land type F2 to land type F1 in MELANDAHA and ISLAMPUR Thanas.

Modifications in the areas of the various cropping patterns in the area were obtained by considering the following hypotheses:

- Transfer 3,000 ha from F2 to F1 land type

- Identical crop distribution to that in the present situation

- Increase outside the drained areas on the same basis as for the without Project situation

- Decrease of 163 ha of NCA for land acquisition for drainage infrastructures.

The main results are the following:

- increase in the areas of rice (1,100 ha), with paddy production rising by up to 273,000 t,

- very Slight increase in cropping intensity, which, for the project as a whole, will rise from 191% to 193% (203% for

the Thana of Melandaha and 202% for the Thana of Islampur).

- stable situation for the other crops (slight decrease in Rabi crops, which will be replaced by HYV Aman and HYV Boro).

Table 5.3.12 shows the area and production of the main crops in the future [WO] and future [W] for Option A.

iii) Option B

In Option B; embankments with inlet and outlet structures are provided to control flooding from both the Jamuna and Old Brahmaputra as well as the same drainage measures as describes under Option A.

Changes on land types distribution have been studied for the six Thanas of the project area on the basis of the analysis of the result obtained from the simulations of the hydrodynamic model MIKE 11 for the project area. Result of the computations are shown in Tables 5.3.19 with the new distributions of land types per thana.

Changes in cropping pattern have been assessed in two areas:

- Outside the embankments (NCA of 23,837 ha less 422 ha for embankments and structures i.e. 23,415 ha) the evolution is the same as per the without Project situation i.e. slight increase of irrigated areas through a transfer from B. Aman to HYV Boro (about 890 ha),

- Inside the embankments (NCA of 50,145 ha less 163 ha for drainage structure i.e. 49,985 ha). The evolution of cultivated areas by cropping patterns has been defined according to following assumptions,

- No global change for areas for cropping patterns Aus/Jute - Rabi crops and Aus/Jute - T. Aman - Rabi crops, but now distributed according to the modified distribution of land types. The first patterns occurs mainly on permeable soils which are poorly suited for T. Paddy crops.

- Change in cropping patterns which include Aman (Aus/Jute - T. Aman, mixed Aus + Aman - Rabi crops, T. Aman - Rabi crops and DWT T. Aman - Boro) by applying their present percentages to the future land type distribution,

- Transfer from B. Aman to HYV Boro as for the without Project situation,

- Change in areas of cropping pattern T. Aman - HYV Boro now covering the remainder of available areas,

- Moreover five years after the completions of the works increase of HYV Aman by 10%.

In terms of areas per crop, the main results of these changes in cropping pattern are as follows for the whole project areas (73,400 ha of NCA).

- Increase of rice areas by 3,500 ha (from 91,940 ha to 95,450 ha) due to:

  - increase in areas of T. Aman by 6,800 ha;
  - decrease in areas of B. Aman, Mixed Aus - Aman and DWT Aman by about 4,200 ha;
  - limited changes of Aus and Boro areas (+900 ha) but notable increase of irrigated HYV Boro up to 30,000 ha i.e. 41% of NCA.

- Simultaneously the irrigated areas increased by about 2,500 ha i.e. about 48% of whole NCA (58% inside the embankment).

The main results excepted from this option, expressed in terms of areas and production are summarized in Table 5.3.25.

Rice production

The rice areas increase by 3,500 ha and the average yield increases from a present 2.85 t/ha up to 3.17 t/ha. The corresponding increase of production is 40,600 tons, achieved after 13 years taking into account the changes in cropping patterns the evolution of yields over 5 years in previous flood - prone areas and the increase in the share of HYVs varieties for Aman Rice (from 60% to 70%).

In comparison with the without project situation the increase of Rice production is 36,470 tons, 62.5% of which coming from the increase of Aman production, 27.5% coming from the increase of Boro, the Aus rice production remaining almost stable (decrease of 380 ha).

Other crops

With regards to other crops, there are very few changes in comparison with the without project situation except slight increase of 560 ha of Jute diminution of pulses areas (1,100 ha) and vegetables area (660 ha), the total area of other crops than rice remain stable (slight decrease of 3% in area).

Irrigated area

The irrigated areas will reach 35,000 ha (8% increase) after 13 years, corresponding to the increase of HYV Boro areas (2,500 ha).

Cropping intensity

Increase in cropping intensity which will rise to 196% for the whole Project. Inside the embankments the cropping intensity will reach 207% outside it will be stable remaining 172%.

The simulation results obtained for the whole Project area in terms of production, operating costs show that assuming that 290 days of works give a full annual employment, the Project area will have a labour supply of 70,680 man-year i.e. an increase of 2,880 may-year in comparison with the reference situation [WO].

INTRODUCTION

Background

The Jamalpur Priority Project covers an area of about 1000 sq. km, on the mainland bounded by the Old Brahmaputra river to the east, the Jamuna river to the west and the Jamalpur to Sarishabari railway to the south.

Originally, the study was intended to cover the lands of the six Thanas of Jamalpur, Sarishabari, Melandaha, Islampur, Dewanganj and Madarganj. Field surveys indicated that the lands of three additional Thanas villages, namely Fulchari, Sariakandi and Kazipur, were also included in the project area. These lands, which are bounded by the Jamuna river, are subjected to erosion and sedimentation processes every year.

About 90% of the people in the project area are dependent on agriculture for their livelihood, whether directly or indirectly.

This is an almost exclusively agricultural region influenced by favourable physical and socio-economic factors, except for the periodical flooding which destroys either part of the Boro rice crops at the beginning of the monsoon, or newly transplanted Aman rice crops midway through the monsoon season.

During the monsoon season, a vast area of land is subject to flooding and the choice of crops is determined to a large extent by flooding characteristics and soil parameters.

Cultivated land covers an net area of 73,985 ha out of a gross area of 92,242 ha, i.e., 80% with, on average, nearly two crops being grown per year.

Rice is the principal crop and staple food and the production is enough for the present population.

A large proportion of the crops is dependent on rainfall but, at present, about 43% of the cultivated land has access to some form of irrigation in the dry season (November - April).

Cattle-rearing is of only limited importance in the study area in view of the lack of pasture land, but the majority of households have poultry.

Objectives

The objective of the report on this annex is to present all parameters which govern present and potential agricultural development of the area.

The present agricultural situation is defined on the basis of information collected during the field surveys and taken from the most recent of the past study reports.

Particular attention is paid next to the development possibilities within the context of proposed works for which several alternatives are considered.

Approach

Sources of data collection were as follows:

- interviews with officials, including Thana agricultural officers, Deputy Director of Agriculture and engineers from the regional agricultural research stations,
- interviews with farmers from different parts of the project area. Farmers were interviewed in groups and also individually,
- interviews with experts of other FAPs,
- agronomic and socio-economic surveys covering some 400 households,
- direct personal observations of land type, crops grown, varieties of crops grown, inputs used and prevalence of pest and diseases,
- project documents, including those from the NCR study and FAP 12 (FCD/I Agricultural study),
- official publications including the Bangladesh Statistical Year Book, MPO technical reports, SRDI documents, BARI and BRRI reports.

1 ENVIRONMENTAL CONDITIONS

1.1 Physiography

The project area lies within the Brahmaputra-Jamuna flood plain. There are three physiographic units, namely: (a) active flood plain, (b) young flood plain and (c) old flood plain. They have been differentiated mainly on the basis of relative age, nature of deposits and characteristics of relief within the area. It is difficult to differentiate sharply each of these physiographic units in areas transitional to each other, particularly in the border areas between active and young flood plains. In a few areas they are intermixed.

(a) The active flood plain underlies agro-ecological region 7 with Char lands and very young alluvial land mostly along the Brahmaputra and Jamuna rivers and a small area along the Chatal and Jhenai rivers.

This region has complex patterns of ridges and inter-ridge depressions, in-filled river channels and cut-off channels. The Char lands are liable to change by riverbank erosion, new sediments are deposited and older lands are buried by layers of new sediments. In some years, the new deposits could be as deep as 2-3 metres or even more in certain places.

The whole area, except the homesteads, built on raised platforms, is subject to seasonal flooding. Flooding is shallow on ridges and moderately deep to deep in the depressions. Early flooding and rapid flow of floodwater over the land are characteristic features of floods in the area.

(b) The young flood plain underlies agro-ecological region 8 which includes mainly sediments deposited since the Brahmaputra river moved into the present Jamuna channel some 200 years ago. This region lies along the banks of the Chatal and Jhenai rivers where land has just stabilised, forming a typical meander flood plain landscape of broad ridges and basins. The higher parts of the ridges are above normal flood level, and the lower parts are mostly shallowly flooded. The flood depths of the basin areas are mostly moderately deep except a few "beel" areas which are deeply to very deeply flooded.

(c) The old flood plain underlies agro-ecological region 9, which occupies the older part of the Brahmaputra flood plain where the sediments were laid down before the river changed its course through the Jamuna river. It has a typical meander flood plain landscape of broad ridges and depressions. This region differs from the young flood plain in having relatively high proportions of highlands, smoother relief and more deeply developed soils

Seasonal flooding is mainly shallow in the north eastern half, but relatively deeper in the south western half. There is evidence that, in the south western half, floodwater during a normal flood year comes from overtopping of the bank of the Jamuna and from the south as backflow through the interconnecting channels, namely Chatal and Jhenai and through some beels, such as Karkala beel near Madarganj. In the eastern half, flooding is mainly by accumulated rainwater which cannot drain out.

1.2 Climate

The Jamalpur area is located between latitude 24°40' and 25.15° north and between longitude 89°30' and 90° east. The area shows fairly homogeneous climatic features.

The climate is dominated by the monsoon. The northeast monsoon, coming from the Siberian anticyclones, blows during the winter months, giving weather that is generally dry and cool: typical temperatures range between 13°C to 28°C from December to February, rainfall in this period amounts to 2% of the annual depth, and average wind speed is also at its lowest value. The availability of soil moisture during this period falls short of crop requirements.

Solar radiation is high during this dry season (rabi). Agronomically, kharif-II crops are harvested in this season, and the rabi crops are planted.

During the following months, from March to June, pre-monsoon (kharif-I), generally convective rainfall is responsible for 20 to 25% of the annual total (2240 mm for Jamalpur station); temperatures rise to a maximum of more than 35°C; humidity, which was minimum in February/March increases quickly; the weather is generally unstable, with a succession of sunny and rainy days and high average wind velocities.

Erratic distribution of rainfall during this period also causes soil-moisture deficits, but heavy thunder showers may sometimes damage the crops. Agronomically, the rabi (winter) crops are harvested in this period, and kharif-I crops are planted.

The south-west monsoon winds usually begin to blow in the month of June and last until October. During that season (kharif-II) heavy rains fall over the region (75 to 80% of the annual total), relative humidity remains very high, between 80 and 90%, temperatures remain stable on average with a lower diurnal range, typically between 25°C and 31°C, solar radiation is low. This is the period when soil moisture availability is in excess of crop requirements.

Agronomically, the kharif-I crops, which were started in the pre-monsoon season, are harvested and the kharif-II crops are planted beginning roughly in mid-June.

In October, rainfall starts to decline and reaches a minimum during December.

The critical aspects of climate in relation to crops are:

- the occurrence and reliability of the pre-monsoon rains and the onset of the monsoon,
- the occurrence of storms that damage standing crops (boro and HYV aus rice),
- the reliability of the monsoon rains, and the rise, duration and recession of floods associated with the monsoon rains; and,
- the reliability, amount and distribution of the end-of-monsoon rains.

The main climatological parameters based on Jamalpur station records are given in table 5.1.1. Reference potential evapotranspiration was estimated using the Penman-Monteith approach (FAO - 1990).

Table 5.1.1 Climatological Parameters

Country: BANGLADESH Meteo station: JAMALPUR
Altitude: 20 metres Coordinates: 24.56 N.L. 89.57 E.L.

Month	Max Temp (°C)	Min Temp (°C)	Humi-dity (%)	Wind (km/day)	Suns-hine (hrs)	Solar rad. (MJ/m^2/ day)	ETo Pen-Mon (mm/day)	Rainfall (mm/day)
January	25.3	10.9	79	43	8.8	16.0	2.2	0.6
February	27.4	12.8	73	52	9.3	18.7	3.0	0.7
March	32.2	17.8	68	78	9.0	21.1	4.1	1.6
April	34.9	22.7	73	86	8.7	22.3	4.9	3.7
May	31.9	23.5	80	104	8.2	22.2	4.9	9.8
June	31.2	25.2	88	78	5.2	17.8	3.9	14.6
July	30.9	25.7	89	78	5.0	17.4	3.8	12.3
August	31.2	25.7	87	86	5.2	17.2	3.8	13.3
September	31.0	25.5	85	69	6.0	17.3	3.7	10.4
October	30.4	23.5	83	52	7.8	17.6	3.5	5.7
November	28.6	18.2	80	43	8.7	16.3	2.8	0.7
December	26.0	13.4	80	35	8.7	15.1	2.3	0.2
YEAR	30.1	20.4	80	67	7.5	18.3	1305	2241

Source: AEZ Climatic data base.
Reference Evapotranspiration, ETo, according to Penman-Monteith

1.3 Hydrology - Flooding

1.3.1 Hydrology

The most striking feature of the hydrology in the project area is the seasonal flooding and drainage. Only about 20% of the area is above normal flood level, located mostly along the north-east border of the project area. About 35% is land subject to shallow flooding, intermixed with highland and medium lowland in the central part of the area; about 40% of the area is moderately to deeply flooded, made up almost entirely of the area located in the western part of the project area. There are small areas of deeply and very deeply flooded land. In general, about 80% of the project area is seasonally flooded. Flood depth increases from east to west. In the western part of the project area, floodwater rises rapidly and also flows rapidly over the land.

Drainage in general is slow. Apart from the Brahmaputra and Jamuna at the eastern and western boundaries of the project area respectively, the Chatal and Jhenai and their branches drain most of the floodwater into the Jamuna. Drainage during the peak monsoon season and also towards the end of the monsoon season becomes impeded if there is high rainfall over the project area or in the upper catchment areas.

The time of arrival, depth and duration of flooding and the rate of rise largely determine the choice and timing of crops. The MPO (now WARPO) has classified the agricultural land resources into five land types on the basis of flood depth and cropping patterns as shown in Table 5.1.2.

Table 5.1.2 Mpo Land Types Based on Flood Depth and Cropping Patterns

Land type	Description	Flood depth (cm)	Nature of flooding	Identifying crop
F0	Highland	Less than 30	Intermittent	Land suited to HYV rice in the wet season
F1	Medium-high	30-90	Seasonal	Land suited to local varieties of aus and transplanted aman
F2	Medium-low	90-180	Seasonal	Land suited to broadcast aman in the wet season
F3	Lowland	>180	Seasonal	Land on which broadcast aman can be grown in the wet season
F4	Low to very low	>180	Seasonal/ perennial	Land on which either the depth or rate or timing of flooding does not permit growing of broadcast aman, but does support local boro in the dry season

The Soil Resources Development Institute (SRDI) carried out semi-detailed soil surveys (1:50 000 scale) in the project area between 1985 and 1990 over the six main Thanas of Jamalpur, Islampur, Sarishabari, Madarganj, Dewanganj and Melandaha. The "Upazila Land Soil Resources Use Guide" recently prepared, is the most up-to-date source of available data for soil properties and land use.

By surveying and analysing soil association maps, topographic maps, flood depth maps and agronomic and climatic data, the soil scientists of SRDI have defined eleven land type classes as shown in table 5.1.3. These are called SODAPS land types because they are part of the Soil Survey Data Processing System.

Table 5.1.3 Sodaps Land Types Based on Flood Depth

No	Land type	Flood depth (cm)	Nature of flooding	MPO
1	Highland	0	Flood free to intermittently flooded	F0
2	Medium highland 1	0 to 30	Seasonally flooded	
3	Medium highland 1B*	0 to 30	Seasonally flooded, but remains in wetland state in part of the dry season	
4	Medium highland 2	30 to 90	Seasonally flooded	F1
5	Medium highland 2B	30 to 90	Seasonally flooded, but remains in wetland state in part of the dry season	
6	Medium lowland	90 to 180	Seasonally flooded	F2
7	Medium lowland B	180 to 300	Seasonally flooded, but remains in wetland state in part of the dry season	F3
8	Lowland	180 to 300	Seasonally flooded	F4
9	Lowland B	180 to 300	Seasonally flooded, but remains in wetland state in part of the dry season	
10	Very lowland	> 300	Seasonally flooded	
11	Very lowland	> 300	Seasonally flooded, but remains in wetland state in part of the dry season	

* The letter B indicates bottom land.

Source: Soil Resources Development Institute.

The land type classification followed in this report is updated from the SRDI documents (reports are in press but draft reports and maps were made available) and made compatible with the MPO classification.

The Thana Soil and Land Resources guides were prepared from semi-detailed soil surveys (1:50000 scale) during 1985-1990. As such information therein is more up-to-date and more detailed than previous documents. They were further refined by interpreting recent air photos. SPOT images and by analysing results of field surveys.

The distribution of the four land types, F0 to F3 (F4 group is insignificant) is shown in Table 5.1.4.

Land type data for the Project area were generated by superimposing times series water level data on the area - elevation curve for the pre - and post project conditions.

DISTRIBUTION OF LAND TYPES BY THANA - PRESENT SITUATION (WO) Table 5.1.4

	THANAS	Total gross area	ADJUSTED GROSS AREAS (a) F0	F1	F2	F3	PRESENT SITUATION (net areas) F0	F1	F2	F3	Total
	JAMALPUR	7837	3114	1184	2670	870	1374	1184	1800		4358
							32%	27%	41%		
	SHARISABARI	3054	1345	963	614	132	1081	963	482		2526
							43%	38%	19%		
inside	MELANDAHA	23320	7935	8810	4131	2444	5264	8810	2796	1109	17979
embankt							29%	49%	16%	6%	
	ISLAMPUR	11977	3038	4687	3473	779	1953	4687	2931	237	9808
							20%	48%	30%	2%	
	DEWANGANJ	3425	1428	655	1148	195	1149	655	1008	55	2867
							40%	23%	35%	2%	
	MADARGANJ	16192	5187	6573	3010	1422	3396	6573	2114	527	12610
							27%	52%	17%	4%	
	sub-total	65804	22046	22872	15045	5841	14217	22872	11131	1928	50148
							28%	46%	22%	4%	
	for the 6										
outside	above:	20062					486	1425	15933	1544	19388
embankt	for 3 other						3%	7%	82%	8%	
	thanas(*)	6376						448	2496	1505	4449
								10%	56%	34%	
	sub-total	26438					486	1873	18429	3049	23837
							2%	8%	77%	13%	
	TOTAL AREAS	92242					14703	24745	29560	4977	73985
							20%	33%	40%	7%	

(a) Refer to Annex 4, Modelling.
(b) FULCHARI, KAZIPUR and SARIAKANDI

1.3.2 Flood Depth Classification

In the flood plains, the depth, duration and the timing of the recession of the flood water from the land, and the permeability of the soils constrain the kinds of crops that can be grown in a given area. The present land use and general pattern of cropping is determined primarily by land levels with relation to flooding.

Farmers traditionally choose their cropping pattern on a particular land based on their experience of flood and soil characteristics. Kharif crops, usually either Aus followed by transplanted Aman or a single crop of broadcast Aman are selected to suit the local depth and duration of flooding. The following Rabi crops, whether mustard, wheat or kheshari are chosen with regard to the recession of the flood and the moisture condition of the land that makes the land favourable for ploughing for Rabi crops and also on the moisture retention capacity of the soils. Thus development of any agricultural production programme will depend very much on the agro-ecological environment. The cropping patterns associated with land in each of the four flood depth classifications may be described as follows:

(a) Highland (F0 - Flood Depth 0-30 cm)

At present 14 700 ha (20%) of the NCA is highland. (8,900 ha impermeable and 5,800 ha permeable)

Permeable high land bears insufficient moisture content in the November and early December with low organic matter and nutrient content. In some areas a high leaching rate of water in the soil leads to the non availability of optimum water retention for T.Aman cultivation. With the increased content of organic matter, availability of HYV seeds, improved farming practices and light irrigation, it is possible to grow crops like Potato, Wheat, Maize and Vegetables.

Horticulture and annual crops like Banana, Papaya, Ginger, Tumeric, Sugar Cane and Vegetables can be grown throughout the whole year if flood protection is assured.

It is on the permeable land of the highlands that sugar cane crops are grown, mainly in the thanas of Dewanganj, Melandaha and Islampur). Aus and jute also occupy a significant proportion of these lands. Cultivation is followed in the winter by rabi crops such as wheat, potatoes, pulses and especially vegetables. Permeable lands on F0 occupy about 5800 ha (i.e. 8%) of the net cultivated area.

On impermeable land, which retains moisture better, the prevailing cropping patterns are triple cropping of the Aus/jute -

T. aman - rabi crop type, or double cropping of the Aus/jute - T. aman or Aus/jute - boro type. Impermeable lands on F0 occupy about 8900 ha (i.e. 12%) of the net cultivated area.

(b) Medium high land (F1 - Flood Depth 30-90 cm)

Medium highland occupy about 24 700 ha (33% of the NCA) in the project area.

Low moisture content prevails during the winter season and land gets completely dried up in January. In some areas shallow flooding during the monsoon persisting until October and low moisture content right from the beginning of the dry season are identified as limiting factors for optimum agricultural production. With the improvement of drainage and irrigation facilities, farming systems and the adoption of improved technology, it is possible to improve the situation to a considerable extent. Due to a very low organic content of the soil, cultivation of manuring crops is very important.

In the most permeable land, the commonest cropping pattern is of the sugar cane type, or groundnut/millet/sweet potato for single crops. On soils retaining moisture better at the end of the monsoon, cropping patterns based on T. aman are the most frequent, with the winter crop usually being Boro.

(c) Medium low land (F2 - Flood Depth 90 - 180 cm)

At present 29 600 ha (40%) of the NCA is medium lowland

Production limitations for this type of land are mainly the persistence of flood water until the end of November followed by rapid drying of the soil so that it is very hard at the beginning of January. This limits the growing of winter crops. This situation can be improved considerably and cultivation of rice varieties with higher yield potential can be increased by the provision of drainage and flood control facilities which enable irrigation along with improved farm management to be practised. In some areas of medium low land, deep flooding exists for 4 to 5 months of the year continuously through the monsoon. Quite often there are risks of loss of the standing crops due to rapid floods, river erosion and sand deposition on the land.

Cropping patterns based on Aman (B Aus+Aman, DWT Aman or B. Aman) are predominant in these areas. Boro is the main winter crop.

(d) Low land (F3 - Flood Depth greater than 180 cm)

Low land remains wet almost throughout the year, resulting in the non cultivation of winter crops. During the monsoon high rapid flooding quite often makes the condition risky to grow Kharif crops at all. Lowland occupies about 5000 ha (i.e. 7%) of the net cultivated area;

Tables 5.1.5 (5 sheets) shows the major cropping patterns for each land type, for the nine thanas of the project area - these data have been used in the appraisal of the present situation, and for the selection of the representative year 1977 as a basis for the MIKE 11 hydrodynamic model.

Table 5.1.5 Existing Major Cropping Patterns by Thana			Sht 1 of 5
JAMALPUR			
Land Type	Major cropping pattern	Area (in ha)	Total (in ha)
Permeable Highland (F0)	Aus - Rabi crops	153	153
Impermeable Highland (F0)	Transplanted Aman - Boro Aus/Jute - Transplanted Aman - Rabi crops or fallow Aus/Jute - Transplanted Aman	586 522 113	1221
Medium Highland (F1)	Transplanted Aman - Boro Aus/Jute - Rabi crops Aus/Jute - Transplanted Aman - Rabi crops or fallow Sugarcane	557 287 255 113	1212
Medium Lowland (F2)	Aus/Jute - Rabi crops Mixed Aus and Broadcast Aman - Rabi crops Boro	1749 310 113	2172
Lowland (F3)	No significant area exit	-	-
		Sub-Total	4758
ISLAMPUR			
Permeable Highland (F0)	Sugarcane Aus - Rabi crops	486 246	732
Impermeable Highland (F0)	Aus/Jute - Transplanted Aman - Rabi crops Aus/Jute - Transplanted Aman Transplanted Aman - Boro	1053 119 113	1285
Medium Highland (F1)	Transplanted Aman - Boro Aus/Jute - Rabi crops Aus/Jute - Transplanted Aman - Rabi crops or fallow Aus/Jute - Rabi crops Aus/Jute - Transplanted Aman Sugarcane	1957 1319 1037 133 130 120	4696
Medium Lowland (F2)	Aus/Jute - Rabi crops Mixed Aus & Broadcast Aman - Rabi crops Deepwater Transplanted Aman - Boro Boro	1530 1033 915 735	4213
Lowland (F3)	Boro Aus or Broadcast Aman - Rabi crops	237 85	322
		Sub-Total	11248

Table 5.1.5 Existing Major Cropping Patterns by Thana			Sht 2 of 5
MELANDAHA			
Land Type	Major cropping pattern	Area (in ha)	Total (in ha)
Permeable Highland (F0)	Aus - Rabi crops or Vegetables Sugarcane	718 647	1365
Impermeable Highland (F0)	Aus/Jute - Transplanted Aman - Rabi crops or fallow	3899	3899
Medium Highland (F1)	Transplanted Aman - Boro Aus/Jute - Transplanted Aman - Rabi crops or fallow Aus/Jute - Rabi crops	5121 2425 1173	8810
Medium Lowland (F2)	Mixed Aus & Broadcast Aman - Rabi crops/Fallow Deepwater Transplanted Aman - Boro Boro Aus/Jute/Millet - Rabi crops/Fallow	2663 1384 667 457	5171
Lowland (F3)	Boro Broadcast Aman	793 656	1449
		Sub-Total	20694
SARISHABARI			
Permeable Highland (F0)	Very negligible area exit	-	
Impermeable Highland (F0)	Aus/Jute - Transplanted Aman - Rabi crops/Fallow Transplanted Aman - Boro Aus/Jute - Transplanted Aman	1003 275 200	1478
Medium Highland (F1)	Aus/Jute - Transplanted Aman - Rabi crops/Fallow Transplanted Aman - Boro Aus/Jute - Rabi crops	1284 559 299	2142
Medium Lowland (F2)	Aus/Jute - Rabi crops Mixed Aus & Broadcast Aman - Rabi crops Deepwater Transplanted Aman - Boro Grassland/Fallow	2640 1207 552 74	4473
Lowland (F3)	No significant area	-	
		Sub-Total	8093

Table 5.1.5 Existing Major Cropping Patterns by Thana Sht 3 of 5

Land Type	Major cropping pattern	Area (in ha)	Total (in ha)
DEWANGANJ			
Permeable Highland (F0)	Sugarcane Aus/Jute - Rabi crops/Fallow	644 389	1033
Impermeable Highland (F0)	Aus/Jute - Transplanted Aman - Rabi crops	141	141
Medium Highland (F1)	Transplanted Aman - Boro Aus - Rabi crops Sugarcane Aus/Jute - Transplanted Aman - Rabi crops/Fallow	297 276 145 146	864
Medium Lowland (F2)	Groundnut/Millet/Sweet potato Aus/Jute - Rabi crops Deepwater T. Aman/T. Aman - Boro Mixed Aus & Broadcast Aman - Rabi crops Boro Grassland/Fallow	1520 695 394 315 158 741	3823
Lowland (F3)	Groundnut/Millet/Sweet potato Broadcast Aman - Rabi crops/Fallow or Boro Grassland/Fallow	680 256 226	1162
		Sub-Total	7023
MADARGANJ			
Permeable Highland (F0)	Aus/Jute - Rabi crops Vegetable & Rabi crops	2391 118	2509
Impermeable Highland (F0)	Aus/Jute - Transplanted Aman - Rabi crops Aus/Jute - Transplanted Aman	654 233	887
Medium Highland (F1)	Transplanted Aman - Boro Aus/Jute - Rabi crops Aus/Jute - Transplanted Aman - Rabi crops Aus/Jute - Transplanted Aman Groundnut/Millet/Sweet potato	2114 1530 1470 573 560	6574
Medium Lowland (F2)	Deepwater Transplanted Aman - Boro Mixed Aus & Broadcast Aman - Rabi crops/Fallow Aus - Rabi crops Groundnut/Sweet potato/Other spices Boro Grassland/Fallow	2355 2305 1349 620 169 414	7212
Lowland (F3)	Boro Broadcast Aman - Rabi crops Grassland	250 150 138	538
		Sub-Total	17720

Table 5.1.5 Existing Major Cropping Patterns by Thana			Sheet 4 of 5
FULCHARI			
Land Type	Major cropping pattern	Area (in ha)	Total (in ha)
Permeable Highland (F0)	No cultivable land	-	
Impermeable Highland (F0)	No cultivable land	-	
Medium Highland (F1)	Very negligible cultivable land	-	
Medium Lowland (F2)	Millet/Sweet potato/Groundnut Aus/Jute - Rabi crops Grassland/Fallow	386 120 105	611
Lowland (F3)	Millet/Sweet potato/Groundnut Broadcast Aman - Rabi crops/Fallow Grassland/Fallow	86 35 65	186
		Sub-Total	797
SARIAKANDI			
Permeable Highland (F0)	Very negligible cultivable land	-	
Impermeable Highland (F0)	Very negligible cultivable land	-	
Medium Highland (F1)	Aus/Jute - Transplanted Aman - Rabi crops Aus/Jute - Transplanted Aman	132 106	238
Medium Lowland (F2)	Aus/Jute - Sweet potato/Millet/Spices - other Rabi crops Aus/Jute - Transplanted Aman - Rabi crops/Fallow Millet/Sweet potato Mixed Aus & Broadcast Aman - Rabi crops or Boro Grassland/Fallow	248 230 178 151 83	890
Lowland (F3)	Deepwater Transplanted Aman - Boro or Boro-Fallow Grassland/Fallow charland	148 46	194
		Sub-Total	1322

Table 5.1.5 Existing Major Cropping Patterns by Thana			Sheet 5 of 5
KAZIPUR			
Land Type	Major cropping pattern	Area (in ha)	Total (in ha)
Permeable Highland (F0)	No significant cultivable area	-	
Impermeable Highland (F0)	No significant cultivable area	-	
Medium Highland (F1)	Aus/Jute - Transplanted Aman - Rabi crops Aus/Jute - Rabi	125 85	210
Medium Lowland (F2)	Aus/Jute - Rabi crops/Fallow Mixed Aus & Broadcast Aman - Rabi crops Sweet potato/Millet/Spices Deepwater Transplanted Aman - Boro Grassland/Fallow	385 180 185 132 113	995
Lowland (F3)	Groundnut/Sweet potato/Millet/Spices Aus - Rabi crops Grassland/Fallow	672 323 130	1125
		Sub-Total	2330
		TOTAL	73985
Data Source:	SRDI Upazila Land and Soil Resource Utilization Guide updated by SPOT imagery interpretation and field verification.		

1.4 Soils

1.4.1 General Nature of Soils

About one third of the area is occupied by the active and young flood plain whereas about two thirds of the area is occupied by old flood plains. All the soils have developed in alluvial sediments deposited by the rivers Jamuna and Brahmaputra at different times. The soils in the active, young and old flood plains show different degrees of development, mainly due to the age of the sediments, drainage condition and texture of the sediments.

On the active and young flood plains, stratified sandy and silty alluvium and shallow soils predominate. Along the channel, there are large areas of deep sandy alluvium. In other places, the deposits range from fine sandy loam to silty clay loam. The highest ridge soils are highly to moderately permeable. At the lower sites, soils are mostly moderately permeable. In the young flood plain, where top soils are puddled for transplanted aman paddy cultivation soils are slightly permeable.

Moisture retention capacity is relatively high making the soils suitable for rainfed rabi crops except on ridges which have deep sandy soils or soils overlying sand at shallow depth. Organic matter content is low to very low. Reaction varies from near neutral to moderately alkaline. There is practically no problem of sulphur or zinc deficiency.

On the old flood plain, highland soils are mainly silt loams and silty clay loams, with a moderately well drained, grey, weakly mottled friable subsoil. Most of the basin soils have a dark to very dark grey silty-clay to clay subsoil. Highland soils are near neutral to moderately acid, whereas the lowland soils are slightly to moderately acid in reaction. Organic matter content in both the highlands and the lowlands is low except in some "beel" areas but soils of lower areas have relatively higher organic matter content than the soils of the highlands. Almost all highland and medium highland soils are deficient in sulphur and zinc.

1.4.2 Soil Classification

As many as 13 soil series have been identified in the project area: 7 in the active and young flood plain, and 6 in the old flood plain, though a few of them recur both in either active and young or young and old flood plains. Sandy alluvium, silty alluvium, Bararchar and Melandaha soils are predominant in the active flood plain areas; Balina, Dhamrai, Kamarkhanda and Savarbazar soils are predominant in young flood plain whereas Nakla, Sherpur, Sonatala, Silmondi and Ghatail soils are predominant in the old flood plain areas. A detailed description of each of these soil profiles is given in the "Reconnaissance Soil Survey Report, Jamalpur district". Their classification, according to the USDA soil classification system (soil taxonomy), is given in Table 5.1.6.

1.4.3 Main Limitations

The limitations to crop production in the active flood plain area (Char lands and new land formations attached to the main lands) and in the young and old flood plain areas are basically different, although a few of them are common in both areas. As such, the limitations in the active flood plain areas and in the young and old flood plain areas are described separately below.

In the active flood plain areas early flooding, sudden rises in floodwater, complex land patterns, deep sandy soil, loss of agricultural land due to river bank erosion, burial of older soils by thick layers of new sediments and very low soil fertility are the major physio-chemical limitations to optimum crop production.

Table 5.1.6 Classification of The Soils Correlation with USDA System

ORDER	SUB ORDER	SUB GROUPS	SERIES
ENTISOLS	AQUENTS	Typic haplaquents	Barar char Kamarkanda sandy alluvium Silty alluvium
INCEPTISOLS	AQUEPTS	Typic haplaquents	Balmia Dhamrai Melandaha Savar Bazar Ghatail
		Aeric haplaquents	Silamondi Sonatela
		Typic dystrocrepts	Jamalpur Sherpur

Early flooding and sudden rises in floodwater in the depressions often cause damage to aus and jute at their early growing stage and to boro at its harvesting stage. To some extent late rabi crops such as wheat, barley, millet, groundnut or sweet potatoes are also affected if they are late sown. Rapid flow of floodwater over the land is a common flood characteristic of the Char land during monsoon period. This often affects broadcast aman.

Complex land patterns such as irregular relief and/or a deep sandy material over silty surface soil are a common land feature of the Char land. Even in the same field, heterogeneous land patterns and variable soil-moisture make it difficult to grow rabi crops. One part of the field may quickly reach the drought stage, while in other parts, crops grow well. In deep sandy soils, percolation losses of irrigation water are high, thus making irrigation uneconomic.

The intensity of river bank erosion is very high in some places. At the same time, in other areas older soils are buried by new sediments, often by sandy material, making previously productive land unproductive. These are common phenomena in Char lands for which farmers are unwilling to invest money for long term higher production.

Char lands are relatively less responsive to application of chemical fertilisers.

In the young and old flood plain highlands, in the western and northern parts, soils are often sandy. Because of the sandy nature of the soil and the high percolation rate which are not conducive to waterlogging by field bunds, transplanted aman cannot be grown on such land.

On medium highlands a sudden rise in floodwater, usually 2-3 times for 7-10 days each time in a year often damages transplanted aman. In almost four years out of five, transplanted aman is damaged at its early stage and needs re-transplantation. Thus late transplantation reduces yields considerably.

On the medium lowland, particularly in Madarganj and the western part of Islampur and Melandaha Thana early floods often damage boro at its harvesting stage.

Plougfan in soils used for transplanted aman prevents or restricts cultivation of dryland crops such as pulses, chilies, onions, etc. Slow drainage also restricts growing of high value rabi crops such as wheat, potato or pulses.

Highlands and medium highlands of the old flood plain areas are deficient in sulphur and zinc, and low in organic matter content.

2 PRESENT SITUATION OF AGRICULTURAL DEVELOPMENT

2.1 Cropping Seasons

The tropical monsoon climate favours production of a wide range of crops in the Jamalpur area. There are three distinct climatic seasons which are interrelated with three more or less distinct cropping seasons as listed below:

- a cool, dry winter season (rabi) covers the period from November to February. However crops are restricted to areas with adequate soil moisture or to irrigated areas. Rabi crops are sown in the winter and harvested in the spring or early summer. The principal rabi crop is boro, which is grown in poorly drained soil or where irrigation can be provided and where no flooding will normally occur before its harvest in May-June,

- the pre-monsoon season, or hot spring (kharif-I) runs from end of March to mid June

- the monsoon season or wet season (kharif-II) extends from mid-June through September

The crop environment during the kharif season is less favourable for high yields because of the uneven distribution of rainfall, variable flooding depths, low solar radiation and high temperatures and humidity. Kharif crops are grown in the spring or summer season and harvested in late summer or early winter. Rice is the predominant crop during the kharif season.

The depth and nature of flooding determine the crops that can be grown in a given area during the Kharif-II season.

Figures 5.2.1, 5.2.2 and 5.2.3 show a generalized cropping calendar for the three cropping seasons in relation to floods and the irrigation season.

2.2 Crops

As for the rest of the country, agriculture of the Jamalpur area is dominated by various rice crops.The varieties are generally classified as local, local improved and high yielding. Other relatively important crops are jute, wheat, pulses, potato, sugar cane, vegetables and oilseeds.

Areas and productions of different types of Paddy, Wheat, Jute, Oil Seed and Potatoes are shown in appendix C.

2.2.1 Main Crops

i) Rice

Rice is the most important crop and is grown throughout the year. It can be grown on most soil types except on sandy soils. Special adapted varieties have been developed for each growing season under rainfed, irrigated or flooded conditions by the Bangladesh Rice Research Institute (BRRI) in close cooperation with the International Rice Research Institute (IRRI). The varieties are also adapted to the preference of the rice growers and the consumers.

A number of high yielding varieties (HYV) have been recommended by the National Seed Board for cultivation during different rice growing periods.

Besides there have been a number of traditional rice varieties for cultivation during different seasonal growing conditions.

The main rice crops Aus, Aman and Boro are grown in early monsoon, late monsoon and dry season respectively. Their cultivation is largely determined by land levels in relation to flooding. A general relationship between land type and main crop rotation is given in table 5.2.1 below for rainfed cultivation:

Table 5.2.1 Land Type/Cropping Pattern Relationship	
Land type	**Main crop rotation**
Permeable highland	Aus - Rabi crops
Permeable medium highland	Aus/Jute - Rabi crops
Poorly drained highland	Aus/Jute - Aman Rabi crops
Medium lowland ridge and basin margins	Mixed Aus/D.W.T. Aman Rabi crops
Low land and medium low land basin centres	D.W. Aman or Boro
Note: The symbol/indicates that the crop may or may not be grown in rotation, usually determined by soil moisture conditions.	

Aus is a photoperiod-insensitive variety. Grain colour is generally red and the quality of grain is coarse with few exceptions. It is grown during the Kharif-I season and traditionally competes with jute.

Broadcast Aus is sown in March-April and harvested in July-August. Due to uncertain production conditions (unpredictable and irregular rainfall pattern), the Aus variety has evolved to a quickly-maturing, low input crop with lower yield than the other rice crops. Local varieties are predominant (85%) and cover about 12,300 ha.

Yields from local varieties range from 1 to 1.7 t/ha. High-yielding varieties (HYVs), which are still not very widespread, give yields of the order of 3 t/ha. These varieties are mostly transplanted.

The Aman variety is the main rice crop and is grown mainly after the Aus and jute crops are harvested. The area planted with Aman is of the order of 44,400 ha in the project area. HYVs cover some 20,000 ha. The crop is transplanted in July and August. Late transplantations have a negative effect on yields for the photosensitive varieties and are caused mainly by drainage difficulties and excessive flooding.

Deep-water transplanted Aman is grown on about 6000 ha of medium lowland. By transplanting seedlings 45-50 days old in May/June, farmers can grow a deep-water aman crop after boro. No ploughing is practised thanks to the soft soil after irrigated boro.

Nearly 7,900 ha of medium lowland are also used for mixed cultivation of local varieties of Aus and Aman. These crops are relatively at risk with sowing taking place in March-April. If the floods are too high at the start of the monsoon season, the Aus plants are destroyed as they are shorter than the Aman seedlings and therefore have less resistance to submersion. If it is not destroyed, the Aus is harvested in June/July while the Aman will be harvested in November/December. The yields obtained for the local varieties are of the order of 1.75 t/ha.

About 29,000 ha of the project area are under Boro. HYV Boro is grown under irrigation, normally transplanted from January to February but continuously up to end of March and harvested in May/June. The HYV rice which is transplanted after mid March is considered as T.Aus. The traditional Boro is grown on low-lying land that is unsuitable for growing any crop during the monsoon season because of severe flooding (about 3200 ha) local Boro is transplanted in November/December). Facilitated by the expansion of modern irrigation, the area given over to HYVs has increased during the last decade. At the present time, this area is of the order of 26 000 ha.

The yields from local varieties are about 2.5 t/ha. Improved varieties give yields ranging from 3.5 to 5 t/ha. depending on the level of inputs.

The average yield for HYVs for the last three growing seasons was 4.5 t/ha in the project area.

The HYV boro planted over 35% of the NCA produces between 40 and 50% of the total rice production.

Aus is generally transplanted after mid-March until early May. As HYV boro varieties can also be grown as Aus because of their photo-insensitivity, some farmers plant these varieties throughout February and March. A new term, Braus, designates the crops transplanted between February 15 and March 15. (BRRI).

Overlapping of transplantation dates may give rise to possible confusion when establishing statistics as to whether these crops transplanted after mid-March are in the Aus or Boro category.

Apart from the selected seeds renewed by farmers every 4 to 5 years, the main inputs consist of fertilisers and pesticides. Almost all farmers apply fertiliser on HYV boro and HYV Aman. Urea, TSP, MP and some zinc and sulphur are used. The use of pesticides (insecticides in particular) is not widespread,partly because of their high price and partly because of the difficulties associated with their use. Many farmers complain of their low efficiency.

Finally, irrigation provides farmers with the opportunity of producing high-value boro rice despite its high cost. Irrigation is reserved essentially for boro, wheat, potato and sugercane at present, although certain crops of T. Aman either transplanted late or located on permeable soils would also need make-up irrigation at the end of the growth cycle. The irrigation water requirements of a boro crop are about 5000 to 6000 m3/ha while those of a T. Aman crop transplanted in mid-July in a soil where the percolation rate is 1.5 mm/day are of the order of 1000 to 1500 m3/ha.

Water requirement calculations are given in Appendix B.

The statistical data concerning the last three production seasons are given in tables 5.C.1 to 5.C.3 in the Appendix C.

The areas and production figures obtained from the cropping patterns noted in the field by SRDI officials provided estimates close to the 1990-1991 statistical data, except for Aus crops which are less represented in the statistics. Figures taken from the 1989-90 and 1990-91 statistics are very low compared to those of the previous seasons.

Present annual production in the project areas is about 260,000 tonnes, nearly half of which is produced during the rabi season. Half of the cultivated land is given over to T. Aman crops during the rainy season.

ii) Jute

The Jamalpur region is known for its production of high-quality jute but this production has been declining in recent years because of fibre marketing difficulties, with jute being replaced by synthetic products, not just on export markets but also on the home market.

Two types of jute, white and Tossa, are cultivated in the project area. White jute (Corchorus capsularis) is grown on medium lowland, while Tossa jute (Corchorus olitorius) is a medium highland to highland crop. Land which is suitable for jute is also suitable for Aus. The farmers choice is governed by economic conditions. In the Jamalpur district, areas given over to jute have decreased from about 26 000 ha in 1985-86 to 12 000 ha in 1989-90, but then rose to 18 000 ha in 1990-91.

Table 5.C.4 in Appendix C summarises the jute area and production values for the six main Thanas in the project area over the last three seasons. It is based on BBS statistics.

In the project area some 11 000 ha of land is given over to jute cultivation with equal distribution of White and Tossa jute. Mean annual production is of the order of 19 000 tonnes, equivalent to an average yield of 1.7 t/ha which is quite low in view of the results obtained at the experimental station where the yield exceeds 3 t/ha.

White jute is sown from end of March to mid-April, while Tossa jute is sown one month later from end of April to mid-May. Jute varieties are sensitive to daytime lengths. Varieties have been released that could be planted in February/early March without the risk of early flowering.

Jute is obtained from the bark of the plants. The crop can therefore be harvested at any stage of maturity between 80 and 120 days.

Plants that are harvested in August at average flowering to early fruit stage (120-130 days), produce higher yields and good quality fibre. Early harvesting will reduce yield. In flood-prone lowlands, white jute is harvested in June. In some medium low to high lands, the farmers harvest jute early in order to release the land for T. Aman. Jute for seed is harvested in October - November.

In the rice-based cropping pattern, jute plays an important role. Rice is rotated with jute. The farmers believe that growing deep-rooted jute after a rice cultivations improves soil fertility. Leaves of jute that fall to the ground add organic matter to the soil.

Jute is a cash crop to farmers. It is the main foreign exchange earning crop of Bangladesh. Jute sticks are extensively used for making walls and fences. It is also the main source of fuel in the villages.

For extraction of good quality fibre, there should be plenty of water close to the jute fields. Slow-flowing water is ideal for jute wetting. Bundles of plants (3-4 m long) are steeped in water in the canals, rivers, beels, road-side ditches or in standing flood water in the field. It has been found that, for wetting of green plants from one acre of land, about 27 000 litres of water is necessary. For complete wetting, the plants should be steeped in water for 18-21 days. Stagnant water enhances the rotting process but it lowers the quality of the fibre. Low-quality jute has less local or export market. In years of low rainfall and low floods, farmers are faced with a scarcity of wetting water.

iii) Wheat

The cultivation of wheat became extremely popular in the 70s with the introduction of HYV seeds, the expansion of irrigation facilities and the use of fertilisers. However, since the early 80s, areas given over to wheat decreased because the farmers preferred HYV boro because of the greater profits they could obtain (on the basis of 1991 prices, the net value of boro is 60% greater than that of wheat).

The table below is drawn from FAP 3 report and illustrates the decline in area of wheat for the past five seasons for which figures area available.

AREA OF WHEAT, JAMALPUR DISTRICT, 1986-91					
Year	1986-87	1987-88	1988-89	1989-90	1990-91
Ha	15,764	14,641	7,813	6,048	7,537

Table 5.C.5 in Appendix C gives the wheat area and production values for the six main Thanas in the Jamalpur district over the last two seasons.

Wheat is the second largest cereal crop but lags a long way behind rice, covering less than 7000 ha whereas rice is grown over area 15 times larger (about 95 000 ha).

The areas currently cultivated were estimated at 6950 ha with a mean yield of 2 t/ha (DDAE Office, Jamalpur, 1992). Fertilisers and pesticides are widely used but because of the difficulties in procuring high-quality seeds and the high cost of irrigation, yields remains low.

The irrigation water requirements of a wheat crop sown in November are of the order of 2000 m3/ha.

Wheat is cultivated in the rabi season. As the flood water recedes, the farmers start ploughing the land (medium low to medium high) for rabi

crops (wheat, mustard, pulses) and boro cultivation. The farmers' choice of wheat cultivation depends on the price and availability of seed, time of land release after flooding, rainfall of October - November, price of and demand for rice, etc. If rain stops early, farmers plant mustard but, in case of unfavourable weather if they fail to sow mustard, the next choice is wheat. When irrigation is available, the farmers give up wheat cultivation and plant boro rice.

The sowing time for wheat is very short. It is recommended that seeds be sown between the second week of November and the first week of December. Delayed sowing reduces yield and grain quality. In late-sown crops, high temperatures and high rainfall at the end of February or in early March, when the plants are at anthesis stage, may cause sterility of the florets, resulting in grain shrivelling and very low yield.

iv) Sugarcane

Sugar cane is grown on permeable land, medium highland and highland (F1 and F0 land types). Canes are grown either for supplying Dewanganj sugar mill or for making gur (molasses) by bullock and power crushers.

The area currently given over to sugar cane in the project area is about 2200 ha. The distribution of cane-growing areas per Thanas is given in table 5.C.6 in the Appendix C.

Sugar cane production is limited to the four Thanas of Jamalpur, Melandaha, Islampur and Dewanganj. Owing to transport difficulties in particular, it has not been possible to develop this crop in the other Thanas (Madarganj, Sharishabari, Fulchari, Kazipur and Sariakandi) where it covers very small areas.

According to officials from the Dewanganj sugar mill, average yields in 1990-1991 varied between 40 and 50 t/ha. Total estimated production is of the order of 100 000 tonnes.

The production capacity of the Dewanganj mill is 10 000 t of sugar per year. This mill is currently operating at full capacity in spite of the sugar marketing difficulties related to competition from Indian sugar.

The recommended time for planting is between October and November but farmers continue planting sets up to February/March.

Very little land is irrigated (10%). Irrigation water requirements are of the order of 3000 m3/ha for a growth period of 15 months.

The plough furrow method of planting sets (10/15 cm deep) is followed. Ratooning is not an accepted practice.

After the first months of planting canes, the farmers adopt the practice of growing one or two crops of potatoes, vegetables, spices or pulses in between the rows. Cane harvesting for the sugar mill commences in October and continues until April.

The mill zone growers sometimes incur losses due to non-lifting of canes in time. Delayed harvesting lowers the yield due to drying up of the canes in the field, thereby reducing the sugar percentages, and deprives the farmers from growing a crop after harvesting. The farmers wrap/twist the dry trash (leaves) round the clumps in such a manner that each column turns into a tied-up bundle, leaving the green tops free for photosynthesis. This method prevents losses from lodging and reduces drying to a certain extent.

To make the canes of the mill zone available to the mills in the crushing season, the cane price has been raised. The price is very high, Tk 40 per maund of cane in the mill zone, i.e., approximately Tk. 1 per kilo or Tk. 1 per cane, regardless of sugar content. It should therefore be a profitable crop for farmers.

v) Potatoes

Potatoes are an important vegetable crop in the project area, grown in the rabi season on medium lowland and medium highland. The cultivated areas vary from one year to the next between 1000 and 2000 ha. The average yields are low, around 8 t/ha, owing to the use of local varieties which are often preferred by consumers.

The crop is rotated with jute, rice and vegetables. Potato can be grown as an intercrop between rows of sugar cane.

Seed potatoes are planted from October to mid-November. Irrigation is widely used for this crop. The water requirements for a crop planted in mid-October are about 1700 m3/ha.

Fertilisers and pesticides are also used but farmers are not always successful in controlling diseases owing to the difficulty in finding adequate products at the proper time.

Table 5.C.7 in the Appendix C gives the area and production figures for the years 1988-1989 to 1990-1991, as supplied by the national statistics services (BBS 1991). The yields calculated from these data are much higher than those observed in the field surveys, which are almost always less than 12 t/ha.

vi) Mustard

Mustard is extensively cultivated in the project area (between 4500 and 5000 ha). It is the major oil seed crop. Oil is extracted either by

traditional bullock-powered presses or by electric-powered expellers. Mustard cakes are used as cattle feed.

Mustard is grown on low, medium low to highlands. In view of the fact that it is a short duration crop (75/100 days) it has been well adjusted to the existing cropping patterns, in particular in double-cropped land, with Aus and jute.

The use of improved varieties is still not very widespread. As a result, present average yields are low, about 0.8 t/ha. Few inputs are used on this crop which is not irrigated.

Table 5.C.8 in the Appendix C summarises the area and production figures for mustard for the six main Thanas of the project area over the last two seasons (1989-90 and 1990-91).

vii) Other Minor Crops

- **Pulses** (Lentil, Chickpea, Mungbean, Blackgram, Pea, Khesari) are the most common and cheapest source of protein for the rural people of the area. Rice and dal (pulses) are considered to be a balanced diet for the rural masses. Broken pulses, residues and waste at crushing and drying plants are used as concentrated cattle feed. Cows grazing on green plants of black gram and khesari produce more milk and maintain better health. The fertility of a soil is improved if a crop of pulses is grown.

  There is a huge demand for pulses in the country, but due to low yields, the area planted with pulses is declining. Expansion of boro, wheat, mustard and potato cultivation on land previously under pulses, has forced the cultivation of pulses into marginal lands.

  Lentil, chickpea, pea and khesari are grown in the rabi season. Mungbean and blackgram are short-duration crops (60-70 days): they can be cultivated in the both rabi and kharif seasons. In a cropping pattern, pulses can be fitted in as a third crop. Pulses can also be grown as a mixed crop with mustard and wheat or as a relay crop in deep-water Aman rice.

- **Millets**, such as cheena, Proso millet (*Panicum miliaceum*)and kaon/foxtail millet (*Setaria italica*) are grown on comparatively poor sandy soils of the char lands. These are considered as disaster crops and are adapted to a wide range of agro-ecological environments. In areas with limited water supply, millets have a reasonable and reliable harvest. Between the two, kaon has a better market value. It is grown as a mixed crop with aus or sesame, as a border crop in aus, or as a lone crop in the

young flood plain by small farmers. Millets are grown in situations where there is a risk of famine.

- **Vegetables, spices and groundnuts**. Vegetables and spices occupy a major place in the agriculture of the project area. It is estimated that these crops cover some 10 000 ha. They are cultivated in open fields or, more often, in vegetable gardens around dwellings. Chilies, onions, cucumbers, radishes, lady's finger and brinjals are to be found in most gardens but the predominant crop is gourds (ash gourd, sweet gourd, bottle gourd, bitter gourd, sako gourd, etc.) because of their hardiness and high resistance to disease.

  Of the vegetables cultivated for their leaves, amaranths and indian spinach are commonly found.

  Sweet potatoes are cultivated on light soils, with large areas being planted, estimated at 1800 ha. The average yield is poor estimated at 6.5 t/ha.

  Cultivated almost exclusively on sand soils of the active flood plain, groundnuts cover some 1700 ha, and give low yields of the order of 1.3 t/ha.

2.2.2 Origin of Data Used for the Assessment of Present Productivity Levels

Data from both primary and secondary source have been reviewed in order to make estimates of agricultural input use (labour, bullock, seeds fertilizers and pesticides) and to ensure a consistent approach for dertermining agricultral production in the present situation. The main data sources used were as follows:

- BBS Reports on the Thana development monitoring project 1990 (June 1991) for the Thanas of Islampur, Sarishabari and Melandaha
- MPO estimates from MPO technical support number 14
- Farm level fertilizer use survey (IFDC) April 91
- Regional agricultural research station of Jamalpur - Annual Report 1991
- Collection of secondary data from block supervisors of the six main Thanas in January 91 and results of field surveys (agro and socio-economic surveys: Feb/March 1991 and September 1992

The average yields obtained through the Consultant's field surveys and other sources, resulting from current cropping conditions frequently affected by flood hazard and other events, are presented below:

Table 5.2.2 Estimated Average Yields (MT/Ha) in Existing Situation

Crops	BBS 1989/91	MPO TR14 (NER)	Agro-economic surveys	Socio-economic surveys	DAE Jamalpur 1991
T.Aus			2.5		
L.Boro	3.15	2.4	3.2	2.2	2.0
HYV Boro	4.50	4.0	4.9	3.8	4.3
B.Aus	1.20	1.2	1.2	1.4	1.3
HYV Aus	2.40	3.4	2.5	2.0	2.9
L.T. Aman	2.15	1.6	2.3	1.6	1.8
HYV Aman	3.70	2.6	3.9	1.9	3.9
DWT Aman			1.2		
Wheat		2.0	2.5	1.5	2.0
Jute	1.55	1.4	1.7	1.3	1.6
Potato	7.70	11.5		5.3	11.2
Mustard	0.70	0.6	0.6	0.8	0.7
Pulses		0.7		0.7	0.7
Egg plant				8.0	10.0
Chilies				1.5	1.5
Onions				4.0	
Sugar cane			47.8	46.4	

(*) HYV Boro and potato 100% irrigated; wheat 50% irrigated.

Detailed results of the field surveys are given in Appendix G.

2.3 Cropping Patterns

As a result of a wide range of possible crops and in view of the irrigation facilities available, farmers can make best use of the available land by growing two and occasionally three crops per year on the same field.

Since rice is the major crop, it tends to dominate the cropping pattern, especially since the rapid development of irrigation.

Depending on land type, soil permeability and irrigation possibilities, rice cropping may be single or double. Triple cropping which would be possible only with short-term local varieties does not occur in the project area.

Each land type is associated with a set of cropping pattern. Single rice cropping is practised on lowlands: boro during the rabi season (over 3200 ha) and B. Aman during the kharif season (over 1500 ha).

Double rice cropping is practised generally in medium highlands (F1) and medium lowlands (F2). The most widespread cropping pattern in terms of land area consists of a succession of one crop of transplanted aman in the kharif season and one crop of boro irrigated in the rabi season (about 20,000 ha or more than one quarter of the net cultivated area).

Non-rice crops are grown generally in rotation with rice, except for a few special crops adapted to the silty-sand, permeable soils of the medium lowlands (groundnut, millet, sweet potato, which cover about 5500 ha or 7% of the NCA). Cropping patterns with aus - rabi crops cover nearly 10,000 ha.

In the kharif-I season, jute competes with aus for land and is considered a substitute crop for aus in cropping patterns. In the project area, the present distribution of aus/jute is approximately 65/35%. The distribution per Thana, as given in official statistics (BBS 1991), is presented below. The BBS statistics were also used to determine the distribution of the main rabi crops.

Table 5.2.3 Aus and Jute Distribution Per Thana					
Thana	Jamalpur	Dewanganj	Sarishabari	Islampur	Madarganj
Aus	70	80	55	60	60
Jute	30	20	45	40	40
Thana	Melandaha	Fulchari	Kazipur	Sariakandi	
Aus	60	80	75	60	
Jute	40	20	25	40	

Triple cropping, which is practised over some 8,000 ha in the project area (only on F0 and F1 land), is based essentially on an aus/jute succession in the kharif-I season, transplanted aman in the kharif-II season and rabi crops (wheat, pulses, spices, vegetables) in the dry season. Triple cropping is not practised every year by the farmers, but occurs generally one year in three. Consequently only 2/3 of triple cropping patterns mentioned by SRDI have been taken into account, the remaining areas being allocated to the T.Aman - HYV Boro cropping pattern.

Cropping patterns by land types, including the main crops are shown for each Thana and for the project area in tables 5.D.1 to 5.D.9 in Appendix D.

Table 5.2.4 summarises the distribution of the main cropping patterns in the present situation by land types illustrated by Figure 5.2.4.

Table 5.2.4 summarises the distribution of main crops in the present situation by Thana.

Table 5.2.4 Main Cropping Patterns - Existing Situation

Crop. inten. sity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							1530	5.2	605	12.2	2135	2.9
S	SUGAR CANE	-		1777	12.1	378	1.5					2155	2.9
S	BORO	-						1842	6.2	1354	27.2	3196	4.3
S	MILLET			39	0.3	606	2.4	878	3.0	479	9.6	2002	2.7
S	GROUNDNUT			39	0.3	187	0.8	1007	3.4	479	9.6	1712	2.3
S	B.AMAN							805	2.7	656	13.2	1461	2.0
S	S.W. POTATO			39	0.3	187	0.8	1096	3.7	479	9.6	1801	2.4
D	AUS	-WHEAT		454	3.1	426	1.7	2381	8.1	102	2.0	3363	4.5
D	AUS	-PULSES		73	0.5	62	0.2	412	1.4	13	0.3	559	0.8
D	AUS	-MUSTARD		262	1.8	254	1.0	1557	5.3	68	1.4	2141	2.9
D	AUS	-POTATO		142	1.0	137	0.6	659	2.2	26	0.5	965	1.3
D	AUS	-EGG PLANT		41	0.3	39	0.2	208	0.7	13	0.3	302	0.4
D	AUS	-CHILLIES		22	0.1	28	0.1	193	0.7	13	0.3	256	0.3
D	AUS	-ONION		22	0.1	19	0.1	133	0.5	6	0.1	179	0.2
D	AUS	-AMAN		1205	8.2	1043	4.2	69	0.2			2317	3.1
D	JUTE	-WHEAT		235	1.6	209	0.8	1547	5.2	34	0.7	2026	2.7
D	JUTE	-PULSES		44	0.3	37	0.1	239	0.8	4	0.1	324	0.4
D	JUTE	-MUSTARD		192	1.3	179	0.7	976	3.3	23	0.5	1370	1.9
D	JUTE	-POTATO		98	0.7	93	0.4	414	1.4	9	0.2	614	0.8
D	JUTE	-EGG PLANT		34	0.2	30	0.1	134	0.5	4	0.1	202	0.3
D	JUTE	-CHILLIES		17	0.1	21	0.1	131	0.4	4	0.1	174	0.2
D	JUTE	-ONION		18	0.1	15	0.1	90	0.3	2	0.0	124	0.2
D	JUTE	-AMAN		1104	7.5	950	3.8	46	0.2			2100	2.8
D	T.AMAN	-BORO		4722	32.1	15243	61.6					19965	27.0
D	T.AMAN	-PULSES				599	2.4					599	0.8
D	AUS+AMAN	-PULSES						4243	14.4	298	6.0	4542	6.1
D	AUS+AMAN	-CHILLIES						2449	8.3	100	2.0	2549	3.4
D	AUS+AMAN	-ONIONS						788	2.7	39	0.8	826	1.1
D	D.W.T. AMAN	-BORO						5732	19.4	164	3.3	5896	8.0
T	JUTE	-T.AMAN	-WHEAT	371	2.5	430	1.7					801	1.1
T	JUTE	-T.AMAN	-PULSES	741	5.0	699	2.8					1439	1.9
T	JUTE	-T.AMAN	-CHILLIES	439	3.0	388	1.6					827	1.1
T	JUTE	-T.AMAN	-ONIONS	330	2.2	314	1.3					644	0.9
T	AUS	-T.AMAN	-WHEAT	377	2.6	384	1.6					761	1.0
T	AUS	-T.AMAN	-PULSES	722	4.9	707	2.9					1429	1.9
T	AUS	-T.AMAN	-CHILLIES	517	3.5	501	2.0					1018	1.4
T	AUS	-T.AMAN	-ONIONS	628	4.3	582	2.4					1210	1.6
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW:					1530	5	605	12	2135	3
			SINGLE CROPPED	1895	13	1357	5	5628	19	3448	69	12328	17
			DOUBLE CROPPED	8684	59	19383	78	22402	76	924	19	51393	69
			TRIPLE CROPPED	4124	28	4005	16					8129	11
			TOTAL	14703	100	24745	100	29560	100	4977	100	73985	100
				20%:		33%:		40%:		7%:			
			CROP. INTENSITY	215		211		176		119		191	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

- MAIN CROPS BY THANA IN THE PRESENT SITUATION

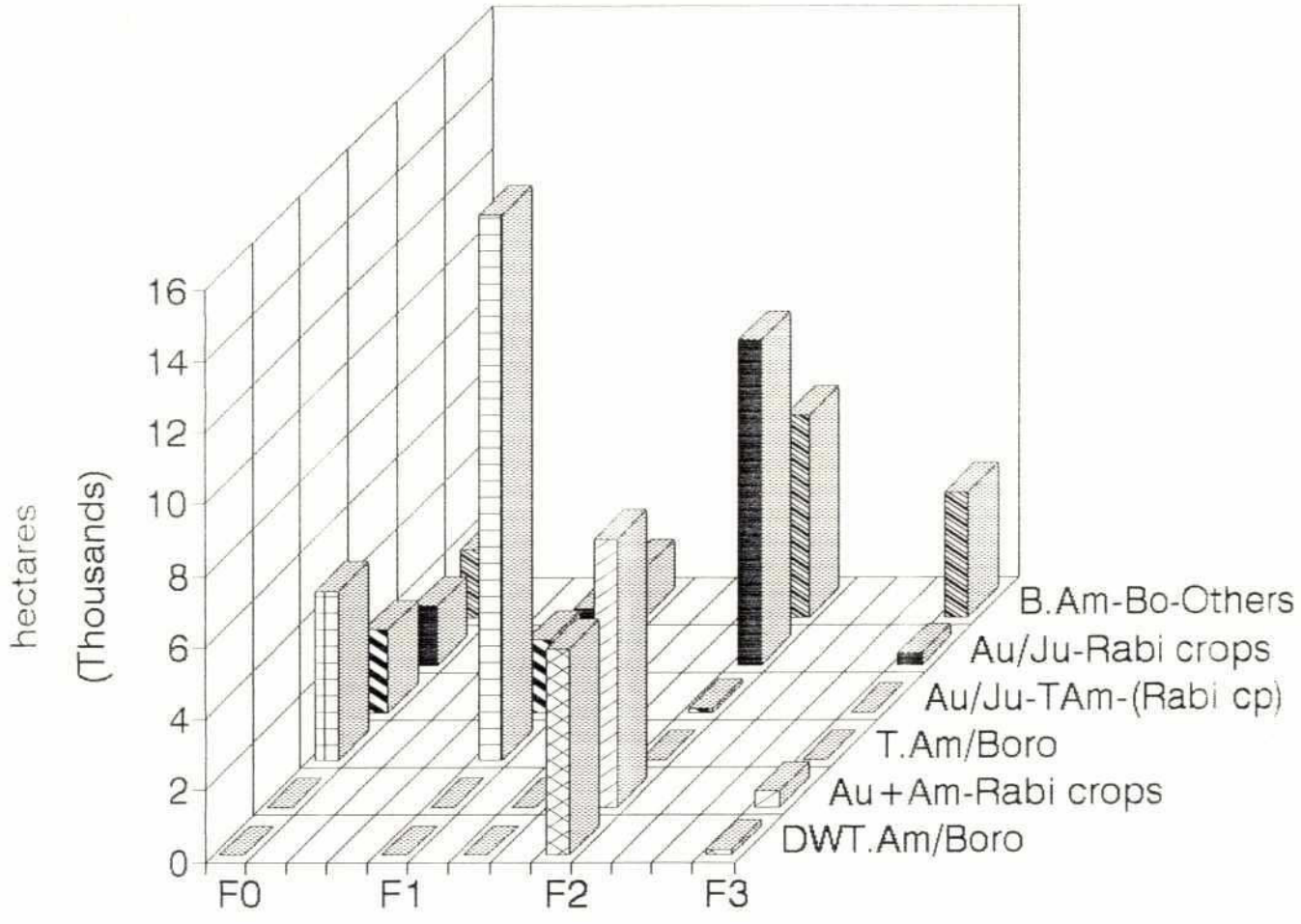
Table 5.2.5

UPAZILA :	DEWANGANJ		ISLAMPUR		JAMALPUR		MADARGANJ		MELANDAHA		SARISHABARI		FULCHARI		SARIAKANDI		KAZIPUR		TOTAL	
	ha		ha		ha		ha		ha		ha		ha		ha		ha		ha	
NCA	7023		11248		4758		17720		20694		8093		797		1322		2330		73985	
SUGAR CANE	789	11%	606	5%	113	2%			647	3%										
WHEAT	478	7%	854	8%	918	19%	1781	10%	913	4%	1505	19%	47	6%	119	9%	336	14%	6951	9%
PULSES	592	8%	2081	18%	476	10%	1675	9%	2387	12%	1280	16%	42	5%	191	14%	170	7%	8893	12%
MUSTARD	334	5%	465	4%	656	14%	697	4%	292	1%	747	9%	35	4%	70	5%	216	9%	3511	5%
POTATO	175	2%	273	2%	240	5%	274	2%	120	1%	368	5%	15	2%	27	2%	86	4%	1579	2%
JUTE	266	4%	1323	12%	791	17%	2958	17%	2831	14%	2031	25%	24	3%	210	16%	212	9%	10645	14%
VEGETABLES	231	3%	1195	11%	502	11%	1341	8%	3229	16%	1377	17%	16	2%	195	15%	225	10%	8311	11%
GROUNDNUT	733	10%					536	3%					157	20%			286	12%	1712	2%
MILLET	733	10%	66	1%			226	1%	445	2%			157	20%	89	7%	286	12%	2002	3%
SWEET POTATO	733	10%					536	3%					157	20%	89	7%	286	12%	1801	2%
L. BORO	158	2%	972	9%	113	2%	419	2%	1460	7%					74	6%			3196	4%
HYV BORO	1048	15%	4562	41%	1553	33%	6949	39%	9122	44%	2280	28%			150	11%	197	8%	25861	35%
L. AUS	947	13%	1702	15%	1596	34%	2619	15%	2439	12%	2126	26%	82	10%	268	20%	545	23%	12325	17%
HYV AUS	167	2%	300	3%	282	6%	462	3%	430	2%	375	5%	14	2%	47	4%	96	4%	2175	3%
L. AMAN	288	4%	2209	20%	819	17%	3017	17%	4763	23%	1295	16%			134	10%	56	2%	12582	17%
HYV AMAN	470	7%	3605	32%	1336	28%	4922	28%	7772	38%	2113	26%			219	17%	92	4%	20528	28%
B.AMAN							805	5%	656	3%									1461	2%
DWT. AMAN	484	7%	915	8%			2355	13%	1384	7%	552	7%			74	6%	132	6%	5896	8%
AUS/AMAN	481	7%	1118	10%	310	7%	1657	9%	2663	13%	1207	15%	35	4%	266	20%	180	8%	7917	11%
GRASSLAND/FALLOW	967	14%					552	3%			74	1%	170	21%	129	10%	243	10%	2135	3%
RICE	4043	58%	15383	137	6009	126	23205	131%	30690	148%	9948	123%	131	16%	1232	93%	1299	56%	91940	124%
TOTAL	10056		22081		9632		33630		40989		17126		952		2335		3625		140425	
CROPPING INTENSITY	1.43		1.96		2.02		1.90		1.98		2.12		1.19		1.77		1.56		1.91	
IRRIGATION (% of NCA)	1541	22%	5323	47%	2264	48%	8113	46%	9763	47%	3400	42%	39	5%	236	18%	451	19%	31130	42%

Source : CS 1992

FIGURE - 5.2.4

MAIN CROPPING PATTERNS
by land type in the project area



These cropping patterns were derived from the SRDI records established during semi-detailed surveys (scale 1:50 000) conducted between 1985 and 1990. These studies,based on systematic land surveys, are the most recent carried out over the entire project area.

Table 5.2.6 summarises the present land use and cropping intensity of the project area for each Thana.

The annual cropping intensity approaches 215% on F0 land, 210% on F1 land, while it is around 175% on F2 and drops to about 120% on F3 land.

For the entire region, the annual cropping intensity is close to 191%, with considerable discrepancies between the zones of the active flood plain close to the Jamuna (Char lands of Kazipur, Dewanganj and Fulchari), where the annual intensity is of the order of 150%, and the other zones where it approaches 200%.

Table 5.2.6 Land Use and Cropping Intensity In The Project Area

UPAZILA	Gross area ha	Fallow ha	Single cropped ha	Double cropped ha	Triple cropped ha	Net cultivated area (NCA) ha	%	Cropped area ha	Cropping intensity %
JAMALPUR	7042	0	226	4117	415	4758	68%	9705	204
			5%	87%	9%				
SHARISABARI	9800	74	0	6801	1218	8093	83%	17330	214
		1%	0%	84%	15%				
MELANDAHA	23974	0	3208	14113	3373	20694	86%	41553	201
		0%	16%	68%	16%				
ISLAMPUR	14621	0	1644	8211	1393	11248	77%	22245	198
		0%	15%	73%	12%				
DEWANGANJ	9564	967	3147	2766	143	7023	73%	10075	143
		14%	45%	39%	2%				
MADARGANJ	20865	552	2522	13230	1415	17720	85%	33781	191
		3%	14%	75%	8%				
FULCHARI	1136	170	472	155	0	797	70%	952	119
		21%	59%	19%	0%				
KAZIPUR	3412	243	857	1147	83	2330	68%	3643	156
		10%	37%	49%	4%				
SARIAKANDI	1828	129	252	853	88	1322	72%	2351	178
		10%	19%	65%	7%				
TOTAL	92242	2135	12330	51398	8129	73985	80%	141635	191
		3%	17%	69%	11%				

Source : SRDI 1990

2.4 Inputs Use

The rapid dissemination of HYVs and the possibilities of obtaining irrigation equipment (loans) have also promoted an increasing use of fertilisers and pesticides over the past 15 years.

However, these inputs are for the most part reserved for irrigated crops (covering one quarter of the cropped land area) and, overall, the quantities used are small.

As in the entire country, agriculture is based on the large reserve of non-specialised labour and the use of draught animals.

i) Fertilisers

The fertilisers used by the farmers are mainly urea, TSP and MP and some zinc and sulphur. Urea accounts for up to 70% of the total quantity of fertiliser, TSP 20/25% and MP 3/5%. The recent privatisation of fertiliser distribution (March 1989) has given new impetus to their distribution. However, their cost remains excessively high for small farms who not have any cash in hand. Small farmers have difficult access to the purchase of fertilizers in due time and in right quantity, which adversely affects crop productivity.

Most of the farms apply fertilisers to HYV boro. All other rice and jute crops are also fertilised, but minor crops (millet, sweet potatoes, groundnuts) are hardly fertilised. Sugar cane is heavily fertilised. The average doses applied per crop are presented in the crop data sheets given in Appendix A.

ii) Pesticides

Most of the farmers are familiar with pesticides. Their application are currently limited, however, to HYVs. The major difficulty encountered in using pesticides is their selection appropriate to the crops affected and the diseases. Farmers are ignorant of the proper doses to be applied, resulting in ineffective use of the pesticides.

In the rural markets pesticides are not generally available, and it is necessary to go to the larger towns to procure them. Major pesticides are Furadan, Dithane, Dimecron, Diazinon and Malathion.

iii) Irrigation

In the project area modern irrigation with deep tube wells (DTWs) and shallow tube wells (STWs) covers more than 90% of the total irrigated area, leaving only 5 to 6% to low lift pumps (LLPs) and manual irrigation by hand tube wells, swing baskets and doons. Modern irrigation has been practised for only two decades.

In the mid sixties LLPs were introduced, which made use of surface water for boro paddy, grown in the dry season (December to April). Later, in the early seventies, tubewells were installed to irrigate modern varieties of rice grown in the medium highlands (F1) and medium lowlands (F2), where there is a lack of surface water.

HYV Boro rice, cannot be grown without irrigation. Supplementary irrigation may be given to T.aman where there is drought. Potato is also irrigated. Sugar cane is only partly irrigated (10 to 15%). Wheat is partly irrigated (50%).

Net irrigation water requirements without considering the residual soil moisture content for some rabi crops are shown in Table 5.2.7. Detailed calculations are given in appendix B.

Table 5.2.8 shows the areas irrigated for each of the thanas in the study area. These areas were obtained on the basis of SRD data and by assigning the respective percentages of 100, 100, 50 and 10 to the main irrigated crops (HYV boro, potato, wheat and sugar cane). The total irrigated area for the zone will be about 31 100 ha, i.e. 42% of the net cultivated area (74 000 ha).

Almost half (between 46% and 48%) of the cultivated areas in the thanas of Islampur, Madarganj, Melandaha and Jamalpur are irrigated.

Table 5.2.7 Net Irrigation Water Requirements (m^3/ha)

Crop	Planting Transpla date	A	M	J	J	A	S	O	N	D	J	F	M	Year
Aman rice	01-08							80	800					880
Aman rice	15-08				50			80	923	351				1404
Boro rice	15-03	1002										624	2317	3943
Boro rice	15-02	848								610	2095	1211	1281	6045
Wheat	01-11								265	624	665	330		1884
Potato	15-11								201	406	607	676	74	1964
Sugarcane	01-10	463							616	592	532	668	761	3632
Aver.rainfall	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo	mm	147	152	117	118	114	111	109	84	71	68	87	127	1305

Table 5.2.8 Irrigated Crops In The Situation

THANA :	DEWANGANJ		ISLAMPUR		JAMALPUR		MADARGANJ		MELANDAHA	
	ha		ha		ha		ha		ha	
NCA	7023		11248		4758		17720		20694	
SUGAR CANE	79	11%	61	5%	11	2%	0	0%	647	3%
WHEAT	239	7%	427	8%	459	19%	890	10%	913	4%
POTATO	175	2%	273	2%	240	5%	274	2%	120	1%
HYV BORO	1048	15%	4562	41%	1553	33%	6949	39%	9122	44%
TOTAL	1541		5323		2264		8113		40989	
IRRIGATION	1541	22%	5323	47%	2264	48%	8113	46%	9763	47%

THANA :	SARISHABARI		FULCHARI		SARIAKANDI		KAZIPUR		TOTAL	
	ha		ha		ha		ha		ha	
NCA	8093		797		1322		2330		73985	
SUGAR CANE	0		0		0		0		0	
WHEAT	752	19%	24	6%	59	9%	168	14%	3475	
POTATO	368	5%	15	2%	27	2%	86	4%	1579	
HYV BORO	2280	28%	0	0%	150	11%	197	8%	25861	
TOTAL	3400		39		236		451		30915	
IRRIGATION	3400	42%	39	5%	236	18%	451	19%	31130	

iv) Labour use

Agriculture in Bangladesh is still traditional where human labour and bullock power are widely used. Use of power tillers and tractors by common farmers is a rare phenomenon in the study area. Labour use is greater in the transplanting of aman and boro (HYV) and in weeding jute and boro (HYV). Besides family labour, manpower is hired whenever necessary. Hiring is done mainly in the transplanting and harvesting seasons.

There are three categories of hired labour:

- permanent labour or labour attached to a family for a season or a year as mutually decided;
- casual hired labour - contracted on a day to day basis;
- contract labour, where labourers either individually or in a group take specific jobs under contract.

Large farm households try to engage permanent hands as well as engaging casual labour in different farm operations.

Generally, harvesting of boro is contracted out as this is a very critical job and the time available is very short. Casual labour is the principal class of wage labour in the study area.

Regarding wages, there are different forms. Permanent hands are paid cash in addition to food and lodging provided by the farmers. Casual labour is paid on daily basis, mostly in cash plus food (2-3 times a day). Cash payment is more prevalent in the commercial centres and in the villages located near the towns. In the case of contract work, either cash or kind is paid. Kind payment is observed in the case of the harvest of boro paddy.

Wages vary from area to area and season to season, but there are no reliable records of such wage movement. Existing wage rates are very low as the supply of labour is abundant (Tk 40-50/day).

v) Draught power

Animal power is the prevalent form of draft power in agricultural operations.

The predominant use is in land preparation, threshing of crops and transportation. A large number of farm households, especially the small farmers, do not possess any draught animals. Instead, they hire in or exchange draught power either on a daily basis or under contract.

Land preparation for crop growing is done by bullock-driven wooden ploughs. One pair of bullocks can plough 0.15 ha of land in a day. To prepare land for seeding or transplanting, 4-6 ploughing are necessary.

2.5 Major Constraints for Agricultural Production

2.5.1 Physical Constraints

The most important factor limiting production in rainfed areas is the lack of control over water. Both moisture deficiency and excesses of rain contribute to instability in agricultural production. The main risks facing crops in the project area are:

- heavy pre-monsoon rains which affect aus/jute yields by damaging the young plants,
- early quick floods which damage not only aus, aman and jute but also the mature boro crop (May-June)
- total submersion of rice for more than 3 to 7 days (depending on the variety) which may occur in flood-prone areas, partially destroys the rice crop
- failure of early rains, delaying sowing of aus and jute, which in turn delays the transplanting of the aman crop
- failure of rain at the end of the monsoon period when aman is flowering affects it adversely.

Normal seasonal floods, which come in July and gradually recede in September, are regarded by the farmers as a blessing, depositing silt and recharging the water table. The depths of the floods vary from year to year. Occasionally high early floods and late floods from the Jamuna and the old Brahmaputra are damaging to crops in the flood plain.

Uncertainty linked with the risks of flooding limits the intensification of irrigated agriculture, which is only possible in areas that are protected against floods. High cropping intensities with improved technologies are only possible under irrigated agriculture if the land is not constrained by flooding depths. In the study area irrigated agriculture is limited to about 31,100 ha, i.e. 42% of the net cultivated area.

Drainage difficulties, which prevent the rapid retreat of floods, restrict the availability of land for growing transplanted aman, which could be an attractive replacement for broadcast aman and mixed aus/aman crops.

2.5.2 Institutional Constraints

Institutional constraints regarding the functioning of the agricultural extension service and agricultural research institutions are described in the annex on sociology.

2.6 Crop Damage

Damage to crops, livestock and agriculture generally occur at the beginning of the monsoon season, principally affecting the newly transplanted Aman fields. Their extent is proportional to the severity of floods and will decrease according to the level of protection brought by the forecast development works. Crops which are more subject to damages in the project area are T.Aman, B.Aman and HYV Boro which is harvested until end of June. The following periods are critical for the crops:

Aman	:	July 1 to September 30
HYV Boro	:	May 1 to June 30 (early - Sudden floods)

Estimates for flood damages on agricultral production are provided by the Bangladesh Bureau of Statistics (BBS). They are based on data from the Department of Agricultural Extension (DAE) and presented in the Table 5.2.9 (except for 1987 and 1988, considered as exceptional years).

Table 5.2.9 Flood Damages to Rice Crops (Jamalpur District)

Year	Crop	Area	Prod.	Avg. Yield	Damaged Areas				Production Losses			
		ha	t	t/ha	Comp. ha	Part. ha	Total ha	Total %	t	t/ha	%	Global %
1983	B.Aman	28794	23904	0.83	240	2225	2465	8	488	0.20	24	2
	L.T.Aman	132584	155311	1.17	7093	28538	35631	26	21765	0.61	52	13
	HYV Aman	31650	51674	1.63	1273	6226	7498	23	6117	0.82	50	11
1984	HYV Boro	34998	89036	2.54	115	502	617	2	396	0.64	25	0
	L.T.Aman	130514	1588435	1.21	6550	11860	18410	13	7316	0.40	33	4
	HYV Aman	25433	51470	2.02	530	1133	1663	6	833	0.50	25	2
1986	HYV Boro	41211	110465	2.68	597	5583	6180	15	7584	1.23	46	7

Source: BBS, Yearbook of Agricultural statistics, 1987-88.

In the above table, crop losses are given both in terms of production and areas totally or partially damaged. With the exception of the exceptional floods of 1987 and 1988 , the years for which data are available are 1983 and 1984 for Aman and 1984 and 1985 for HYV Boro. This gives a valuable idea of the impact of the floods on yields during normal years.

On this basis, the average rates of damaged areas for the major crops, compared with respective yield reduction, are assumed as follows:

	Damaged Areas	Yield Reduction
LT Aman	20%	43%
HYV Aman	15%	38%
HYV Boro	8%	36%

Globally, the mean percentage of normally occurring losses has thus been estimated as follows:

8.5% for LT Aman,
8.0% for HYV Aman,
9.0% for HYV Boro.

For the Project, as a conservative approach, it has been assumed that yield losses as well as affected areas are both in the range of 25%, representing about 6% of global losses. These rates only apply to land types F1, F2 and F3, it being assumed that there is no damage on F0 land.

2.7 Livestock

As in other parts of the country, livestock is an integral part of the farming system in the project area, in spite of the fact that land is not available for grazing and scarcity of animal feed. The animals live almost entirely on the by-products of crops grown for human consumption.

Livestock is kept as a supporting activity to crop production and as a secondary source of income.

The most important types of livestock in the area are cattle, goats, chickens and ducks. Buffaloes, horses and sheep are rare.

According to the Agriculture and Livestock census of 1983/84, about 65% of all total households had cattle. Table 5.D.10 in Appendix D shows the main results of this livestock census.

Table 5.D.11 in Appendix D shows a summary of livestock population in 1990/91. Cattle were the most important livestock in the project area. Bullocks are kept mainly for draft purposes and cows for production of milk and calves. Sometimes cows are used for draft purposes.

Paddy straw, wheat straw, pulse straw and grasses are the main feedstuffs for cattle. HYV aman and boro are the main sources of paddy straw. Roadside grasses and weeds from crop fields and fallow, sugarcane tops and pulses are the main sources of green feedstuffs. Table 5.D.12 in Appendix D presents the straw production in the present situation.

On average, ignoring losses, the daily ration of a cow is less than 4 kg of straw - a very low figure. Only those with large farms have the possibility of feeding their cattle with oil cake, rice bran and wheat bran together with rice straw and grasses.

The increasing proportion of straw of HYV boro in animal feed causes gradual emaciation of the cattle, mainly due to the high lignin and silicate content of the straw.

The quality of paddy straw, which is the main feedstuff of cattle, will not be improved by an agricultural development project based on an increased area of HYV.

Animal outputs are first destined for self-consumption. Their value can be estimated as follows, per cultivated area per year:

•	Milk	300 l x 1.35 cows/ha x 0.7 x 12 Tk = Tk 3402
•	Calf	1.35 cows/ha x 0.7 x 700 Tk = Tk 661
•	Goat/ sheep kid	1.9 x 0.7 x 150 Tk = Tk 200
•	Chicken/duck	30 x 14 Tk = Tk 420
•	Total	Tk 4683

The inputs consisting of farm by-products and roughage may be neglected, except for straw, the consumption of which may be estimated at 5 kg/day/cow, representing a value of 3000 Tk per hectare. Finally, the value added of animal production is about 1500 Tk per hectare.

Cattle perform the vital task of land preparation. The estimated number of draught animals is about 100 000.

If it is borne in mind that 50% of the cows are draft animals, a ratio of 1 pair of draft oxen to about 1.5 ha is obtained, which corresponds with the work force needed per hectare (FAP 12 considers that a pair of good oxen can plough 4 acres of land). Apparently, there is no shortage of draft power in the region. However, many small farmers do not possess any draft animals or only one, which they have to share with others for ploughing operations.

Goats, the second most important ruminant in the area are kept by all types of households. About 53% of all farm households possess goats. Sheep are rare in the area. No special attention is given to their feeding and management.

Chickens are very common in the project area. Ducks are kept mostly in the low lying areas where more natural feeds are available. Diseases like Ranikhet (Newcastle disease) and foul cholera are quite common and take a heavy toll every year.

3 POTENTIAL AGRICULTURAL DEVELOPMENT

3.1 Foreword

Land in the project area is already used intensively, as the cropping intensity is more than 200% except in areas along the Jamuna (Char lands), which are directly affected by the river's meandering and change of bed.

A large proportion of the land (F2 and F3 lands) is nevertheless subject to excessively deep submersion and risk of damage and can be developed by using advanced technologies (irrigation, HYVs), which would require major capital investment, careful land preparation and a higher level of inputs.

Controlled flooding, with protection of agricultural lands from early floods and improved drainage, will provide opportunities for higher production levels per ha through controlled and shorter inundation periods faciliting better farming methods, higher resource investment in inputs, the use of HYVs and the extension of the growing period.

Newly improved varieties released by BARI,BRRI,BJRI have been introduced through the Agricultural Extension services. These varieties are adapted to the local growing conditions. Special emphasis has been laid on the improvement of rice, wheat,potatoes,oilseeds,sugercanes and vegetables.Recommended varieties of crops are given in appendix I.

3.2 Future Yields

Prediction of future yields is the most sensitive factor in the estimation of the agricultural benefits. Studying trends in crop yields is particularly complicated because it is necessary to assess the progress of new varieties, changes in input use, climate influence, and others factors such as pest attacks.

Moreover, yields obtained by research are potential ones, which may not be achieved by all farmers owing to the particular conditions prevailing at present in the project area (flooding, difficulties in drainage, inadequate supply of inputs).

For all these reasons, it has been considered here that the progress of productivity that could be ascribed to the project implementation would exclusively proceed from the shifting from flood prone conditions to damage-free conditions and from the consequent changes in cropping parrterns due to land type redistribution.

On the basis of assumptions made above on crop damages (para 2.6), two sets of average yields have been estimated for crops subject to flood damages. They are presented in the Table 5.3.1.

With respect to the other crops, it has been assumed that a single yield level, corresponding to a single inputs level, is applicable in both the with (W) and without (WO) project conditions. These yield levels were finally adopted after consultation and analysis of existing information and after observation of the results of field surveys. These are also shown in the Table 5.3.1.

Table 5.3.1 Crop Yields Estimates In The Present and Future Situations

Rice Crops	Damaged Land		Damage-free Land		Total	
	Area ha	Yield t/ha	Area ha	Yield t/ha	Area ha	Av. Yield t/ha
B.Aus			12325	1.20	12325	1.20
HYV Aus			2175	3.00	2175	3.00
B.Aman	365	1.13	1096	1.50	1461	1.41
DWT Aman	1474	1.13	4422	1.50	5896	1.41
Mix. Aus + Aman	1979	1.31	5938	1.75	7917	1.64
L.T. Aman	2192	1.65	11052	2.20	13244	2.11
HYV Aman	3289	2.81	16577	3.75	19866	3.59
L.Boro			3196	2.50	3196	2.50
HYV Boro	5284	3.38	20577	4.50	25861	4.27

Other Crops assumed to be unaffected by normal damage.

Crop	Av. Yield (t/ha)	Crop	Av. Yield (t/ha)
Wheat	2.00	Onions	3.50
Jute	1.70	Egg plant	5.00
Potato	8.00	Chilies	1.50
Mustard	0.80	Millet	0.80
Pulses	0.85	Groundnut	1.30
Sugar cane	45.00	Sweetpotato	6.50

3.3 Description of Alternative Situations Studied

3.3.1 Without Project (WO) Situation

The basic situation of the project area, on which the reference situation and forecast alternatives will be built up, is shown in Table 5.3.2.

The assumptions made with regard to the increase in agricultural development under future without project condition were the following:

- No modification in cropping intensity. It is already close to or above 200% in the main Thanas of the project area,
- No modification in cropping patterns, except for B. Aman which will progressively be replaced by HYV Boro (for 1,461 ha) during the whole period of the project,
- No modification in the stock-breeding situation, which is of relatively little importance in the region's agricultural development (the value added of stock-breeding is only about 5% of the value added of agriculture as a whole).

The crop distribution per land type, for the future situation is shown in Table 5.3.3.

The increase in areas of B. Aman will enable HYV boro to be extended to about 27,300 ha (about 37% of the NCA).

Irrigated areas, which currently amount to 31200 ha will increase to 32,600 ha.

The change from B. Aman to HYV Boro will result in an increase in rice production of about 4,100 tonnes.

Table 5.3.4 shows the areas and productions of the main crops in the reference situation (W0). (Future without project situation).

Table 5.3.5 to 5.3.10 show the evoluton during the Project period of rice areas, damaged rice areas, other crop areas, production of crops, rice production and operating costs.

Table 5.3.2 Main Cropping Patterns - Existing Situation

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							1530	5.2	605	12.2	2135	2.9
S	SUGAR CANE	-		1777	12.1	378	1.5					2155	2.9
S	BORO	-						1842	6.2	1354	27.2	3196	4.3
S	MILLET			39	0.3	606	2.4	878	3.0	479	9.6	2002	2.7
S	GROUNDNUT			39	0.3	187	0.8	1007	3.4	479	9.6	1712	2.3
S	B.AMAN							805	2.7	656	13.2	1461	2.0
S	S.W. POTATO			39	0.3	187	0.8	1096	3.7	479	9.6	1801	2.4
D	AUS	-WHEAT		454	3.1	426	1.7	2381	8.1	102	2.0	3363	4.5
D	AUS	-PULSES		73	0.5	62	0.2	412	1.4	13	0.3	559	0.8
D	AUS	-MUSTARD		262	1.8	254	1.0	1557	5.3	68	1.4	2141	2.9
D	AUS	-POTATO		142	1.0	137	0.6	659	2.2	26	0.5	965	1.3
D	AUS	-EGG PLANT		41	0.3	39	0.2	208	0.7	13	0.3	302	0.4
D	AUS	-CHILLIES		22	0.1	28	0.1	193	0.7	13	0.3	256	0.3
D	AUS	-ONION		22	0.1	19	0.1	133	0.5	6	0.1	179	0.2
D	AUS	-AMAN		1205	8.2	1043	4.2	69	0.2			2317	3.1
D	JUTE	-WHEAT		235	1.6	209	0.8	1547	5.2	34	0.7	2026	2.7
D	JUTE	-PULSES		44	0.3	37	0.1	239	0.8	4	0.1	324	0.4
D	JUTE	-MUSTARD		192	1.3	179	0.7	976	3.3	23	0.5	1370	1.9
D	JUTE	-POTATO		98	0.7	93	0.4	414	1.4	9	0.2	614	0.8
D	JUTE	-EGG PLANT		34	0.2	30	0.1	134	0.5	4	0.1	202	0.3
D	JUTE	-CHILLIES		17	0.1	21	0.1	131	0.4	4	0.1	174	0.2
D	JUTE	-ONION		18	0.1	15	0.1	90	0.3	2	0.0	124	0.2
D	JUTE	-AMAN		1104	7.5	950	3.8	46	0.2			2100	2.8
D	T.AMAN	-BORO		4722	32.1	15243	61.6					19965	27.0
D	T.AMAN	-PULSES				599	2.4					599	0.8
D	AUS+AMAN	-PULSES						4243	14.4	298	6.0	4542	6.1
D	AUS+AMAN	-CHILLIES						2449	8.3	100	2.0	2549	3.4
D	AUS+AMAN	-ONIONS						788	2.7	39	0.8	826	1.1
D	D.W.T. AMAN	-BORO						5732	19.4	164	3.3	5896	8.0
T	JUTE	-T.AMAN	-WHEAT	371	2.5	430	1.7					801	1.1
T	JUTE	-T.AMAN	-PULSES	741	5.0	699	2.8					1439	1.9
T	JUTE	-T.AMAN	-CHILLIES	439	3.0	388	1.6					827	1.1
T	JUTE	-T.AMAN	-ONIONS	330	2.2	314	1.3					644	0.9
T	AUS	-T.AMAN	-WHEAT	377	2.6	384	1.6					761	1.0
T	AUS	-T.AMAN	-PULSES	722	4.9	707	2.9					1429	1.9
T	AUS	-T.AMAN	-CHILLIES	517	3.5	501	2.0					1018	1.4
T	AUS	-T.AMAN	-ONIONS	628	4.3	582	2.4					1210	1.6
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW:					1530	5	605	12	2135	3
			SINGLE CROPPED	1895	13	1357	5	5628	19	3448	69	12328	17
			DOUBLE CROPPED	8684	59	19383	78	22402	76	924	19	51393	69
			TRIPLE CROPPED	4124	28	4005	16					8129	11
			TOTAL	14703	100	24745	100	29560	100	4977	100	73985	100
				20%		33%		40%		7%			
			CROP. INTENSITY	215		211		176		119		191	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

Table 5.3.3 Main Cropping Patterns - Future Situation Without Project

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							1530	5.2	605	12.2	2135	2.9
S	SUGAR CANE	-		1777	12.1	378	1.5					2155	2.9
S	BORO	-						2647	9.0	2010	40.4	4657	6.3
S	MILLET			39	0.3	606	2.4	878	3.0	479	9.6	2002	2.7
S	GROUNDNUT			39	0.3	187	0.8	1007	3.4	479	9.6	1712	2.3
S	B.AMAN												
S	S.W. POTATO			39	0.3	187	0.8	1096	3.7	479	9.6	1801	2.4
D	AUS	-WHEAT		454	3.1	426	1.7	2381	8.1	102	2.0	3363	4.5
D	AUS	-PULSES		73	0.5	62	0.2	412	1.4	13	0.3	559	0.8
D	AUS	-MUSTARD		262	1.8	254	1.0	1557	5.3	68	1.4	2141	2.9
D	AUS	-POTATO		142	1.0	137	0.6	659	2.2	26	0.5	965	1.3
D	AUS	-EGG PLANT		41	0.3	39	0.2	208	0.7	13	0.3	302	0.4
D	AUS	-CHILLIES		22	0.1	28	0.1	193	0.7	13	0.3	256	0.3
D	AUS	-ONION		22	0.1	19	0.1	133	0.5	6	0.1	179	0.2
D	AUS	-AMAN		1205	8.2	1043	4.2	69	0.2			2317	3.1
D	JUTE	-WHEAT		235	1.6	209	0.8	1547	5.2	34	0.7	2026	2.7
D	JUTE	-PULSES		44	0.3	37	0.1	239	0.8	4	0.1	324	0.4
D	JUTE	-MUSTARD		192	1.3	179	0.7	976	3.3	23	0.5	1370	1.9
D	JUTE	-POTATO		98	0.7	93	0.4	414	1.4	9	0.2	614	0.8
D	JUTE	-EGG PLANT		34	0.2	30	0.1	134	0.5	4	0.1	202	0.3
D	JUTE	-CHILLIES		17	0.1	21	0.1	131	0.4	4	0.1	174	0.2
D	JUTE	-ONION		18	0.1	15	0.1	90	0.3	2	0.0	124	0.2
D	JUTE	-AMAN		1104	7.5	950	3.8	46	0.2			2100	2.8
D	T.AMAN	-BORO		4722	32.1	15243	61.6					19965	27.0
D	T.AMAN	-PULSES				599	2.4					599	0.8
D	AUS+AMAN	-PULSES						4243	14.4	298	6.0	4542	6.1
D	AUS+AMAN	-CHILLIES						2449	8.3	100	2.0	2549	3.4
D	AUS+AMAN	-ONIONS						788	2.7	39	0.8	826	1.1
D	D.W.T. AMAN	-BORO						5732	19.4	164	3.3	5896	8.0
T	JUTE	-T.AMAN	-WHEAT	371	2.5	430	1.7					801	1.1
T	JUTE	-T.AMAN	-PULSES	741	5.0	699	2.8					1439	1.9
T	JUTE	-T.AMAN	-CHILLIES	439	3.0	388	1.6					827	1.1
T	JUTE	-T.AMAN	-ONIONS	330	2.2	314	1.3					644	0.9
T	AUS	-T.AMAN	-WHEAT	377	2.6	384	1.6					761	1.0
T	AUS	-T.AMAN	-PULSES	722	4.9	707	2.9					1429	1.9
T	AUS	-T.AMAN	-CHILLIES	517	3.5	501	2.0					1018	1.4
T	AUS	-T.AMAN	-ONIONS	628	4.3	582	2.4					1210	1.6
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW					1530	5	605	12	2135	3
			SINGLE CROPPED	1895	13	1357	5	5628	19	3448	69	12328	17
			DOUBLE CROPPED	8684	59	19383	78	22402	76	924	19	51393	69
			TRIPLE CROPPED	4124	28	4005	16					8129	11
			TOTAL	14703	100	24745	100	29560	100	4977	100	73985	100
				20%		33%		40%		7%			
			CROP. INTENSITY	215		211		176		119		191	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

Table 5.3.4 Reference Situation [WO] - Areas and Production

Crops	Present situation Areas (ha)	Yield (t/ha)	Production (t)	Gross value MTk	Future situation Areas (ha)	Yield (t/ha)	Production (t)	Gross value MTk
L.Boro	3196	2.50	7990	50282	3196	2.50	7990	50282
HYV Boro	25861	4.27	110430	658627	27322	4.27	116595	695396
B. Aus	12324	1.20	14790	97401	12324	1.20	14790	97401
HYV Aus	2175	3.00	6525	38935	2175	3.00	6525	38935
L.T. Aman	13244	2.11	27931	181328	13244	2.11	27931	181328
HYV Aman	19866	3.59	71414	444538	19866	3.59	71414	444538
B. Aman	1461	1.41	2055	13341				
DWT. Aman	5896	1.41	8291	60677	5896	1.41	8291	60677
Mix. Aus+Aman	7917	1.64	12989	84391	7917	1.64	12989	84391
Total paddy	91940	2.85	262415	1629519	91940	2.90	266525	1652947
Wheat	6951	2.00	13902	122407	6951	2.00	13902	122407
Jute	10645	1.70	18096	213922	10645	1.70	18096	213922
Sugar cane	2155	45.00	96975	87568	2155	45.00	96975	87568
Potato	1579	8.00	12632	50339	1579	8.00	12632	50339
Mustard	3511	0.80	2809	33287	3511	0.80	2809	33287
Pulses	8892	0.85	7558	98103	8892	0.85	7558	98103
Vegetables	8311		20196	149495	8311		20196	149491
Millet	2002	0.80	1602	11150	2002	0.80	1602	11150
Groundnut	1712	1.30	2226	19366	1712	1.30	2226	19366
Sweet potato	1801	6.50	11706	30553	1801	6.50	11706	30553
Sub-t.other crops	47559			816189	47559			816185
TOTAL	139499			2445708	139499			2469132
Irrigated area	31131	42%			32592	44%		
Fallow/grassland	2135	3%			2135	3%		
Single cropping	12327	17%			12327	17%		
Double cropping	51393	69%			51393	69%		
Triple cropping	8129	11%			8129	11%		
Cropping intensity	191%				191%			

Source: Consultant's calculation; results of simulation.
Notes: Future situation is given for 2022
Gross value is calculated with economic prices.

Table 5.3.5

JPPS WITHOUT PROJECT SITUATION — RICE AREAS										
YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
Loc. AUS HA	12324	12324	12324	12324	12324	12324	12324	12324	12324	12324
HYV AUS HA	2175	2175	2175	2175	2175	2175	2175	2175	2175	2175
AUS + AMAN HA	7917	7917	7917	7917	7917	7917	7917	7917	7917	7917
DWT. AMAN HA	5896	5896	5896	5896	5896	5896	5896	5896	5896	5896
B. AMAN HA	1461	1410	1360	1309	1259	1209	856	604	352	0
Loc. AMAN HA	13244	13244	13244	13244	13244	13244	13244	13244	13244	13244
HYV AMAN HA	19866	19866	19866	19866	19866	19866	19866	19866	19866	19866
Loc. BORO HA	3196	3196	3196	3196	3196	3196	3196	3196	3196	3196
HYV BORO HA	25861	25911	25961	26012	26062	26112	26465	26717	26969	27322
RICE HA	91940	91939	91939	91939	91939	91939	91939	91939	91939	91940

Table 5.3.6

JPPS WITHOUT PROJECT SITUATION — DAMAGED RICE AREAS										
YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
HYV AMAN RICE 1 HA	3289	3289	3289	3289	3289	3289	3289	3289	3289	3289
L.T. AMAN RICE 1 HA	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192
B. AMAN RICE 1 HA	365	352	340	327	315	302	214	151	88	0
DWT. AMAN RICE 1 HA	1474	1474	1474	1474	1474	1474	1474	1474	1474	1474
AUS/AMAN RICE 1 HA	1979	1979	1979	1979	1979	1979	1979	1979	1979	1979
HYV BORO RICE 1 HA	5284	5297	5309	5322	5334	5347	5435	5498	5561	5649
AN. AGRI. DAMAGES '000 TK - Eco. prices	73033	73086	73140	73194	73248	73302	73678	73947	74216	74593

Source : Consultant's calculations - Agroeconomical simulation.

Table 5.3.7 JPPS Without Project Situation - Crop Areas

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
MILLET 0 HA	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002
GROUNDNUT 0 HA	1712	1712	1712	1712	1712	1712	1712	1712	1712	1712
SW. POTATO 0 HA	1801	1801	1801	1801	1801	1801	1801	1801	1801	1801
MUSTARD HA	3511	3511	3511	3511	3511	3511	3511	3511	3511	3511
PULSES HA	8892	8892	8892	8892	8892	8892	8892	8892	8892	8892
POTATO HA	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579
JUTE HA	10645	10645	10645	10645	10645	10645	10645	10645	10645	10645
WHEAT HA	6951	6951	6951	6951	6951	6951	6951	6951	6951	6951
VEGETABLES HA	8311	8311	8311	8311	8311	8311	8311	8311	8311	8311
SUGAR CANE HA	2155	2155	2155	2155	2155	2155	2155	2155	2155	2155
CULTIVATED AREA	73984	73984	73984	73984	73984	73984	73984	73984	73984	73984
SINGLE CROPPED AREA	12327	12327	12327	12327	12327	12327	12327	12327	12327	12327
DOUBLE CROPPED AREA	51393	51393	51393	51393	51393	51393	51393	51393	51393	51393
TRIPLE CROPPED AREA	8129	8129	8129	8129	8129	8129	8129	8129	8129	8129
GRASSLAND/FALLOW HA	2135	2135	2135	2135	2135	2135	2135	2135	2135	2135
IRRIGATION HA	31131	31181	31232	31282	31333	31383	31736	31987	32239	32592
CROPPING INTENSITY %	191	191	191	191	191	191	191	191	191	191

Table 5.3.8 JPPS Without Project Situation - Production (Tons)

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
JUTE PRODUCTION	18096	18096	18096	18096	18096	18096	18096	18096	18096	18096
WHEAT PRODUCTION	13902	13902	13902	13902	13902	13902	13902	13902	13902	13902
S. CANE PRODUCTION	96975	96975	96975	96975	96975	96975	96975	96975	96975	96975
MUSTARD PRODUCTION	2809	2809	2809	2809	2809	2809	2809	2809	2809	2809
POTATO PRODUCTION	12632	12632	12632	12632	12632	12632	12632	12632	12632	12632
S.POTATO PRODUCTION	11706	11706	11706	11706	11706	11706	11706	11706	11706	11706
VEGETAB. PRODUCTION	20196	20196	20196	20196	20196	20196	20196	20196	20196	20196
MILLET PRODUCTION	1602	1602	1602	1602	1602	1602	1602	1602	1602	1602
G'NUT PRODUCTION	2226	2226	2226	2226	2226	2226	2226	2226	2226	2226
PULSES PRODUCTION	7558	7558	7558	7558	7558	7558	7558	7558	7558	7558
GROSS VALUE CROPS '000 TK-Eco. prices	2445708	2446516	2447324	2448132	2448939	2449747	2455401	2459440	2463478	2469132

Table 5.3.9 JPPS Without Project Situation - Rice Productions (Tons)

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
L AUS RICE PROD.	14790	14790	14790	14790	14790	14790	14790	14790	14790	14790
HYV AUS RICE PROD.	6525	6525	6525	6525	6525	6525	6525	6525	6525	6525
L T AMAN RICE PROD.	27931	27931	27931	27931	27931	27931	27931	27931	27931	27931
B AMAN RICE PROD.	2055	1984	1913	1842	1771	1700	1204	850	496	0
DWT AMAN RICE PROD.	8291	8291	8291	8291	8291	8291	8291	8291	8291	8291
HYV AMAN RICE PROD.	71414	71414	71414	71414	71414	71414	71414	71414	71414	71414
AUS/AMAN RICE PROD.	12989	12989	12989	12989	12989	12989	12989	12989	12989	12989
L BORO RICE PROD.	7990	7990	7990	7990	7990	7990	7990	7990	7990	7990
HYV BORO RICE PROD.	110430	110643	110855	111068	111280	111493	112981	114043	115106	116594
AUS RICE PRODUCTION	27809	27809	27809	27809	27809	27809	27809	27809	27809	27809
AMAN RICE PRODUCTION	116186	116115	116044	115973	115902	115832	115336	114981	114627	114131
BORO RICE PRODUCTION	118420	118633	118845	119058	119270	119483	120971	122033	123096	124584
RICE PRODUCTION	262415	262557	262699	262840	262982	263124	264116	264824	265533	266524
STRAW PRODUCTION	262593	262693	262792	262891	262990	263089	263784	264280	264776	265471

Table 5.3.10 JPPS Without Project Situation - Operating Costs ('000 Tk) - Economic Prices

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
INPUTS	669464	669742	670021	670300	670578	670857	672807	674200	675594	677544
FERTILIZERS	190284	190382	190479	190577	190674	190772	191454	191941	192428	193111
PESTICIDES	45328	45353	45379	45404	45430	45455	45633	45760	45887	46065
SEEDS/PLANTS	90656	90630	90603	90577	90550	90523	90337	90204	90071	89885
IRRIGATION	86917	87076	87235	87394	87552	87711	88822	89615	90409	91520
DRAUGHT POWER	256278	256301	256325	256349	256372	256396	256562	256680	256798	256964
AG. MANPOWER	733309	733460	733611	733762	733913	734064	735122	735878	736634	737692
AG. MANPOWER man-year	67428	67442	67456	67469	67483	67497	67594	67664	67733	67831
AG.CONTINGENCIES	140277	140320	140363	140406	140449	140492	140793	141008	141223	141524
AG. PRODUCTION COSTS	1543050	1543522	1543995	1544468	1544940	1545413	1548722	1551086	1553450	1556759

3.3.2 Option A

In this option, the planned works programme does not provide for any heavy control structures. Only drainage improvement measures will enable a reduction in the period of submersion, which affects mainly type F2 land.

Most of the major and minor natural depressions are located in MELANDAHA and ISLAMPUR Thana (32 000 ha) other minor water-bodies related to a deficient cross drainage along man-made obstacles can be considered as spread over all project's Thana (74 000 ha).

In quantitative terms, the following has been established:

- Grouped beels identified on the 4" to a mile map: 13 (total number of beels 47) with catchments in excess of 100 ha, say 200 ha.

- Individual small beels identified on the 4" to a mile map: 42, with catchments of about 20 ha each.

- Minor water bodies: 300, with a tentatively concerned catchment area of about 2 ha each.

Therefore, the total area concerned by the drainage improvements would be as follows:

Grouped beels	2,600
Individual beels	840
Minor water bodies	600
Total	4,040
	say 4,000 ha

Drainage improvements alone, without flood control, will have an impact in terms of water depth duration at the end of monsoon season, mainly on account of the accelerated drainage of accumulated water during rainfall events in areas where rural roads had interfered with normal drainage.

For evaluation purposes, it has been assumed that about 75% of the land concerned by the drainage improvement, i.e. 3 000 ha, will be transferred from land type F2 to land type F1 in MELANDAHA and ISLAMPUR Thanas.

Modifications in the areas of the various cropping patterns in the area are shown in Table 5.3.11. They were obtained by considering the following hypotheses:

- Transfer from 3,000 ha of F2 to F1 land type,

- Identical crop distribution to that in the present situation,
- Decrease of 163 ha of NCA for land acquisition for drainage infrastructures,
- Increase outside the drained areas on the same basis as for the without project situation.

The main results are the following:

- increase in the areas of rice (1,100 ha), with paddy production rising by up to 273,000 t,
- very slight increase in cropping intensity, which, for the project as a whole, will rise from 191% to 193% (203% for the Thana of Melandaha and 202% for the Thana of Islampur).
- stable situation for the other crops (slight decrease in rabi crops, which will be replaced by HYV Aman and HYV Boro).

Table 5.3.12 sets out the main results expected under this option.

Tables 5.3.13 to 5.3.18 show the evolution of rice areas, damaged areas, other crops areas and productions, and operating costs for the whole period of the project (1993 - 2022).

Table 5.3.11 Main Cropping Patterns In The Future Situation - Option A

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							1530	5.8	605	20.8	2135	2.9
S	SUGAR CANE	-		1777	12.1	416	1.5					2193	3.0
S	BORO	-						1984	7.5	1992	68.5	3976	5.4
S	MILLET			39	0.3	684	2.5	827	3.1	479	16.5	2030	2.7
S	GROUNDNUT			39	0.3	187	0.7	1007	3.8	479	16.5	1712	2.3
S	B.AMAN												
S	S.W. POTATO			39	0.3	187	0.7	1096	4.1	479	16.5	1801	2.4
D	AUS	-WHEAT		454	3.1	440	1.6	2244	8.5	102	3.5	3240	4.4
D	AUS	-PULSES		73	0.5	63	0.2	384	1.5	13	0.5	533	0.7
D	AUS	-MUSTARD		262	1.8	265	1.0	1457	5.5	68	2.3	2051	2.8
D	AUS	-POTATO		142	1.0	143	0.5	613	2.3	26	0.9	924	1.3
D	AUS	-EGG PLANT		41	0.3	41	0.1	196	0.7	13	0.4	291	0.4
D	AUS	-CHILLIES		22	0.1	30	0.1	181	0.7	13	0.5	246	0.3
D	AUS	-ONION		22	0.1	20	0.1	120	0.5	6	0.2	167	0.2
D	AUS	-AMAN		1205	8.2	1114	4.0	69	0.3			2388	3.2
D	JUTE	-WHEAT		235	1.6	218	0.8	1441	5.5	34	1.2	1928	2.6
D	JUTE	-PULSES		44	0.3	38	0.1	220	0.8	4	0.2	306	0.4
D	JUTE	-MUSTARD		192	1.3	189	0.7	898	3.4	23	0.8	1301	1.8
D	JUTE	-POTATO		98	0.7	98	0.4	380	1.4	9	0.3	585	0.8
D	JUTE	-EGG PLANT		34	0.2	31	0.1	124	0.5	4	0.1	194	0.3
D	JUTE	-CHILLIES		17	0.1	23	0.1	121	0.5	4	0.2	165	0.2
D	JUTE	-ONION		18	0.1	15	0.1	80	0.3	2	0.1	115	0.2
D	JUTE	-AMAN		1104	7.5	1014	3.7	46	0.2			2165	2.9
D	T.AMAN	-BORO		4722	32.1	17293	62.3					22015	29.8
D	T.AMAN	-PULSES				791	2.9					791	1.1
D	AUS+AMAN	-PULSES						3950	15.0	298	10.3	4249	5.8
D	AUS+AMAN	-CHILLIES						2276	8.6	100	3.4	2376	3.2
D	AUS+AMAN	-ONIONS						713	2.7	39	1.3	751	1.0
D	D.W.T. AMAN	-BORO						4458	16.9	164	5.6	4622	6.3
T	JUTE	-T.AMAN	-WHEAT	371	2.5	460	1.7					831	1.1
T	JUTE	-T.AMAN	-PULSES	741	5.0	785	2.8					1526	2.1
T	JUTE	-T.AMAN	-CHILLIES	439	3.0	432	1.6					871	1.2
T	JUTE	-T.AMAN	-ONIONS	330	2.2	352	1.3					682	0.9
T	AUS	-T.AMAN	-WHEAT	377	2.6	420	1.5					797	1.1
T	AUS	-T.AMAN	-PULSES	722	4.9	792	2.9					1513	2.1
T	AUS	-T.AMAN	-CHILLIES	517	3.5	561	2.0					1077	1.5
T	AUS	-T.AMAN	-ONIONS	628	4.3	645	2.3					1273	1.7
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW					1530	6	605	21	2135	3
			SINGLE CROPPED	1895	13	1474	5	4914	19	3430	118	11713	16
			DOUBLE CROPPED	8684	59	21825	79	19971	76	924	32	51404	70
			TRIPLE CROPPED	4124	28	4446	16					8570	12
			TOTAL	14703	100	27745	100	26415	100	4956	100	73822	100
				20%		38%		36%		6%		(*)	
			CROP. INTENSITY	215		211		176		119		193	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.
(*) : areas reduced by 163 ha for land acquisition for drainage works.

Table 5.3.12 Areas and Production - Option A

Crops	Future without project situation Areas (ha)	Yield (t/ha)	Production (t)	Gross value MTk	Future with project situation Areas (ha)	Yield (t/ha)	Production (t)	Gross value MTk
L.Boro	3196	2.50	7990	50282	2831	2.50	7078	44542
HYV Boro	27322	4.27	116595	695396	27782	4.27	118536	706972
B. Aus	12324	1.20	14790	97401	12324	1.20	14790	97401
HYV Aus	2175	3.00	6525	38935	2175	3.00	6525	38935
L.T. Aman	13244	2.11	27931	181328	14371	2.11	30256	196422
HYV Aman	19866	3.59	71414	444538	21557	3.59	77360	481551
B. Aman								
DWT. Aman	5896	1.41	8291	60677	4622	1.41	6500	47570
Mix. Aus+Aman	7917	1.64	12989	84391	7376	1.64	12103	78634
Total paddy	91940	2.90	266525	1652947	93038	2.94	273148	1692027
Wheat	6951	2.00	13902	122407	6796	2.00	13592	119678
Jute	10645	1.70	18096	213922	10669	1.70	18137	214427
Sugar cane	2155	45.00	96975	87568	2193	45.00	98685	89113
Potato	1579	8.00	12632	50339	1509	8.00	12072	48117
Mustard	3511	0.80	2809	33287	3352	0.80	2682	31782
Pulses	8892	0.85	7558	98103	8918	0.85	7580	98338
Vegetables	8311		20196	149491	8208		19986	148012
Millet	2002	0.80	1602	11150	2030	0.80	1624	11303
Groundnut	1712	1.30	2226	19366	1712	1.30	2226	19366
Sweet potato	1801	6.50	11706	30553	1801	6.50	11706	30553
Sub-t.other crops	47559			816185	47188			810998
TOTAL	139499			2469132	140226			2503025
Irrigated area	32592	44%			32908	45%		
Fallow/grassland	2135	3%			2135	3%		
Single cropping	12327	17%			11712	16%		
Double cropping	51393	69%			51403	69%		
Triple cropping	8129	11%			8570	12%		
Cropping intensity	191%				193%			

Source: Consultant's calculation; results of simulation.
Notes: Future situation is given for 2022
Gross value is calculated with economic prices.

Table 5.3.13

JPPS OPTION A1 — RICE AREAS										
YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2021
Loc. AUS HA	12324	12322	12322	12322	12322	12322	12325	12325	12325	12325
HYV AUS HA	2175	2174	2174	2174	2174	2174	2175	2175	2175	2175
AUS + AMAN HA	7917	7910	7802	7695	7587	7479	7378	7378	7378	7378
DWT. AMAN HA	5896	5882	5628	5373	5118	4863	4622	4622	4622	4622
B. AMAN HA	1461	1461	1356	1252	1148	1044	695	490	286	0
Loc. AMAN HA	13244	13244	13469	13695	13920	14146	14371	14371	14371	14371
HYV AMAN HA	19866	19866	20204	20542	20880	21219	21557	21557	21557	21557
Loc. BORO HA	3196	3189	3116	3043	2970	2897	2831	2831	2831	2831
HYV BORO HA	25861	25847	26043	26239	26436	26632	27086	27291	27495	27701
RICE HA	91940	91895	92114	92335	92555	92776	93040	93040	93040	93041

Table 5.3.14

JPPS OPTION A1 — DAMAGED RICE AREAS										
YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2021
HYV AMAN RICE 1 HA	3289	3289	3373	3458	3543	3627	3712	3712	3712	3712
L.T. AMAN RICE 1 HA	2192	2192	2249	2305	2362	2418	2475	2475	2475	2475
B. AMAN RICE 1 HA	365	365	339	313	287	261	174	123	72	0
DWT. AMAN RICE 1 HA	1474	1471	1407	1343	1279	1215	1154	1154	1154	1154
AUS/AMAN RICE 1 HA	1979	1977	1950	1922	1894	1866	1840	1840	1840	1840
HYV BORO RICE 1 HA	5284	5281	5329	5378	5427	5476	5589	5640	5692	5743
AN. AGRI. DAMAGES '000 TK-Eco. prices	73033	72996	73701	74407	75113	75818	76823	77041	77259	77565

Table 5.3.15 JPPS Option A1 - Crop Areas

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
MILLET 0 HA	2002	2002	2008	2013	2019	2024	2030	2030	2030	2030
GROUNDNUT 0 HA	1712	1712	1712	1712	1712	1712	1712	1712	1712	1712
SW. POTATO 0 HA	1801	1801	1801	1801	1801	1801	1801	1801	1801	1801
MUSTARD HA	3511	3507	3476	3444	3412	3380	3352	3352	3352	3352
PULSES HA	8892	8888	8894	8899	8904	8909	8918	8918	8918	8918
POTATO HA	1579	1579	1565	1551	1537	1523	1509	1509	1509	1509
JUTE HA	10645	10641	10646	10651	10656	10661	10670	10670	10670	10670
WHEAT HA	6951	6947	6917	6886	6856	6825	6798	6798	6798	6798
VEGETABLES HA	8311	8307	8287	8267	8247	8227	8210	8210	8210	8210
SUGAR CANE HA	2155	2155	2162	2170	2177	2185	2193	2193	2193	2193
CULTIVATED AREA	73984	73951	73919	73887	73855	73823	73824	73824	73824	73824
SINGLE CROPPED AREA	12327	12320	12197	12074	11951	11828	11712	11712	11712	11712
DOUBLE CROPPED AREA	51393	51367	51370	51373	51375	51378	51407	51407	51407	51407
TRIPLE CROPPED AREA	8129	8129	8217	8305	8394	8482	8570	8570	8570	8570
GRASSLAND/FALLOW HA	2135	2135	2135	2135	2135	2135	2135	2135	2135	2135
IRRIGATION HA	31131	31116	31284	31451	31619	31786	32214	32419	32623	32909
CROPPING INTENSITY %	191	191	192	192	192	193	193	193	193	193

Table 5.3.16 JPPS Option A1 - Production (Tons)

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
JUTE PRODUCTION	18096	18091	18100	18108	18117	18125	18139	18139	18139	18139
WHEAT PRODUCTION	13902	13896	13834	13773	13712	13651	13596	13596	13596	13596
S. CANE PRODUCTION	96975	96975	97317	97659	98001	98343	98685	98685	98685	98685
MUSTARD PRODUCTION	2809	2806	2781	2755	2730	2704	2682	2682	2682	2682
POTATO PRODUCTION	12632	12632	12520	12408	12296	12184	12072	12072	12072	12072
S.POTATO PRODUCTION	11706	11706	11706	11706	11706	11706	11706	11706	11706	11706
VEGETAB. PRODUCTION	20196	20188	20146	20105	20064	20022	19988	19988	19988	19988
MILLET PRODUCTION	1602	1602	1606	1611	1615	1620	1624	1624	1624	1624
G'NUT PRODUCTION	2226	2226	2226	2226	2226	2226	2226	2226	2226	2226
PULSES PRODUCTION	7558	7555	7560	7564	7569	7573	7580	7580	7580	7580
GROSS VALUE CROPS '000 TK-Eco. prices	2445675	2444751	2453228	2461705	2470182	2478659	2491993	2495271	2498550	2503139

Table 5.3.17 JPPS Option A1 - Rice Production (Tons)

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
L AUS RICE PROD.	14790	14787	14787	14787	14787	14788	14791	14791	14791	14791
HYV AUS RICE PROD.	6525	6524	6524	6524	6524	6524	6525	6525	6525	6525
L T AMAN RICE PROD.	27931	27931	28396	28861	29326	29791	30256	30256	30256	30256
B AMAN RICE PROD.	2055	2055	1908	1762	1615	1469	978	690	403	0
DWT AMAN RICE PROD.	8291	8273	7915	7556	7198	6840	6500	6500	6500	6500
HYV AMAN RICE PROD.	71414	71414	72604	73793	74982	76171	77360	77360	77360	77360
AUS/AMAN RICE PROD.	12989	12978	12802	12625	12449	12272	12106	12106	12106	12106
L BORO RICE PROD.	7990	7973	7790	7608	7426	7243	7078	7078	7078	7078
HYV BORO RICE PROD.	110430	110374	111202	112029	112857	113684	115603	116465	117328	118536
AUS RICE PRODUCTION	27809	27800	27712	27624	27536	27448	27370	27370	27370	27370
AMAN RICE PRODUCTION	116186	116162	117223	118285	119346	120408	121148	120860	120573	120170
BORO RICE PRODUCTION	118420	118347	118992	119637	120282	120927	122680	123543	124405	125613
RICE PRODUCTION	262415	262309	263927	265546	267164	268783	271198	271773	272348	273153
STRAW PRODUCTION	262593	262471	263363	264254	265146	266038	267535	267937	268340	268904

Table 5.3.18 JPPS Option A1 - Operating Costs ('000 Tk) Economic Prices

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
INPUTS	669456	669193	671336	673479	675622	677766	681529	682660	683791	685374
FERTILIZERS	190284	190211	191064	191916	192769	193621	195021	195417	195813	196366
PESTICIDES	45327	45313	45601	45889	46177	46466	46892	46995	47098	47242
SEEDS/PLANTS	90650	90622	90502	90382	90263	90143	89922	89814	89706	89555
IRRIGATION	86917	86874	87467	88059	88652	89244	90652	91296	91940	92842
DRAUGHT POWER	256278	256173	256703	257232	257762	258292	259042	259138	259234	259368
AG. MANPOWER	733297	733007	735127	737247	739367	741488	744634	745248	745861	746723
AG. MANPOWER man-year	67427	67400	67595	67790	67985	68180	68469	68526	68582	68663
AG.CONTINGENCIES	140275	140220	140646	141073	141499	141925	142616	142791	142965	143209
AG. PRODUCTION COSTS	1543029	1542420	1547109	1551799	1556489	1561178	1568780	1570699	1572617	1575304

3.3.3 Option B

In option B, embankments with inlet and outlet structures are provided to control flooding from both the Jamuna and Old Brahmaputra as well as the same drainage measures as described under option A.

Changes on land types distribution have been studied for the six Thanas of the project area on the basis of the analysis of the result obtained from the simulations of the hydrodynamic model MIKE 11 for the project area. Result of the computations are shown in Table 5.3.19 with the new distributions of land types per thana given in Tables 5.E.1 to 5.E.12 in Appendix E.

Changes in cropping pattern have been assessed in two areas:

(i) Outside the embankments (NCA of 23,837 ha less 422 for embankments and structures i.e. 23,415 ha) the evolution is the same as per the without project situation, i.e. slight increase of irrigated areas through a transfer from B. Aman to HYV Boro (about 890 ha).

(ii) inside the embankments (NCA of 50,148 ha less 163 ha for drainage structures i.e. 49,985 ha).

The MIKE 11 results for the area inside the embankments can be summarized as follows:

	Present situation	Future Situation	
		(1)	(2)
F0	14217	27449	27449
F1	22872	18879	18879
F2	11131	3730	3567
F3	1928	90	90
Total	50148	50148	49985

(1) As per model simulation results.

(2) Areas reduced by 163 ha to allow for drainage works.

The evolution of cultivated areas by cropping patterns has been defined according to following assumptions:

- No global change of areas for cropping patterns, Aus/Jute - Rabi crops and Aus/Jute - T. Aman - Rabi Crops, but now distributed according to the modified distribution of land types.

- The first pattern occurs mainly on permeable soils which are poorly suited for transplanted paddy crops.

Example:

Land Type	F0	F1	F2	F3	Total
Present situation (ha)	X0	X1	X2	X3	T
Future situation (ha)	X0+Y0	X1+Y1	Y2	Y3	T
With X2+X3 = Y0 + Y1 + Y2 + Y3					

- Change in cropping patterns which include Aman (Aus/Jute T. Aman, Mixed Aus + Aman - Rabi crops, T. Aman - Rabi crops and DWT Aman - Boro) by applying their present percentages to the future land types distribution.

- Transfer from B. Aman to HYV Boro, as for the without project situation,

- Change in areas of cropping pattern T. Aman - HYV Boro now covering the remainder of available areas,

- Moreover, five years after the completion of the works increase of HYV Aman by 10% (loc/HYV = 40% / 60%).

In terms of areas per crop, the main results of these changes in cropping pattern are as follows for the whole project area (73,400 ha of NCA).

- Increase of rice areas by 3,500 ha (from 91,940 ha to 95,450 ha), due to:

  - increase in areas of T. Aman by 6,800 ha,

  - decrease in areas of B. Aman, Mixed Aus - Aman and DWT. Aman by about 4,200 ha,

  - limited changes of Aus and Boro areas (+900 ha) but notable increase of irrigated HYV Boro up to 30,000 ha, i.e. 41% of NCA.

- Simultaneously the irrigated areas increase by about 2,500 ha i.e. about 48% of the whole NCA (58% inside the embankment).

Tables 5.3.20 to 5.3.24 show the distribution of cropping patterns per land type for protected and unprotected areas in the present and future situation.

Table 5.3.19 Project Situation (Opt. B) - Distribution of Land Types by Thana

	THANAS	Total gross area	ADJUSTED GROSS AREAS (a) F0	F1	F2	F3	AGRICULTURAL SIMULATION (net areas) F0	F1	F2	F3	Total
inside embankt	JAMALPUR	7837	3114	1184	2670	870	2365	1316	679		4360
							54%	30%	16%		
	SHARISABARI	3054	1345	963	614	132	1327	889	310		2526
							53%	35%	12%		
	MELANDAHA	23320	7935	8810	4131	2444	10781	6424	774		17979
							60%	36%	4%		
	ISLAMPUR	11977	3038	4687	3473	779	5743	3669	396		9808
							59%	37%	4%		
	DEWANGANJ	3425	1428	655	1148	195	2246	567	52		2865
							78%	20%	2%		
	MADARGANJ	16192	5187	6573	3010	1422	4986	6015	1519	90	12610
							40%	48%	12%	1%	
	sub-total	65804	22046	22872	15045	5841	27448	18880	3730	90	50148
							55%	38%	7%	0%	
outside embankt	for the 6 above:	20062					486	1425	15933	1544	19388
							3%	7%	82%	8%	
	for 3 other thanas(b)	6376						448	2496	1505	4449
								10%	56%	34%	
	sub-total	26438					486	1873	18429	3049	23837
							2%	8%	77%	13%	
	TOTAL AREAS	92242					27934	20753	22159	3139	73985
							38%	28%	30%	4%	

(a) Refer to Annex 4, Modelling.
(b) FULCHARI, KAZIPUR and SARIAKANDI

Table 5.3.20 Present Situation - Main Cropping Patterns Outside The Embnkt.

Crop.intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							1406	7.6	467	15.3	1873	7.9
S	SUGAR CANE	-		32	6.6	53	2.8					85	0.4
S	BORO	-						341	1.9	86	2.8	427	1.8
S	MILLET					9	0.5	786	4.3	479	15.7	1274	5.3
S	GROUNDNUT							914	5.0	479	15.7	1393	5.8
S	B.AMAN							564	3.1	340	11.2	904	3.8
S	S.W. POTATO							1003	5.4	479	15.7	1482	6.2
D	AUS	-WHEAT		9	1.8	84	4.5	1465	7.9	102	3.3	1659	7.0
D	AUS	-PULSES		2	0.5	11	0.6	245	1.3	13	0.4	272	1.1
D	AUS	-MUSTARD		6	1.2	48	2.6	910	4.9	68	2.2	1032	4.3
D	AUS	-POTATO		4	0.9	31	1.6	400	2.2	26	0.9	461	1.9
D	AUS	-EGG PLANT		1	0.1	6	0.3	120	0.6	13	0.4	139	0.6
D	AUS	-CHILLIES		0	0.1	9	0.5	128	0.7	13	0.4	151	0.6
D	AUS	-ONION		1	0.1	4	0.2	80	0.4	6	0.2	91	0.4
D	AUS	-AMAN		77	15.8	117	6.2	69	0.4			263	1.1
D	JUTE	-WHEAT		3	0.6	36	1.9	1051	5.7	34	1.1	1124	4.7
D	JUTE	-PULSES		1	0.2	7	0.4	150	0.8	4	0.1	162	0.7
D	JUTE	-MUSTARD		3	0.6	30	1.6	602	3.3	23	0.7	658	2.8
D	JUTE	-POTATO		2	0.5	20	1.1	264	1.4	9	0.3	295	1.2
D	JUTE	-EGG PLANT		0	0.1	4	0.2	81	0.4	4	0.1	89	0.4
D	JUTE	-CHILLIES		0	0.1	6	0.3	90	0.5	4	0.1	100	0.4
D	JUTE	-ONION		0	0.1	2	0.1	56	0.3	2	0.1	61	0.3
D	JUTE	-AMAN		63	13.0	81	4.3	46	0.2			190	0.8
D	T.AMAN	-BORO		142	29.2	645	34.5					787	3.3
D	T.AMAN	-PULSES											
D	AUS+AMAN	-PULSES						3071	16.7	172	5.6	3243	13.6
D	AUS+AMAN	-CHILLIES						1878	10.2	56	1.8	1934	8.1
D	AUS+AMAN	-ONIONS						574	3.1	23	0.8	597	2.5
D	D.W.T. AMAN	-BORO						2136	11.6	144	4.7	2280	9.6
T	JUTE	-T.AMAN	-WHEAT	11	2.3	49	2.6					60	0.3
T	JUTE	-T.AMAN	-PULSES	26	5.4	118	6.3					145	0.6
T	JUTE	-T.AMAN	-CHILLIES	15	3.0	66	3.6					81	0.3
T	JUTE	-T.AMAN	-ONIONS	9	1.8	40	2.2					49	0.2
T	AUS	-T.AMAN	-WHEAT	14	2.9	70	3.7					84	0.4
T	AUS	-T.AMAN	-PULSES	26	5.3	126	6.7					152	0.6
T	AUS	-T.AMAN	-CHILLIES	16	3.2	82	4.4					98	0.4
T	AUS	-T.AMAN	-ONIONS	23	4.7	118	6.3					141	0.6
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW:					1406	8	467	15	1873	8
			SINGLE CROPPED	32	7	62	3	3608	20	1864	61	5565	23
			DOUBLE CROPPED	315	65	1141	61	13415	73	718	24	15589	65
			TRIPLE CROPPED	139	29	670	36					809	3
			TOTAL	486	100	1873	100	18429	100	3049	100	23837	100
				2%		8%		77%		13%			
			CROP. INTENSITY	222		232		173		124		172	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

Table 5.3.21 Future Situation - Main Cropping Patterns Outside The Embnkt.

Crop.inten: sity	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW						1381	7.6	459	15.3	1840	7.9
S	SUGAR CANE -		31	6.6	52	2.8					83	0.4
S	BORO -						889	4.9	418	14.0	1307	5.6
S	MILLET				9	0.5	772	4.3	471	15.7	1251	5.3
S	GROUNDNUT						898	5.0	471	15.7	1369	5.8
S	B.AMAN											
S	S.W. POTATO						985	5.4	471	15.7	1456	6.2
D	AUS	-WHEAT	8	1.8	82	4.5	1439	7.9	100	3.3	1630	7.0
D	AUS	-PULSES	2	0.5	11	0.6	241	1.3	13	0.4	267	1.1
D	AUS	-MUSTARD	6	1.2	47	2.6	894	4.9	67	2.2	1014	4.3
D	AUS	-POTATO	4	0.9	30	1.6	393	2.2	26	0.9	453	1.9
D	AUS	-EGG PLANT	1	0.1	6	0.3	117	0.6	13	0.4	137	0.6
D	AUS	-CHILLIES	0	0.1	9	0.5	126	0.7	13	0.4	148	0.6
D	AUS	-ONION	1	0.1	4	0.2	79	0.4	6	0.2	89	0.4
D	AUS	-AMAN	76	15.8	115	6.2	68	0.4			258	1.1
D	JUTE	-WHEAT	3	0.6	36	1.9	1032	5.7	33	1.1	1104	4.7
D	JUTE	-PULSES	1	0.2	7	0.4	147	0.8	4	0.1	159	0.7
D	JUTE	-MUSTARD	3	0.6	30	1.6	592	3.3	22	0.7	647	2.8
D	JUTE	-POTATO	2	0.5	20	1.1	259	1.4	9	0.3	290	1.2
D	JUTE	-EGG PLANT	0	0.1	3	0.2	79	0.4	4	0.1	87	0.4
D	JUTE	-CHILLIES	0	0.1	6	0.3	88	0.5	4	0.1	99	0.4
D	JUTE	-ONION	0	0.1	2	0.1	55	0.3	2	0.1	60	0.3
D	JUTE	-AMAN	62	13.0	79	4.3	45	0.2			186	0.8
D	T.AMAN	-BORO	139	29.2	634	34.5					773	3.3
D	T.AMAN	-PULSES										
D	AUS+AMAN	-PULSES					3017	16.7	169	5.6	3186	13.6
D	AUS+AMAN	-CHILLIES					1845	10.2	55	1.8	1900	8.1
D	AUS+AMAN	-ONIONS					563	3.1	23	0.8	586	2.5
D	D.W.T. AMAN	-BORO					2098	11.6	142	4.7	2239	9.6
T	JUTE	-T.AMAN -WHEAT	11	2.3	48	2.6					59	0.3
T	JUTE	-T.AMAN -PULSES	26	5.4	116	6.3					142	0.6
T	JUTE	-T.AMAN -CHILLIES	14	3.0	65	3.6					80	0.3
T	JUTE	-T.AMAN -ONIONS	9	1.8	40	2.2					48	0.2
T	AUS	-T.AMAN -WHEAT	14	2.9	68	3.7					82	0.4
T	AUS	-T.AMAN -PULSES	25	5.3	124	6.7					149	0.6
T	AUS	-T.AMAN -CHILLIES	15	3.2	80	4.4					96	0.4
T	AUS	-T.AMAN -ONIONS	23	4.7	116	6.3					139	0.6
			ha	%	ha	%	ha	%	ha	%	ha	%
		GRASSLAND/FALLOW:					1381	8	459	15	1840	8
		SINGLE CROPPED	31	7	61	3	3544	20	1831	61	5467	23
		DOUBLE CROPPED	309	65	1121	61	13178	73	705	24	15313	65
		TRIPLE CROPPED	137	29	658	36					795	3
		TOTAL	477	100	1840	100	18103	100	2995	100	23415	100
			2%		8%		77%		13%		(*)	
		CROP. INTENSITY	222		232		173		124		172	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.
(*) : areas reduced by 422 ha to allow for embankments.

L02

Table 5.3.22 Present Situation - Main Cropping Patterns Within The Embnkt.

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							124	1.1	138	7.2	262	0.5
S	SUGAR CANE	-		1745	12.3	325	1.4					2070	4.1
S	BORO	-						1501	13.5	1268	65.8	2769	5.5
S	MILLET			39	0.3	597	2.6	92	0.8			728	1.5
S	GROUNDNUT			39	0.3	187	0.8	93	0.8			319	0.6
S	B.AMAN							242	2.2	316	16.4	558	1.1
S	S.W. POTATO			39	0.3	187	0.8	93	0.8			319	0.6
D	AUS	-WHEAT		445	3.1	342	1.5	917	8.2			1704	3.4
D	AUS	-PULSES		70	0.5	50	0.2	166	1.5			287	0.6
D	AUS	-MUSTARD		256	1.8	206	0.9	646	5.8			1109	2.2
D	AUS	-POTATO		138	1.0	107	0.5	259	2.3			504	1.0
D	AUS	-EGG PLANT		41	0.3	33	0.1	89	0.8			162	0.3
D	AUS	-CHILLIES		21	0.1	19	0.1	65	0.6			105	0.2
D	AUS	-ONION		21	0.1	15	0.1	53	0.5			89	0.2
D	AUS	-AMAN		1128	7.9	926	4.0					2054	4.1
D	JUTE	-WHEAT		232	1.6	173	0.8	496	4.5			902	1.8
D	JUTE	-PULSES		43	0.3	30	0.1	90	0.8			162	0.3
D	JUTE	-MUSTARD		189	1.3	149	0.6	374	3.4			712	1.4
D	JUTE	-POTATO		96	0.7	73	0.3	150	1.3			319	0.6
D	JUTE	-EGG PLANT		34	0.2	26	0.1	53	0.5			113	0.2
D	JUTE	-CHILLIES		17	0.1	15	0.1	41	0.4			74	0.1
D	JUTE	-ONION		17	0.1	12	0.1	34	0.3			63	0.1
D	JUTE	-AMAN		1041	7.3	869	3.8					1910	3.8
D	T.AMAN	-BORO		4580	32.2	14598	63.8					19178	38.2
D	T.AMAN	-PULSES				599	2.6					599	1.2
D	AUS+AMAN	-PULSES						1172	10.5	127	6.6	1299	2.5
D	AUS+AMAN	-CHILLIES						571	5.1	44	2.3	615	1.2
D	AUS+AMAN	-ONIONS						214	1.9	16	0.8	230	0.5
D	D.W.T. AMAN	-BORO						3597	32.3	19	1.0	3616	7.2
T	JUTE	-T.AMAN	-WHEAT	360	2.5	381	1.7					741	1.5
T	JUTE	-T.AMAN	-PULSES	714	5.0	581	2.5					1295	2.6
T	JUTE	-T.AMAN	-CHILLIES	425	3.0	321	1.4					746	1.5
T	JUTE	-T.AMAN	-ONIONS	321	2.3	273	1.2					595	1.2
T	AUS	-T.AMAN	-WHEAT	363	2.6	314	1.4					677	1.4
T	AUS	-T.AMAN	-PULSES	696	4.9	581	2.5					1277	2.5
T	AUS	-T.AMAN	-CHILLIES	501	3.5	420	1.8					920	1.8
T	AUS	-T.AMAN	-ONIONS	605	4.3	464	2.0					1069	2.1
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW					124	1	138	7	262	1
			SINGLE CROPPED	1863	13	1295	6	2020	18	1584	82	6762	13
			DOUBLE CROPPED	8369	59	18242	80	8987	81	206	11	35804	71
			TRIPLE CROPPED	3984	28	3335	15					7319	15
			TOTAL	14217	100	22872	100	11131	100	1928	100	50148	100
				28%		46%		22%		4%			
			CROP. INTENSITY	215		209		181		111		201	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

Table 5.3.23 Future Situation - Main Cropping Patterns Within The Embnkt.

Crop.inten: sity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							89	2.5	24	26.2	113	1.2
S	SUGAR CANE	-		1745	6.4	325	1.7					2070	4.1
S	BORO	-						464	13.0	41	45.2	504	1.0
S	MILLET			83	0.3	623	3.3	23	0.6			728	1.5
S	GROUNDNUT			51	0.2	201	1.1	67	1.9			319	1.6
S	B.AMAN												
S	S.W. POTATO			51	0.2	201	1.1	67	1.9			319	1.6
D	AUS	-WHEAT		828	3.0	554	2.9	313	8.8			1696	3.4
D	AUS	-PULSES		150	0.5	91	0.5	46	1.3			287	1.6
D	AUS	-MUSTARD		534	1.9	357	1.9	210	5.9			1101	2.2
D	AUS	-POTATO		255	0.9	170	0.9	79	2.2			504	1.0
D	AUS	-EGG PLANT		77	0.3	54	0.3	32	0.9			162	1.3
D	AUS	-CHILLIES		48	0.2	34	0.2	22	0.6			105	1.2
D	AUS	-ONION		44	0.2	29	0.2	16	0.4			89	1.2
D	AUS	-AMAN		1968	7.2	785	4.2					2754	5.5
D	JUTE	-WHEAT		432	1.6	291	1.5	171	4.8			894	1.8
D	JUTE	-PULSES		82	0.3	52	0.3	28	0.8			162	1.3
D	JUTE	-MUSTARD		336	1.2	236	1.3	132	3.7			704	1.4
D	JUTE	-POTATO		159	0.6	110	0.6	50	1.4			319	1.6
D	JUTE	-EGG PLANT		54	0.2	39	0.2	21	0.6			113	1.2
D	JUTE	-CHILLIES		34	0.1	25	0.1	15	0.4			74	1.1
D	JUTE	-ONION		31	0.1	21	0.1	11	0.3			63	1.1
D	JUTE	-AMAN		1805	6.6	734	3.9					2539	5.1
D	T.AMAN	-BORO		14698	53.5	10143	53.7					24841	49.7
D	T.AMAN	-PULSES				469	2.5					469	1.9
D	AUS+AMAN	-PULSES						381	10.7	17	19.1	398	1.8
D	AUS+AMAN	-CHILLIES						179	5.0	6	6.9	185	1.4
D	AUS+AMAN	-ONIONS						61	1.7	2	2.6	63	1.1
D	D.W.T. AMAN	-BORO						1091	30.6			1091	2.2
T	JUTE	-T.AMAN	-WHEAT	360	1.3	381	2.0					741	1.5
T	JUTE	-T.AMAN	-PULSES	714	2.6	581	3.1					1295	2.6
T	JUTE	-T.AMAN	-CHILLIES	425	1.5	321	1.7					746	1.5
T	JUTE	-T.AMAN	-ONIONS	321	1.2	273	1.4					595	1.2
T	AUS	-T.AMAN	-WHEAT	363	1.3	314	1.7					677	1.4
T	AUS	-T.AMAN	-PULSES	696	2.5	581	3.1					1277	2.6
T	AUS	-T.AMAN	-CHILLIES	501	1.8	420	2.2					920	1.8
T	AUS	-T.AMAN	-ONIONS	605	2.2	464	2.5					1069	2.1
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW:					89	3	24	26	113	0
			SINGLE CROPPED	1930	7	1349	7	620	17	41	45	3940	8
			DOUBLE CROPPED	21535	78	14194	75	2858	80	26	29	38613	77
			TRIPLE CROPPED	3984	15	3335	18					7319	15
			TOTAL	27449	100	18879	100	3567	100	90	100	49985	100
				55%:		38%:		7%:		0%:			
			CROP. INTENSITY	207		211		180		129		207	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.
(*) : areas reduced by 163 ha to allow for drainage.

Table 5.3.24 Main Cropping Patterns In The Future Situation - Option B

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							1470	6.8	482	16.6	1952	2.7
S	SUGAR CANE	-		1776	6.4	377	1.8					2153	2.9
S	BORO	-						1352	6.2	459	15.8	1812	2.5
S	MILLET			83	0.3	631	3.0	795	3.7	471	16.2	1979	2.7
S	GROUNDNUT			51	0.2	201	1.0	965	4.5	471	16.2	1688	2.3
S	B.AMAN												
S	S.W. POTATO			51	0.2	201	1.0	1052	4.9	471	16.2	1775	2.4
D	AUS	-WHEAT		837	3.0	636	3.1	1751	8.1	100	3.4	3325	4.5
D	AUS	-PULSES		153	0.5	102	0.5	287	1.3	13	0.5	555	0.8
D	AUS	-MUSTARD		540	1.9	404	2.0	1104	5.1	67	2.3	2115	2.9
D	AUS	-POTATO		259	0.9	200	1.0	471	2.2	26	0.9	956	1.3
D	AUS	-EGG PLANT		78	0.3	59	0.3	149	0.7	13	0.4	299	0.4
D	AUS	-CHILLIES		49	0.2	43	0.2	148	0.7	13	0.5	253	0.3
D	AUS	-ONION		45	0.2	33	0.2	95	0.4	6	0.2	178	0.2
D	AUS	-AMAN		2044	7.3	901	4.3	68	0.3			3013	4.1
D	JUTE	-WHEAT		435	1.6	326	1.6	1204	5.6	33	1.1	1998	2.7
D	JUTE	-PULSES		83	0.3	59	0.3	175	0.8	4	0.2	321	0.4
D	JUTE	-MUSTARD		339	1.2	266	1.3	724	3.3	22	0.8	1350	1.8
D	JUTE	-POTATO		161	0.6	130	0.6	309	1.4	9	0.3	609	0.8
D	JUTE	-EGG PLANT		54	0.2	42	0.2	100	0.5	4	0.1	200	0.3
D	JUTE	-CHILLIES		34	0.1	31	0.1	103	0.5	4	0.2	172	0.2
D	JUTE	-ONION		32	0.1	23	0.1	66	0.3	2	0.1	123	0.2
D	JUTE	-AMAN		1867	6.7	813	3.9	45	0.2			2725	3.8
D	T.AMAN	-BORO		14838	53.1	10777	52.0					25615	34.9
D	T.AMAN	-PULSES				469	2.3					469	0.6
D	AUS+AMAN	-PULSES						3397	15.7	186	6.4	3583	4.9
D	AUS+AMAN	-CHILLIES						2024	9.3	61	2.1	2085	2.8
D	AUS+AMAN	-ONIONS						624	2.9	25	0.9	649	0.9
D	D.W.T. AMAN	-BORO						3189	14.7	142	4.9	3330	4.5
T	JUTE	-T.AMAN	-WHEAT	371	1.3	429	2.1					800	1.1
T	JUTE	-T.AMAN	-PULSES	740	2.7	697	3.4					1437	2.0
T	JUTE	-T.AMAN	-CHILLIES	439	1.6	387	1.9					826	1.1
T	JUTE	-T.AMAN	-ONIONS	330	1.2	313	1.5					643	0.9
T	AUS	-T.AMAN	-WHEAT	376	1.3	383	1.8					759	1.0
T	AUS	-T.AMAN	-PULSES	721	2.6	705	3.4					1426	1.9
T	AUS	-T.AMAN	-CHILLIES	516	1.8	500	2.4					1016	1.4
T	AUS	-T.AMAN	-ONIONS	627	2.2	580	2.8					1207	1.6
				ha	%	ha	%	ha	%	ha	%	ha	%
			GRASSLAND/FALLOW:					1470	7	482	17	1952	3
			SINGLE CROPPED	1962	7	1410	7	4164	19	1872	64	9407	13
			DOUBLE CROPPED	21845	78	15316	74	16034	74	731	25	53926	73
			TRIPLE CROPPED	4121	15	3993	19					8114	11
			TOTAL	27927	100	20720	100	21668	100	2910	100	73400	100
				38%:		28%:		30%:		4%:			
			CROP. INTENSITY :	208		212		174		131		196	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.
(*) : areas reduced by 585 ha to allow for embankments and drainage.

The main results expected from this option are expressed in terms of areas and production in Table 5.3.25 they may be summarised as follows:

- Rice production

The rice areas increase by 3,500 ha and the average yield increases from a present 2.85 t/ha up to 3.17 t/ha (in the future without project situation it achieves only 2.90 t/ha). The corresponding increase of production is 40,600 tons, achieved after 13 years, taking into account the changes in cropping patterns, the evolution of yields over 5 years in previous flood-prone areas and the increase in the share of HYV's varieties for Aman rice (from 60% to 70%).

In comparison with the without project situation the increase of rice production is 36,470 tons, 62.5% of which coming from the increase of Aman production 27.5% coming from the increase of Boro, the Aus rice production remaining almost stable (decrease of 380 ha), as shown in to the Table 5.3.26.

- Other crops

With regard to other crops there are very few notable changes in comparison with the without project situation except slight increase of 560 ha of Jute, diminution of pulses areas (1,100 ha) and vegetables areas (660 ha) the total area of other crops than rice remain stable (slight decrease of 3% in area).

- Irrigated area

The irrigated areas will reach 35,000 ha (8% increase) after 13 years, corresponding to the increase of HYV Boro areas (2,500 ha).

- Cropping intensity

Increase in cropping intensity which will rise to 196% for the whole project. Inside the embankments the cropping intensity will reach 207%, outside it will be stable remaining at 172%.

Tables 5.3.27 to 5.3.32 set out the simulation results obtained for the whole project area in terms of production, operating costs (inputs, manpower, draught power, irrigation) and they show that assuming that 290 days of works give a full annual employment, the project area will have a labour supply of 70680 man-year i.e. an increase of 2,880 man-year in comparison with the reference situation (WO).

Table 5.3.25 Areas and Production - Option B

Crops	Future without project situation				Future with project situation			
	Areas (ha)	Yield (t/ha)	Production (t)	Gross value MTk	Areas (ha)	Yield (t/ha)	Production (t)	Gross value MTk
L.Boro	3196	2.50	7990	50282	924	2.50	2310	14537
HYV Boro	27322	4.27	116595	695396	29833	4.45	132693	791408
B. Aus	12324	1.20	14790	97401	12837	1.20	15405	101451
HYV Aus	2175	3.00	6525	38935	2265	3.00	6796	40552
L.T. Aman	13244	2.11	27931	181328	12181	2.19	26712	173414
HYV Aman	19866	3.59	71414	444538	27752	3.74	103851	646452
B. Aman DWT. Aman	5896	1.41	8291	60677	3331	1.44	4787	35033
Mix. Aus+Aman	7917	1.64	12989	84391	6320	1.65	10441	67836
Total paddy	91940	2.90	266525	1652947	95443	3.17	302995	1870683
Wheat	6951	2.00	13902	122407	6884	2.00	13768	121227
Jute	10645	1.70	18096	213922	11205	1.70	19048	225176
Sugar cane	2155	45.00	96975	87568	2153	45.00	96885	87487
Potato	1579	8.00	12632	50339	1566	8.00	12528	49924
Mustard	3511	0.80	2809	33287	3466	0.80	2773	32860
Pulses	8892	0.85	7558	98103	7790	0.85	6622	85954
Vegetables	8311		20196	149491	7653		18830	138302
Millet	2002	0.80	1602	11150	1979	0.80	1583	11018
Groundnut	1712	1.30	2226	19366	1688	1.30	2194	19088
Sweet potato	1801	6.50	11706	30553	1775	6.50	11538	30114
Sub-t.other crops	47559			816185	46159			801149
TOTAL	139499			2469132	141602			2671832
Irrigated area	32592	44%			35056	48%		
Fallow/grassland	2135	3%			1953	3%		
Single cropping	12327	17%			9407	13%		
Double cropping	51393	69%			53926	73%		
Triple cropping	8129	11%			8115	11%		
Cropping intensity	191%				196%			

Source: Consultant's calculation; results of simulation.
Notes: Future situation is given for 2022
Gross value is calculated with economic prices.

Table 5.3.26 Rice Productions and Gross Value - Option B

	AMAN RICE		AUS RICE		BORO RICE		TOTAL RICE	
	Production tons	Gr. value MTK	Production tons	Gr. value MTK	Production tons	Gr. value MTK	Production tons	Gr. value MTK
Future without project situation (1)	114131	728738	27810	178531	124585	745677	266525	1652947
	43%	44%	10%	11%	47%	45%	100%	100%
Future with project situation (2)	140571	888817	27422	175921	135003	805945	302995	1870683
	46%	48%	9%	9%	45%	43%	100%	100%
Difference (2)-(1)	26440	160079	-388	-2610	10418	60268	36470	217736
Percentage of total	72%	74%	-1%	-1%	29%	28%	100%	100%

Table 5.3.27

JPPS OPTION B — RICE AREAS										
YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
Loc. AUS HA	12324	12312	12377	12442	12507	12572	12785	12785	12785	12785
HYV AUS HA	2175	2172	2184	2195	2207	2218	2256	2256	2256	2256
AUS + AMAN HA	7917	7896	7666	7436	7207	6977	6320	6320	6320	6320
DWT. AMAN HA	5896	5877	5507	5136	4766	4396	3331	3331	3331	3331
B. AMAN HA	1461	1428	1315	1203	1090	978	520	367	214	0
Loc. AMAN HA	13244	13242	13665	14087	14510	14933	13301	12575	12575	12575
HYV AMAN HA	19866	19863	20603	21343	22083	22822	27947	28673	28673	28673
Loc. BORO HA	3196	3188	2861	2535	2208	1882	925	925	925	925
HYV BORO HA	25861	25870	26367	26865	27362	27859	29520	29673	29826	30041
RICE HA	91940	91848	92545	93242	93940	94637	96905	96905	96905	96906

Table 5.3.28

JPPS OPTION B — DAMAGED AREAS										
YEAR	1993	1994	1995	1996	1998	2001	2005	2010	2015	2022
HYV AMAN RICE 1 HA HA	3289	3288	3033	2778	2269	1506	490	236	236	236
L.T. AMAN RICE 1 HA HA	2192	2192	2022	1852	1513	1004	327	158	158	158
B. AMAN RICE 1 HA HA	365	357	329	300	244	160	130	91	53	0
DWT. AMAN RICE 1 HA HA	1474	1469	1390	1312	1154	929	633	559	559	559
AUS/AMAN RICE 1 HA HA	1979	1974	1924	1875	1776	1636	1459	1415	1415	1415
HYV BORO RICE 1 HA HA	5284	5286	4910	4535	3783	2668	1186	847	885	938
AN. AGRI. DAMAGES '000 TK-Eco. prices	73033	72992	67952	62913	52833	37861	18189	13401	13564	13792

Table 5.3.29 JPPS Option B - Crop Areas

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
MILLET 0 HA	2002	1999	1970	1942	1914	1886	1804	1804	1804	1804
GROUNDNUT 0 HA	1712	1708	1702	1695	1688	1681	1664	1664	1664	1664
SW. POTATO 0 HA	1801	1797	1790	1783	1776	1769	1751	1751	1751	1751
MUSTARD HA	3511	3503	3447	3390	3334	3278	3123	3123	3123	3123
PULSES HA	8892	8878	8813	8747	8681	8615	8437	8437	8437	8437
POTATO HA	1579	1577	1561	1546	1530	1515	1471	1471	1471	1471
JUTE HA	10645	10634	10723	10813	10902	10992	11277	11278	11278	11278
WHEAT HA	6951	6940	6904	6867	6831	6794	6702	6702	6702	6702
VEGETABLES HA	8313	8300	8317	8333	8350	8366	8433	8433	8433	8433
SUGAR CANE HA	2155	2154	2154	2154	2153	2153	2153	2153	2153	2153
CULTIVATED AREA	73985	73892	73799	73707	73614	73522	73401	73400	73400	73400
SINGLE CROPPED AREA	12327	12306	11855	11404	10954	10503	9185	9185	9185	9185
DOUBLE CROPPED AREA	51393	51328	51443	51558	51673	51788	52248	52247	52247	52247
TRIPLE CROPPED AREA	8130	8128	8397	8666	8936	9205	10015	10015	10015	10015
GRASSLAND/FALLOW HA	2135	2130	2104	2078	2052	2026	1953	1953	1953	1953
IRRIGATION HA	31131	31134	31597	32061	32524	32987	34558	34711	34864	35078
CROPPING INTENSITY %	191	191	192	193	194	195	198	198	198	198

Table 5.3.30 JPPS Option B - Productions (Tons)

YEAR	1993	1994	1995	1996	1998	2001	2005	2010	2015	2022
JUTE PRODUCTION	18096	18078	18230	18382	18687	19173	19173	19173	19173	19173
WHEAT PRODUCTION	13902	13881	13808	13735	13589	13404	13404	13404	13404	13404
S. CANE PRODUCTION	96975	96962	96949	96936	96911	96885	96885	96885	96885	96885
MUSTARD PRODUCTION	2809	2803	2758	2713	2623	2498	2498	2498	2498	2498
POTATO PRODUCTION	12632	12617	12494	12370	12123	11768	11768	11768	11768	11768
S.POTATO PRODUCTION	11706	11682	11636	11590	11497	11382	11382	11382	11382	11382
VEGETAB. PRODUCTION	20202	20173	20239	20305	20436	20678	20676	20675	20675	20675
MILLET PRODUCTION	1602	1599	1576	1554	1508	1443	1443	1443	1443	1443
G'NUT PRODUCTION	2226	2221	2212	2203	2185	2163	2163	2163	2163	2163
PULSES PRODUCTION	7558	7547	7491	7435	7323	7173	7172	7171	7171	7171
STRAW PRODUCTION	262596	262410	265884	269359	276308	287225	293775	295654	295956	296378
GROSS VALUE CROPS '000 TK-Eco. prices	2445802	2443943	2473195	2502446	2560949	2652901	2700899	2714863	2717318	2721756

Table 5.3.31 JPPS Option B - Rice Productions (Tons)

YEAR	1993	1994	1995	1996	1998	2001	2005	2010	2015	2022
L AUS RICE PROD.	14790	14775	14853	14931	15087	15343	15343	15343	15343	15343
HYV AUS RICE PROD.	6525	6518	6553	6587	6656	6769	6769	6769	6769	6769
L T AMAN RICE PROD.	27932	27928	28951	29974	32021	35096	29083	27580	27580	27580
B AMAN RICE PROD.	2055	2008	1850	1692	1376	905	732	517	302	0
DWT AMAN RICE PROD.	8291	8265	7739	7213	6162	4648	4759	4787	4787	4787
HYV AMAN RICE PROD.	71417	71406	74419	77432	83459	92510	104344	107303	107303	107303
AUS/AMAN RICE PROD.	12989	12955	12575	12194	11434	10349	10422	10441	10441	10441
L BORO RICE PROD.	7990	7970	7154	6338	4706	2312	2312	2312	2312	2312
HYV BORO RICE PROD.	110430	110472	113132	115792	121111	129289	131507	132579	133225	134129
AUS RICE PRODUCTION	27809	27771	27693	27615	27460	27286	27323	27332	27332	27332
AMAN RICE PRODUCTION	116189	116084	119247	122409	128735	138333	144130	145407	145192	144890
BORO RICE PRODUCTION	118420	118442	120286	122130	125818	131602	133820	134891	135537	136442
RICE PRODUCTION	262418	262296	267226	272155	282013	297221	305273	307630	308061	308664

Table 5.3.32 JPPS Option B - Operating Costs ('000 Tk) Economic Prices

YEAR	1993	1994	1995	1996	1997	1998	2005	2010	2015	2022
INPUTS	669488	669008	675009	681011	687012	693014	716092	717744	718591	719776
FERTILIZERS	190290	190179	192162	194145	196128	198111	205398	205890	206186	206600
PESTICIDES	45331	45312	46036	46760	47485	48209	51778	52173	52250	52359
SEEDS/PLANTS	90666	90549	90617	90684	90752	90820	91154	91082	91001	90888
IRRIGATION	86917	86942	88476	90010	91544	93078	98224	98707	99189	99864
DRAUGHT POWER	256283	256027	257719	259411	261103	262795	269538	269892	269964	270065
AG. MANPOWER	733340	732704	738801	744898	750995	757092	780304	781574	782034	782676
AG. MANPOWER man-year	67431	67372	67933	68493	69054	69615	71749	71866	71908	71967
AG.CONTINGENCIES	140283	140171	141381	142591	143801	145011	149640	149932	150062	150245
AG. PRODUCTION COSTS	1543110	1541883	1555192	1568500	1581808	1595116	1646035	1649250	1650686	1652698

RELATIONSHIP OF CROP SEASONS TO FLOODS AND IRRIGATION

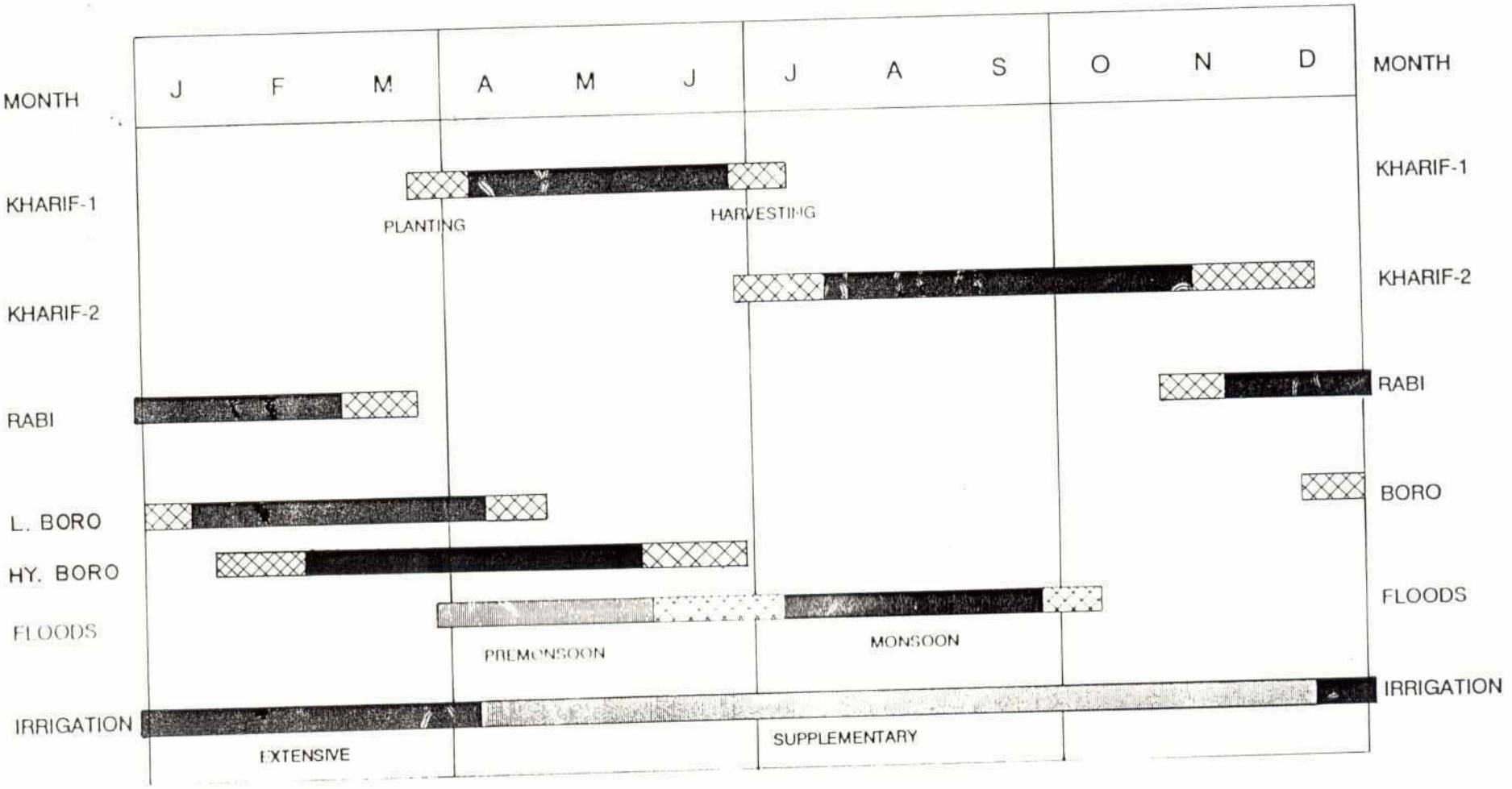


FIGURE-5.2.1

FIGURE - 5.2.2

RELATIONSHIP OF CROPPING PATTERN TO LAND TYPE (WITHOUT IRRIGATION)

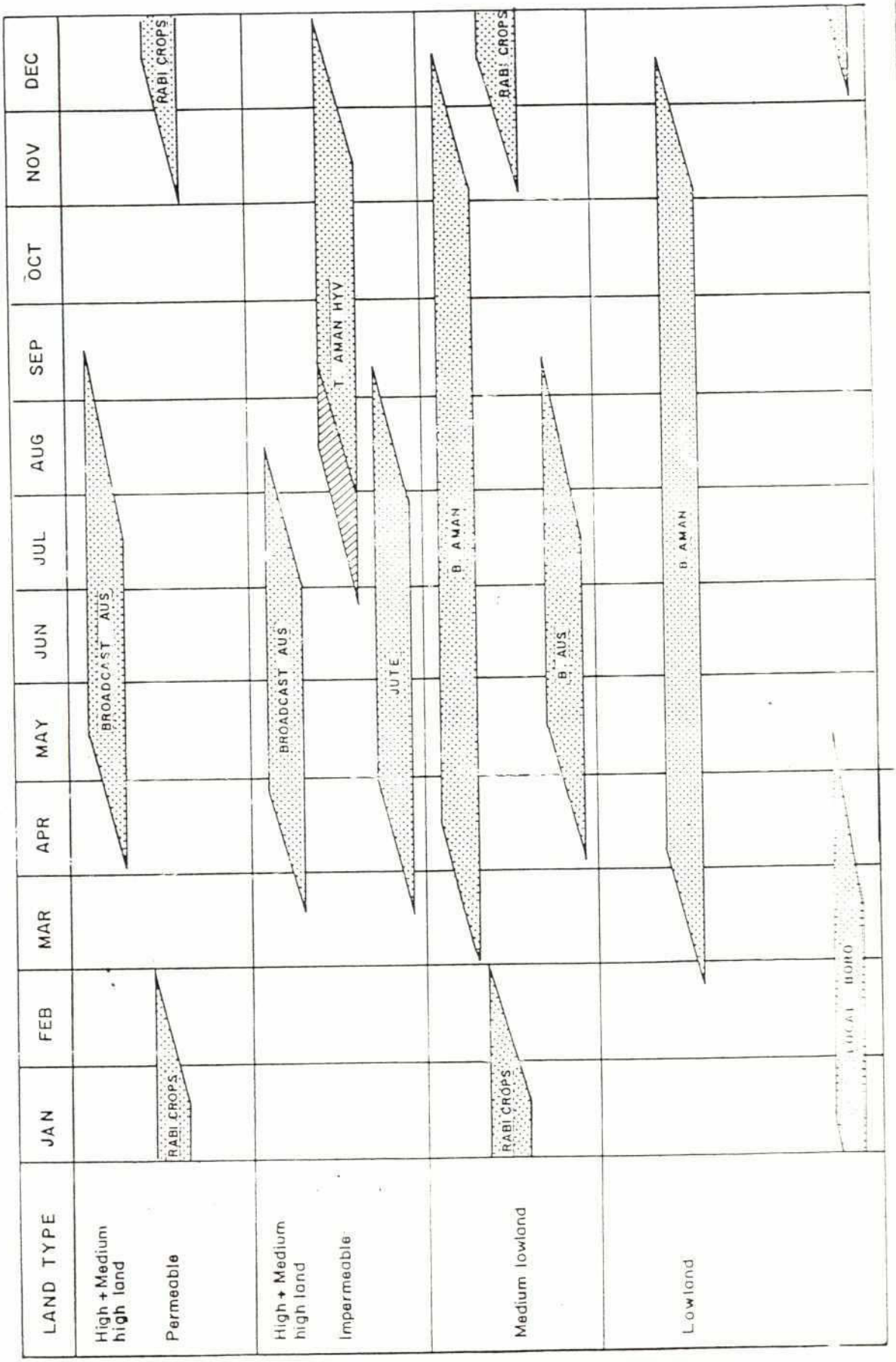


FIGURE - 5.2.3

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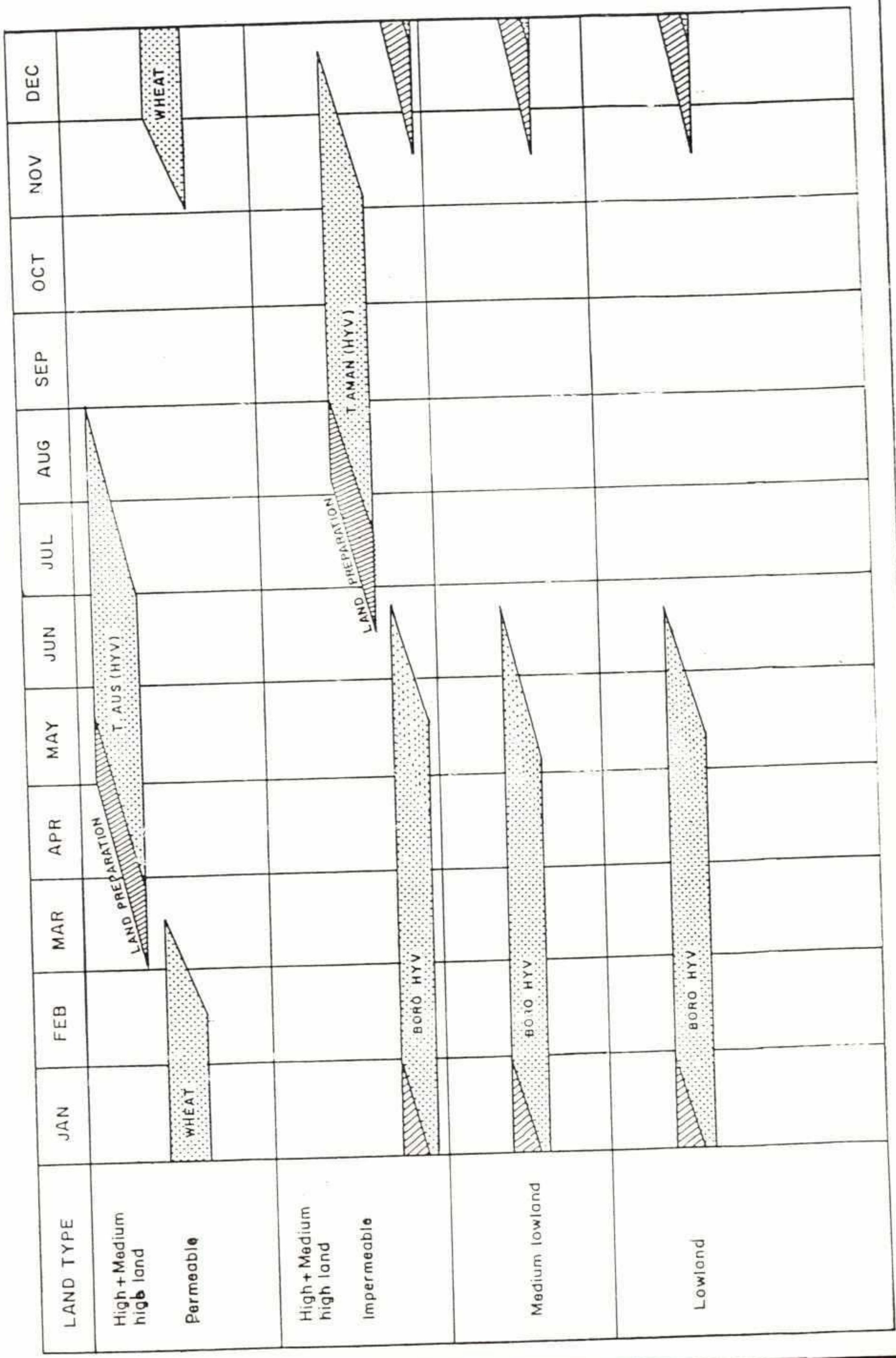
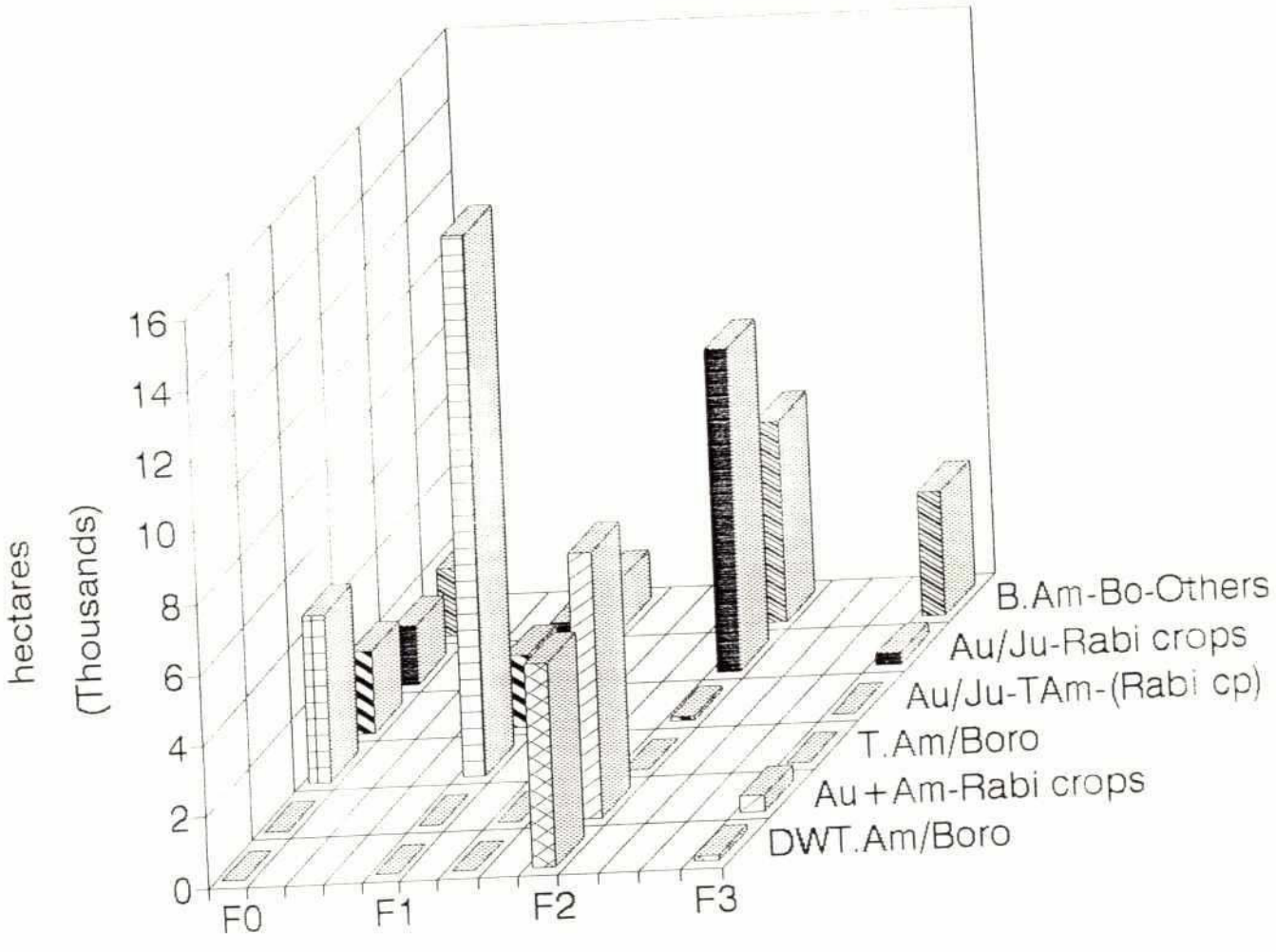
RELATIONSHIP OF CROPPING PATTERN TO LAND TYPE
(WITH IRRIGATION)



MAIN CROPPING PATTERNS
by land type in the project area



ANNEX 5

APPENDIX

A CROP DATA SHEETS

Table No	Basic Assumptions Title
5.A.1	L. Aus
5.A.2	HYV Aus
5.A.3	B. Aman - Damage Free Areas
5.A.4	B. Aman - Damaged Areas
5.A.5	D.W.T. Aman - Damage-free Areas
5.A.6	D.W.T. Aman - Damaged Areas
5.A.7	B. Aus + Aman - Damage-free Areas
5.A.8	B. Aus + Aman - Damaged Areas
5.A.9	L. Boro - Damage-free Areas
5.A.10	L. Boro - Damaged Areas
5.A.11	HYV Boro - Damage-free Areas
5.A.12	HYV Boro - Damaged Areas
5.A.13	L.T. Aman - Damage-free Areas
5.A.14	L.T. Aman - Damaged Areas
5.A.15	HYV Aman Damaged-free Areas
5.A.16	HYV Aman - Damaged Areas
5.A.17	HYV Wheat
5.A.18	Jute
5.A.19	Groundnut
5.A.20	Mustard
5.A.21	Potato
5.A.22	Sugarcane
5.A.23	Pulses
5.A.24	Onions
5.A.25	Chillies
5.A.26	Egg-Plant
5.A.27	Millet
5.A.28	Sweet Potato
5.A.29	Gross Margin - Rice Crops - Econ & Fin Prices
5.A.30	Gross Margin - Other Crops - Econ & Fin Prices

APPENDIX

A CROP DATA SHEETS

Basic Assumptions

- In conformity with the adopted methodology, this appendix presents one set of crop data sheets expressed in financial and economic value. The yields presented in these data sheets correspond to damage-free conditions, and will be considered as target yields for the project situation, inside the protected area.

- Yields in damaged conditions are estimated at 75% of those in damage-free conditions. It is assumed that 80% of the damaged area would be replanted. This yield level has been assumed on the basis that no further provision is necessary in the calculations of production values for additional costs for seed and hired labour and taking into account the lower yield of the replanted crops.

- Labour: according to the agro-economic surveys, 50% of labour requirements are provided by hired labour counted, as per GPA, at its weighted cost between peak season rates and off-season rates. Family labour, not being an actual expense, is only valued at its economic cost in the economic analysis.

- Credit cost is counted, as per GPA, at 16% interest p.a. on 80% of cash costs for half a year. It is not considered in the economic analysis, since it corresponds to an internal transfer.

- Unforeseen costs are counted at 10% of all production costs, including hired labour and credit cost.

- Gross Margin (financial) = Gross value - production costs excluding family labour.

- Value Added (financial) = Gross margin + Hired labour.

  = Gross value - production costs excluding all labour costs

** RICE - L. AUS **

Variety : local Growing period : 115/130 days

		Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha):	1.20	FARM. G. PRICE (TK/KG):	6.074	5.345		
BY PRODUCT (T/ha) :	1.80	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) : 8999	7902

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		**********											*******	
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS			standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS		days	35	45	39.15	1575	1370
.MANPOWER	total	days	80	50	37.5	2000	3000
	hired	days	40				
	family	days	40				
.FERTILIZERS							
UREA		Kg	50	4.58	6.64	229	332
TSP		Kg		5.40	10.15		
MP		Kg		4.05	8.18		
.PESTICIDES							
INSECTICIDES		Kg		504.0	438.5		
.SEEDS		Kg	90	10.5	9.2	945	832
				SUB-TOTAL		4749	5534
				CREDIT		304	
				UNFORESEEN (10%)		505	553
				TOTAL		5558	6087

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	5641	5115	/day :	71	64
+ GROSS MARGIN	/ha :	3441	1815	/day :	43	23

Table 5.A.2

** HYV AUS **

Variety : BR 3/BR9 Growing period : 115/130 days

		Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha):	3.00	FARM. G. PRICE (TK/KG):	6.074	5.345		
BY PRODUCT (T/ha) :	3.00	FARM. G. PRICE (TK/KG):	0.715	0.622	GROSS VALUE (TK) :	20367 : 17902

	A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE	**********												
AVERAGE RAINFALL mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	55	45	39.15	2475	2153
.MANPOWER total	days	160	50	37.5	4000	6000
hired	days	80				
family	days	80				
.FERTILIZERS						
UREA	Kg	130	4.58	6.64	595	863
TSP	Kg	60	5.40	10.15	324	609
MP	Kg	15	4.05	8.18	61	123
.PESTICIDES						
INSECTICIDES	Kg	0.5	504.0	438.5	252	219
.SEEDS	Kg	30	10.0	8.8	300	264
SUB-TOTAL					8007	10231
CREDIT					512	
UNFORESEEN (10%)					852	1023
TOTAL					9372	11255

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	15395	13247	/day :	96	83
+ GROSS MARGIN	/ha :	10995	6647	/day :	69	42

** B. AMAN **

Variety : local Growing period : 120/140 days

			Fin.	Econ.		Fin.	Econ.
Damage free areas							
AVER. YIELD (T/ha):	1.50	FARM. G. PRICE (TK/KG):	6.438	5.665			
BY PRODUCT (T/ha) :	1.5	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :	11082	9738

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE					**********	**********	**********							
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	43	45	39.15	1935	1683
.MANPOWER total	days	100	50	37.5	2500	3750
hired	days	50				
family	days	50				
.FERTILIZERS						
UREA	Kg	20	4.58	6.64	92	133
TSP	Kg	10	5.40	10.15	54	102
MP	Kg		4.05	8.18		
.PESTICIDES						
INSECTICIDES	Kg	0.1	504.0	438.5	50	44
.SEEDS	Kg	100	10.0	8.8	1000	880
SUB-TOTAL					5631	6592
CREDIT					360	
UNFORESEEN (10%)					599	659
TOTAL					6591	7251

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	7241	6612	/day :	72	66
+ GROSS MARGIN	/ha :	4491	2487	/day :	45	25

** B. AMAN **

Variety : local Growing period : 120/140 days

		Fin.	Econ.
Damaged areas			
AVER. YIELD (T/ha):	1.13		
FARM. G. PRICE (TK/KG):		6.438	5.665
BY PRODUCT (T/ha) :	1.125		
FARM. G. PRICE (TK/KG):		0.95	0.827
GROSS VALUE (TK) :		8312	7303

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE					**********	**********	**********							
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	43	45	39.15	1935	1683
.MANPOWER total	days	100	50	37.5	2500	3750
hired	days	50				
family	days	50				
.FERTILIZERS						
UREA	Kg	20	4.58	6.64	92	133
TSP	Kg	10	5.40	10.15	54	102
MP	Kg		4.05	8.18		
.PESTICIDES						
INSECTICIDES	Kg	0.1	504.0	438.5	50	44
.SEEDS	Kg	100	10.0	8.8	1000	880
SUB-TOTAL					5631	6592
CREDIT					360	
UNFORESEEN (10%)					599	659
TOTAL					6591	7251

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	4471	4178	/day :	45	42
+ GROSS MARGIN	/ha :	1721	53	/day :	17	1

Table 5.A.5

** RICE - D.W.T. AMAN **

Variety : local Growing period : 160/200 days

Damage free areas				Fin.	Econ.
AVER. YIELD (T/ha):	1.50	FARM. G. PRICE (TK/KG):		6.438	5.665
BY PRODUCT (T/ha) :	3.00	FARM. G. PRICE (TK/KG):		0.95	0.827
			GROSS VALUE (TK) :	12507	10978

	A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE	**********												
AVERAGE RAINFALL mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	110	50	37.5	2750	4125
hired	days	55				
family	days	55				
.FERTILIZERS						
UREA	Kg	50	4.58	6.64	229	332
TSP	Kg	25	5.40	10.15	135	254
MP	Kg	10	4.05	8.18	41	82
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	30	10.0	8.8	300	264
SUB-TOTAL					5255	6623
CREDIT					336	
UNFORESEEN (10%)					559	662
TOTAL					6150	7285

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	9382	8230	/day	85	75
+ GROSS MARGIN	/ha	6357	3693	/day	58	34

** RICE - D.W.T. AMAN **

Variety : local Growing period : 160/200 days

			Fin.	Econ.		Fin.	Econ.
Damaged areas							
AVER. YIELD (T/ha):	1.13	FARM. G. PRICE (TK/KG):	6.438	5.665			
BY PRODUCT (T/ha) :	2.25	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :	9380	8233

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		**********												
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	110	50	37.5	2750	4125
hired	days	55				
family	days	55				
.FERTILIZERS						
UREA	Kg	50	4.58	6.64	229	332
TSP	Kg	25	5.40	10.15	135	254
MP	Kg	10	4.05	8.18	41	82
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	30	10.0	8.8	300	264
SUB-TOTAL					5255	6623
CREDIT					336	
UNFORESEEN (10%)					559	662
TOTAL					6150	7285

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	6255	5486	/day	57	50
+ GROSS MARGIN	/ha	3230	948	/day	29	9

Table 5.A.7

** RICE - B. AUS+AMAN **

Variety : local Growing period : 120/200 days

			Fin.	Econ.		Fin.	Econ.
Damage free areas							
AVER. YIELD (T/ha):	1.75	FARM. G. PRICE (TK/KG):	6.256	5.505			
BY PRODUCT (T/ha) :	2.10	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :	12943	11370

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		**********												
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	110	50	37.5	2750	4125
hired	days	55				
family	days	55				
.PERTILIZERS						
UREA	Kg		4.58	6.64		
TSP	Kg		5.40	10.15		
MP	Kg		4.05	8.18		
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	25	10.5	9.2	263	231
SUB-TOTAL					4813	5922
CREDIT					308	
UNFORESEEN (10%)					512	592
TOTAL					5633	6514

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	10335	9393	/day :	94	85
+ GROSS MARGIN	/ha :	7310	4856	/day :	66	44

** RICE - B. AUS+AMAN **

Variety : local Growing period : 120/200 days

			Fin.	Econ.		Fin.	Econ.
Damaged areas							
AVER. YIELD (T/ha):	1.31	FARM. G. PRICE (TK/KG):	6.256	5.505			
BY PRODUCT (T/ha) :	1.58	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :	9707	8527

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		**********												
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	110	50	37.5	2750	4125
hired	days	55				
family	days	55				
.FERTILIZERS						
UREA	Kg		4.58	6.64		
TSP	Kg		5.40	10.15		
MP	Kg		4.05	8.18		
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	25	10.5	9.2	263	231
SUB-TOTAL					4813	5922
CREDIT					308	
UNFORESEEN (10%)					512	592
TOTAL					5633	6514

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	7100	6551	/day :	65	60
+ GROSS MARGIN	/ha :	4075	2013	/day :	37	18

** RICE - L.BORO **

Variety : local Growing period : 120/150 days

			Fin.	Econ.			Fin.	Econ.
Damage free areas								
AVER. YIELD (T/ha):	2.5	FARM. G. PRICE (TK/KG):	6.212	5.467				
BY PRODUCT (T/ha) :	2.5	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :		17905	15733

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		******								**********				
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo		147	152	117	118	114	111	109	84	71	68	87	127	1305
NIR		85								61	210	121	128	605

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	45	45	39.15	2025	1762
.MANPOWER total	days	150	50	37.5	3750	5625
hired	days	75				
family	days	75				
.FERTILIZERS						
UREA	Kg	160	4.58	6.64	733	1062
TSP	Kg	60	5.40	10.15	324	609
MP	Kg	30	4.05	8.18	122	245
.PESTICIDES						
INSECTICIDES	Kg	0.5	504.0	438.5	252	219
.SEEDS	Kg	40	10.0	8.8	400	352

SUB-TOTAL	7605	9875	
CREDIT	487		
UNFORESEEN (10%)	809	987	
TOTAL	8901	10862	

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	13129	11058	/day :	88	74
+ GROSS MARGIN	/ha :	9004	4870	/day :	60	32

** RICE - L.BORO **

Variety : local Growing period : 120/150 days

		Fin.	Econ.		Fin.	Econ.
Damaged areas						
AVER. YIELD (T/ha):	1.875 FARM. G. PRICE (TK/KG):	6.212	5.467			
BY PRODUCT (T/ha) :	1.875 FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :	13429	11799

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		******								**********				
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo		147	152	117	118	114	111	109	84	71	68	87	127	1305
NIR		85								61	210	121	128	605

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	45	45	39.15	2025	1762
.MANPOWER total	days	150	50	37.5	3750	5625
hired	days	75				
family	days	75				
.FERTILIZERS						
UREA	Kg	160	4.58	6.64	733	1062
TSP	Kg	60	5.40	10.15	324	609
MP	Kg	30	4.05	8.18	122	245
.PESTICIDES						
INSECTICIDES	Kg	0.5	504.0	438.5	252	219
.SEEDS	Kg	40	10.0	8.8	400	352
SUB-TOTAL					7605	9875
CREDIT					487	
UNFORESEEN (10%)					809	987
TOTAL					8901	10862

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	8653	7125	/day :	58	47
+ GROSS MARGIN	/ha :	4528	937	/day :	30	6

Table 5.A.11

** RICE - HYV BORO **

Variety : BR14/BR18 Growing period : 150/170 days

Damage free areas														Fin.	Econ.	
AVER. YIELD (T/ha):	4.5	FARM. G. PRICE (TK/KG):												6.212	5.467	
BY PRODUCT (T/ha) :	3.6	FARM. G. PRICE (TK/KG):												0.715	0.622	
													GROSS VALUE (TK) :	30528	26839	
			A	M	J	J	A	S	O	N	D	J	F	M	T	
GROWING STAGE			**********											**********		
AVERAGE RAINFALL	mm		111	304	439	380	411	311	172	21	8	17	21	49	2241	
ETo			147	152	117	118	114	111	109	84	71	68	87	127	1305	
NIR			85								61	210	121	128	605	

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	55	45	39.15	2475	2153
.MANPOWER total	days	180	50	37.5	4500	6750
hired	days	90				
family	days	90				
.FERTILIZERS						
UREA	Kg	175	4.58	6.64	802	1162
TSP	Kg	75	5.40	10.15	405	761
MP	Kg	30	4.05	8.18	122	245
.PESTICIDES						
INSECTICIDES	Kg	1.25	504.0	438.5	630	548
.SEEDS	Kg	40	10.0	8.8	400	352
.IRRIGATION					5000	3150
			SUB-TOTAL		14333	15122
			CREDIT		917	
			UNFORESEEN (10%)		1525	1512
			TOTAL		16775	16634

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	18703	17630	/day :	104	98
+ GROSS MARGIN	/ha :	13753	10205	/day :	76	57

Table 5.A.12

** RICE - HYV BORO **

Variety : BR14/BR18 Growing period : 150/170 days

Damaged areas				Fin.	Econ.			Fin.	Econ.
AVER. YIELD (T/ha):	3.38	FARM. G. PRICE (TK/KG):		6.212	5.467				
BY PRODUCT (T/ha) :	2.70	FARM. G. PRICE (TK/KG):		0.715	0.622	GROSS VALUE (TK) :		22896	20125

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		**********										**********		
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo		147	152	117	118	114	111	109	84	71	68	87	127	1305
NIR		85								61	210	121	128	605

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	55	45	39.15	2475	2153
.MANPOWER total	days	180	50	37.5	4500	6750
hired	days	90				
family	days	90				
.FERTILIZERS						
UREA	Kg	175	4.58	6.64	802	1162
TSP	Kg	75	5.40	10.15	405	761
MP	Kg	30	4.05	8.18	122	245
.PESTICIDES						
INSECTICIDES	Kg	1.25	504.0	438.5	630	548
.SEEDS	Kg	40	10.0	8.8	400	352
.IRRIGATION					5000	3150
SUB-TOTAL					14333	15122
CREDIT					917	
UNFORESEEN (10%)					1525	1512
TOTAL					16775	16634

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	11071	10920	/day	62	61
+ GROSS MARGIN	/ha	6121	3495	/day	34	19

** L.T. AMAN **

Variety : local Growing period : 120/140 days

			Fin.	Econ.		Fin.	Econ.
Damage free areas							
AVER. YIELD (T/ha):	2.20	FARM. G. PRICE (TK/KG):	6.438	5.665			
BY PRODUCT (T/ha) :	2.20	FARM. G. PRICE (TK/KG):	0.95	0.827	GROSS VALUE (TK) :	16254	1428

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE					**********	**********	**********							
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	224

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	45	45	39.15	2025	1762
.MANPOWER total	days	140	50	37.5	3500	5250
hired	days	70				
family	days	70				
.FERTILIZERS						
UREA	Kg	100	4.58	6.64	458	664
TSP	Kg	60	5.40	10.15	324	609
MP	Kg	20	4.05	8.18	81	164
.PESTICIDES						
INSECTICIDES	Kg	0.25	504.0	438.5	126	110
.SEEDS	Kg	30	10.0	8.8	300	264
SUB-TOTAL					6814	8822
CREDIT					436	
UNFORESEEN (10%)					725	882
TOTAL					7975	9704

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	12128	10353	/day :	87	74
+ GROSS MARGIN	/ha :	8278	4578	/day :	59	33

Table 5. A. 14

** L.T. AMAN **

Variety : local Growing period : 120/140 days

		Fin.	Econ.			Fin.	Econ.
Damaged areas							
AVER. YIELD (T/ha):	1.65	6.438	5.665				
BY PRODUCT (T/ha) :	1.65	0.95	0.827	GROSS VALUE (TK) :		12190	10712

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE					**********									
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	45	45	39.15	2025	1762
.MANPOWER total	days	140	50	37.5	3500	5250
hired	days	70				
family	days	70				
.FERTILIZERS						
UREA	Kg	100	4.58	6.64	458	664
TSP	Kg	60	5.40	10.15	324	609
MP	Kg	20	4.05	8.18	81	164
.PESTICIDES						
INSECTICIDES	Kg	0.25	504.0	438.5	126	110
.SEEDS	Kg	30	10.0	8.8	300	264
SUB-TOTAL					6814	8822
CREDIT					436	
UNFORESEEN (10%)					725	882
TOTAL					7975	9704

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	8065	6783	/day :	58	48
+ GROSS MARGIN	/ha :	4215	1008	/day :	30	7

Table 5.A.15

** HYV AMAN **

Variety : BR10/BR11 Growing period : 140/145 days

		Fin.	Econ.		Fin.	Econ.
Damage free areas						
AVER. YIELD (T/ha):	3.750 FARM. G. PRICE (TK/KG):	6.438	5.665			
BY PRODUCT (T/ha) :	3.375 FARM. G. PRICE (TK/KG):	0.715	0.622	GROSS VALUE (TK) :	26556	23345

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE					**********	**********	**********							
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	55	45	39.15	2475	2153
.MANPOWER total	days	170	50	37.5	4250	6375
hired	days	85				
family	days	85				
.FERTILIZERS						
UREA	Kg	150	4.58	6.64	687	996
TSP	Kg	50	5.40	10.15	270	508
MP	Kg	25	4.05	8.18	101	205
.PESTICIDES						
INSECTICIDES	Kg	1.25	504.0	438.5	630	548
.SEEDS	Kg	35	9.0	7.9	315	277
SUB-TOTAL					8728	11062
CREDIT					559	
UNFORESEEN (10%)					929	1106
TOTAL					10216	12168

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	21015	18190	/day :	124	107
+ GROSS MARGIN	/ha :	16340	11177	/day :	96	66

** HYV AMAN **

Variety : BR10/BR11 Growing period : 140/145 days

			Fin.	Econ.		Fin.	Econ.
Damaged areas							
AVER. YIELD (T/ha):	2.81	FARM. G. PRICE (TK/KG):	6.438	5.665			
BY PRODUCT (T/ha) :	2.53	FARM. G. PRICE (TK/KG):	0.715	0.622	GROSS VALUE (TK) :	19917	17509

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE					**********	**********	**********							
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS			standard	unit cost			cost/ha		
				Fin.		Econ.	Fin.		Econ.
.DRAUGHT ANIMALS		days	55	45	:	39.15	2475	:	2153
.MANPOWER	total	days	170	50	:	37.5	4250	:	6375
	hired	days	85		:			:	
	family	days	85		:			:	
.FERTILIZERS					:			:	
UREA		Kg	150	4.58	:	6.64	687	:	996
TSP		Kg	50	5.40	:	10.15	270	:	508
MP		Kg	25	4.05	:	8.18	101	:	205
.PESTICIDES					:			:	
INSECTICIDES		Kg	1.25	504.0	:	438.5	630	:	548
.SEEDS		Kg	35	9.0	:	7.9	315	:	277
					:			:	
SUB-TOTAL							8728	:	11062
CREDIT							559	:	
UNFORESEEN (10%)							929	:	1106
TOTAL							10216	:	12168

			Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :		14376	12353	/day :	85	73
+ GROSS MARGIN	/ha :		9701	5341	/day :	57	31

** HYV WHEAT **

Variety : Kanchan/Akbar Growing period : 100/105 days

		Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha):	2.00	FARM. G. PRICE (TK/KG):	6.312	8.142		
BY PRODUCT (T/ha) :	1.60	FARM. G. PRICE (TK/KG):	0.950	0.827	* GROSS VALUE (TK) : 14144	17617

GROWING STAGE		A	M	J	J	A	S	O	N	D	J	F	M	T
									**********					
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo	mm	147	152	117	118	114	111	109	84	71	68	87	127	1305
kc									0.50	0.95	1.20	0.56		
N. irr. requirements	mm								25	62	68	32		188

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	50	45	39.15	2250	1958
.MANPOWER total	days	90	50	37.5	2250	3375
hired	days	45				
family	days	45				
.FERTILIZERS						
UREA	Kg	100	4.58	6.64	458	664
TSP	Kg	75	5.40	10.15	405	761
MP	Kg	25	4.05	8.18	101	205
.PESTICIDES						
INSECTICIDES	Kg	0.6	504.0	438.5	302	263
.SEEDS	Kg	140	12.0	15.5	1680	2167
.IRRIGATION					750	473
			SUB-TOTAL		8197	9865
			CREDIT		525	
			UNFORESEEN (10%)		872	986.5
			TOTAL		9593	10852

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	7026	10468	/day	78	116
+ GROSS MARGIN	/ha :	4551	6756	/day	51	75

** JUTE - Tossa **

Variety : local Growing period : 100/140 days

		Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha):	1.70	FARM. G. PRICE (TK/KG):	8.012	8.493		
BY PRODUCT (T/ha) :	2.55	FARM. G. PRICE (TK/KG):	2.55	2.219	GROSS VALUE (TK) : 20123	20095

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		**********											*******	
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	55	45	39.15	2475	2153
.MANPOWER total	days	200	50	37.5	5000	7500
hired	days	100				
family	days	100				
.FERTILIZERS						
UREA	Kg	60	4.58	6.64	275	398
TSP	Kg	20	5.40	10.15	108	203
MP	Kg	30	4.05	8.18	122	245
.PESTICIDES						
INSECTICIDES	Kg	1.7	504.0	438.5	857	745
.SEEDS	Kg	10	24.0	25.4	240	254
.IRRIGATION						
SUB-TOTAL					9076	11500
CREDIT					581	
UNFORESEEN (10%)					966	1150
TOTAL					10623	12650

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	15000	15695	/day	75	78
+ GROSS MARGIN	/ha	9500	7445	/day	48	37

** GROUNDNUT **

Variety : Dakha Growing period : 115/130 days

		Fin.	Econ.	Fin.	Econ.
AVER. YIELD (T/ha):	1.3	FARM. G. PRICE (TK/KG):	10.00 : 8.70		
				* GROSS VALUE (TK) :	13000 : 11311

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE									**********					
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	224

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin. :	Econ.	Fin. :	Econ.
.DRAUGHT ANIMALS	days	40	45 :	39.15	1800 :	1566
.MANPOWER total	days	100	50 :	37.5	2500 :	3750
hired	days	50	:		:	
family	days	50	:		:	
.FERTILIZERS			:		:	
UREA	Kg		4.58 :	6.64	:	
TSP	Kg		5.40 :	10.15	:	
MP	Kg		4.05 :	8.18	:	
.PESTICIDES			:		:	
INSECTICIDES	Kg		504.0 :	438.5	:	
.SEEDS	Kg	75	32.0 :	27.8	2400 :	2088
.IRRIGATION			:		:	
SUB-TOTAL					6700 :	7404
CREDIT					429 :	
UNFORESEEN (10%)					713 :	740
TOTAL					7842 :	8144

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	7908 :	7291	/day :	79 :	73
+ GROSS MARGIN	/ha :	5158 :	3166	/day :	52 :	32

** MUSTARD **

Variety : Local Growing period : 100/110 days

		Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha):	0.80	FARM. G. PRICE (TK/KG):	13.47	11.85		
				GROSS VALUE (TK) :	10773	9483

	A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE							**********						
AVERAGE RAINFALL mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	55	45	39.15	2475	2153
.MANPOWER total	days	60	50	37.5	1500	2250
hired	days	30				
family	days	30				
.FERTILIZERS						
UREA	Kg	30	4.58	6.64	137	199
TSP	Kg	50	5.40	10.15	270	508
MP	Kg	15	4.05	8.18	61	123
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	10	19.0	16.7	190	167
.IRRIGATION						

SUB-TOTAL	4633	5400
CREDIT	297	
UNFORESEEN (10%)	493	540
TOTAL	5423	5940

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	7000	6015	/day	117	100
+ GROSS MARGIN	/ha	5350	3540	/day	89	59

** POTATO **

Variety : Holland Growing period : 110/130 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 8.0 FARM. G. PRICE (TK/KG):	4.58	3.985	GROSS VALUE (TK) :	36640	31877

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		****								**********				
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo	mm	147	152	117	118	114	111	109	84	71	68	87	127	1305
kc									0.70	1.00	1.10	0.20		
N. irr. requirements	mm								42	65	62	1		170

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	50	45	39.15	2250	1958
.MANPOWER total	days	240	50	37.5	6000	9000
hired	days	120				
family	days	120				
.FERTILIZERS						
UREA	Kg	250	4.58	6.64	1145	1660
TSP	Kg	130	5.40	10.15	702	1320
MP	Kg	30	4.05	8.18	122	245
.PESTICIDES						
INSECTICIDES	Kg	1	504.0	438.5	504	438
.SEEDS	Kg	1000	8.5	7.4	8500	7395
.IRRIGATION					1500	945
SUB-TOTAL					20723	22961
CREDIT					1326	
UNFORESEEN (10%)					2205	2296
TOTAL					24254	25257

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	18986	16520	/day	79	69
+ GROSS MARGIN	/ha	12386	6620	/day	52	28

Table 5.A.22

** SUGAR CANE **

Variety : Local Growing period : 360/450 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 45.0 FARM. G. PRICE (TK/KG):	0.95	0.903	GROSS VALUE (TK) :	42750	40613

GROWING STAGE		A	M	J	J	A	S	O	N	D	J	F	M	T
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241
ETo	mm	147	152	117	118	114	111	109	84	71	68	87	127	1305
kc		0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
N. irr. requirements	mm	22							46	47	38	49	56	258

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	65	45	39.15	2925	2545
.MANPOWER total	days	250	50	37.5	6250	9375
hired	days	125				
family	days	125				
.FERTILIZERS						
UREA	Kg	200	4.58	6.64	916	1328
TSP	Kg	125	5.40	10.15	675	1269
MP	Kg	90	4.05	8.18	365	736
.PESTICIDES						
INSECTICIDES	Kg	2.5	504.0	438.5	1260	1096
.CUTTINGS	U	5000	1.0	0.95	5000	4750
.IRRIGATION					500	315
SUB-TOTAL					17891	21414
CREDIT					1145	
UNFORESEEN (10%)					1904	2141
TOTAL					20939	23555

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	28686	27370	/day	115	109
+ GROSS MARGIN	/ha	21811	17057	/day	87	68

Table 5.A.23

** PULSES (Lentils) **

Variety : Local Growing period : 75/90 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 0.85 FARM. G. PRICE (TK/KG):	14.92	12.98	GROSS VALUE (TK) :	12682	11033

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE								**********						
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	30	45	39.15	1350	1175
.MANPOWER total	days	60	50	37.5	1500	2250
hired	days	30				
family	days	30				
.FERTILIZERS						
UREA	Kg	30	4.58	6.64	137	199
TSP	Kg	50	5.40	10.15	270	508
MP	Kg	15	4.05	8.18	61	123
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	10	25.0	22.0	250	220
.IRRIGATION						
SUB-TOTAL					3568	4474
CREDIT					228	
UNFORESEEN (10%)					380	447
TOTAL					4176	4921

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	10156	8587	/day	339	286
+ GROSS MARGIN	/ha	8506	6112	/day	284	204

Table 5.A.24

** ONIONS **

Variety : Texas grano Growing period : 130/150 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 3.5 FARM. G. PRICE (TK/KG):	9.05	7.87	GROSS VALUE (TK) :	31675	27557

	A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE							**********						
AVERAGE RAINFALL mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	250	50	37.5	6250	9375
hired	days	125				
family	days	125				
.FERTILIZERS						
UREA	Kg	80	4.58	6.64	366	531
TSP	Kg	80	5.40	10.15	432	812
MP	Kg	70	4.05	8.18	284	573
.PESTICIDES						
INSECTICIDES	Kg	2	504.0	438.5	1008	877
.SEEDS	Kg	6	600.0	522.0	3600	3132
.IRRIGATION						

	Fin.	Econ.
SUB-TOTAL	13740	16866
CREDIT	879	
UNFORESEEN (10%)	1462	1687
TOTAL	16081	18552

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	22469	19317	/day :	180	155
+ GROSS MARGIN	/ha :	15594	9005	/day :	125	72

** CHILLIES **

Variety : local Growing period : 90/120 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 1.5 FARM. G. PRICE (TK/KG):	10.00	8.70	GROSS VALUE (TK	15000	13050

GROWING STAGE		A	M	J	J	A	S	O	N	D	J	F	M	T
		**********										**********		
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost		cost/ha	
			Fin.	Econ.	Fin.	Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	120	50	37.5	3000	4500
hired	days	60				
family	days	60				
.FERTILIZERS						
UREA	Kg	150	4.58	6.64	687	996
TSP	Kg	150	5.40	10.15	810	1523
MP	Kg	50	4.05	8.18	203	409
.PESTICIDES						
INSECTICIDES	Kg	1	504.0	438.5	504	438
.SEEDS	Kg	1	25.0	21.8	25	22
.IRRIGATION						
SUB-TOTAL					7029	9454
CREDIT					450	
UNFORESEEN (10%)					748	945
TOTAL					8226	10399

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	10074	7601	/day	84	63
+ GROSS MARGIN	/ha	6774	2651	/day	56	22

Table 5.A.26

** EGG-PLANT **

Variety : local Growing period : 90/100 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 5.0 FARM. G. PRICE (TK/KG):	2.00	1.74	GROSS VALUE (TK) :	10000	8700

	A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE								**********					
AVERAGE RAINFALL mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	80	50	37.5	2000	3000
hired	days	40				
family	days	40				
.FERTILIZERS						
UREA	Kg	50	4.58	6.64	229	332
TSP	Kg	50	5.40	10.15	270	508
MP	Kg	20	4.05	8.18	81	164
.PESTICIDES						
INSECTICIDES	Kg	0.1	504.0	438.5	50	44
.SEEDS	Kg	1	250.0	217.5	250	218
.IRRIGATION						
SUB-TOTAL					4680	5830
CREDIT					300	
UNFORESEEN (10%)					498	583
TOTAL					5478	6413

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	6722	5587	/day	84	70
+ GROSS MARGIN	/ha	4522	2287	/day	57	29

Table 5.A.27

** MILLET **

Variety : local Growing period : 80/100 days

	Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha): 0.8 FARM. G. PRICE (TK/KG):	8.00	6.96	GROSS VALUE (TK) :	6400	5568

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE		******										******		
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	20	45	39.15	900	783
.MANPOWER total	days	50	50	37.5	1250	1875
hired	days	25				
family	days	25				
.FERTILIZERS						
UREA	Kg		4.58	6.64		
TSP	Kg		5.40	10.15		
MP	Kg		4.05	8.18		
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDS	Kg	20	8.0	7.0	160	139
.IRRIGATION						
SUB-TOTAL					2310	2797
CREDIT					148	
UNFORESEEN (10%)					246	280
TOTAL					2704	3077

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha	5071	4554	/day	101	91
+ GROSS MARGIN	/ha	3696	2491	/day	74	50

** SWEET POTATO **

Variety : local Growing period : 115/130 days

		Fin.	Econ.		Fin.	Econ.
AVER. YIELD (T/ha):	6.50	FARM. G. PRICE (TK/KG):	3.00	2.61	GROSS VALUE (TK) :	19500	16965

		A	M	J	J	A	S	O	N	D	J	F	M	T
GROWING STAGE									**********					
AVERAGE RAINFALL	mm	111	304	439	380	411	311	172	21	8	17	21	49	2241

PRODUCTION COSTS		standard	unit cost Fin.	unit cost Econ.	cost/ha Fin.	cost/ha Econ.
.DRAUGHT ANIMALS	days	40	45	39.15	1800	1566
.MANPOWER total	days	76	50	37.5	1900	2850
hired	days	38				
family	days	38				
.FERTILIZERS						
UREA	Kg		4.58	6.64		
TSP	Kg		5.40	10.15		
MP	Kg		4.05	8.18		
.PESTICIDES						
INSECTICIDES	Kg		504.0	438.5		
.SEEDLINGS	U	20000	0.01	0.01	200	174
.IRRIGATION						
SUB-TOTAL					3900	4590
CREDIT					250	
UNFORESEEN (10%)					415	459
TOTAL					4565	5049

		Fin.	Econ.		Fin.	Econ.
+ VALUE ADDED	/ha :	17025	15051	/day :	224	198
+ GROSS MARGIN	/ha :	14935	11916	/day :	197	157

- GROSS MARGINS PER HECTARE - RICE CROPS Table 5.A.29

Gross margins per hectare (financial) - damage free areas

CROPS	Yield (t/ha) grain	Yield (t/ha) straw	Price (Tk/kg) grain	Price (Tk/kg) straw	G. value Tk/ha	Pro. costs Tk/ha	Gross margin Tk/ha
L. AUS	1.200	1.800	6.074	0.950	8999	5558	3441
HYV AUS	3.000	3.000	6.074	0.715	20367	9372	10995
B. AMAN	1.500	1.500	6.438	0.950	11082	6591	4491
L.T.AMAN	2.200	2.200	6.438	0.950	16254	7975	8278
HYV T.AMAN	3.750	3.375	6.438	0.715	26556	10216	16340
D.W.T AMAN	1.500	3.000	6.438	0.950	12507	6150	6357
Mix. AUS+AMAN	1.750	2.100	6.256	0.950	12943	5633	7310
L. BORO	2.500	2.500	6.212	0.950	17905	8901	9004
HYV BORO	4.500	3.600	6.212	0.715	30528	16775	13753

Gross margins per hectare (financial) - damaged areas

CROPS	Yield (t/ha) grain	Yield (t/ha) straw	Price (Tk/kg) grain	Price (Tk/kg) straw	G. value Tk/ha	Pro. costs Tk/ha	Gross margin Tk/ha
B. AMAN	1.125	1.125	6.438	0.950	8312	6591	1721
L.T.AMAN	1.650	1.650	6.438	0.950	12190	7975	4215
HYV T.AMAN	2.813	2.531	6.438	0.715	19917	10216	9701
D.W.T AMAN	1.125	2.250	6.438	0.950	9380	6150	3230
Mix. AUS+AMAN	1.313	1.575	6.256	0.950	9707	5633	4075
HYV BORO	3.375	2.700	6.212	0.715	22896	16775	6121

Gross margins per hectare (economic) - damage free areas

CROPS	Yield (t/ha) grain	Yield (t/ha) straw	Price (Tk/kg) grain	Price (Tk/kg) straw	G. value Tk/ha	Pro. costs Tk/ha	Gross margin Tk/ha
L. AUS	1.200	1.800	5.345	0.827	7902	6087	1815
HYV AUS	3.000	3.000	5.345	0.622	17902	11255	6647
B. AMAN	1.500	1.500	5.665	0.827	9738	7251	2487
L.T.AMAN	2.200	2.200	5.665	0.827	14282	9704	4578
HYV T.AMAN	3.750	3.375	5.665	0.622	23345	12168	11177
D.W.T AMAN	1.500	3.000	5.665	0.827	10978	7285	3693
Mix. AUS+AMAN	1.750	2.100	5.505	0.827	11370	6514	4856
L. BORO	2.500	2.500	5.467	0.827	15733	10862	4870
HYV BORO	4.500	3.600	5.467	0.622	26839	16634	10205

Gross margins per hectare (economic) - damaged areas

CROPS	Yield (t/ha) grain	Yield (t/ha) straw	Price (Tk/kg) grain	Price (Tk/kg) straw	G. value Tk/ha	Pro. costs Tk/ha	Gross margin Tk/ha
B. AMAN	1.125	1.125	5.665	0.827	7303	7251	53
L.T.AMAN	1.650	1.650	5.665	0.827	10712	9704	1008
HYV T.AMAN	2.813	2.531	5.665	0.622	17509	12168	5341
D.W.T AMAN	1.125	2.250	5.665	0.827	8233	7285	948
Mix. AUS+AMAN	1.313	1.575	5.505	0.827	8527	6514	2013
HYV BORO	3.375	2.700	5.467	0.622	20129	16634	3495

GROSS MARGINS PER HA - Table 5.A.30

Gross margins per hectare (financial prices) -

CROPS	Yield t/ha	Price Tk/kg	G. value Tk/ha	Pro. costs Tk/ha	Gross margin Tk/ha
WHEAT (*)	2.00	6.312	14144	9593	4551
POTATO	8.00	4.580	36640	24254	12386
PULSES	0.85	14.920	12682	4176	8506
MUSTARD	0.80	13.466	10773	5423	5350
ONIONS	3.50	9.050	31675	16081	15594
EGG PLANT	5.00	2.000	10000	5478	4522
CHILLIES	1.50	10.000	15000	8226	6774
SUGAR CANE	45.00	0.950	42750	20939	21811
GROUNDNUT	1.30	10.000	13000	7842	5158
MILLET	0.80	8.000	6400	2704	3696
SWEET POTATO	6.50	3.000	19500	4565	14935
JUTE (*)	1.70	8.012	20123	10623	9500

Gross margins per hectare (economic prices) -

CROPS	Yield t/ha	Price Tk/kg	G. value Tk/ha	Pro. costs Tk/ha	Gross margin Tk/ha
WHEAT (*)	2.00	8.142	17607	10852	6756
POTATO	8.00	3.985	31877	25257	6620
PULSES	0.85	12.980	11033	4921	6112
MUSTARD	0.80	11.850	9480	5940	3540
ONIONS	3.50	7.874	27557	18552	9005
EGG PLANT	5.00	1.740	8700	6413	2287
CHILLIES	1.50	8.700	13050	10399	2651
SUGAR CANE	45.00	0.903	40613	23555	17057
GROUNDNUT	1.30	8.700	11310	8144	3166
MILLET	0.80	6.960	5568	3077	2491
SWEET POTATO	6.50	2.610	16965	5049	11916
JUTE (*)	1.70	8.493	20095	12650	7445

(*) : By-product value included
Source: Consultant's estimates

ANNEX 5

APPENDIX

B EVAPOTRANSPIRATION AND IRRIGATION REQUIREMENTS

Table 5.B.2

Rice Evapotranspiration and Irrigation Requirements

Climate : banjamal
Crop : PADDY
Effective Rainfall: 90 %

Station: JAMALPUR
Date of Transplant : 1 August

150

Month	Decade	Stage	Area %	Coeff	ETcrop mm/day	Perc. mm/dy	LPrep mm/dy	RiceRq mm/day	EffRain mm/dec	IRReq. mm/day	IRReq mm/dec
Jul	1	NUR	0.10	1.20	0.46	0.1	0.5	1.1	11.9	0.00	0.0
Jul	2	LP	0.33	1.18	1.45	0.3	2.3	4.0	35.7	0.46	4.6
Jul	3	LP	0.78	1.13	3.32	0.8	2.3	6.3	88.6	0.00	0.0
Aug	1	A	1.00	1.10	4.18	1.0	0.0	5.2	122.1	0.00	0.0
Aug	2	A	1.00	1.10	4.17	1.0	0.0	5.2	128.2	0.00	0.0
Aug	3	B	1.00	1.09	4.11	1.0	0.0	5.1	116.6	0.00	0.0
Sep	1	B	1.00	1.07	4.02	1.0	0.0	5.0	104.9	0.00	0.0
Sep	2	B	1.00	1.06	3.93	1.0	0.0	4.9	93.2	0.00	0.0
Sep	3	C	1.00	1.05	3.82	1.0	0.0	4.8	79.3	0.00	0.0
Oct	1	C	1.00	1.05	3.75	1.0	0.0	4.7	65.5	0.00	0.0
Oct	2	C	1.00	1.05	3.67	1.0	0.0	4.7	51.6	0.00	0.0
Oct	3	C	1.00	1.05	3.44	1.0	0.0	4.4	36.5	0.80	8.0
Nov	1	D	1.00	1.01	3.09	0.8	0.0	3.9	18.0	2.12	21.2
Nov	2	D	1.00	0.92	2.63	0.6	0.0	3.2	1.2	3.09	30.9
Nov	3	D	1.00	0.84	2.22	0.3	0.0	2.5	1.6	2.36	23.6
Totals					483	119	50	1043	955		88

Table 5.B.2

Rice Evapotranspiration and Irrigation Requirements

Climate : banjamal
Crop : PADDY
Effective Rainfall: 90 %

Station: JAMALPUR
Date of Transplant : 15 August

Month	Decade	Stage	Area %	Coeff	ETcrop mm/day	Perc. mm/dy	LPrep mm/dy	RiceRq mm/day	EffRain mm/dec	IRReq. mm/day	IRReq mm/dec
Jul	2	NUR	0.05	1.20	0.24	0.0	0.3	0.5	2.9	0.20	1.0
Jul	3	N/L	0.16	1.19	0.75	0.2	1.4	2.3	18.9	0.40	4.0
Aug	1	LP	0.55	1.15	2.40	0.5	2.3	5.2	67.2	0.00	0.0
Aug	2	L/A	0.89	1.11	3.74	0.9	1.1	5.8	113.8	0.00	0.0
Aug	3	A	1.00	1.10	4.14	1.0	0.0	5.1	116.6	0.00	0.0
Sep	1	A/B	1.00	1.10	4.09	1.0	0.0	5.1	104.9	0.00	0.0
Sep	2	B	1.00	1.08	4.02	1.0	0.0	5.0	93.2	0.00	0.0
Sep	3	B	1.00	1.07	3.88	1.0	0.0	4.9	79.3	0.00	0.0
Oct	1	B/C	1.00	1.05	3.76	1.0	0.0	4.8	65.5	0.00	0.0
Oct	2	C	1.00	1.05	3.67	1.0	0.0	4.7	51.6	0.00	0.0
Oct	3	C	1.00	1.05	3.44	1.0	0.0	4.4	36.5	0.80	8.0
Nov	1	C	1.00	1.05	3.21	1.0	0.0	4.2	18.0	2.41	24.1
Nov	2	C/D	1.00	1.03	2.92	0.9	0.0	3.8	1.2	3.72	37.2
Nov	3	D	1.00	0.97	2.56	0.7	0.0	3.3	1.6	3.10	31.0
Dec	1	D	1.00	0.88	2.16	0.4	0.0	2.6	2.0	2.40	24.0
Dec	2	D	1.00	0.80	1.80	0.1	0.0	1.9	1.2	1.82	9.1
Totals					458	117	50	913	774		138

Table 5.B.3

CROPWAT : 15 May 1992

Rice Evapotranspiration and Irrigation Requirements

Climate : BANJAMAL
Crop : PADDY
Effective Rainfall: 90 %

Station: JAMALPUR
Date of Transplant : 15 March

Month	Decade	Stage	Area %	Coeff	ETcrop mm/day	Perc. mm/dy	LPrep mm/dy	RiceRq mm/day	EffRain mm/dec	IRReq. mm day	IRReq mm/dec
Feb	2	NUR	0.05	1.20	0.19	0.0	0.9	1.1	0.2	1.07	5.4
Feb	3	N/L	0.16	1.19	0.65	0.2	5.0	5.9	1.5	5.70	57.0
Mar	1	LP	0.55	1.15	2.35	0.8	8.1	11.3	6.1	10.66	106.6
Mar	2	L/A	0.89	1.11	4.05	1.3	4.1	9.4	12.1	8.22	82.2
Mar	3	A	1.00	1.10	4.80	1.5	0.0	6.3	20.1	4.29	42.9
Apr	1	A/B	1.00	1.10	5.07	1.5	0.0	6.6	23.3	4.24	42.4
Apr	2	B	1.00	1.08	5.30	1.5	0.0	6.8	28.2	3.98	39.8
Apr	3	B	1.00	1.07	5.22	1.5	0.0	6.7	49.2	1.80	18.0
May	1	B/C	1:00	1.05	5.23	1.5	0.0	6.7	71.5	0.00	0.0
May	2	C	1.00	1.05	5.25	1.5	0.0	6.8	93.2	0.00	0.0
May	3	C	1.00	1.05	4.87	1.5	0.0	6.4	106.0	0.00	0.0
Jun	1	C	1.00	1.05	4.38	1.5	0.0	5.9	123.4	0.00	0.0
Jun	2	C/D	1.00	1.03	3.91	1.4	0.0	5.3	138.6	0.00	0.0
Jun	3	D	1.00	0.97	3.68	1.1	0.0	4.7	130.4	0.00	0.0
Jul	1	D	1.00	0.88	3.39	0.7	0.0	4.0	119.5	0.00	0.0
Jul	2	D	1.00	0.80	3.05	0.2	0.0	3.3	55.0	0.00	0.0
Totals					598	176	180	1372	978		394

Table 5.B.4

CROPWAT : 15 May 1992

Crop data : WHEAT		Crop file : WHEAT				
Growth Stage		Init	Devel	Mid	Late	Total
Length Stage	[days]	25	25	30	30	110
Crop Coefficient	[coeff.]	0.50	->	1.20	0.60	
Rooting Depth	[meter]	0.30	->	1.00	1.00	
Depletion level	[fract.]	0.50	->	0.50	0.70	
Yield-response F.	[coeff.]	0.40	0.60	0.80	0.40	1.00

CROPWAT : 15 May 1992

Table 5.B.5

Crop Evapotranspiration and Irrigation Requirements

Climate File : BANJAMAL
Crop : WHEAT
Climate Station: JAMALPUR
Planting date : 1 November

Month	Dec	Stage	Coeff Kc	ETcrop mm/day	ETcrop mm/dec	Eff.Rain mm/dec	IRReq. mm/day	IRReq. mm/dec
Nov	1	init	0.50	1.53	15.3	18.0	0.00	0.0
Nov	2	init	0.50	1.42	14.2	1.2	1.30	13.0
Nov	3	in/de	0.57	1.51	15.1	1.6	1.35	13.5
Dec	1	deve	0.78	1.91	19.1	2.0	1.71	17.1
Dec	2	deve	1.06	2.39	23.9	2.3	2.15	21.5
Dec	3	mid	1.20	2.70	27.0	3.2	2.38	23.8
Jan	1	mid	1.20	2.69	26.9	4.1	2.28	22.8
Jan	2	mid	1.20	2.69	26.9	5.0	2.19	21.9
Jan	3	late	1.10	2.72	27.2	5.4	2.18	21.8
Feb	1	late	0.90	2.44	24.4	5.8	1.86	18.6
Feb	2	late	0.70	2.07	20.7	6.2	1.44	14.4
TOTAL					240.6	54.9		188.4

Table 5.8.6

CROPWAT : 15 May 1992

Crop Evapotranspiration and Irrigation Requirements

Climate File : BANJAMAL
Climate Station: JAMALPUR
Crop : POTATO
Planting date : 15 November

Month	Dec	Stage	Coeff Kc	ETcrop mm/day	ETcrop mm/dec	Eff.Rain mm/dec	IRReq. mm/day	IRReq. mm/dec
Nov	2	init	0.55	1.56	7.8	0.6	1.44	7.2
Nov	3	init	0.55	1.45	14.5	1.6	1.29	12.9
Dec	1	init	0.55	1.35	13.5	2.0	1.15	11.5
Dec	2	deve	0.66	1.48	14.8	2.3	1.25	12.5
Dec	3	deve	0.88	1.98	19.8	3.2	1.66	16.6
Jan	1	de/mi	1.05	2.34	23.4	4.1	1.93	19.3
Jan	2	mid	1.10	2.46	24.6	5.0	1.96	19.6
Jan	3	mid	1.10	2.72	27.2	5.4	2.18	21.8
Feb	1	mid	1.10	2.98	29.8	5.8	2.40	24.0
Feb	2	late	1.02	3.01	30.1	6.2	2.39	23.9
Feb	3	late	0.86	2.87	28.7	9.0	1.97	19.7
Mar	1	late	0.70	2.60	13.0	5.6	1.49	7.4
TOTAL					247.4	50.8		196.5

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Crop Evapotranspiration and Irrigation Requirements

Climate File : banjamal
Crop : SUGARCANE
Climate Station: JAMALPUR
Planting date : 1 October

Month	Dec	Stage	Coeff Kc	ETcrop mm/day	ETcrop mm/dec	Eff.Rain mm/dec	IRReq. mm/day	IRReq. mm/dec
Oct	1	init	0.95	3.39	33.9	58.2	0.00	0.0
Oct	2	init	0.95	3.33	33.3	45.8	0.00	0.0
Oct	3	init	0.95	3.12	31.2	32.4	0.00	0.0
Nov	1	init	0.95	2.91	29.1	16.3	1.28	12.8
Nov	2	init	0.95	2.70	27.0	1.5	2.54	25.4
Nov	3	init	0.95	2.51	25.1	1.7	2.34	23.4
Dec	1	init	0.95	2.32	23.2	1.9	2.14	21.4
Dec	2	init	0.95	2.14	21.4	2.1	1.93	19.3
Dec	3	init	0.95	2.13	21.3	2.9	1.85	18.5
Jan	1	deve	0.95	2.13	21.3	3.7	1.77	17.7
Jan	2	deve	0.95	2.13	21.3	4.5	1.68	16.8
Jan	3	deve	0.95	2.35	23.5	4.8	1.87	18.7
Feb	1	deve	0.95	2.58	25.8	5.2	2.06	20.6
Feb	2	deve	0.95	2.80	28.0	5.5	2.25	22.5
Feb	3	deve	0.95	3.17	31.7	8.0	2.37	23.7
Mar	1	deve	0.95	3.53	35.3	9.8	2.55	25.5
Mar	2	deve	0.95	3.89	38.9	12.0	2.70	27.0
Mar	3	deve	0.95	4.15	41.5	17.8	2.36	23.6
Apr	1	mid	0.95	4.40	44.0	21.0	2.29	22.9
Apr	2	mid	0.95	4.65	46.5	25.5	2.09	20.9
Apr	3	mid	0.95	4.65	46.5	44.0	0.25	2.5
May	1	mid	0.95	4.72	47.2	63.9	0.00	0.0
May	2	mid	0.95	4.75	47.5	83.0	0.00	0.0
May	3	mid	0.95	4.40	44.0	94.3	0.00	0.0
Jun	1	mid	0.95	3.96	39.6	109.7	0.00	0.0
Jun	2	mid	0.95	3.61	36.1	123.0	0.00	0.0
Jun	3	mid	0.95	3.61	36.1	115.7	0.00	0.0
Jul	1	mid	0.95	3.65	36.5	106.5	0.00	0.0
Jul	2	mid	0.95	3.62	36.2	98.3	0.00	0.0
Jul	3	mid	0.95	3.61	36.1	102.0	0.00	0.0
Aug	1	late	0.95	3.61	36.1	109.1	0.00	0.0
Aug	2	late	0.95	3.60	36.0	114.5	0.00	0.0
Aug	3	late	0.95	3.58	35.8	104.0	0.00	0.0
Sep	1	late	0.95	3.55	35.5	93.4	0.00	0.0
Sep	2	late	0.95	3.52	35.2	82.9	0.00	0.0
Sep	3	late	0.95	3.46	34.6	70.5	0.00	0.0
Oct	1	late	0.95	3.39	33.9	58.2	0.00	0.0
Oct	2	late	0.95	3.33	33.3	45.8	0.00	0.0
Oct	3	late	0.95	3.12	31.2	32.4	0.00	0.0
Nov	1	late	0.95	2.91	29.1	16.3	1.28	12.8
Nov	2	late	0.95	2.70	27.0	1.5	2.54	25.4
Nov	3	late	0.95	2.51	25.1	1.7	2.34	23.4
TOTAL					1401.6	1951.5		424.7

ANNEX 5

APPENDIX

C STATISTICS - PROJECT AREA

Table No	Title
5.C.1	Area - Production of T. Aman Rice
5.C.2	Area - Production of Aus Rice
5.C.3	Area - Production of Boro Rice
5.C.4	Area - Production of Jute
5.C.5	Area - Production of Wheat
5.C.6	Area - Production of Sugarcane
5.C.7	Area - Production of Potato
5.C.8	Area - Production of Mustard

STATISTIC - JAMALPUR AREA

Figure No	Title
5.C.1	Area and Production of Aus Paddy by Varieties
5.C.2	Area and Production of Aman Paddy by Varieties
5.C.3	Area and Production of Boro Paddy by Varieties
5.C.4	Area and Production of Wheat
5.C.5	Area and Production of Jute
5.C.6	Area and Production of Sugar Cane
5.C.7	Area and Production of Oil Seeds (Rape and Mustard)
5.C.8	Production of Major Vegetables

TABLE 5.C.1 : AREA (ha), PRODUCTION (Paddy in ton) OF T.AMAN IN THE PROJECT AREA.

THANA	Area (*)	HYV Area	HYV Prod.	HYV Yield	LOCAL Area	LOCAL Prod.	LOCAL Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
1988-1989										
JAMALPUR	7042	3262	4171	1.3	1565	1460	0.9	4827	5631	1.2
SHARISABARI	9800	2301	5414	2.4	2071	271	0.1	4371	5685	1.3
MELANDAHA	23974	9899	10000	1.0	4897	2857	0.6	14796	12857	0.9
ISLAMPUR	14621	2678	1217	0.5	1716	609	0.4	4395	1826	0.4
DEWANGANJ	9564	734	513	0.7	2419	513	0.2	3153	1026	0.3
MADARGANJ	20865	2970	3883	1.3	6143	1294	0.2	9113	5177	0.6
TOTAL	85866	21844	25199	1.2	18811	7004	0.4	40655	32202	0.8
1989-1990										
JAMALPUR	7042	2300	8541	3.7	2083	4123	2.0	4384	12664	2.9
SHARISABARI	9800	2144	9498	4.4	3062	7001	2.3	5206	16499	3.2
MELANDAHA	23974	6403	27420	4.3	7422	16980	2.3	13825	44400	3.2
ISLAMPUR	14621	1399	5791	4.1	1572	3485	2.2	2970	9275	3.1
DEWANGANJ	9564	116	445	3.9	605	1141	1.9	721	1586	2.2
MADARGANJ	20865	1922	6387	3.3	6588	15469	2.3	8510	21856	2.6
TOTAL	85866	14283	58082	4.1	21333	48199	2.3	35616	106281	3.0
1990-1991										
JAMALPUR	7042	3256	11605	3.6	1562	3481	2.2	4818	15086	3.1
SHARISABARI	9800	2297	7513	3.3	2067	4152	2.0	4364	11664	2.7
MELANDAHA	23974	9882	33168	3.4	4888	9057	1.9	14770	42225	2.9
ISLAMPUR	14621	1738	5162	3.0	1114	1798	1.6	2852	6960	2.4
DEWANGANJ	9564	153	493	3.2	507	1052	2.1	660	1545	2.3
MADARGANJ	20865	2964	8146	2.7	6133	13001	2.1	9097	21147	2.3
TOTAL	85866	20290	66086	3.3	16271	32541	2.0	36561	98627	2.7

Source : Data compiled by the Consultant from basic data of Bangladesh Bureau of statistics
(*) area concerned in the project

TABLE 5.C.2 - AREA (ha), PRODUCTION (Paddy in ton) OF AUS RICE IN THE PROJECT AREA.

THANA	Area (*)	1988-1989 HYV Area	HYV Prod.	HYV Yield	LOCAL Area	LOCAL Prod.	LOCAL Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
JAMALPUR	7042	443	1347	3.0	2080	2313	1.1	2523	3659	1.5
SHARISABARI	9800	123	340	2.8	690	836	1.2	813	1175	1.4
MELANDAHA	23974	271	750	2.8	2555	3283	1.3	2826	4033	1.4
ISLAMPUR	14621	131	412	3.1	1602	2217	1.4	1734	2629	1.5
DEWANGANJ	9564	247	775	3.1	3124	3782	1.2	3371	4557	1.4
MADARGANJ	20865	783	2088	2.7	5956	8242	1.4	6739	10330	1.5
TOTAL	85866	1998	5712	2.9	16008	20673	1.3	18006	26384	1.5

THANA	Area (*)	1989-1990 HYV Area	HYV Prod.	HYV Yield	LOCAL Area	LOCAL Prod.	LOCAL Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
JAMALPUR	7042	402	993	2.5	1601	1828	1.1	2003	2820	1.4
SHARISABARI	9800	146	396	2.7	537	815	1.5	683	1211	1.8
MELANDAHA	23974	202	500	2.5	1295	1646	1.3	1497	2146	1.4
ISLAMPUR	14621	60	149	2.5	1465	1552	1.1	1526	1701	1.1
DEWANGANJ	9564	261	488	1.9	2383	2439	1.0	2644	2927	1.1
MADARGANJ	20865	165	449	2.7	1412	1549	1.1	1577	1998	1.3
TOTAL	85866	1236	2975	2.4	8693	9828	1.1	9929	12803	1.3

THANA	Area (*)	1990-1991 HYV Area	HYV Prod.	HYV Yield	LOCAL Area	LOCAL Prod.	LOCAL Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
JAMALPUR	7042	307	738	2.4	1459	1855	1.3	1767	2592	1.5
SHARISABARI	9800	153	379	2.5	614	910	1.5	767	1289	1.7
MELANDAHA	23974	198	476	2.4	1376	1749	1.3	1574	2224	1.4
ISLAMPUR	14621	84	203	2.4	1146	1255	1.1	1231	1458	1.2
DEWANGANJ	9564	392	942	2.4	2906	4000	1.4	3298	4942	1.5
MADARGANJ	20865	147	326	2.2	1907	2827	1.5	2053	3153	1.5
TOTAL	85866	1282	3063	2.4	9408	12595	1.3	10690	15657	1.5

Source : Data compiled by the Consultant from basic data of Bangladesh Bureau of statistics

TABLE 5.C.3: AREA (ha), PRODUCTION (Paddy in ton) OF BORO IN THE PROJECT AREA.

THANA	Area (*)	1988-1989 HYV Area	HYV Prod.	HYV Yield	Area	Prod.	Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
JAMALPUR	7042	2972	12321	4.1				2972	12321	4.1
SHARISABARI	9800	3835	16640	4.3				3835	16640	4.3
MELANDAHA	23974	13659	54136	4.0				13659	54136	4.0
ISLAMPUR	14621	4224	15474	3.7				4224	15474	3.7
DEWANGANJ	9564	3044	12478	4.1				3044	12478	4.1
MADARGANJ	20865	6783	27117	4.0				6783	27117	4.0
TOTAL	85866	34516	138165	4.0				34516	138165	4.0

THANA	Area (*)	1989-1990 HYV Area	HYV Prod.	HYV Yield	Area	Prod.	Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
JAMALPUR	7042	2654	12077	4.6	313	860	2.7	2967	12937	4.4
SHARISABARI	9800	3292	16089	4.9	536	1383	2.6	3828	17472	4.6
MELANDAHA	23974	12221	53065	4.3	1418	3777	2.7	13639	56842	4.2
ISLAMPUR	14621	2380	9672	4.1	361	914	2.5	2741	10586	3.9
DEWANGANJ	9564	609	2664	4.4	29	76	2.6	638	2741	4.3
MADARGANJ	20865	6563	27272	4.2	502	1200	2.4	7065	28473	4.0
TOTAL	85866	27719	120840	4.4	3159	8211	2.6	30878	129050	4.2

THANA	Area (*)	1990-1991 HYV Area	HYV Prod.	HYV Yield	Area	Prod.	Yield	TOTAL Area	TOTAL Prod.	TOTAL Yield
JAMALPUR	7042	2753	13009	4.7	265	813	3.1	3019	13821	4.6
SHARISABARI	9800	3338	16825	5.0	459	1353	2.9	3797	18178	4.8
MELANDAHA	23974	12035	62137	5.2	1279	4123	3.2	13314	66260	5.0
ISLAMPUR	14621	2293	n.a		448	2194	4.9	2741	2194	0.8
DEWANGANJ	9564	487	n.a		27	371	14.0	514	371	0.7
MADARGANJ	20865	7328	36922	5.0	784	3234	4.1	8111	40157	5.0
TOTAL	85866	25454	128893	5.1	3262	12088	3.7	28715	140981	4.9

Source : Data compiled by the Consultant from basic data of Bangladesh Bureau of statistics

TABLE 5.C.4: AREA (ha), PRODUCTION (ton) OF JUTE IN THE PROJECT AREA.

THANA	Gross Area	WHITE			TOSSA			TOTAL		
		Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1988-1989										
JAMALPUR	7042	384	198	0.5	384	222	0.6	768	420	0.5
SHARISABARI	9800	460	266	0.6	494	340	0.7	954	607	0.6
MELANDAHA	23974	1451	894	0.6	868	599	0.7	2319	1492	0.6
ISLAMPUR	14621	793	488	0.6	603	416	0.7	1396	904	0.6
DEWANGANJ	9564	363	210	0.6	203	118	0.6	567	328	0.6
MADARGANJ	20865	1137	658	0.6	587	421	0.7	1723	1079	0.6
TOTAL	85866	4588	2715	0.6	3139	2116	0.7	7727	4831	0.6
1989-1990										
JAMALPUR	7042	265	382	1.4	366	592	1.6	631	975	1.5
SHARISABARI	9800	337	546	1.6	429	772	1.8	766	1317	1.7
MELANDAHA	23974	606	941	1.6	1252	1896	1.5	1858	2837	1.5
ISLAMPUR	14621	386	722	1.9	229	391	1.7	615	1114	1.8
DEWANGANJ	9564	46	69	1.5	46	84	1.9	91	153	1.7
MADARGANJ	20865	732	791	1.1	1171	1476	1.3	1904	2267	1.2
TOTAL	85866	2372	3451	1.5	3493	5211	1.5	5865	8662	1.5
1990-1991										
JAMALPUR	7042	395	578	1.5	372	619	1.7	767	1197	1.6
SHARISABARI	9800	811	1201	1.5	766	1413	1.8	1577	2614	1.7
MELANDAHA	23974	1616	2182	1.4	1656	2460	1.5	3272	4642	1.4
ISLAMPUR	14621	447	656	1.5	391	705	1.8	839	1361	1.6
DEWANGANJ	9564	92	136	1.5	76	124	1.6	168	260	1.6
MADARGANJ	20865	1495	2556	1.7	1299	2690	2.1	2794	5246	1.9
TOTAL	85866	4856	7309	1.5	4560	8010	1.8	9416	15319	1.6

Source : Data compiled by the Consultant from basic data of Bangladesh Bureau of statistics

TABLE 5.C.5: AREA (ha), PRODUCTION (ton) OF WHEAT IN JAMALPUR DISTRICT.

UPAZILA	1989-1990								
	Irrigated			Non-irrigated			TOTAL		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	808	1634	2.0	970	1608	1.7	1778	3242	1.8
SHARISABARI	154	326	2.1	331	490	1.5	485	816	1.7
MELANDAHA	509	423	0.8	655	717	1.1	1164	1140	1.0
ISLAMPUR	420	931	2.2	553	870	1.6	973	1801	1.9
DEWANGANJ	85	208	2.4	305	603	2.0	390	811	2.1
MADARGANJ	46	106	2.3	1212	2239	1.8	1258	2345	1.9
TOTAL	2022	3628	1.8	4026	6527	1.6	6048	10155	1.7

UPAZILA	1990-1991								
	Irrigated			Non-irrigated			TOTAL		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	889	1870	2.1	1091	1822	1.7	1980	3692	1.9
SHARISABARI	244	569	2.3	665	1103	1.7	909	1672	1.8
MELANDAHA	993	2636	2.7	527	1047	2.0	1520	3683	2.4
ISLAMPUR	716	1684	2.4	591	901	1.5	1307	2585	2.0
DEWANGANJ	102	252	2.5	305	559	1.8	407	811	2.0
MADARGANJ	665	1974	3.0	749	1484	2.0	1414	3458	2.4
TOTAL	3609	8985	2.5	3928	6916	1.8	7537	15901	2.1

Source : NCRS.1992.

TABLE 5.C.6: AREA (ha), PRODUCTION (ton) OF SUGAR CANE - PROJECT AREA.

THANA	Area (*)	F0		F1		Total		
		Area	Prod.	Area	Prod.	Area	Prod.	%
JAMALPUR	7042			113	5085	113	5085	5.2
MELANDAHA	23974	647	29115			647	29115	30.0
ISLAMPUR	14621	486	21870	120	5400	606	27270	28.1
DEWANGANJ	9564	644	28980	145	6525	789	35505	36.6
TOTAL		1777	79965	378	17010	2155	96975	100

(*) area in the project
Source : CS 1992

TABLE 5.C.7 : AREA (ha), PRODUCTION (in ton) OF POTATO IN THE PROJECT AREA.

THANA	1988-1989								
	HYV			LOCAL			TOTAL		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	124	747	6.0				124	747	6.0
SHARISABARI	227	1936	8.5				227	1936	8.5
MELANDAHA	475	4841	10.2				475	4841	10.2
ISLAMPUR	535	3826	7.2				535	3826	7.2
DEWANGANJ	162	962	6.0				162	962	6.0
MADARGANJ	589	3985	6.8				589	3985	6.8
TOTAL	2112	16297	7.7				2112	16297	7.7

THANA	1989-1990								
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	47	610	12.9	15	95	6.5	62	706	11.4
SHARISABARI	84	1400	16.6	92	700	7.6	176	2100	11.9
MELANDAHA	154	2240	14.5	71	535	7.5	225	2775	12.3
ISLAMPUR	96	1644	17.1	66	579	8.8	162	2223	13.7
DEWANGANJ	4	47	13.1	4	21	5.4	8	68	9.0
MADARGANJ	219	3855	17.6	183	1522	8.3	402	5377	13.4
TOTAL	604	9797	16.2	430	3453	8.0	1035	13249	12.8

THANA	1990-1991								
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	71	929	13.1	21	138	6.7	91	1067	11.7
SHARISABARI	103	1606	15.5	75	615	8.2	179	2221	12.4
MELANDAHA	209	3686	17.6	130	1207	9.3	339	4893	14.4
ISLAMPUR	112	2287	20.3	52	534	10.2	165	2821	17.1
DEWANGANJ	4	61	14.1	5	38	8.2	9	99	11.0
MADARGANJ	308	5132	16.7	240	3332	13.9	548	8465	15.4
TOTAL	808	13701	17.0	523	5865	11.2	1331	19566	14.7

Source : Data compiled by the Consultant from basic data of Bangladesh Bureau of statistics

TABLE 5.C.8 : AREA (ha), PRODUCTION (ton) OF MUSTARD CROP IN THE PROJECT AREA.

THANA	1989-1990								
	HYV			Local			TOTAL		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	47	44	0.9	130	84	0.6	177	127	0.7
SHARISABARI	31	31	1.0	276	229	0.8	306	260	0.8
MELANDAHA	87	96	1.1	747	587	0.8	834	683	0.8
ISLAMPUR	23	26	1.1	285	210	0.7	309	236	0.8
DEWANGANJ	1	1	1.0	26	26	1.0	27	27	1.0
MADARGANJ	55	76	1.4	948	700	0.7	1003	776	0.8
TOTAL	244	273	1.1	2411	1837	0.8	2656	2110	0.8

THANA	1990-1991								
	HYV			Local			TOTAL		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
JAMALPUR	29	40	1.4	159	148	0.9	189	188	1.0
SHARISABARI	23	24	1.0	225	167	0.7	248	191	0.8
MELANDAHA	51	66	1.3	475	450	0.9	526	516	1.0
ISLAMPUR	24	24	1.0	330	213	0.6	354	237	0.7
DEWANGANJ	12	13	1.1	61	50	0.8	73	64	0.9
MADARGANJ	73	109	1.5	3058	1295	0.4	3131	1403	0.4
TOTAL	213	277	1.3	4308	2323	0.5	4521	2600	0.6

Source : Data compiled by the Consultant from basic data of Bangladesh Bureau of statistic

AREA AND PRODUCTION OF AUS PADDY BY VARIETIES
(JAMALPUR DISTRICT)

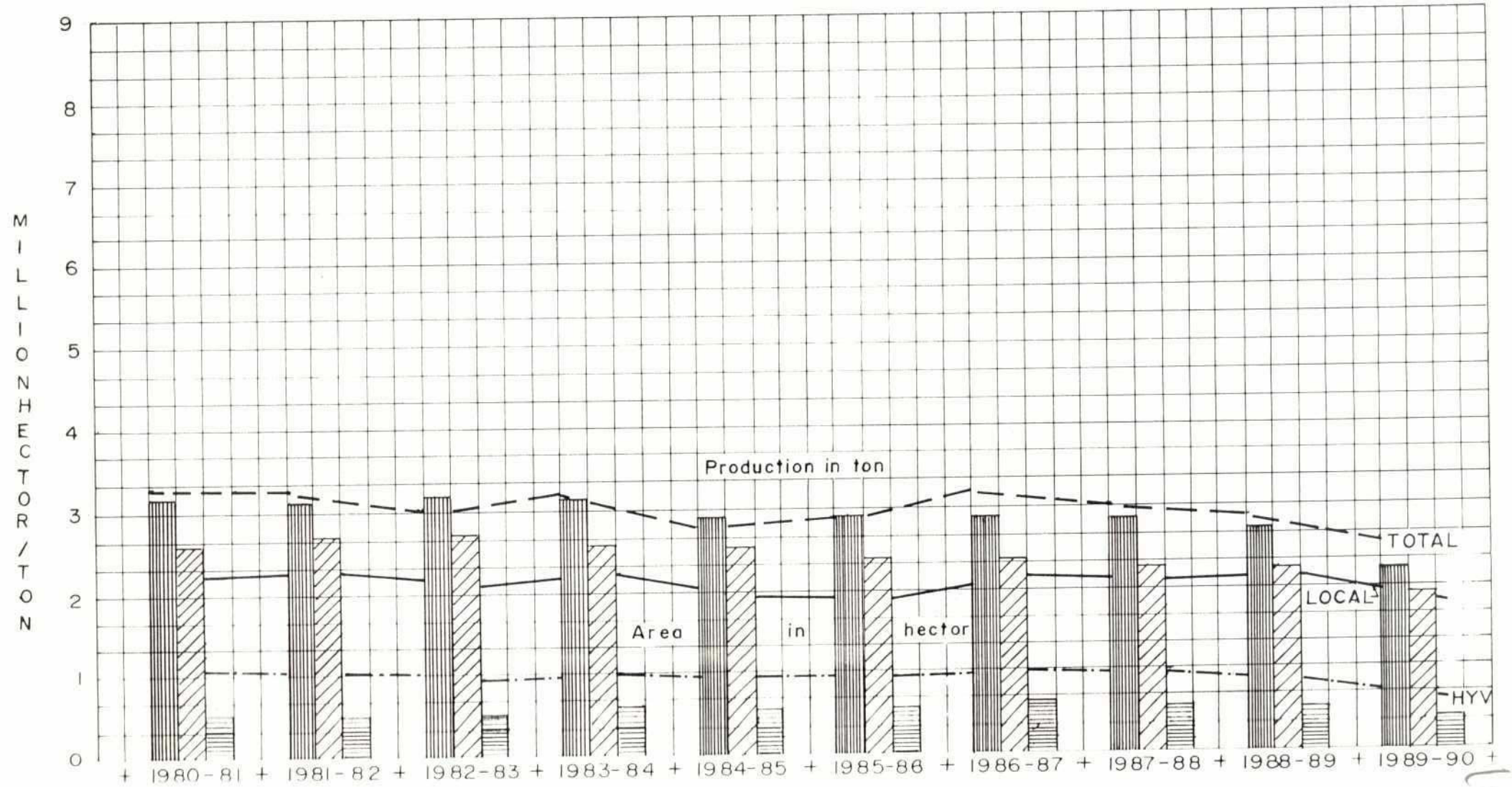
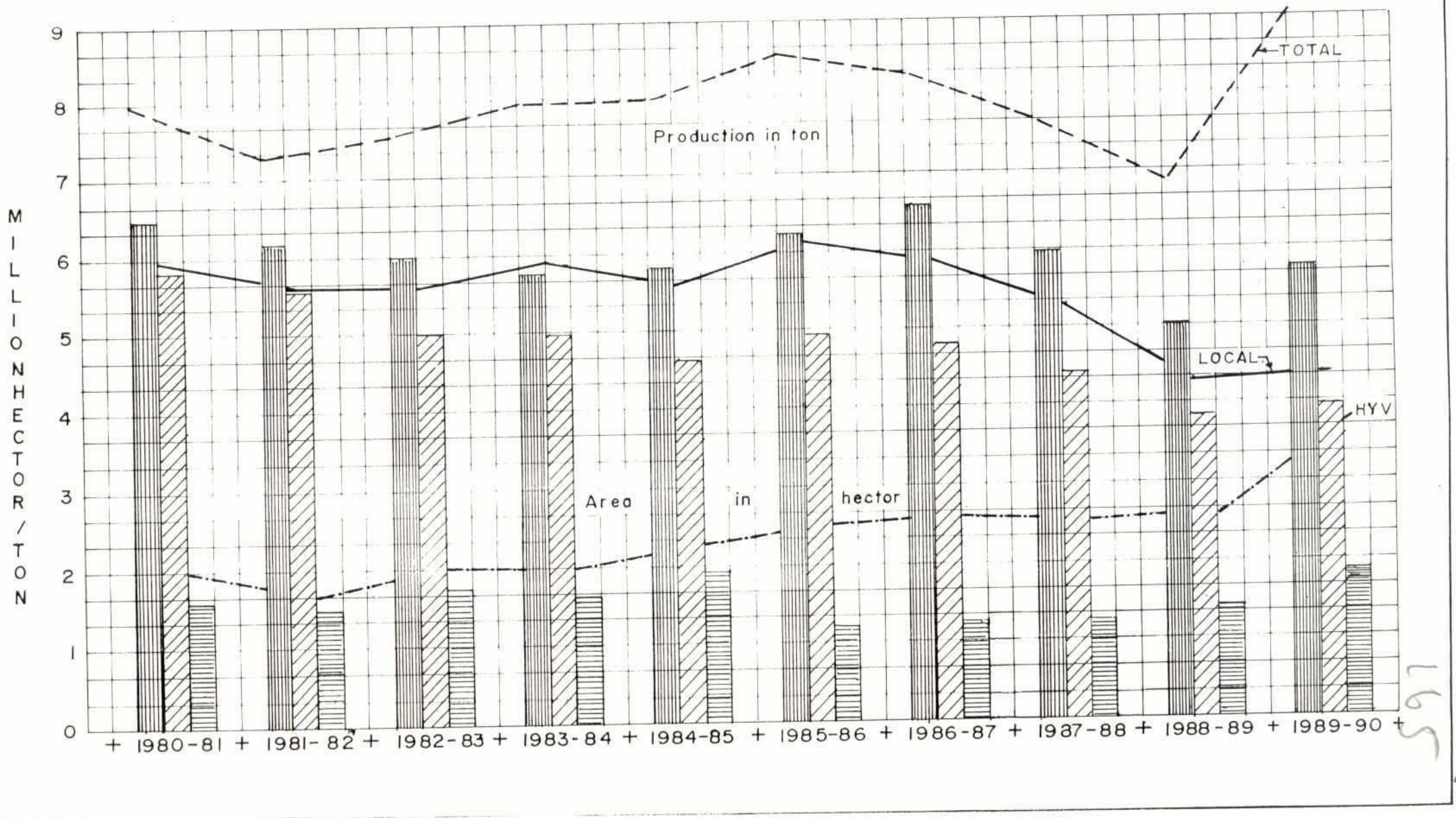


FIGURE - 5.C.1

AREA AND PRODUCTION OF AMAN PADDY BY VARIETIES
(JAMALPUR DISTRICT)



AREA AND PRODUCTION OF BORO PADDY BY VARIETIES
(JAMALPUR DISTRICT)

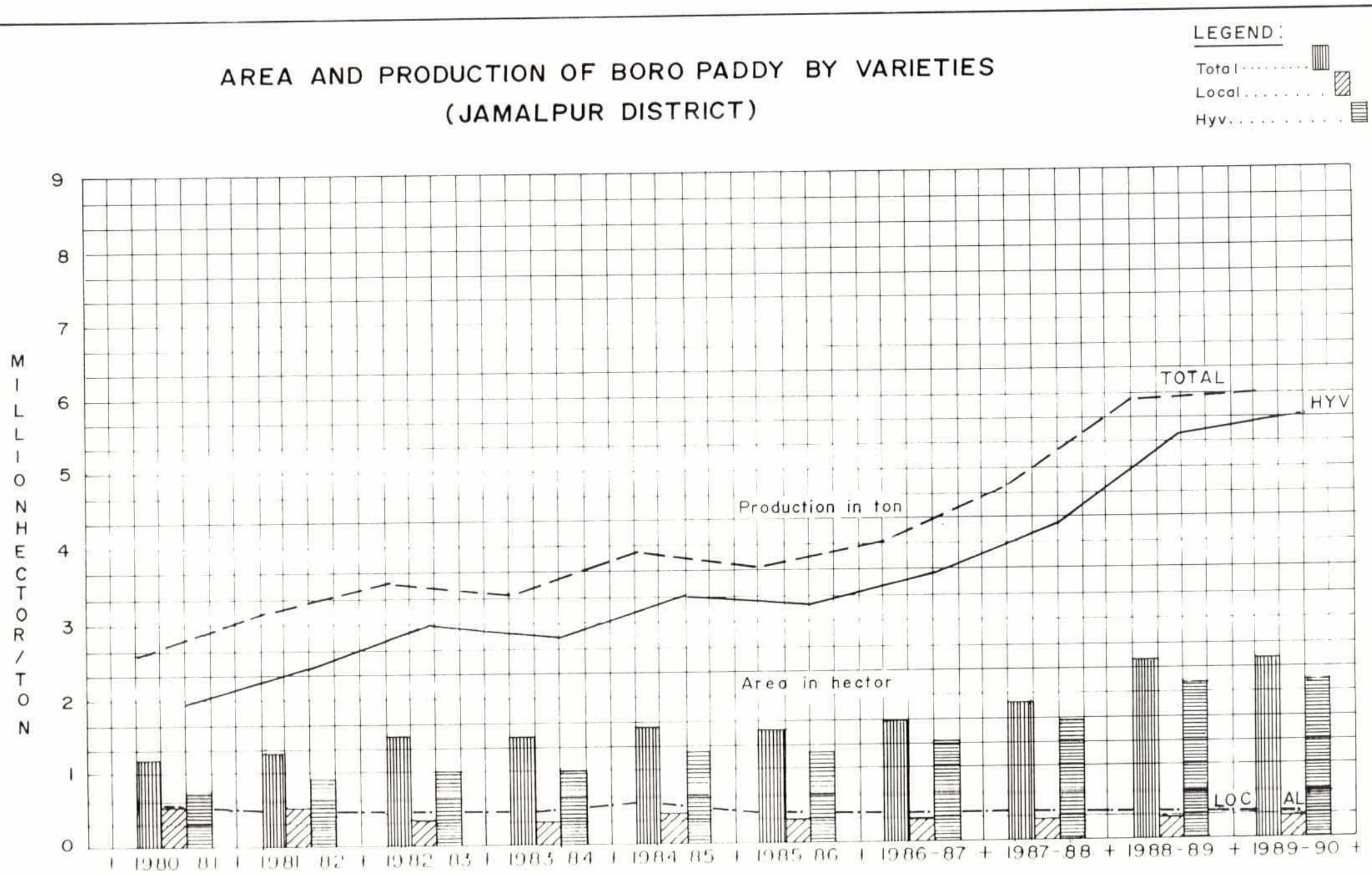
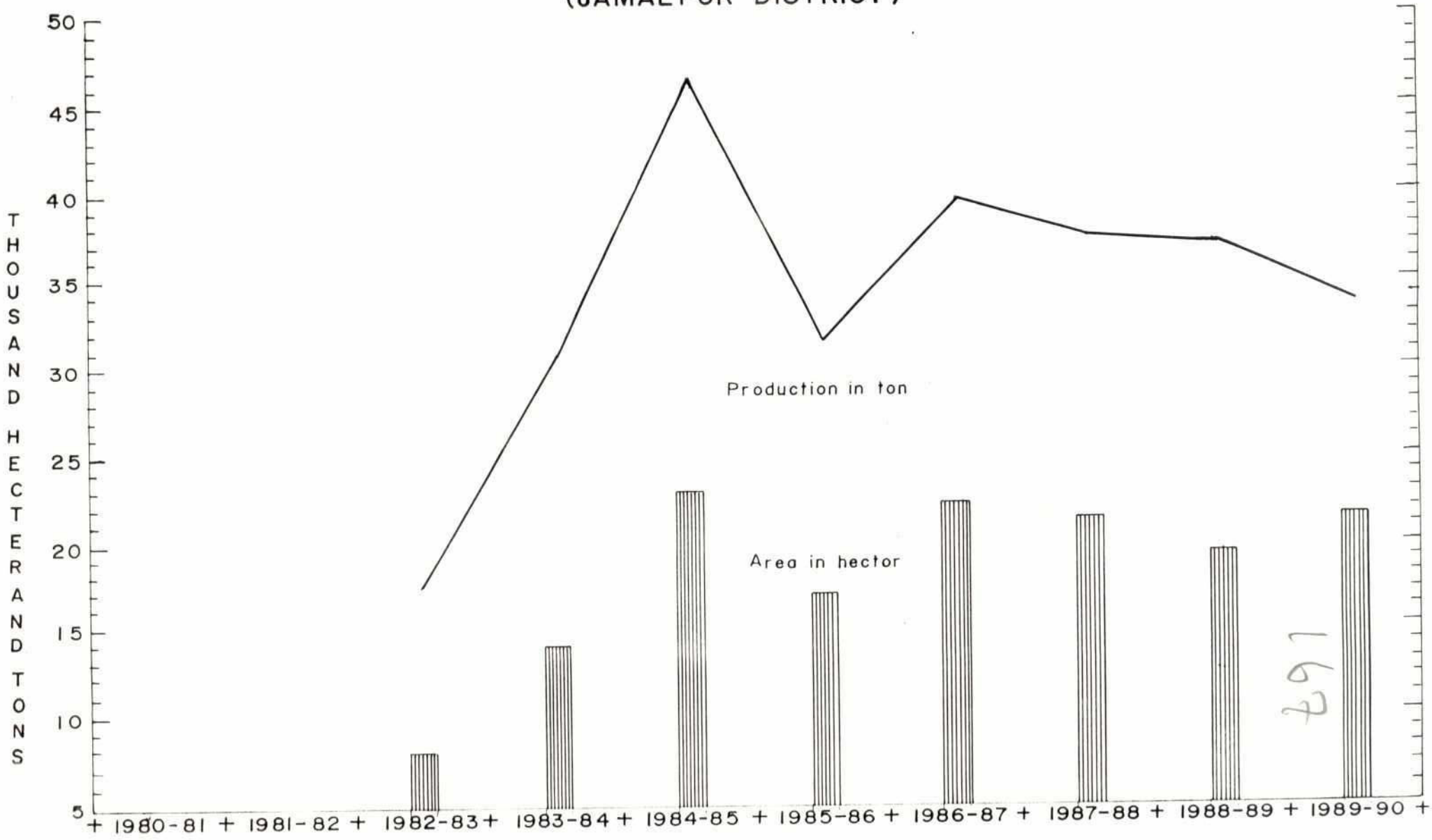


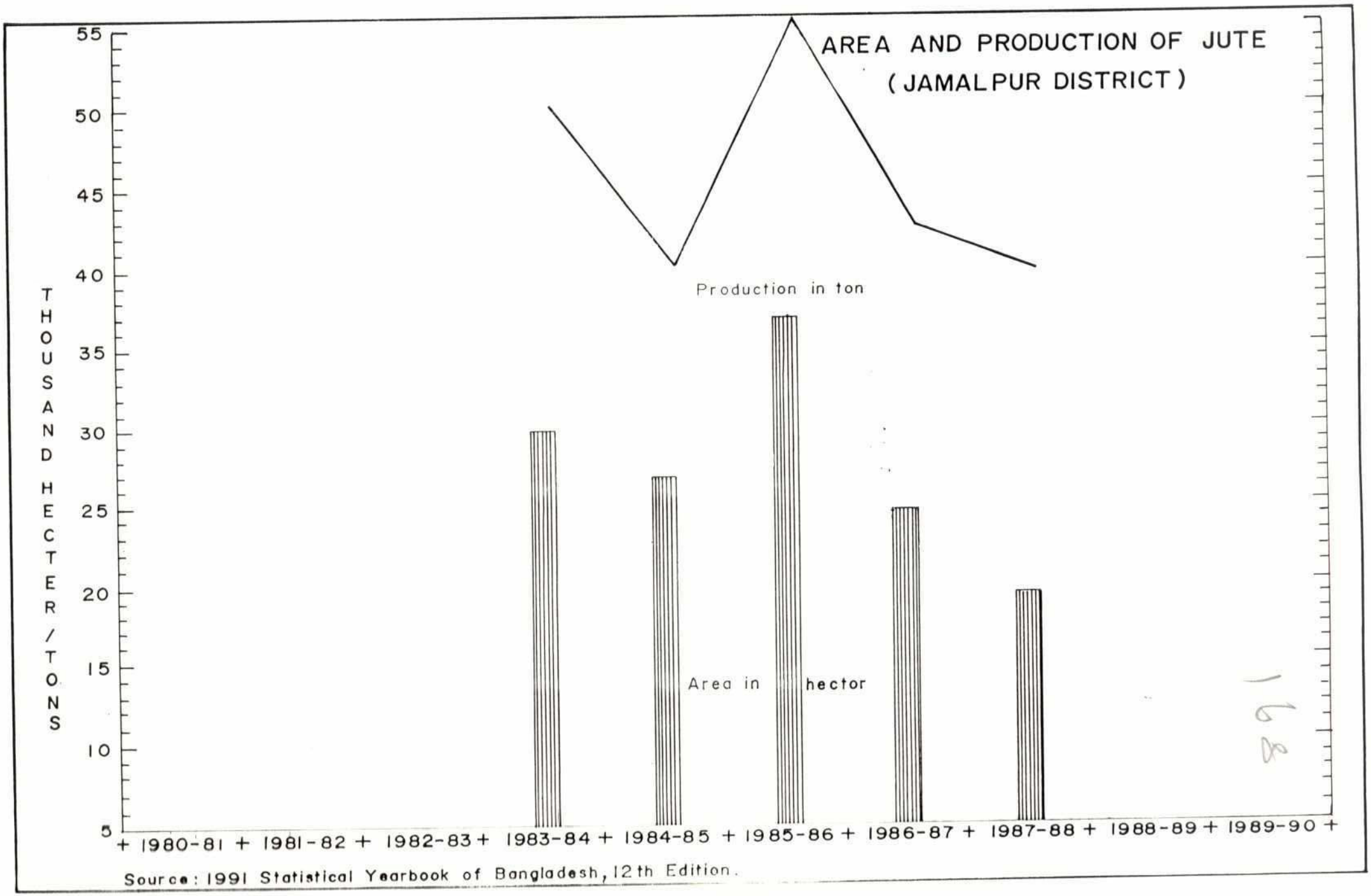
FIGURE-5.C.3

AREA AND PRODUCTION OF WHEAT
(JAMALPUR DISTRICT)



Source: 1991 Statistical Yearbook of Bangladesh, 12th Edition.

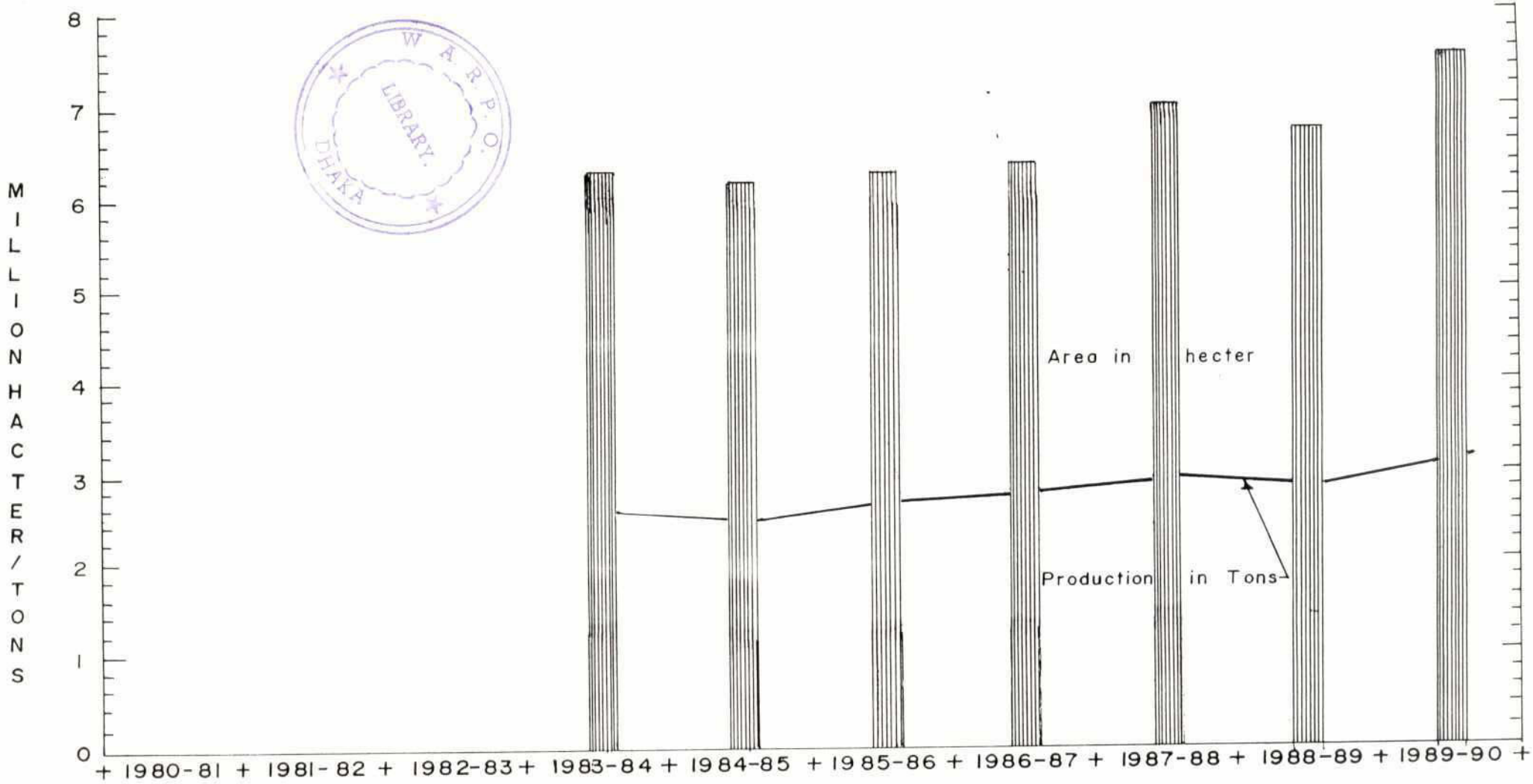
FIGURE - 5.C.4



Source: 1991 Statistical Yearbook of Bangladesh, 12th Edition.

FIGURE - 5.C.5

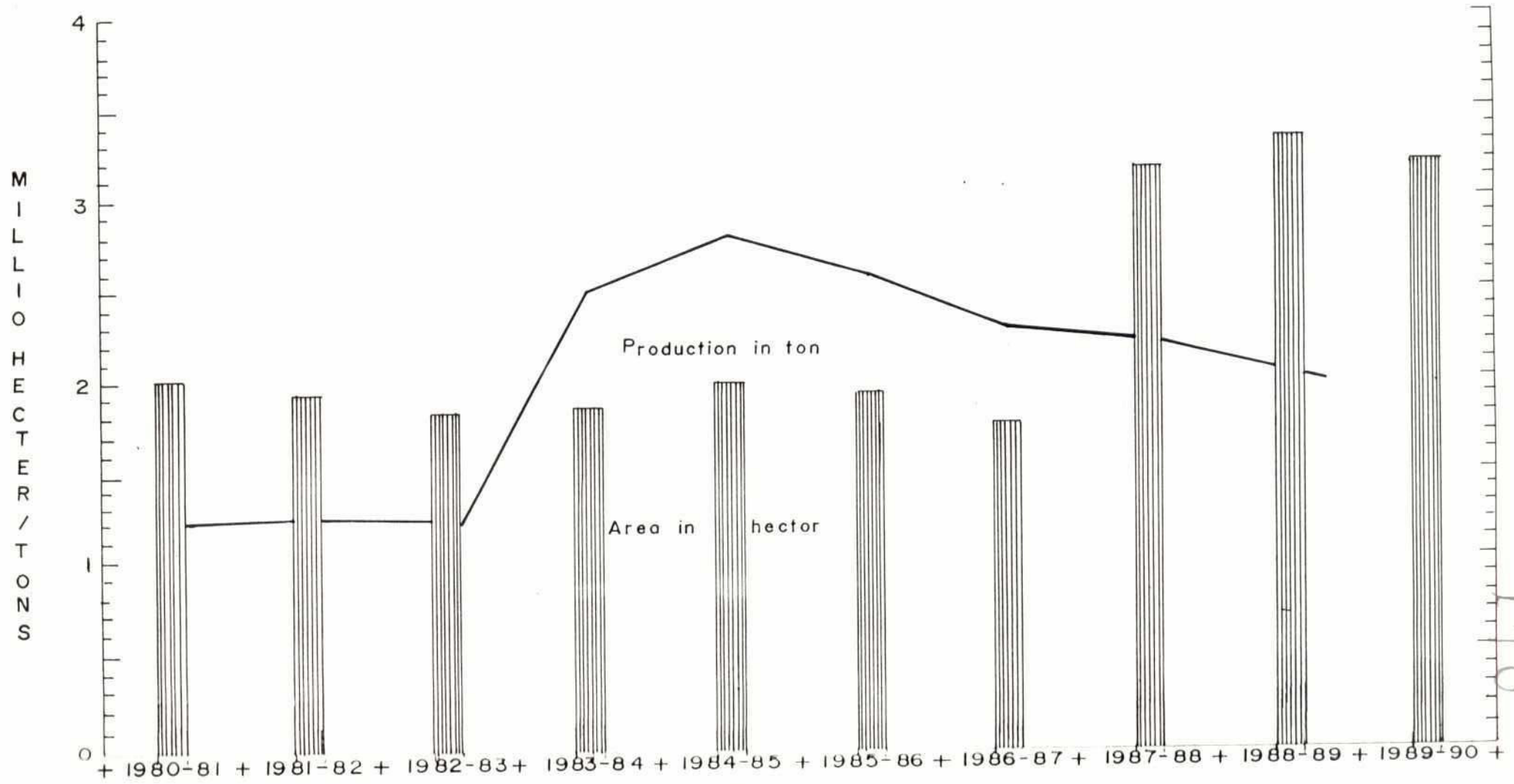
AREA AND PRODUCTION OF SUGARCANE
(JAMALPUR DISTRICT)



Source: Statistical Yearbook of Bangladesh, 12th Edition 1991.

FIGURE-5.C.6

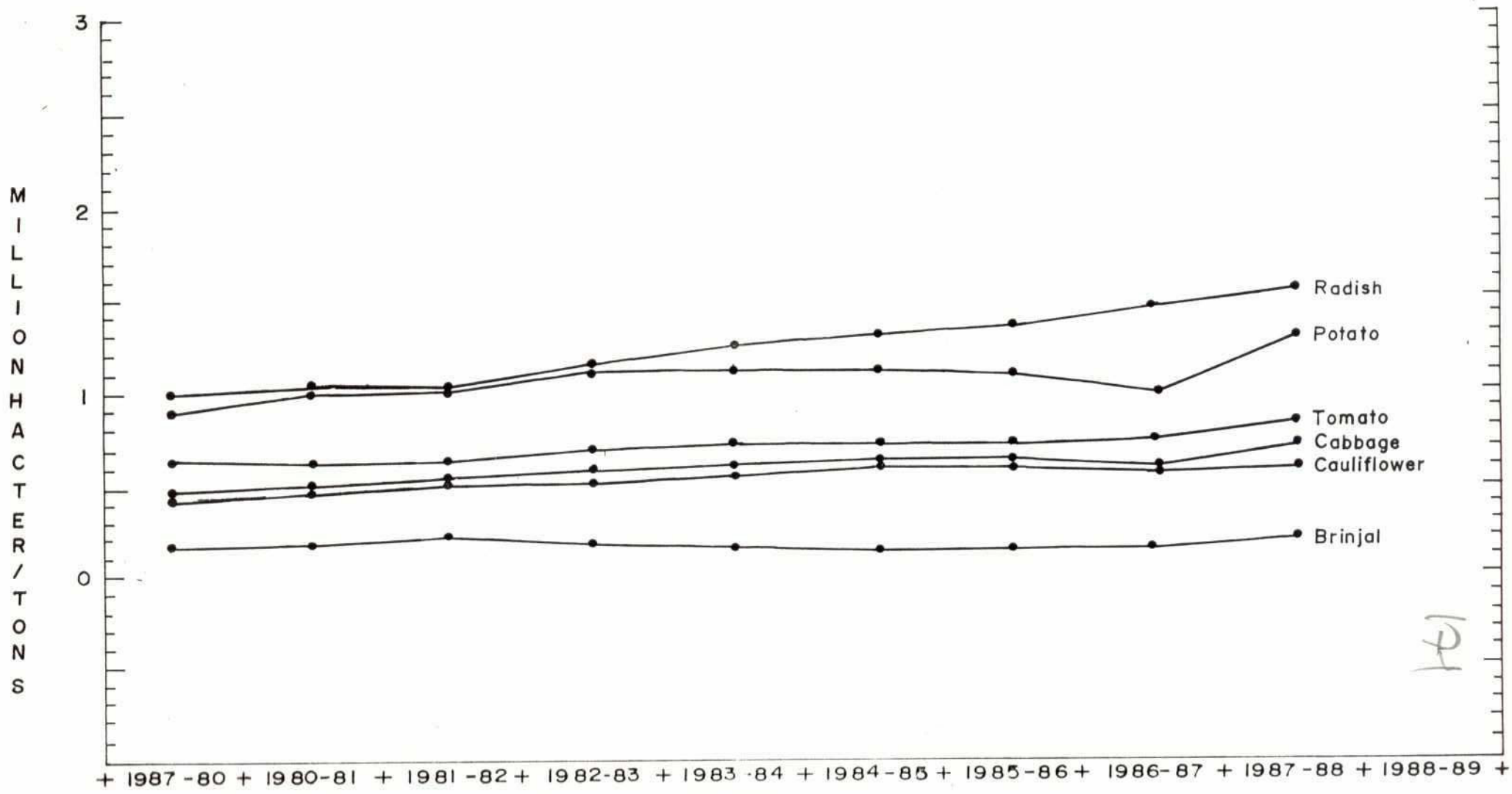
AREA AND PRODUCTION OF OILSEEDS
RAPE AND MUSTARD
(JAMALPUR DISTRICT)



Source : 1991 Statistical Yearbook of Bangladesh, 12th Edition

FIGURE-5.C.7

PRODUCTION OF MAJOR VEGETABLES
(JAMALPUR DISTRICT)



Source: 1991 Statistical Yearbook of Bangladesh, 12th Edition.

FIGURE-5.C.8

ANNEX 5

APPENDIX

D MAIN CROPPING PATTERNS BY THANA IN THE PRESENT SITUATION
LIVESTOCK IN THE PRESENT SITUATION

* MAIN CROPPING PATTERNS * THANA : DEWANGANG Table 5.D.1

Crop.: inten: sity :	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	:GRASSLAND/FALLOW						741	19.4	226	19.4	967	13.8
S	:SUGAR CANE -		644	54.9	145	16.8					789	11.2
S	:BORO -						158	4.1			158	2.2
S	:MILLET						507	13.3	227	19.5	733	10.4
S	:GROUNDNUT						507	13.3	227	19.5	733	10.4
S	:B.AMAN											
S	S.W. POTATO						507	13.3	227	19.5	733	10.4
D	:AUS	-WHEAT	92	7.8	65	7.6	219	5.7			377	5.4
D	:AUS	-PULSES	30	2.6	21	2.5	77	2.0			129	1.8
D	:AUS	-MUSTARD	63	5.3	44	5.1	160	4.2			267	3.8
D	:AUS	-POTATO	40	3.4	28	3.3	72	1.9			140	2.0
D	:AUS	-EGG PLANT	6	0.5	4	0.5	15	0.4			26	1.4
D	:AUS	-CHILLIES	3	0.2	2	0.2	7	0.2			12	1.2
D	:AUS	-ONION	2	0.2	2	0.2	6	0.2			10	1.1
D	:AUS	-AMAN			41	4.7					41	2.6
D	:JUTE	-WHEAT	15	1.3	11	1.3	55	1.4			81	1.2
D	:JUTE	-PULSES	8	0.6	5	0.6	19	0.5			32	1.5
D	:JUTE	-MUSTARD	16	1.3	11	1.3	40	1.0			67	1.0
D	:JUTE	-POTATO	10	0.9	7	0.8	18	0.5			35	1.5
D	:JUTE	-EGG PLANT	1	0.1	1	0.1	4	0.1			6	1.1
D	:JUTE	-CHILLIES	1	0.1	0	0.1	2	0.0			3	1.0
D	:JUTE	-ONION	1	0.0	0	0.0	1	0.0			2	1.0
D	:JUTE	-AMAN			10	1.2					10	1.1
D	:T.AMAN	-BORO	149	12.7	415	48.1					564	8.0
D	:T.AMAN	-PULSES										
D	:AUS+B.AMAN	-PULSES					230	6.0	121	10.4	351	5.0
D	:AUS+B.AMAN	-MUSTARD					69	1.8	36	3.1	105	1.5
D	:AUS+B.AMAN	-ONIONS					16	0.4	9	0.7	25	1.4
D	:D.W.T. AMAN	-BORO					394	10.3	90	7.7	484	6.9
T	:JUTE	-T.AMAN -WHEAT	3	0.2	1	0.2					4	1.1
T	:JUTE	-T.AMAN -PULSES	12	1.0	6	0.7					18	1.3
T	:JUTE	-T.AMAN -CHILLIES	2	0.2	1	0.1					3	1.0
T	:JUTE	-T.AMAN -ONIONS	2	0.2	1	0.1					3	1.0
T	:AUS	-T.AMAN -WHEAT	11	0.9	6	0.6					16	1.2
T	:AUS	-T.AMAN -PULSES	41	3.5	21	2.4					62	0.9
T	:AUS	-T.AMAN -CHILLIES	12	1.0	6	0.7					18	0.3
T	:AUS	-T.AMAN -ONIONS	12	1.0	6	0.7					19	0.3
			ha	%	ha	%	ha	%	ha		ha	%
		GRASSLAND/FALLOW:					741	19	226	19	967	14
		SINGLE CROPPED	644	55	145	17	1678	44	680	59	3147	45
		DOUBLE CROPPED	436	37	670	78	1404	37	256	22	2766	39
		TRIPLE CROPPED	94	8	49	6					143	2
		TOTAL	1174	100	864	100	3823	100	1162	100	7023	100
			17%		12%		54%		17%			
		CROP. INTENSITY	153		189		137		122		143	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

★ MAIN CROPPING PATTERNS ★ THANA : FULCHARI Table 5.D.2

Crop. intensity	Main cropping patterns	PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW					105	17.2	65	34.9	170	21.3
S	SUGAR CANE -										
S	BORO -										
S	MILLET					129	21.1	29	15.4	157	19.7
S	GROUNDNUT					129	21.1	29	15.4	157	19.7
S	B.AMAN										
S	S.W. POTATO					129	21.1	29	15.4	157	19.7
D	AUS -WHEAT					38	6.2			38	4.8
D	AUS -PULSES					13	2.2			13	1.7
D	AUS -MUSTARD					28	4.5			28	3.5
D	AUS -POTATO					12	2.0			12	1.6
D	AUS -EGG PLANT					3	0.4			3	0.3
D	AUS -CHILLIES					1	0.2			1	0.2
D	AUS -ONION					1	0.2			1	0.1
D	AUS -AMAN										
D	JUTE -WHEAT					9	1.5			9	1.2
D	JUTE -PULSES					3	0.5			3	0.4
D	JUTE -MUSTARD					7	1.1			7	0.9
D	JUTE -POTATO					3	0.5			3	0.4
D	JUTE -EGG PLANT					1	0.1			1	0.1
D	JUTE -CHILLIES					0	0.1			0	0.0
D	JUTE -ONION					0	0.0			0	0.0
D	JUTE -AMAN										
D	T.AMAN -BORO										
D	T.AMAN -PULSES										
D	AUS+B.AMAN -PULSES							26	13.7	26	3.2
D	AUS+B.AMAN -MUSTARD							8	4.1	8	1.0
D	AUS+B.AMAN -ONIONS							2	1.0	2	0.2
D	D.W.T. AMAN -BORO										
T	JUTE -T.AMAN -WHEAT										
T	JUTE -T.AMAN -PULSES										
T	JUTE -T.AMAN -CHILLIES										
T	JUTE -T.AMAN -ONIONS										
T	AUS -T.AMAN -WHEAT										
T	AUS -T.AMAN -PULSES										
T	AUS -T.AMAN -CHILLIES										
T	AUS -T.AMAN -ONIONS										
		ha	%	ha	%	ha	%	ha	%	ha	%
	GRASSLAND/FALLOW:					105	17	65	35	170	21
	SINGLE CROPPED					386	63	86	46	472	59
	DOUBLE CROPPED					120	20	35	19	155	19
	TRIPLE CROPPED										
	TOTAL					611	100	186	100	797	100
						77%		23%			
	CROP. INTENSITY					120		119		119	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * THANA : ISLAMPUR Table 5.D.3

Crop. intensity	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW											
S	SUGAR CANE -		486	24.1	120	2.6					606	5.4
S	BORO -						735	17.4	237		972	8.6
S	MILLET				66	1.4					66	0.6
S	GROUNDNUT											
S	B.AMAN											
S	S.W. POTATO											
D	AUS	-WHEAT	43	2.1	12	0.2	353	8.4			407	3.6
D	AUS	-PULSES	11	0.5	3	0.1	93	2.2			107	0.9
D	AUS	-MUSTARD	27	1.4	7	0.2	244	5.8			279	2.5
D	AUS	-POTATO	22	1.1	6	0.1	136	3.2			164	1.5
D	AUS	-EGG PLANT	3	0.1	1	0.0	24	0.6			28	0.2
D	AUS	-CHILLIES	3	0.1	1	0.0	25	0.6			29	0.3
D	AUS	-ONION	5	0.2	1	0.0	42	1.0			48	0.4
D	AUS	-AMAN	50	2.5	55	1.2					105	0.9
D	JUTE	-WHEAT	19	0.9	5	0.1	235	5.6			260	2.3
D	JUTE	-PULSES	7	0.3	2	0.0	62	1.5			71	0.6
D	JUTE	-MUSTARD	18	0.9	5	0.1	163	3.9			186	1.7
D	JUTE	-POTATO	15	0.7	4	0.1	91	2.2			109	1.0
D	JUTE	-EGG PLANT	2	0.1	0	0.0	16	0.4			18	0.2
D	JUTE	-CHILLIES	2	0.1	1	0.0	17	0.4			19	0.2
D	JUTE	-ONION	3	0.2	1	0.0	28	0.7			32	0.3
D	JUTE	-AMAN	33	1.7	36	0.8					70	0.6
D	T.AMAN	-BORO	567	28.1	3080	65.6					3647	32.4
D	T.AMAN	-PULSES			599	12.8					599	5.3
D	AUS+B.AMAN	-PULSES					619	14.7	51		670	6.0
D	AUS+B.AMAN	-MUSTARD					240	5.7	20		260	2.3
D	AUS+B.AMAN	-ONIONS					174	4.1	14		188	1.7
D	D.W.T. AMAN	-BORO					915	21.7			915	8.1
T	JUTE	-T.AMAN -WHEAT	38	1.9	37	0.8					75	0.7
T	JUTE	-T.AMAN -PULSES	143	7.1	141	3.0					283	2.5
T	JUTE	-T.AMAN -CHILLIES	43	2.1	42	0.9					85	0.8
T	JUTE	-T.AMAN -ONIONS	58	2.9	57	1.2					115	1.0
T	AUS	-T.AMAN -WHEAT	56	2.8	56	1.2					112	1.0
T	AUS	-T.AMAN -PULSES	176	8.7	174	3.7					350	3.1
T	AUS	-T.AMAN -CHILLIES	106	5.2	104	2.2					210	1.9
T	AUS	-T.AMAN -ONIONS	83	4.1	82	1.7					164	1.5
			ha	%	ha	%	ha	%	ha		ha	%
	GRASSLAND/FALLOW:											
	SINGLE CROPPED		486	24	186	4	735	17	237	74	1644	15
	DOUBLE CROPPED		829	41	3819	81	3478	83	85	26	8211	73
	TRIPLE CROPPED		702	35	691	15					1393	12
	TOTAL		2017	100	4696	100	4213	100	322	100	11248	100
			18%		42%		37%		3%			
	CROP. INTENSITY		211		211		183		126		198	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * THANA : JAMALPUR Table 5.D.4

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW												
S	SUGAR CANE	-				113	9.3					113	2.4
S	BORO	-						113	5.2			113	2.4
S	MILLET												
S	GROUNDNUT												
S	B.AMAN												
S	S.W. POTATO												
D	AUS	-WHEAT		33	2.4	62	5.1	507	23.3			603	12.7
D	AUS	-PULSES		5	0.4	9	0.7	79	3.6			93	1.9
D	AUS	-MUSTARD		24	1.7	45	3.7	390	18.0			459	9.6
D	AUS	-POTATO		12	0.9	22	1.8	134	6.2			168	3.5
D	AUS	-EGG PLANT		4	0.3	7	0.5	58	2.6			68	1.4
D	AUS	-CHILLIES		2	0.2	4	0.3	35	1.6			41	0.9
D	AUS	-ONION		1	0.1	2	0.2	22	1.0			25	0.5
D	AUS	-AMAN		106	7.7	25	2.1					131	2.8
D	JUTE	-WHEAT		10	0.7	18	1.5	217	10.0			245	5.1
D	JUTE	-PULSES		2	0.2	4	0.3	34	1.6			40	0.8
D	JUTE	-MUSTARD		10	0.7	19	1.6	167	7.7			197	4.1
D	JUTE	-POTATO		5	0.4	9	0.8	58	2.7			72	1.5
D	JUTE	-EGG PLANT		2	0.1	3	0.2	25	1.1			29	0.6
D	JUTE	-CHILLIES		1	0.1	2	0.1	15	0.7			17	0.4
D	JUTE	-ONION		1	0.0	1	0.1	9	0.4			11	0.2
D	JUTE	-AMAN		46	3.3	11	0.9					56	1.2
D	T.AMAN	-BORO		833	60.6	720	59.4					1553	32.6
D	T.AMAN	-PULSES											
D	AUS+B.AMAN	-PULSES						180	8.3			180	3.8
D	AUS+B.AMAN	-MUSTARD						102	4.7			102	2.2
D	AUS+B.AMAN	-ONIONS						28	1.3			28	0.6
D	D.W.T. AMAN	-BORO											
T	JUTE	-T.AMAN	-WHEAT	14	1.0	7	0.6					21	1.4
T	JUTE	-T.AMAN	-PULSES	40	2.9	19	1.6					59	1.2
T	JUTE	-T.AMAN	-CHILLIES	16	1.2	8	0.7					24	0.5
T	JUTE	-T.AMAN	-ONIONS	14	1.0	7	0.5					20	0.4
T	AUS	-T.AMAN	-WHEAT	33	2.4	16	1.3					49	1.0
T	AUS	-T.AMAN	-PULSES	70	5.1	34	2.8					104	2.2
T	AUS	-T.AMAN	-CHILLIES	43	3.1	21	1.7					64	1.3
T	AUS	-T.AMAN	-ONIONS	49	3.6	24	2.0					73	1.5
				ha	%	ha	%	ha	%	ha		ha	%
			GRASSLAND/FALLOW										
			SINGLE CROPPED			113	9	113	5			226	5
			DOUBLE CROPPED	1095	80	963	79	2059	95			4117	87
			TRIPLE CROPPED	279	20	136	11					415	9
			TOTAL	1374	100	1212	100	2172	100			4758	100
				29%		25%		46%					
			CROP. INTENSITY	220		202		195				204	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * THANA : KAZIPUR Table 5.D.5

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							113	11.4	130	11.6	243	10.4
S	SUGAR CANE	-											
S	BORO	-											
S	MILLET							62	6.2	224	19.9	286	12.3
S	GROUNDNUT							62	6.2	224	19.9	286	12.3
S	B.AMAN												
S	S.W. POTATO							62	6.2	224	19.9	286	12.3
D	AUS	-WHEAT				20	9.6	122	12.2	102	9.1	244	10.5
D	AUS	-PULSES				2	1.2	16	1.6	13	1.2	32	1.4
D	AUS	-MUSTARD				13	6.0	81	8.2	68	6.1	162	7.0
D	AUS	-POTATO				7	3.3	31	3.1	26	2.3	64	2.8
D	AUS	-EGG PLANT				2	1.1	15	1.6	13	1.2	31	1.3
D	AUS	-CHILLIES				2	1.2	16	1.6	13	1.2	32	1.4
D	AUS	-ONION				1	0.5	7	0.7	6	0.5	14	0.6
D	AUS	-AMAN											
D	JUTE	-WHEAT				4	2.1	41	4.1	34	3.0	79	3.4
D	JUTE	-PULSES				1	0.4	5	0.5	4	0.4	11	0.5
D	JUTE	-MUSTARD				4	2.0	27	2.7	23	2.0	54	2.3
D	JUTE	-POTATO				2	1.1	10	1.0	9	0.8	21	0.9
D	JUTE	-EGG PLANT				1	0.4	5	0.5	4	0.4	10	0.4
D	JUTE	-CHILLIES				1	0.4	5	0.5	4	0.4	11	0.5
D	JUTE	-ONION				0	0.2	2	0.2	2	0.2	5	0.2
D	JUTE	-AMAN											
D	T.AMAN	-BORO				65	30.9					65	2.8
D	T.AMAN	-PULSES											
D	AUS+B.AMAN	-PULSES						99	10.0			99	4.3
D	AUS+B.AMAN	-MUSTARD						64	6.5			64	2.8
D	AUS+B.AMAN	-ONIONS						17	1.7			17	0.7
D	D.W.T. AMAN	-BORO						132	13.3			132	5.7
T	JUTE	-T.AMAN	-WHEAT			3	1.6					3	0.1
T	JUTE	-T.AMAN	-PULSES			9	4.2					9	0.4
T	JUTE	-T.AMAN	-CHILLIES			5	2.5					5	0.2
T	JUTE	-T.AMAN	-ONIONS			3	1.6					3	0.1
T	AUS	-T.AMAN	-WHEAT			10	4.9					10	0.4
T	AUS	-T.AMAN	-PULSES			19	9.2					19	0.8
T	AUS	-T.AMAN	-CHILLIES			14	6.5					14	0.6
T	AUS	-T.AMAN	-ONIONS			19	9.2					19	0.8

	ha	%	ha	%	ha	%	ha	%	ha	%
GRASSLAND/FALLOW:					113	11	130	12	243	10
SINGLE CROPPED					185	19	672	60	857	37
DOUBLE CROPPED			127	60	697	70	323	29	1147	49
TRIPLE CROPPED			83	40					83	4
TOTAL			210	100	995	100	1125	100	2330	100
			9%:		43%:		48%:			
CROP. INTENSITY			240		170		129		156	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * THANA : MADARGANJ Table 5.D.6

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							414	5.7	138	25.6	552	3.1
S	SUGAR CANE	-											
S	BORO	-						169	2.3	250	46.4	419	2.4
S	MILLET			39	1.2	187	2.8					226	1.3
S	GROUNDNUT			39	1.2	187	2.8	310	4.3			536	3.0
S	B.AMAN							805	11.2			805	4.5
S	S.W. POTATO			39	1.2	187	2.8	310	4.3			536	3.0
D	AUS	-WHEAT		231	6.8	148	2.2	347	4.8			726	4.1
D	AUS	-PULSES		23	0.7	15	0.2	37	0.5			76	0.4
D	AUS	-MUSTARD		107	3.2	69	1.0	172	2.4			347	2.0
D	AUS	-POTATO		49	1.5	32	0.5	56	0.8			137	0.8
D	AUS	-EGG PLANT		22	0.7	14	0.2	36	0.5			73	0.4
D	AUS	-CHILLIES		7	0.2	4	0.1	11	0.2			23	0.1
D	AUS	-ONION		10	0.3	7	0.1	17	0.2			34	0.2
D	AUS	-AMAN		495	14.6	466	7.1					961	5.4
D	JUTE	-WHEAT		155	4.6	98	1.5	335	4.6			588	3.3
D	JUTE	-PULSES		23	0.7	15	0.2	37	0.5			76	0.4
D	JUTE	-MUSTARD		107	3.2	69	1.0	174	2.4			350	2.0
D	JUTE	-POTATO		49	1.5	32	0.5	56	0.8			137	0.8
D	JUTE	-EGG PLANT		22	0.7	14	0.2	36	0.5			73	0.4
D	JUTE	-CHILLIES		7	0.2	4	0.1	11	0.2			23	0.1
D	JUTE	-ONION		10	0.3	7	0.1	17	0.2			34	0.2
D	JUTE	-AMAN		500	14.7	468	7.1					968	5.5
D	T.AMAN	-BORO		1022	30.1	3572	54.3					4594	25.9
D	T.AMAN	-PULSES											
D	AUS+B.AMAN	-PULSES						1005	13.9	101	18.7	1106	6.2
D	AUS+B.AMAN	-MUSTARD						362	5.0	36	6.7	398	2.2
D	AUS+B.AMAN	-ONIONS						139	1.9	14	2.6	153	0.9
D	D.W.T. AMAN	-BORO						2355	32.7			2355	13.3
T	JUTE	-T.AMAN	-WHEAT	98	2.9	210	3.2					308	1.7
T	JUTE	-T.AMAN	-PULSES	54	1.6	135	2.1					189	1.1
T	JUTE	-T.AMAN	-CHILLIES	30	0.9	67	1.0					97	0.5
T	JUTE	-T.AMAN	-ONIONS	35	1.0	80	1.2					115	0.6
T	AUS	-T.AMAN	-WHEAT	48	1.4	110	1.7					158	0.9
T	AUS	-T.AMAN	-PULSES	72	2.1	157	2.4					229	1.3
T	AUS	-T.AMAN	-CHILLIES	52	1.5	116	1.8					168	1.9
T	AUS	-T.AMAN	-ONIONS	46	1.4	104	1.6					151	0.8

	ha	%	ha	%	ha	%	ha	%	ha	%
GRASSLAND/FALLOW:					414	6	138	26	552	3
SINGLE CROPPED	118	3	560	9	1594	22	250	46	2522	14
DOUBLE CROPPED	2842	84	5034	77	5204	72	151	28	13230	75
TRIPLE CROPPED	436	13	980	15					1415	8
TOTAL	3396	100	6573	100	7212	100	539	100	17720	100
	19%:		37%:		41%:		3%:			
CROP. INTENSITY	209		206		172		128		191	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * THANA : MELANDAHA Table 5.D.7

Crop.: inten: sity :	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW											
S	SUGAR CANE -		647	12.3							647	3.1
S	BORO -						667	12.9	793	54.7	1460	7.1
S	MILLET				353	4.0	92	1.8			445	2.2
S	GROUNDNUT											
S	B.AMAN								656	45.3	656	3.2
S	S.W. POTATO											
D	AUS	-WHEAT	55	1.0	63	0.7	75	1.4			193	0.9
D	AUS	-PULSES	4	0.1	4	0.1	6	0.1			14	0.1
D	AUS	-MUSTARD	41	0.8	46	0.5	59	1.1			146	0.7
D	AUS	-POTATO	19	0.4	22	0.2	19	0.4			60	0.3
D	AUS	-EGG PLANT	7	0.1	8	0.1	10	0.2			24	0.1
D	AUS	-CHILLIES	7	0.1	8	0.1	10	0.2			25	0.1
D	AUS	-ONION	3	0.1	3	0.0	4	0.1			10	0.0
D	AUS	-AMAN	398	7.6	313	3.6					712	3.4
D	JUTE	-WHEAT	37	0.7	42	0.5	75	1.4			153	0.7
D	JUTE	-PULSES	4	0.1	4	0.1	6	0.1			14	0.1
D	JUTE	-MUSTARD	41	0.8	46	0.5	59	1.1			146	0.7
D	JUTE	-POTATO	19	0.4	22	0.2	19	0.4			60	0.3
D	JUTE	-EGG PLANT	7	0.1	8	0.1	10	0.2			24	0.1
D	JUTE	-CHILLIES	7	0.1	8	0.1	10	0.2			25	0.1
D	JUTE	-ONION	3	0.1	3	0.0	4	0.1			10	0.0
D	JUTE	-AMAN	398	7.6	313	3.6					712	3.4
D	T.AMAN	-BORO	1489	28.3	6250	70.9					7738	37.4
D	T.AMAN	-PULSES										
D	AUS+B.AMAN	-PULSES					1287	24.9			1287	6.2
D	AUS+B.AMAN	-MUSTARD					1109	21.5			1109	5.4
D	AUS+B.AMAN	-ONIONS					267	5.2			267	1.3
D	D.W.T. AMAN	-BORO					1384	26.8			1384	6.7
T	JUTE	-T.AMAN -WHEAT	175	3.3	109	1.2					283	1.4
T	JUTE	-T.AMAN -PULSES	389	7.4	242	2.7					631	3.0
T	JUTE	-T.AMAN -CHILLIES	290	5.5	180	2.0					470	2.3
T	JUTE	-T.AMAN -ONIONS	187	3.5	116	1.3					303	1.5
T	AUS	-T.AMAN -WHEAT	175	3.3	109	1.2					283	1.4
T	AUS	-T.AMAN -PULSES	272	5.2	169	1.9					442	2.1
T	AUS	-T.AMAN -CHILLIES	245	4.7	152	1.7					397	1.9
T	AUS	-T.AMAN -ONIONS	348	6.6	216	2.5					564	2.7
			ha	%	ha	%	ha	%	ha		ha	%
	GRASSLAND/FALLOW:											
	SINGLE CROPPED		647	12	353	4	759	15	1449	100	3208	16
	DOUBLE CROPPED		2537	48	7164	81	4412	85			14113	68
	TRIPLE CROPPED		2080	40	1293	15					3373	16
	TOTAL		5264	100	8810	100	5171	100	1449	100	20694	100
			25%:		43%:		25%:		7%:			
	CROP. INTENSITY		227		211		185		100		201	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * UPAZILA : SARISHABARI Table 5.D.8

Crop.inten: sity :	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW						74	1.7			74	0.9
S	SUGAR CANE -											
S	BORO -											
S	MILLET											
S	GROUNDNUT											
S	B.AMAN											
S	S.W. POTATO											
D	AUS	-WHEAT			56	2.6	658	14.7			714	8.8
D	AUS	-PULSES			6	0.3	82	1.8			88	1.1
D	AUS	-MUSTARD			30	1.4	381	8.5			411	5.1
D	AUS	-POTATO			21	1.0	182	4.1			202	2.5
D	AUS	-EGG PLANT			3	0.1	39	0.9			42	0.5
D	AUS	-CHILLIES			6	0.3	79	1.8			86	1.1
D	AUS	-ONION			2	0.1	31	0.7			34	0.4
D	AUS	-AMAN	155	10.5	99	4.6					254	3.1
D	JUTE	-WHEAT			30	1.4	538	12.0			569	7.0
D	JUTE	-PULSES			5	0.2	67	1.5			72	0.9
D	JUTE	-MUSTARD			25	1.2	312	7.0			336	4.2
D	JUTE	-POTATO			17	0.8	149	3.3			166	2.0
D	JUTE	-EGG PLANT			3	0.1	32	0.7			35	0.4
D	JUTE	-CHILLIES			5	0.2	65	1.5			70	0.9
D	JUTE	-ONION			2	0.1	25	0.6			27	0.3
D	JUTE	-AMAN	127	8.6	81	3.8					208	2.6
D	T.AMAN	-BORO	663	44.8	1065	49.7					1728	21.4
D	T.AMAN	-PULSES										
D	AUS+B.AMAN	-PULSES					677	15.1			677	8.4
D	AUS+B.AMAN	-MUSTARD					408	9.1			408	5.0
D	AUS+B.AMAN	-ONIONS					122	2.7			122	1.5
D	D.W.T. AMAN	-BORO					552	12.3			552	6.8
T	JUTE	-T.AMAN -WHEAT	44	3.0	56	2.6					100	1.2
T	JUTE	-T.AMAN -PULSES	103	7.0	133	6.2					236	2.9
T	JUTE	-T.AMAN -CHILLIES	58	4.0	75	3.5					133	1.6
T	JUTE	-T.AMAN -ONIONS	34	2.3	44	2.1					79	1.0
T	AUS	-T.AMAN -WHEAT	54	3.6	69	3.2					122	1.5
T	AUS	-T.AMAN -PULSES	91	6.1	116	5.4					207	2.6
T	AUS	-T.AMAN -CHILLIES	60	4.1	77	3.6					137	1.7
T	AUS	-T.AMAN -ONIONS	89	6.0	115	5.3					204	2.5
			ha	%	ha	%	ha	%	ha		ha	%
		GRASSLAND/FALLOW:					74	2			74	1
		SINGLE CROPPED										
		DOUBLE CROPPED	945	64	1457	68	4399	98			6801	84
		TRIPLE CROPPED	533	36	685	32					1218	15
		TOTAL	1478	100	2142	100	4473	100			8093	100
			18%		26%		55%					
		CROP. INTENSITY	236		232		198				214	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

* MAIN CROPPING PATTERNS * THANA : SARIAKANDI Table 5.D.9

Crop. intensity	Main cropping patterns			PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW							83	9.3	46	23.7	129	9.8
S	SUGAR CANE	-								74	38.1	74	5.6
S	BORO	-						89	10.0			89	6.7
S	MILLET												
S	GROUNDNUT												
S	B.AMAN												
S	S.W. POTATO							89	10.0			89	6.7
D	AUS	-WHEAT						63	7.0			63	4.7
D	AUS	-PULSES						8	0.9			8	0.6
D	AUS	-MUSTARD						42	4.7			42	3.2
D	AUS	-POTATO						16	1.8			16	1.2
D	AUS	-EGG PLANT						8	0.9			8	0.6
D	AUS	-CHILLIES						8	0.9			8	0.6
D	AUS	-ONION						4	0.4			4	0.3
D	AUS	-AMAN				45	18.7	69	7.8			114	8.6
D	JUTE	-WHEAT						42	4.7			42	3.2
D	JUTE	-PULSES						6	0.6			6	0.4
D	JUTE	-MUSTARD						28	3.1			28	2.1
D	JUTE	-POTATO						11	1.2			11	0.8
D	JUTE	-EGG PLANT						5	0.6			5	0.4
D	JUTE	-CHILLIES						5	0.6			5	0.4
D	JUTE	-ONION						2	0.3			2	0.2
D	JUTE	-AMAN				30	12.5	46	5.2			76	5.7
D	T.AMAN	-BORO				76	31.8					76	5.7
D	T.AMAN	-PULSES											
D	AUS+B.AMAN	-PULSES						146	16.5			146	11.1
D	AUS+B.AMAN	-MUSTARD						95	10.7			95	7.2
D	AUS+B.AMAN	-ONIONS						25	2.8			25	1.9
D	D.W.T. AMAN	-BORO								74	38.1	74	5.6
T	JUTE	-T.AMAN	-WHEAT			6	2.4					6	0.4
T	JUTE	-T.AMAN	-PULSES			15	6.2					15	1.1
T	JUTE	-T.AMAN	-CHILLIES			9	3.7					9	0.7
T	JUTE	-T.AMAN	-ONIONS			6	2.4					6	0.4
T	AUS	-T.AMAN	-WHEAT			9	3.7					9	0.7
T	AUS	-T.AMAN	-PULSES			16	6.9					16	1.2
T	AUS	-T.AMAN	-CHILLIES			11	4.8					11	0.9
T	AUS	-T.AMAN	-ONIONS			16	6.8					16	1.2

	ha	%	ha	%	ha	%	ha	%	ha	%
GRASSLAND/FALLOW:					83	9	46	24	129	10
SINGLE CROPPED					178	20	74	38	252	19
DOUBLE CROPPED			150	63	629	71	74	38	853	65
TRIPLE CROPPED			88	37					88	7
TOTAL			238	100	890	100	194	100	1322	100
			18%:		67%:		15%:			
CROP. INTENSITY			237		171		138		178	

Source : Consultant's computation based on SRDI soils & lands surveys carried out from 1985 to 1990.

- LIVESTOCK - PROJECT AREA -

Table 5.D.10

UPAZILA	Total farm holdings	Net Cultiv. area (ha)	Holdings with bovine number:	%	Bovines Number	Number /hold:	Number /ha	Hold. with goa/she:	Goats/sheeps Number	Number /hold.	Number /ha
DEWANGANG	6149	5879	3948	64.2	12789	3.2	2.2	3582	10358	1.7	1.8
Small farms	3798	1233	1786	47.0	3994	2.2	3.2	2019	4940	1.3	4.0
Medium farms:	1858	2736	1685	90.7	5795	3.4	2.1	1203	3819	2.1	1.4
Large farms	492	1911	477	96.9	3000	6.3	1.6	360	1598	3.2	0.8
ISLAMPUR	11588	9676	7432	64.1	22190	3.0	2.3	5980	17679	1.5	1.8
Small farms	7818	2655	3935	50.3	8716	2.2	3.3	3704	9497	1.2	3.6
Medium farms:	3088	4459	2837	91.9	9661	3.4	2.2	1830	6179	2.0	1.4
Large farms	682	2562	661	96.9	3814	5.8	1.5	446	2004	2.9	0.8
JAMALPUR	6569	4882	4481	68.2	13127	2.9	2.7	3385	8838	1.3	1.8
Small farms	4706	1569	2694	57.2	5912	2.2	3.8	2278	5351	1.1	3.4
Medium farms:	1633	2429	1561	95.6	5694	3.6	2.3	962	2882	1.8	1.2
Large farms	230	885	226	98.4	1521	6.7	1.7	145	605	2.6	0.7
MADARGANJ	20906	15442	13477	64.5	43101	3.2	2.8	12284	39252	1.9	2.5
Small farms	15188	4924	8011	52.7	18974	2.4	3.9	8191	22772	1.5	4.6
Medium farms:	4978	7584	4737	95.2	19009	4.0	2.5	3525	13240	2.7	1.7
Large farms	740	2934	728	98.4	5118	7.0	1.7	568	3240	4.4	1.1
MALANDAH	28137	19527	17342	61.6	50787	2.9	2.6	13912	40283	1.4	2.1
Small farms	21260	6788	10729	50.5	23993	2.2	3.5	9837	25463	1.2	3.8
Medium farms:	5944	9007	5697	95.8	20843	3.7	2.3	3453	11682	2.0	1.3
Large farms	933	3732	916	98.2	5951	6.5	1.6	622	3138	3.4	0.8
SHARISHABARI:	10288	6934	7210	70.1	20218	2.8	2.9	5479	15020	1.5	2.2
Small farms	7659	2556	4690	61.2	10163	2.2	4.0	3802	9323	1.2	3.6
Medium farms:	2288	3215	2190	95.7	7876	3.6	2.4	1442	4635	2.0	1.4
Large farms	341	1163	330	96.8	2179	6.6	1.9	235	1062	3.1	0.9
PROJECT AREA:	83637	62341	53891	64.4	162213	1.9	1.9	44623	131431	1.6	1.6
Small farms	60429	19724	31845	52.7	71752	1.2	3.6	29832	77347	1.3	3.9
Medium farms:	19789	29430	18707	94.5	68878	3.5	2.3	12415	42437	2.1	1.4
Large farms	3419	13187	3338	97.7	21584	6.3	1.6	2376	11647	3.4	0.9

Source : The Bangladesh census of agriculture and livestock :1983-84 -November 1988.

- Small farms :.02 - 1 ha
- Medium farms : 1 - 3 ha
- Large farms : 3 ha & above

LIVESTOCK POPULATION IN THE PROJECT AREA. 1990/1991 Table 5.D.11

UPAZILA	NCA ha	Cattle No.	/ha	Buffaloes No.	/ha	Goat/sheep No.	/ha	: Duck/poultry: No.	/ha	Others No.
JAMALPUR	4758	13724	2.9	2336	0.5	10366	2.2	50954	10.7 :	292
SHARISABARI	8093	26151	3.2	379	0.0	17434	2.2	100435	12.4 :	379
MELANDAHA	20694	76000	3.7	2000	0.1	46000	2.2	339000	16.4 :	2000
ISLAMPUR	11248	28116	2.5	1278	0.1	12780	1.1	131634	11.7 :	426
DEWANGANJ	7023	15078	2.1	1795	0.3	13642	1.9	89032	12.7 :	718
MADARGANJ	17720	35334	2.0	906	0.1	28992	1.6	268176	15.1 :	906
TOTAL	69536	194403	2.8	8694	0.1	129214	1.9	979231	14.1 :	4721

Source : District Livestock Office .Jamalpur 1992.

TABLE 5.D.12 - Estimated straw production.

Crop	Area ha	Yield t/ha	Total grain production t	Straw/grain ratio	Straw production t
B. Aus	12325	1.40	17255	1.5	25883
HYV Aus	2175	3.00	6525	1.0	6525
Aus+Aman	7917	1.64	12984	1.2	15581
B.Aman	1461	1.41	2060	1.0	2060
D.W.T. Aman	5896	1.41	8313	2.0	16627
L. Aman	13244	2.11	27945	1.0	27945
HYV Aman	19866	3.59	71319	0.9	64187
HYV Boro	25862	4.27	110431	0.8	88345
L. Boro	3196	2.50	7990	1.0	7990
Wheat	6951	2	13902	0.8	11122
Total			278724		266263

Source : CS 1992

ANNEX 5

APPENDIX

E MAIN CROPPING PATTERNS BY THANA

Table 5.E.1

AJUSTED LAND CATEGORIES DISTRIBUTION FOR (WO) AND (W) SITUATIONS
AREA WITHIN EMBANKMENTS (Ha)
JAMALPUR
Model reference year : 1977

		(a) FO	(b) F1	(c) F2	(d) F3	(e) TOTAL
W	1) Gross/net coef.	50%	0%	25%	25%	100%
I						
T						
H	2) Reported net cultiv.	1374	1184	1800	0	4358
O	area	32%	27%	41%	0%	100%
U						
T	3) Adjusted gross area	3114	1184	2670	870	7837
		40%	15%	34%	11%	100%
O						
P	4) (Gross - Net) area	1740	0	870	870	3479
T						
I						
O	5) Model calc. gross	4123	1103	1272	1338	7836
N	area	53%	14%	16%	17%	100%
	6) Model calc. net	2384	1103	402	468	4357
	area	55%	25%	9%	11%	100%
	7) Model calc. gross	4992	972	990	884	7838
O	area	64%	12%	13%	11%	100%
P						
T	8) Model calc. net	3253	972	120	14	4359
I	area	75%	22%	3%	0%	100%
O						
N						
B	9) Correct. cultivated	2365	1316	579	0	4359
	net area	54%	30%	16%	0%	100%

1) This coefficient is applicated on the difference between total gross and net area (e4)
2) Reported data from agriculture
3) (3) = (2) + (4)
4) (4) = (e4) x (1)
5) Reference model calculation
6) (6) = (5) - (4)
7) Option model calculation
8) (8) = (7) - (4)
9) Correction of the areas to be homogenous with the reported net agricul. area
(9) = (8) / (6) x (2), then proportionnal adjustement on the total net area

See text for comments on applied methodology.

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* NEW CROPPING PATTERNS * THANA : JAMALPUR B Inside Table

Crop. Inten. sity	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW											
S	SUGAR CANE	-	61	2.6	86	6.5					147	3.4
S	BORO	-			26	2.0	43	6.3			69	1.6
S	MILLET											
S	GROUNDNUT											
S	B.AMAN											
S	S.W. POTATO											
D	AUS	-WHEAT	69	2.9	129	9.8	150	22.0			347	8.0
D	AUS	-PULSES	10	0.4	20	1.5	23	3.4			53	1.2
D	AUS	-MUSTARD	49	2.1	97	7.4	115	16.9			262	6.0
D	AUS	-POTATO	24	1.0	38	2.9	40	5.8			101	2.3
D	AUS	-EGG PLANT	7	0.3	14	1.1	17	2.5			39	0.9
D	AUS	-CHILLIES	4	0.2	9	0.7	10	1.5			23	0.5
D	AUS	-ONION	3	0.1	5	0.4	6	0.9			14	0.3
D	AUS	-AMAN	161	6.8	39	3.0					200	4.6
D	JUTE	-WHEAT	20	0.8	50	3.8	64	9.4			134	3.1
D	JUTE	-PULSES	4	0.2	8	0.6	10	1.5			23	0.5
D	JUTE	-MUSTARD	21	0.9	42	3.2	49	7.3			112	2.6
D	JUTE	-POTATO	10	0.4	16	1.2	17	2.5			43	1.0
D	JUTE	-EGG PLANT	3	0.1	6	0.5	7	1.1			17	0.4
D	JUTE	-CHILLIES	2	0.1	4	0.3	4	0.6			10	0.2
D	JUTE	-ONION	1	0.0	2	0.2	3	0.4			6	0.1
D	JUTE	-AMAN	69	2.9	17	1.3					86	2.0
D	T.AMAN	-BORO	1431	60.5	541	41.1					1972	45.2
D	T.AMAN	-PULSES										
D	AUS+B.AMAN	-PULSES			43	3.3	70	10.3			113	2.6
D	AUS+B.AMAN	-MUSTARD			24	1.9	40	5.9			64	1.5
D	AUS+B.AMAN	-ONIONS			7	0.5	11	1.6			17	0.4
D	D.W.T. AMAN	-BORO										
T	JUTE	-T.AMAN - WHEAT	21	0.9	5	0.4					26	0.6
T	JUTE	-T.AMAN - PULSES	59	2.5	13	1.0					72	1.7
T	JUTE	-T.AMAN - CHILLIES	24	1.0	5	0.4					30	0.7
T	JUTE	-T.AMAN - ONIONS	20	0.9	4	0.3					25	0.6
T	AUS	-T.AMAN - WHEAT	50	2.1	11	0.8					61	1.4
T	AUS	-T.AMAN - PULSES	104	4.4	23	1.8					128	2.9
T	AUS	-T.AMAN - CHILLIES	64	2.7	14	1.1					78	1.8
T	AUS	-T.AMAN - ONIONS	73	3.1	16	1.2					89	2.0
			ha	%	ha	%	ha	%	ha	%	ha	%
		GRASSLAND/FALLOW:										
		SINGLE CROPPED	61	3	112	9	43	6			216	5
		DOUBLE CROPPED	1888	80	1112	84	636	94			3637	83
		TRIPLE CROPPED	415	18	92	7					507	12
		TOTAL	2365	100	1316	100	679	100			4360	100
			54%:		30%:		16%:					
		CROP. INTENSITY	215		198		194				207	

(*) Only 35% of area increment per land type (vs WO situation) is supposed to apply new cropping pattern.

AJUSTED LAND CATEGORIES DISTRIBUTION FOR (WO) AND (W) SITUATIONS
AREA WITHIN EMBANKMENTS (Ha)
SHARISABARI
Model reference year : 1977

			(a)	(b)	(c)	(d)	(e)
			F0	F1	F2	F3	TOTAL
W	1) Gross/net coef.		50%	0%	25%	25%	100%
I							
T							
H	2) Reported net cultiv.		1081	963	482	0	2526
O	area		43%	38%	19%	0%	100%
U							
T	3) Adjusted gross area		1345	963	614	132	3054
			44%	32%	20%	4%	100%
O							
P	4) (Gross - Net) area		264	0	132	132	528
T							
I							
O	5) Model calc. gross		1341	728	757	227	3053
N	area		44%	24%	25%	7%	100%
	6) Model calc. net		1077	726	625	95	2525
	area		43%	29%	25%	4%	100%
	7) Model calc. gross		1648	703	553	150	3054
O	area		54%	23%	18%	5%	100%
P							
T	8) Model calc. net		1384	703	421	18	2526
I	area		55%	28%	17%	1%	100%
O							
N							
	9) Correct. cultivated		1327	889	310	0	2526
B	net area		53%	35%	12%	0%	100%

1) This coefficient is applicated on the difference between total gross and net area (e4)
2) Reported data from agriculture
3) (3) = (2) + (4)
4) (4) = (e4) x (1)
5) Reference model calculation
6) (6) = (5) - (4)
7) Option model calculation
8) (8) = (7) - (4)
9) Correction of the areas to be homogenous with the reported net agricul. area
(9) = (8) / (6) x (2), then proportionnal adjustement on the total net area

See text for comments on applied methodology.

* NEW CROPPING PATTERNS * TNANA : SARISHABARI B Inside Table

Crop. intensity	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	:GRASSLAND/FALLOW											
S	:SUGAR CANE -											
S	:BORO -											
S	:MILLET											
S	:GROUNDNUT											
S	:B.AMAN											
S	S.W. POTATO											
D	:AUS	-WHEAT			13	1.5	46	14.7			59	2.3
D	:AUS	-PULSES			2	0.2	6	1.8			7	0.3
D	:AUS	-MUSTARD			7	0.8	26	8.5			34	1.3
D	:AUS	-POTATO			4	0.4	13	4.1			16	0.6
D	:AUS	-EGG PLANT			1	0.1	3	0.9			3	0.1
D	:AUS	-CHILLIES			2	0.2	6	1.8			7	0.3
D	:AUS	-ONION			1	0.1	2	0.7			3	0.1
D	:AUS	-AMAN	91	6.9	34	3.9					126	5.0
D	:JUTE	-WHEAT			11	1.2	37	12.1			48	1.9
D	:JUTE	-PULSES			1	0.1	5	1.5			6	0.2
D	:JUTE	-MUSTARD			6	0.7	22	7.0			28	1.1
D	:JUTE	-POTATO			3	0.3	10	3.3			13	0.5
D	:JUTE	-EGG PLANT			1	0.1	2	0.7			3	0.1
D	:JUTE	-CHILLIES			1	0.1	5	1.5			6	0.2
D	:JUTE	-ONION			0	0.1	2	0.6			2	0.1
D	:JUTE	-AMAN	75	5.6	28	3.2					103	4.1
D	:T.AMAN	-BORO	691	52.1	557	62.7					1248	49.4
D	:T.AMAN	-PULSES										
D	:AUS+B.AMAN	-PULSES										
D	:AUS+B.AMAN	-MUSTARD										
D	:AUS+B.AMAN	-ONIONS										
D	:D.W.T. AMAN	-BORO			36	4.0	127	40.9			162	6.4
T	:JUTE	-T.AMAN - WHEAT	39	2.9	15	1.7					54	2.1
T	:JUTE	-T.AMAN - PULSES	91	6.9	35	4.0					126	5.0
T	:JUTE	-T.AMAN - CHILLIES	52	3.9	20	2.2					71	2.8
T	:JUTE	-T.AMAN - ONIONS	30	2.3	12	1.3					42	1.7
T	:AUS	-T.AMAN - WHEAT	47	3.6	18	2.1					65	2.6
T	:AUS	-T.AMAN - PULSES	80	6.0	31	3.5					111	4.4
T	:AUS	-T.AMAN - CHILLIES	53	4.0	20	2.3					73	2.9
T	:AUS	-T.AMAN - ONIONS	79	5.9	30	3.4					109	4.3
			ha	%	ha	%	ha	%	ha	%	ha	%
		GRASSLAND/FALLOW:										
		SINGLE CROPPED :										
		DOUBLE CROPPED :	857	65	707	80	310	100			1874	74
		TRIPLE CROPPED :	470	35	182	20					652	26
		TOTAL :	1327	100	889	100	310	100			2526	100
		:	53%		35%		12%					
		CROP. INTENSITY :	235		220		200				226	

(*) Only 35% of area increment per land type (vs WO situation) is supposed to apply new cropping pattern.

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AJUSTED LAND CATEGORIES DISTRIBUTION FOR (WO) AND (W) SITUATIONS
AREA WITHIN EMBANKMENTS (Ha)
MELANDAHA
Model reference year : 1977

		(a) F0	(b) F1	(c) F2	(d) F3	(e) TOTAL
W	1) Gross/net coef.	50%	0%	25%	25%	100%
I						
T	2) Reported net cultiv.	5264	8810	2796	1109	17979
H	area	29%	49%	16%	6%	100%
O						
U	3) Adjusted gross area	7935	8810	4131	2444	23320
T		34%	38%	18%	10%	100%
O	4) (Gross - Net) area	2671	0	1335	1335	5341
P						
T	5) Model calc. gross	9030	4465	5515	4309	23319
I	area	39%	19%	24%	18%	100%
O						
N	6) Model calc. net	6360	4465	4180	2974	17978
	area	35%	25%	23%	17%	100%
	7) Model calc. gross	16100	3357	2530	1333	23320
O	area	69%	14%	11%	6%	100%
P						
T	8) Model calc. net	13430	3357	1193	0	17979
I	area	75%	19%	7%	0%	100%
O						
N						
	9) Correct. cultivated	10781	6424	774	0	17979
B	net area	60%	36%	4%	0%	100%

1) This coefficient is applicated on the difference between total gross and net area.(e4)
2) Reported data from agriculture
3) (3) = (2) + (4)
4) (4) = (e4) x (1)
5) Reference model calculation
6) (6) = (5) - (4)
7) Option model calculation
8) (8) = (7) - (4)
9) Correction of the areas to be homogenous with the reported net agricul. area
(9) = (8) / (6) x (2), then proportionnal adjustement on the total net area

See text for comments on applied methodology.

Table 5.E. 6

* NEW CROPPING PATTERNS * TNANA : MELANDAHA B Inside Table

Crop.: inten: sity :	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	:GRASSLAND/FALLOW											
S	:SUGAR CANE	-	884	8.2							884	4.9
S	:BORO	-			192	3.0	213	27.5			405	2.3
S	:MILLET		144	1.3	250	3.9	21	2.7			414	2.3
S	:GROUNDNUT											
S	:B.AMAN						41	5.3			41	0.2
S	S.W. POTATO											
D	:AUS	-WHEAT	101	0.9	67	1.0	17	2.2			185	1.0
D	:AUS	-PULSES	7	0.1	5	0.1	1	0.2			13	0.1
D	:AUS	-MUSTARD	74	0.7	51	0.8	13	1.7			139	0.8
D	:AUS	-POTATO	35	0.3	21	0.3	4	0.6			60	0.3
D	:AUS	-EGG PLANT	12	0.1	8	0.1	2	0.3			23	0.1
D	:AUS	-CHILLIES	13	0.1	9	0.1	2	0.3			24	0.1
D	:AUS	-ONION	5	0.0	4	0.1	1	0.1			10	0.1
D	:AUS	-AMAN	672	6.2	189	2.9					861	4.8
D	:JUTE	-WHEAT	67	0.6	55	0.8	17	2.2			139	0.8
D	:JUTE	-PULSES	7	0.1	5	0.1	1	0.2			13	0.1
D	:JUTE	-MUSTARD	74	0.7	51	0.8	13	1.7			139	0.8
D	:JUTE	-POTATO	35	0.3	21	0.3	4	0.6			60	0.3
D	:JUTE	-EGG PLANT	12	0.1	8	0.1	2	0.3			23	0.1
D	:JUTE	-CHILLIES	13	0.1	9	0.1	2	0.3			24	0.1
D	:JUTE	-ONION	5	0.0	4	0.1	1	0.1			10	0.1
D	:JUTE	-AMAN	672	6.2	189	2.9					861	4.8
D	:T.AMAN	-BORO	4579	42.5	3780	58.8					8359	46.5
D	:T.AMAN	-PULSES										
D	:AUS+B.AMAN	-PULSES			88	1.4	51	6.5			138	0.8
D	:AUS+B.AMAN	-MUSTARD			76	1.2	44	5.6			119	0.7
D	:AUS+B.AMAN	-ONIONS			18	0.3	10	1.4			29	0.2
D	:D.W.T. AMAN	-BORO			542	8.4	312	40.4			854	4.8
T	:JUTE	-T.AMAN - WHEAT	283	2.6	66	1.0					349	1.9
T	:JUTE	-T.AMAN - PULSES	630	5.8	146	2.3					776	4.3
T	:JUTE	-T.AMAN - CHILLIES	469	4.4	109	1.7					578	3.2
T	:JUTE	-T.AMAN - ONIONS	302	2.8	70	1.1					373	2.1
T	:AUS	-T.AMAN - WHEAT	283	2.6	66	1.0					349	1.9
T	:AUS	-T.AMAN - PULSES	441	4.1	102	1.6					543	3.0
T	:AUS	-T.AMAN - CHILLIES	397	3.7	92	1.4					489	2.7
T	:AUS	-T.AMAN - ONIONS	564	5.2	131	2.0					695	3.9

	ha	%	ha	%	ha	%	ha	%	ha	%
GRASSLAND/FALLOW:										
SINGLE CROPPED	1028	10	442	7	274	35			1744	10
DOUBLE CROPPED	6384	59	5200	81	500	65			12083	67
TRIPLE CROPPED	3369	31	782	12					4152	23
TOTAL	10781	100	6424	100	774	100			17979	100
	60%:		36%:		4%:					
CROP. INTENSITY	222		205		165				213	

(*) Only 35% of area increment per land type (vs WO situation) is supposed to apply new cropping pattern.

AJUSTED LAND CATEGORIES DISTRIBUTION FOR (WO) AND (W) SITUATIONS
AREA WITHIN EMBANKMENTS (Ha)
ISLAMPUR
Model reference year : 1977

		(a) F0	(b) F1	(c) F2	(d) F3	(e) TOTAL
W	1) Gross/net coef.	50%	0%	25%	25%	100%
I	2) Reported net cultiv. area	1953 20%	4687 48%	2931 30%	237 2%	9808 100%
T	3) Adjusted gross area	3038 25%	4687 39%	3473 29%	779 7%	11977 100%
O	4) (Gross - Net) area	1085	0	542	542	2169
I	5) Model calc. gross area	3300 28%	2505 21%	4048 34%	2122 18%	11975 100%
N	6) Model calc. net area	2215 23%	2505 26%	3506 36%	1580 16%	9806 100%
	7) Model calc. gross area	8224 69%	2149 18%	1520 13%	84 1%	11977 100%
O	8) Model calc. net area	7140 73%	2149 22%	520 5%	[illegible] 0%	9808 100%
P	9) Correct. cultivated net area	5743 59%	3669 37%	396 4%	[illegible] 0%	9808 100%

1) This coefficient is applicated on the difference between total gross and net area (e4)
2) Reported data from agriculture
3) (3) = (2) + (4)
4) (4) = (e4) x (1)
5) Reference model calculation
6) (6) = (5) - (4)
7) Option model calculation
8) (8) = (7) - (4)
9) Correction of the areas to be homogenous with the reported net agricul. area (9) = (8) / (6) x (2), then proportionnal adjustement on the total net area

See text for comments on applied methodology.

* NEW CROPPING PATTERNS * TNANA : ISLAMPUR /B Inside Table

Crop.: inten: sity :	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	:GRASSLAND/FALLOW											
S	:SUGAR CANE -		825	14.4	71	1.9					897	9.1
S	:BORO -				222	6.1	114	28.7			336	3.4
S	:MILLET											
S	:GROUNDNUT											
S	:B.AMAN											
S	S.W. POTATO											
D	:AUS	-WHEAT	73	1.3	66	1.8	23	5.7			162	1.7
D	:AUS	-PULSES	18	0.3	17	0.5	6	1.5			41	0.4
D	:AUS	-MUSTARD	47	0.8	45	1.2	16	4.0			108	1.1
D	:AUS	-POTATO	38	0.7	27	0.7	9	2.2			74	0.8
D	:AUS	-EGG PLANT	5	0.1	4	0.1	2	0.4			11	0.1
D	:AUS	-CHILLIES	5	0.1	5	0.1	2	0.4			11	0.1
D	:AUS	-ONION	8	0.1	8	0.2	3	0.7			19	0.2
D	:AUS	-AMAN	113	2.0	32	0.9					145	1.5
D	:JUTE	-WHEAT	33	0.6	41	1.1	15	3.8			89	0.9
D	:JUTE	-PULSES	12	0.2	12	0.3	4	1.0			28	0.3
D	:JUTE	-MUSTARD	32	0.6	30	0.8	10	2.6			72	0.7
D	:JUTE	-POTATO	25	0.4	18	0.5	6	1.5			49	0.5
D	:JUTE	-EGG PLANT	3	0.1	3	0.1	1	0.3			7	0.1
D	:JUTE	-CHILLIES	3	0.1	3	0.1	1	0.3			7	0.1
D	:JUTE	-ONION	5	0.1	5	0.1	2	0.5			12	0.1
D	:JUTE	-AMAN	75	1.3	22	0.6					97	1.0
D	:T.AMAN	-BORO	2565	44.7	1838	50.1					4403	44.9
D	:T.AMAN	-PULSES	315	5.5	356	9.7					671	6.8
D	:AUS+B.AMAN	-PULSES			94	2.5	40	10.0			133	1.4
D	:AUS+B.AMAN	-MUSTARD			36	1.0	15	3.9			52	0.5
D	:AUS+B.AMAN	-ONIONS			26	0.7	11	2.8			37	0.4
D	:D.W.T. AMAN	-BORO			277	7.5	118	29.7			394	4.0
T	:JUTE	-T.AMAN - WHEAT	83	1.4	22	0.6					105	1.1
T	:JUTE	-T.AMAN - PULSES	313	5.5	83	2.3					397	4.0
T	:JUTE	-T.AMAN - CHILLIES	94	1.6	25	0.7					119	1.2
T	:JUTE	-T.AMAN - ONIONS	127	2.2	34	0.9					161	1.6
T	:AUS	-T.AMAN - WHEAT	124	2.2	33	0.9					157	1.6
T	:AUS	-T.AMAN - PULSES	388	6.7	103	2.8					491	5.0
T	:AUS	-T.AMAN - CHILLIES	232	4.0	62	1.7					294	3.0
T	:AUS	-T.AMAN - ONIONS	182	3.2	48	1.3					230	2.3
			ha	%	ha	%	ha	%	ha	%	ha	%
		GRASSLAND/FALLOW:										
		SINGLE CROPPED	825	14	293	8	114	29			1233	13
		DOUBLE CROPPED	3375	59	2965	81	282	71			6623	68
		TRIPLE CROPPED	1542	27	410	11					1953	20
		TOTAL	5743	100	3669	100	396	100			9808	100
			59%		37%		4%					
		CROP. INTENSITY	212		203		171				207	

(*) Only 35% of area increment per land type (vs WO situation) is supposed to apply new cropping pattern.

AJUSTED LAND CATEGORIES DISTRIBUTION FOR (WO) AND (W) SITUATIONS
AREA WITHIN EMBANKMENTS (Ha)
DEWANGANJ
Model reference year : 1977

		(a) F0	(b) F1	(c) F2	(d) F3	(e) TOTAL
W	1) Gross/net coef.	50%	0%	25%	25%	100%
I	2) Reported net cultiv. area	1149 40%	655 23%	1008 35%	55 2%	2867 100%
T	3) Adjusted gross area	1428 42%	655 19%	1148 34%	195 6%	3425 100%
O	4) (Gross - Net) area	279	0	140	140	558
P						
T	5) Model calc. gross area	1521 44%	679 20%	909 27%	316 9%	3425 100%
I	6) Model calc. net area	1242 43%	679 24%	770 27%	177 6%	2867 100%
O						
N						
C	7) Model calc. gross area	2558 75%	551 16%	289 8%	27 1%	3425 100%
P	8) Model calc. net area	2279 79%	551 19%	37 1%	0 0%	2867 100%
T						
I						
O						
N						
B	9) Correct. cultivated net area	2246 78%	567 20%	52 2%	0 0%	2867 100%

1) This coefficient is applicated on the difference between total gross and net area (e4)
2) Reported data from agriculture
3) (3) = (2) + (4)
4) (4) = (e4) x (1)
5) Reference model calculation
6) (6) = (5) - (4)
7) Option model calculation
8) (8) = (7) - (4)
9) Correction of the areas to be homogenous with the reported net agricul. area
(9) = (8) / (6) x (2), then proportionnal adjustement on the total net area

See text for comments on applied methodology.

* NEW CROPPING PATTERNS * TNANA : DEWANGANG B Inside

Crop.: inten: sity :	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW											
S	SUGAR CANE -		960	42.7	48	8.5					1008	35.2
S	BORO -				25	4.3	6	10.6			30	1.1
S	MILLET											
S	GROUNDNUT											
S	B.AMAN											
S	S.W. POTATO											
D	AUS	-WHEAT	183	8.2	51	9.0	5	8.7			239	8.3
D	AUS	-PULSES	60	2.7	17	3.0	2	3.1			79	2.8
D	AUS	-MUSTARD	125	5.5	36	6.3	3	6.4			164	5.7
D	AUS	-POTATO	80	3.6	20	3.5	1	2.8			101	3.5
D	AUS	-EGG PLANT	12	0.5	3	0.6	0	0.6			16	0.5
D	AUS	-CHILLIES	6	0.2	2	0.3	0	0.3			7	0.3
D	AUS	-ONION	4	0.2	1	0.2	0	0.2			6	0.2
D	AUS	-AMAN	28	1.2	14	2.4					42	1.5
D	JUTE	-WHEAT	31	1.4	10	1.8	1	2.2			42	1.5
D	JUTE	-PULSES	15	0.7	4	0.8	0	0.8			20	0.7
D	JUTE	-MUSTARD	31	1.4	9	1.6	1	1.6			41	1.4
D	JUTE	-POTATO	20	0.9	5	0.9	0	0.7			25	0.9
D	JUTE	-EGG PLANT	3	0.1	1	0.2	0	0.2			4	0.1
D	JUTE	-CHILLIES	1	0.1	0	0.1	0	0.1			2	0.1
D	JUTE	-ONION	1	0.1	0	0.1	0	0.1			1	0.1
D	JUTE	-AMAN	7	0.3	3	0.6					10	0.4
D	T.AMAN	-BORO	533	23.7	165	29.2					698	24.3
D	T.AMAN	-PULSES										
D	AUS+B.AMAN	-PULSES			35	6.1	9	16.6			43	1.5
D	AUS+B.AMAN	-MUSTARD			10	1.8	3	5.0			13	0.5
D	AUS+B.AMAN	-ONIONS			2	0.4	1	1.2			3	0.1
D	D.W.T. AMAN	-BORO			87	15.4	20	38.9			108	3.8
T	JUTE	-T.AMAN - WHEAT	4	0.2	0	0.1					5	0.2
T	JUTE	-T.AMAN - PULSES	19	0.8	2	0.4					21	0.7
T	JUTE	-T.AMAN - CHILLIES	3	0.2	0	0.1					4	0.1
T	JUTE	-T.AMAN - ONIONS	3	0.1	0	0.1					4	0.1
T	AUS	-T.AMAN - WHEAT	17	0.8	2	0.3					19	0.7
T	AUS	-T.AMAN - PULSES	64	2.8	7	1.2					71	2.5
T	AUS	-T.AMAN - CHILLIES	18	0.8	2	0.4					20	0.7
T	AUS	-T.AMAN - ONIONS	19	0.9	2	0.4					21	0.7
			ha	%	ha	%	ha	%	ha	%	ha	%
		GRASSLAND/FALLOW:										
		SINGLE CROPPED	960	43	73	13	6	11			1038	36
		DOUBLE CROPPED	1140	51	478	84	46	89			1664	58
		TRIPLE CROPPED	148	7	16	3					164	6
		TOTAL	2248	100	567	100	52	100			2867	100
			78%:		20%:		2%:					
		CROP. INTENSITY :	164		190		189				170	

(*) Only 35% of area increment per land type (vs WO situation) is supposed to apply new cropping pattern.

ADJUSTED LAND CATEGORIES DISTRIBUTION FOR (WO) AND (W) SITUATIONS
AREA WITHIN EMBANKMENTS (Ha)
MADERGANJ
Model reference year : 1977

		(a) F0	(b) F1	(c) F2	(d) F3	(e) TOTAL
W	1) Gross/net coef.	50%	0%	25%	25%	100%
I						
T						
H	2) Reported net cultiv.	3396	6573	2114	527	12610
O	area	27%	52%	17%	4%	100%
U						
T	3) Adjusted gross area	5187	6573	3010	1423	16192
		32%	41%	19%	9%	100%
O						
P	4) (Gross - Net) area	1791	0	896	896	3582
T						
I						
O	5) Model calc. gross	4636	4876	4989	1691	16192
N	area	29%	30%	31%	10%	100%
	6) Model calc. net	2845	4876	4094	796	12610
	area	23%	39%	32%	6%	100%
	7) Model calc. gross	6287	4802	4062	1041	16192
O	area	39%	30%	25%	6%	100%
P						
T	8) Model calc. net	4496	4802	3167	146	12610
I	area	36%	38%	25%	1%	100%
O						
N						
	9) Correct. cultivated	4986	6015	1519	90	12610
B	net area	40%	48%	12%	1%	100%

1) This coefficient is applicated on the difference between total gross and net area (e4)
2) Reported data from agriculture
3) (3) = (2) + (4)
4) (4) = (e4) x (1)
5) Reference model calculation
6) (6) = (5) - (4)
7) Option model calculation
8) (8) = (7) - (4)
9) Correction of the areas to be homogenous with the reported net agricul. area
(9) = (8) / (6) x (2), then proportionnal adjustement on the total net area

See text for comments on applied methodology.

* NEW CROPPING PATTERNS * TNANA : MADARGANJ B Inside Table

Crop.: intensity:	Main cropping patterns		PROJECT AREA F0 ha	F0 %	F1 ha	F1 %	F2 ha	F2 %	F3 ha	F3 %	TOTAL ha	TOTAL %
	GRASSLAND/FALLOW				31	0.5	124	8.1	24	26.2	178	1.4
S	SUGAR CANE	-										
S	BORO	-			13	0.2	109	7.2	41	45.2	162	1.3
S	MILLET		75	1.5	156	2.6					231	1.8
S	GROUNDNUT		75	1.5	179	3.0	59	3.9			314	2.5
S	B.AMAN				61	1.0	154	10.2			215	1.7
S	S.W. POTATO		75	1.5	179	3.0	59	3.9			314	2.5
D	AUS	-WHEAT	292	5.9	149	2.5	67	4.4			508	4.0
D	AUS	-PULSES	29	0.6	15	0.3	7	0.5			52	0.4
D	AUS	-MUSTARD	135	2.7	70	1.2	32	2.1			238	1.9
D	AUS	-POTATO	63	1.3	31	0.5	11	0.7			104	0.8
D	AUS	-EGG PLANT	28	0.6	15	0.2	7	0.5			50	0.4
D	AUS	-CHILLIES	9	0.2	5	0.1	2	0.1			16	0.1
D	AUS	-ONION	13	0.3	7	0.1	3	0.2			23	0.2
D	AUS	-AMAN	649	13.0	389	6.5					1038	8.2
D	JUTE	-WHEAT	196	3.9	95	1.6	33	2.2			324	2.6
D	JUTE	-PULSES	29	0.6	15	0.3	7	0.5			52	0.4
D	JUTE	-MUSTARD	135	2.7	70	1.2	33	2.2			239	1.9
D	JUTE	-POTATO	63	1.3	31	0.5	11	0.7			104	0.8
D	JUTE	-EGG PLANT	28	0.6	15	0.2	7	0.5			50	0.4
D	JUTE	-CHILLIES	9	0.2	5	0.1	2	0.1			16	0.1
D	JUTE	-ONION	13	0.3	7	0.1	3	0.2			23	0.2
D	JUTE	-AMAN	656	13.2	391	6.5					1046	8.3
D	T.AMAN	-BORO	1751	35.1	2981	49.6					4732	37.5
D	T.AMAN	-PULSES										
D	AUS+B.AMAN	-PULSES			76	1.3	225	14.8	17	19.1	318	2.5
D	AUS+B.AMAN	-MUSTARD			27	0.5	81	5.3	6	6.9	114	0.9
D	AUS+B.AMAN	-ONIONS			10	0.2	31	2.0	2	2.6	44	0.3
D	D.W.T. AMAN	-BORO			177	2.9	451	29.7			628	5.0
T	JUTE	-T.AMAN - WHEAT	147	3.0	175	2.9					323	2.6
T	JUTE	-T.AMAN - PULSES	85	1.7	112	1.9					197	1.6
T	JUTE	-T.AMAN - CHILLIES	46	0.9	56	0.9					102	0.8
T	JUTE	-T.AMAN - ONIONS	54	1.1	66	1.1					120	1.0
T	AUS	-T.AMAN - WHEAT	73	1.5	92	1.5					165	1.3
T	AUS	-T.AMAN - PULSES	108	2.2	131	2.2					239	1.9
T	AUS	-T.AMAN - CHILLIES	78	1.6	97	1.6					175	1.4
T	AUS	-T.AMAN - ONIONS	70	1.4	87	1.4					157	1.2
			ha	%	ha	%	ha	%	ha	%	ha	%
	GRASSLAND/FALLOW:				31	1	124	8	24		178	1
	SINGLE CROPPED		225	5	587	10	382	25	41		1235	10
	DOUBLE CROPPED		4099	82	4579	76	1014	67	26		9718	77
	TRIPLE CROPPED		661	13	817	14					1479	12
	TOTAL		4986	100	6015	100	1519	100	90		12610	100
			40%		48%		12%		1%			
	CROP. INTENSITY		209		203		167		129		201	

(*) Only 35% of area increment per land type (vs WO situation) is supposed to apply new cropping pattern.

ANNEX 5

APPENDIX

F MARKETING OF AGRICULTURAL PRODUCTS

CONTENTS

LIST OF TABLES

APPENDIX

F MARKETING OF AGRICULTURAL PRODUCTS

F.1 Methodology

The findings in this presentation are based on recent field surveys of the original farmers in groups of 5-10 or more at a time selecting at random village/local markets, big Hats/Bazars, wholesale markets at Jamalpur and other Thanas, traders, merchants, district and Thana officers, Public Corporations, private firms except the secondary data used from other sources mentioned where necessary.

F.1.1 General Background

i) Thana - Markets/Hats/Bazars

The "Thana-Hats" are the main marketing and biggest markets in each Thana for marketing of all sorts of goods and commodities agricultural and non-agricultural. These markets, popularly known as "HAT", normally open twice a week as follows:

1. Jamalpur - Saturday and Tuesday
2. Madarganj - Saturday and Wednesday
3. Dewanganj - Saturday and Wednesday
4. Islampur - Saturday and Tuesday
5. Melandah - Saturday and Thursday
6. Sharishabari - Monday and Thursday

In addition Nandina under Jamalpur Thana (but outside Project area) is one of the biggest centres (or big market) for marketing of all kinds of goods. It is also a railway station served by Dhaka-Mymensingh - Jamalpur Railway and also by the river Brahmaputra and Jamalpur-Mym-Dhaka road (motorable). Under each Thana there are smaller Hats/Bazars, and village or local markets at the lowest reaches scattered all over the district. The village/local markets are meant for exchange of small quantities of goods for daily requirements and they assemble daily in the morning. The daily markets, however, sit daily while big Hats (Bazars) sit once or twice a week.

Table 5.F.1 MARKETING OF MAJOR AGRICULTURAL PRODUCTS AT A GLANCE

Crops	Wheresold	Quantities sold ?	Remarks		
			Demand High/low	Qualities enough ?	Quantities enough ?
AUS	Negligible	Negligible			
AMAN	Bepasis 80% 20% to local markets	50 - 70%	High	Yes	Yes
BORO	Beparis 80% 20% to local markets	50 - 70%	High	Yes	Yes
JUTE	95% to Beparis 5% to local markets	100%	Low	No	No
WHEAT	Negligible	Negligible	-	Yes	No
POTATO*	Local markets	75%	High	Yes	No
ONION*	Local markets	25%	High	Yes	No

Source: Field Survey

Table 5.D.1 indicates that the farmers sell 50-70% of their Aman/Boro rice harvest, which does not mean that they produce enough of them, and sell out the surplus in spite of the fact that the harvest price remains at the bottom of the season. This is mostly what is called "distress sale", which means that the farmers become empty-handed after investing their entire resource on input costs. They may have borrowed money from a village money lender at a very high rate of interest or they may require funds for some most urgent immediate family needs and so they require some cash to tide over this very difficult period and hence are forced to sell a portion of their produce to meet these immediate requirements at the lowest price only to purchase when the price is much higher towards the end of the season or before the arrival of another crop. They produce little jute now, which was their only cash crop sometime ago. The new crop is the only asset on which the poor (small and medium size farmers) may fall back.

Credit is extremely scarce. The institutional sources of credit which are gaining ground gradually are not easily accessible to the lower, smaller categories of farmers because the procedures and formalities they have to satisfy are very long and cumbersome. They do not get the funds when they actually need them. However the farmers are harassed for the completion of many formalities and credit not only handicaps production but limits the scope for marketing their products as well.

F.1.2 Transport Facilities of Jamalpur District

Jamalpur town is fortunate IN having a Railway Junction connecting Jamalpur with Mymelnsing-Dhaka-Railway-Line, Jamalpur-Sarishabari Railway line and Jamalpur Bahadurabad Railway line. This is the junction which connects Jamalpur with the entire eastern railway networks of the country and West, North and South Bangladesh with ferries across the river Jamuna at Jagannnathganj Ghat down from Sarishabari and Bahadurabad Ghat down from Dewanganj. But internal road transport and communication are in extremely bad condition. Jamalpur is connected with one Thana, Sarishabari with Jamalpur-Tangail-Dhaka Highway upto Digpait and then by a narrow metalled road up to Sarishabari. All other Thanas are connected partly with brick-soling roads and partly with only earthen tracks with a ferry a few miles away from Jamalpur at Chatal river West of Jhenai Bridge to reach Islampur, Melandah and Dewandganj. From Islampur to Dewanganj Road there is simply an earthen track that is practically impassable by vehicular traffic. To reach Madarganj one has to cross two river crossings with no roads. Part of this road is also simply earthen track.

The internal trunk roads for connecting countrysides with Thanas and Hats/Bazars and market places and with District Headquarters are either non-existent or in extremely bad shape.

Table 5.F.2 shows the road mileage, railway mileage and riverine transport facilities.

Table 5.F.2 ROADS AND RAILWAYS TRANSPORT

Name of Thana	Road in km	Road in Km		No of bridges and culverts	River in km	Navigable round the year	Navigable in monsoon	Railmileage in km	No of stations
		Pucca	Kutcha						
DEWANGANJ	197.3	19.3	178.8	78	-	20	30	5	3
ISLAMPUR	626	8	610	54	20	2	3	8	2
JAMALPUR SADAR	1021.26	98.31	922.95	255	491	160	331	45	6
MADERGANJ	-	?	445	150	-	12	37	-	-
MELANDAH	-	?	785	232	-	5	42	19	2
SARISHABARI	-	4.5	209	358	-	5	60	24.5	6
TOTAL	1845,16	138,11	3150,75	1127	511	204	503	101.5	19

Source: District statistical office, Jamalpur.

The bad transport and communication system and facilities make transport and movement of agricultural goods extremely difficult, time-consuming and hence costly. Many agricultural goods are cheaper in "pockets" but the farmers do not get a fair price for their goods and have no incentives to increase their production such as vegetables.

Table 5.F.3 will explain the means of transport available in the entire Jamalpur District:

Table 5.F.3 MEANS OF TRANSPORT IN JAMALPUR

Name of Thana	Cars	Trucks	Buses	Rickshaws		Country boat		Carts
				Auto	Manual	Engine	Manual	
DEWANGANJ		10			330	42	2092	1170
ISLAMPUR					25	62	137	211
JAMALPUR SADAR	7	30	10	40	3890	150	1949	3335
MADERGANJ					54	85	495	335
MELANDAH		1	3		513	41	938	969
SARISHABARI		7	5	5	20?	83	2485	360
TOTAL	7	48	18	45	5019	463	8096	6380

Sources: District Statistical Office Jamalpur

Table 5.F.3 shows that modern mechanical means of transport such as case, trucks, buses, auto-rickshaws are far outnumbered by traditional manuallyrun devices such as bullock/buffalo carts, country boats, manual rickshaws, etc. Modern transport facilities could not develop because of the absence of motorable metalled roads within Jamalpur, which have greatly hindered both "INTERNAL" and "EXTERNAL" trades, more particularly relating to agricultural marketing.

Approximately twice (503 km) the all weather riverine route of 204 km, is navigable only during the monsoon as most river routes become dry during winter and river transport is halted during this period. River transport is cheaper than other types of transport.

F.1.3 Marketing of Paddy and Wheat in Jamalpur

i) Surplus Production

Rice and wheat taken together, that is the total cereal food grain production in Jamalpur district, is surplus in relation to its requirements of all the Thanas, only the Bakshiganj Thana falling outside JPPS area. All other Thanas have attained self-sufficiency in food grain production with a surplus for "export" to other places of the country as will be evident in the Table 5.F.4.

Table 5.F.4 FOOD GRAIN SURPLUS BY THANA

Thana	Surplus of food grain rice/wheat (M. Ton (4-2))
1. JAMALPUR	49 079
2. SHARISHABARI	13 318
3. MELANDAH	35 758
4. ISLAMPUR	12 243
5. DEWANGANJ	16 697
6. MADARGANJ	17 384
7. BAKSHIGANJ*	(-)140 (Deficit)
TOTAL	144 345

* Bakshiganj Thana falls outside the Projet.

Source: Office of the DY. Director, Agrl. Extension

The present surplus food grains are likely to increase further in the future consequent to the implementation of the JPP and the surplus food grain with a probable declining population is likely to depress prices at the farm gate level to the disadvantage of the farmers if effective measures are not taken for efficient marketing mechanisms to dispose properly of the surplus crops.

ii) Rice/Paddy Marketing Mechanism Channels in Jamalpur (prices, transport costs, etc.):

Rice (paddy) is by far the major agricultural crop in Jamalpur District. The rice marketing channels are shown by a diagram which indicates the movements of paddy/rice through different channels to reach end consumers in and outside the district. The growers sell mostly paddy either to beparis/traders if the quantity is large at the farm-gate or directly to small village or local markets if the quantity is large. They carry paddy either as a head-load or by hand. They may rickshaw or bullock carts both for passengers and for transport of their goods. The Beparis collect large quantities of paddy and take them to the rice-mills

(stage 3) from stage 2, ie big Hats/Bazars. After paddy is milled at stage 4 in large Thanas and other rice markets and milling centres, part of it (paddy)) goes to Joyderpur, Tongi and Kaliakoir rice mills and sometimes to the one in Chittagong. The rickshaws charge TK 3-5 per maund of paddy according to distance covered.

From rice-mills the small beparis/traders use cycles "Bhars", if the rice is 1 to 2.50 mds in weight at a transport cost of TK 3-5 per maund. It was seen after the survey that transport of rice through cycles and pushing it is very popular where the road is good though it involves extreme human drudgery. It was found that cycles carrying rice were coming from a far off place at Bhatara Bazar near Bausi Railway Station a few miles away from Sharishabari, a distance of about 31 km. But if there is no metalled road and only earthen village tracks the distance coverable by cycle transport may not exceed 10 miles at the maximum, depending on the load to be carried. Bullock carts are largely used, which charge TK 507 or more according to the weight of the goods and distance to be covered.

During the rainy season boats are used where possible, charging a cost for transport of TK 10-20 per maund depending on distance to be covered.

On Jamalpur wholesale markets there were about 100 cycles carrying rice to urban markets against 40-50 "Bhars" daily. The numbers sharply fluctuate from day to day due to the seasonal variation, weather conditions and demand. The market price of rice at Jamalpur, Nandina and other Thanas varied slightly in the wholesale markets of these places. Cycles are also used for the transport of rice by small traders who carry rice from one market to the other. This "inter-Thanas movement of rice, their origin and destination are determined by price differentials in various markets.

During the 1991 season, the price of rice (paddy) varied from TK 220-TK 260 at the growers level.

The price increases as it changes hands first to the middlemen, millers, big merchants and then on to the wholesale market at Badamsali, Dhaka, and from them on to the retailers and consumers. Three maunds of paddy when milled and reduced give two maunds of clean rice.

Clean rice coming out of the rice mills goes to different destinations as shown in diagram I from Jamalpur to the country is main and largest wholesale market of Badamtali in Dhaka.

Paddy also accumulated in Jamalpur and other centers goes to big rice-mills situated at Joyderpur, Tongi, Kaliakoir and even sometimes those in Chittagong for milling. The rice milled at Joyderpur, Tongi and Dhaka goes mostly to the central wholesale market at Badamtali. The transport

cost of rice/paddy from Jamalpur to the various destinations is TK 1800 to TK 2500 per truck with 170 to 200 mds capacity.

Milling rates vary from TK 200 mds capacity for the farmers and TK 8 for the Beparis. The discrimination in milling rates between the farmers and traders (Beparis) is due to the fact that traders (Beparis) are their regular customers and they bring larger quantities of paddy to the mill.

On an average 75-100 cycles, 30-50 "Bhars" and other means of transport bring 250-300 mds of rice daily in Jamalpur wholesale rice-markets. The quantities vary from day to day and week to week. Part of it is consumed locally and the rest is exported to outside centers, Tangail Dhaka etc. About 40% is kept for local consumption and 60% is exported.

The exportable surplus declines from the harvest peak season to lean season. The price also varies between Aus and Aman/Boro as they are qualitatively different. Aus is normally regarded as "Boro quality" or "inferior quality" rice in relation to Aman/Boro. Both cycles and "Bhars" are owned by the small traders themselves. If they do not own bicycles they may hire them at TK 10 per day, reducing their profit margin. But if they own a cycle and carry rice to the markets this TK 10 spent on hiring a bicycle adds to their income. A bicycle can carry a maximum load of 2.50 mds or at best 3.00 mds with much difficulty. The farm-gate price of rice is lower on average by TK 15-20 per maund from the prices at the wholesale urban center at Jamalpur.

Not only internal transport within the Jamalpur District boundary or for that matter within JPPS area is in a very bad shape and hence costly and extremely difficult, raising transport costs and hence ultimate retail prices at the consumer level, but a share in the adoption of marketing function and activities by the growers goes to the middlemen, which might fully or partly accrue to the growers according to the rate of their participation in performing marketing functions by themselves or groups. No cooperatives or farmers organizations are in existence.
The credit situation is extremely difficult as discussed elsewhere. Farmers usually and normally propose village money-lenders, friends and relations for a loan which is available to them at any time they need or want it, in spite of the fact that they have to pay higher interest, which may be both in cash or in kind. On Dewanganj side there is a custom that the farmers borrow money before the initiation of cultivation process of, for instance, rice. He borrows 100 Taka or more on condition that immediately after the harvest the borrower farmer will remain under obligation to give the lender one maund of rice for each 100 Taka he might have borrowed. The price of paddy, though, remains at the lowest yet it may be around TK 225 or nearly so. Therefore a farm pays interest at TK 120-125 for 4 months or TK 375 percent per year, which is exorbitant and unbelievably high. If a farmer borrowed Taka 2000 he will have to pay 10 maunds of rice and if he got 20 maunds of paddy in

all from his small land he had either to give 50% of his harvest to the lender or sell it in the market. If the debt is larger either he gives more than 50% of his produce or sells it to repay his debts with interest.

This we call a "forced sale" or "distress sale", which means that the farmer is compelled to part with his produce even his harvest is not sufficient for meeting his family needs and requirements. This holds true in case of borrowing for other produce and also for family consumption whatsoever the case may be.

The most important vegetables which were found "surplus" temporarily during the survey were bitter gourd (locally called "Karalla") in very large quantities brought in "Bhars" from east of Jamalpur and some gourds and a few cucumbers. Roughly about 70-80 "Bhars" of bitter gourds weighing about 125 mds come to the wholesale vegetable markets daily. The supply will gradually decline after the present peak season. Bitter gourd, gourd or cucumbers are transported in gunny bags on trucks or bus tops as additional cargo, because a truck carries about 200 mds of cargo, the transport cost being Taka 30 per "gunny bag" containing 2.00-2.50 mds each and Taka 30 for each passenger. The farmers reported that one unit of land fetches much more money profit that from of any other crop. But all lands are not equally suitable for vegetable cultivation and that river bed land is susceptible to floods even in normal years, and so there are great risks involved during some periods for the production of different types of vegetables. There is also seasonal limitation during some part of the year or season (winter or summer). Some vegetables may not grow at all or if they grow qualities are not palatable demand is low and hence the price falls so much that profit margins sharply fall.

"Bhars" is a device made of a slit bamboo pole about 5 feet in length, with a basket hung on each end, in which goods are kept and the entire load is carried on the shoulder by the middle of the pole.

The exorbitantly high rate of interest paid for agricultural credit is by far the greatest problem is the JPPS area, as it is elsewhere in the country. This works as a disincentive to the farmers and restricts adequate farm investment. Increased farm investment as foreseen for higher yields and production in future (W) may not be achieved if easy accessibility, timely availability, and rural credit at a lower/reasonable interest rate cannot be ensured.

The rice marketing channels and the involvement of middlemen in the undertaking of marketing functions and activities are shown on Figure 5.F.1.

F.1.4 Marketing of Wheat

The staple food for an average Bangladeshi is rice. In the remote countryside rice, a bit of salt or chillies may be the normal diet of many poor people. Wheat or wheat products are still regarded as an "inferior" food item though it is becoming popular gradually as a next or close substitute for rice both in the rural and urban areas of Bangladesh. In rural areas it is used as "Chapatis" and in urban areas it has many commercial and industrial uses which are very popular among all classes of people.

The production of wheat is on a small or limited scale, which is mostly produced for family or domestic consumption to supplement cereal/rice requirements. Very little therefore goes to the market. GOB occasionally imports wheat with rice to meet the deficiency or yearly shortfall or receives it as food aid mostly from the USA under PL-480, which are mostly used in development such as FFW* or RWP*. Production of wheat in Jamalpur shows continuous decline from 37,340 in 1987/88 to 36,850 in 1989/90 and to 36,650 million tons in 1990/91 (BBS, SYB, 1991, p. 194)[1].

F.1.5 Jute Marketing in Jamalpur

Bangladesh is and has been famous for the production of more than 80% of world jute of the finest varieties. It had practically enjoyed the monopoly position in the production and world trade of raw jute. The jute industries of Dundee in Scotland were developed by and were dependent on raw jute supplied virtually by the jute growing areas now included within Bangladesh territory. In fact Jamalpur was at one of the major fine jute growing areas of former Mymensingh District, ranked only after Tangail District within the entire jute growing areas of Bangladesh. Jute was the main or virtually the only cash crop of the farmers. Calcutta, the former capital of United Bengal with more than 100 jute mills (before 1947), was the world center of the jute trade and marketing and this contributed substantially to the development of this city as the 2nd largest city of the British Empire.

Jamalpur, which was one of the major contributors to the total jute production in the country, produces little jute now and both the acreage and jute production in the district have been continuously declining over the years and jute production faces perhaps complete extinction in the foreseeable future if the present trend and situation are not reversible to the "advantage" of the growers.

The advantages of jute as a natural fibre are many. They were more than outweighed by the introduction of synthetic material as near

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[1] FFW = FOOD FOR WORKS, RWP = RURAL WORKS PROGRAM

substitutes for the uses of jute and jute goods all over the world, including Bangladesh. The result was that demand for jute in the foreign markets sharply fell and prices of jute steeply fell also in the domestic market so much so that the per unit cost of jute does not cover the prices it fetches.

The jute mills of Bangladesh are not in a position to consume the entire production of jute and so its prices register a continuous downward trend with occasional fluctuations, but in no case guarantee a minimum fair price to the growers. The growers think it unwise and economically not viable or desirable to invest in jute production. There is therefore continuous shift of average from jute to some other uses or the adoption of a new cropping pattern with less emphasis on jute cultivation.

The GOB established BJC (Bangladesh Jute Corporation) to stabilise jute prices through a Price Support Policy consisting of jute trade and control of jute markets first through purchasing in of jute by its jute purchasing centres spread all over the country, at a fixed price determined by the GOB in advance each year. This also did not help much because of decline in demand and the international price of jute. The price fixed by the GOB was not sufficient to cover the cost of production.

While talking to the Consultant in a village, an established jute grower lamented over the pitiable condition of jute production. He reported that he had abandoned jute production because 0.26 decimal of jute cultivation last year would cost him TK 1000 but 0.26 decimal land would give him 4.00 mds of jute which would fetch him only about TK 800 or so (4.00 mds x TR 200).

The GOB-established BJMC purchasing centers are 8 (eight) in the Jamalpur District: (1) Jamalpur, (2) Islampur, (3) Dewanganj, (4) Melandah Bazar, (5) Nurundi, (6) Pyarpur, (7) Nandina Bazar and (8) Sharishabari (with 2 Press houses and grading and pucca baling facilities.

As this is not the jute marketing season, farm-gate prices at farmer's level could not be collected. Therefore the prices collected refer to the 1991 jute season quoted by the farmers. The jute now grows in charland on the river beds or similar low lying, very limited areas of "Birland". Jute cultivation is conditioned by and dependent on easy accessibility of running clean water for retting and washing purposes on which the lustre, colour and hence its quality depends ultimately. The beels depressions, "khats", riverlets, rivers, ponds, tanks and like waterbodies have become silted up and shallow and in many cases unsuitable for retting and washing of jute. Carrying jute to distant places is costly and laborious which would further add to its production cost.

After the jute is dried it is bundled and stacked. The growers sell almost the entire produce mostly in bulk to the purchasers at the farm houses, who carry them to the big "hats" or market places. From where they are transferred either to kutcha baling or pucca baling presses for gradation according to international centers such as Sharishabari, Jamalpur, Bhairab Bazar, etc. Sharishabari is one of the most important and biggest jute centers of the country falling within JPPS area. It has 3 jute mills and 3 pucca and 3 kutcha baling presses and private purchasing centers in addition to BJC purchasing center.

Jute is carried to the local or village market for sale if the quantity is small enough to carry as head-load, when the farmers require a little cash. But for a good and big market or purchasing center (such as those of BJC) country boat, rickshaws and vans are used. From the big markets or purchasing centers such as Sharishabari, Jamalpur, etc., jute is again transported by big country boats or by trucks if the situation permits. Jamalpur is connected by very good motor road (ie. part of Jamalpur-Tangail-Dhaka highway) with Sharishabari and jute is sometimes transported from even Jamalpur to Sharishabari for grading pucca baling and outward transportation to NGJ or Mongla Port.

At Sharishabari 80% of the total jute marketed is moved by boats and 20% by other means of transport (for coverage of short distance) such as horse-drawn or buffalo or bullock-drawn carts, rickshaws or vans or even by "bhar".

Last year (1991) the farmgate price of jute varied between TK 125-260. Horse, bullock and buffalo carts, rickshaws or vans charge TK.2-5 per maund according to distance to be covered for transportation of jute. Boats charge TK.20 per maund for transportation of jute from the border of Madarganj to Sharishabari and TK.25-30 beyond that distance or from Rangpur and Bogra district points, within S. Bari TK.10 and Hadarganij TK.14. Transport by truck is TK.40.00 per maund from Jamalpur to Dhaka + TK.10 additional charge per maund (incidental charge).

Jute has two important varieties:

White, also called "deshi" locally ("capsulary" is botanical name) and tosha (locally called and botanical name is "Olitarius"). The tosha is in high demand abroad and its price is higher both in domestic and international markets. A comparison in the trends of the year-to-year fluctuation of jute prices and their relation is shown with a bar chart compiled from the quotation supplied by BJMC at Jamalpur office for the last seven years (see Table 5.F.5 and Fig. 5.F.3). The following table gives an idea about the volume of jute prices with the volume of jute:

Table 5.F.5 SOWING IN THE YEARLY FLUCTUATIONS OF THE VOLUME OF PURCHASES BY THE BJNC CENTER AT JAMALPUR AND JUTE PRICES OFFERED

Category	Years							Remarks
	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	
White (Deshi)	74,645	62,563	7,249	750	4,298	19,265	10,103	Private firms remained closed as this is not the jute marketing season
	219/=	124/=	269/=	254/=	295/=	347/=	216/=	
Tosha	43,303	25,709	12,790	18,390	12,322	4,293	2,497	
	241/=	165/=	411/=	305/=	325/=	396/=	288/=	

Prices per maund TK/Maund

Source: BJMC, Jamalpur.

Jute is transported from Dewanganj and Islampur mostly by boats up to NGJ and other destinations because of lack of transportation by other means (trucks). Railway transport is clumsy and difficult and costlier for unseen reasons.

The BJMC prices are TK.15-T.20/= higher than the farmgate prices. But the growers cannot avail themselves of this advantage because of the distance factor difficult transport problem and high transport costs to be borne by them if the growers transported them individually. Moreover, it is time-consuming and opportunity cost of labour at a time when it is in large demand for the preparation of the next harvest.

It may be mentioned that the BJMC is not provided with adequate timely financial assistance by the GOB to purchase an adequate quantity of jute to stabilize or raise market prices and hence BJMC measures have little effect on domestic market prices. It was also reported that about TK. 8,10,000 accumulated during the last 2 years for paucity of adequate funds still remains to be paid to the jute supplier. This results in a depressing effect on jute prices.

As a whole as the situation now exists the prospect of jute cultivation is bleak if adequate measures are not adopted for rationalisation of jute cultivation in JPPS area and for that matter for the entire country as a whole.

Cost of jute production should be decreased through efficient and better management. HYV of crops may be introduced to increase yield per acre. To diversify the uses of jute both in the domestic and foreign market is a must.

Use of jute sticks and jute for the production of paper and pulp, hardboard, carpets, upholsteries, road wool, cloth, windows screen and

so on may be popularised abroad because jute price is conditioned by demand and price in the world market (see Table 5.F.6).

A Dhaka daily newspaper reports that there is apprehension that target of 19,970 acres of jute fixed for this year will not be even 25% realised because of the apathetic attitude of the farmers towards jute production. The district agriculture officer has, however, attributed this cause partly to drought. The newspaper reporter on the other hand says that the farmers' attitude towards the reduction in jute acreage is due to the low price of jute and availability of agricultural credit needed for jute cultivation.

Jute stick is sold around Taka 200/= per maund, sometimes at higher prices than those of jute. Even then farmers are apathetic to grow jute in spite of the high price of the by-product (jute stick). This is because of the blind belief that selling of jute sticks causes misfortune and lowers one's prestige. The belief also says that lower status people only sell jute.

Table 5.F.6 TREND OF JUTE EXPORT FROM BANGLADESH AND ITS FOREIGN EXCHANGE EARNINGS: (1982-83 to 1987-88) (In Bale)

Quantity and value	Years					
	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88
Nos. of bales	22,46,276	19,01,066	14,17,712	23,01,100	22,37,419	13,44,705
Value in million Taka	2,584.9	2,875.9	3,898.4	3,677.0	3,160.7	2,490.9
Av. price per bale (in Taka)	1,150.74	1,512.78	2,749.78	1,597.93	1,412.65	1,852.37

Source: BBGS, 1990 Statistical Yearbook of Bangladesh, p. 368.

Table 5.F.6 indicates that export of jute (in bales) declined from 1982-83 to 59-86% in 1987-88.

The jute marketing channels are explained with a diagram (Figure 5.D.2). The prices of white and tosha jute vary qualitatively. Tosha jute is of superior quality which is in higher demand in the world market, fetching higher prices than those of white variety. Price trends of both the white and tosha varieties and their relative differentials are explained with a bar diagram (Figure 5.F.3).

F.1.6 Marketing of Sugarcane in Jamalpur

Jamalpur district has a sugar mill located at Dewanganj. Jamalpur as a whole is an important sugar mill area of the country and also has suitable soil for the growth of sugar cane. Sugar cane grows almost all

over the district but it is intensely cultivated around accessible areas of the Dewanganj Sugar Mill (known as Zeal-Bangla Sugar Mill). The sugar mill authorities earmark sugar mill zones after surveys. Within this sugar mill zone sugar cane growers grow sugar canes and sell their produce to the Mill through purchasing centers located at convenient places. The sugar mill officials supply each grower a "Purjee" (permission or authorization slip) which entitles its owner to sell 45 maunds of sugar cane to the mill authorities compulsorily at a fixed price per maund (TK. 37 in 1991).

In exchange for this advantage the mill supplies fertilizers and cutting on credit to the growers at fixed prices. The season being over and after the harvest the sugar cane is carried to the purchasing centers established by the mills mostly through bullock/buffalo-car. The cost of transport varies between TK.8.00 and 10.00 per maund according to the distance between the sugar cane land and purchase centers. This transport cost is to be borne by the growers.

Sugar cane within mill-zone areas must only be sold to the mill. Production of "gur" (molasses) is also prohibited in the mill-zone areas. The sugar mill is under the BSMC and therefore is owned, managed and operated by the Bangladesh Sugar Mill Corporation (BSMC), on behalf of the GOB. The prices of sugar cane and sugar are fixed and determined by the GOB.

During the last crushing season the price of Bangladesh sugar was much higher than that of the smuggled sugar from India which overflooded the local markets. The result was that local sugar stockpiled in the mill godown and remained unsold. The mill had to lower prices of sugar.

The growers during interviews by the consultant complained against the mill officials and certain irregularities.

Firstly the "Purjees" (permission slips) are maldistributed and on payment of TK.200-600 each, depending upon the amount/quantity of authorised sale of sugar cane. If one does not pay this money one has a lower quantity authorised by the so-called "Purjee" but others who have paid illegal gratification get authorisation for more than the quantity they produce.

This extra authorization is sold out to those who could not procure authorization, raising their cost of production and reducing profit.

Secondly, the growers are supplied a lower quantity of fertilizers than the recommended doses (sometimes only 60% or so), so that production per acre is smaller. The farmers in addition are deceived by calculation of fertilizer price on the basis of a fake quantity (higher) but supplied a lower quantity. Prices of fertilizers are a bit higher than the prevailing

market prices. But the growers are forced to purchase costlier fertilizers because they do not have their cash to purchase fertilizers in the competitive market.

At the time of the supply of sugar cane, the growers reported that manipulation is made in properly weighing of sugarcane and it is mostly underweighed and is paid accordingly, producing losses to the farmers. In the matter of distribution of cuttings for use as "seedling" there are also malpractices which work as disincentives to the growers and the cumulative result is that the sugar cane growers are deprived of their actual return of profit. It is apprehended that sugar cane cultivation may face the same fate in future as is faced by jute cultivation, another cash crop which dominates the farming system as the country's most important cash crop and major foreign exchange earnings for.

The loan in kind is entered in monetary terms or Taka value in the mill accounts book and interest is charged at a 16% per year. Sometimes 70% of the total price of sugar cane supplied is deducted from the total sum due to the farmers. Of the total deduction, about 60% consists of credit on account of fertilizers alone.

The sugarcane growers in addition have to execute a bond in 50/= Taka stamps to be made over to the mill authorities to the effect that the growers will abide by the decision of the mill and in return enjoy certain advantages and that they will remain under obligation and refrain from production of "gur" (molasses). Normally Taka 15-20 is less in the prices the jute growers receive per maund than the prices quoted at wholesale markets or the price fixed by the BJC. But farmers have virtually no access to BJC purchasing centers located mostly in Thana or semi-urban centers which are far away from the overwhelming majority of farmers.

F.1.7 Vegetable Marketing in JPPS Area (Jamalpur)

Jamalpur district grows a good number of vegetables which are usually and normally grown all over the district: but the farmers have now become much "rice-oriented" and try to grow rice in any land available to them and suitable for rice cultivation. Their cropping pattern is also "rice-oriented" in the sense that preference is given first to rice cultivation, cultivation of other crops coming next after the demand of rice cultivation is first met. Little quantities of vegetables such as beans gourd, water gourd, bitter gourd, sweet gourd, lady's fingers, brinjal "potol", "jhinga", "chichunga", cucumber, radish, cauliflowers, cabbages tomato, potato and spices like onions, chilies, garlic are grown all over the district but the intensity of production varies within the district boundary depending on the availability of better suited land for their production, without releasing any land from the cultivation of rice. At present, large-scale vegetables are grown in river beds or char areas

rather than on "Bir[1]" land on a commercial basis. Formerly vegetables used to be grown in small quantities either around the courtyards or in kitchen gardens. Kitchen gardens have almost disappeared and with it the cultivation of vegetables. Vegetable cultivation has shifted mostly to low lying areas or river beds now.

A large quantity of vegetables such as gourd, bitter gourd (small and large), potato, radish, onion, lady's fingers, etc. grow east of Jamalpur town, mostly in the Brahmaputra River bed or on the other side of the river. Most of vegetables come to the centres or to Jamalpur Wholesale Vegetable Market for disposal. Some vegetables on particular occasions are in temporary excess at the beginning of the new season or harvest such as potato, gourd, bitter gourd, cucumber, radish and others.

Through none of them is surplus on the basis of their total demand, some move from Jamalpur to Tangail, Mymensingh Dhaka markets at the beginning of the season due to the price differential.

Potato and onion first move from Jamalpur to Dhaka at the beginning of the season. At a later stage when Jamalpur stocks become exhausted, potato and onions move in the opposite direction, during the off season, when prices remain comparatively low due to large supply at Dhaka market. Potato, onion, etc. from Rangpur and Danajpur come to Dhaka as well as to Jamalpur.

Potato/onion movements:

(1)	Early variety:	Jamalpur	→	Dhaka
(2)	Late variety:	Jamalpur	←	Dhaka

Bitter gourd and only surplus vegetable brinjals move from Jamalpur to Dhaka.

The vegetables are normally carried from the land to the nearby village markets if there is one but they are mostly transported to big "hats" or weekly upazila hats. Almost all the stocks are used to meet local demand. But Brinjal, gourd, bitter gourd, potato, cucumber, onion and chillies move out of Jamalpur because of much price differential. They are exported to Tangail, Dhaka in gunny bags and carried on bus tops or on the tops of cargo trucks as additional cargo. The prices of vegetables vary roughly by 0.50 Taka to 1.00 Taka between the prices at farm gate and wholesale markets at Jamalpur and by the same rate between wholesale market price at Jamalpur and retail prices at Dhaka vegetable markets (see Table 5.F.7).

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[1] "Bir" lands as opposed to char land are not in river beds but are suitable for cultivation of rice.

Table 5.F.7 PRICES QUOTED AT WHOLESALE VEGETABLE MARKET AT JAMALPUR (DURING THE WEEK 6th TO 12th MAY 1992) COMPARED WITH THOSE IN MOHAMMADPUR RETAIL MARKET, DHAKA

Vegetables	Prices at Jamalpur & Dhaka	
	Prices quoted at Jamalpur wholesale market (TK/kg)	Prices quoted at Mohammadpur market, Dhaka (TK/kg)
1. Potato	30.00 (early variety) - 7.00 (late)	40.00 (early variety) - 7.00 (late)
2. Gourd	5.50	7.00
3. Bitter gourd	6.50 (large) - 10.00 (small)	8.00 (large) - 10.00 (small)
4. Cucumber (per 4)	4.00	7.00
5. "Potol"	12.00	14.00
6. Radish (per 4)	10.00 - 4.00	20.00 - 5.00
7. Brinjal	6.00	10.00
8. Lady's finger	10.00	10.00
9. "Jhinga"	10.00	10.00
10. "Chichinga"	10.00	10.00
11. Chillies	16.00	16.00
12. Onions	25.00 (early) - 8.00 (late)	30.00 (early) - 10.00 (late)

Source: Field Survey.

ANNEX 5

G FIELD INVESTIGATIONS (AGRO-ECONOMICS)

APPENDIX

G FIELD INVESTIGATIONS (AGRO-ECONOMICS)

G.1 Implementation

The field investigations in the area of agroeconomics and economics were carried out from October 1991 to January 1992, in several phases:

- Preparation of the questionnaire by the project agroeconomist team.
- Testing of the questionnaire, modifications (minor) and printing of 400 final copies.
- Meeting with block supervisor (organised by extension officer) at each of six thanas, during which: information given to block supervisors (about 10 per thana) and detailed explanation of the questionnaires, then distribution under the responsibility of the extension officer.
- One month later, further meeting at the thana offices to compile the questionnaires.
- Computerisation and analysis at MPO in Dhaka.

It should be noted that during the investigations by block supervisors, field trips were performed to monitor the correct progress of the operation. At the same time the project team carried out their own enquiries amongst farmers. At the end of the investigations, 367 questionnaires were collected and analyzed.

G.2 Analysis and Results

An initial quantitative analysis of the questionnaires enabled the existing situation in the project area to be assessed. Part of the processed data was taken into account for the preparation of the crop data sheets i/e

- inputs used,
- human and animal labour,
- crop budgets.

Given the small size of the sampled area (400 ha) with respect to the total project area (92,242 ha) it has not been possible to make use of the processed data concerning crop distribution per land type and concerrning the crop damage. It was considered more reliable to base the study on SRDI and BBS data and the results of hydraulic simlation.

Qualitative assessment of the results per thana proved very useful as well particularly with regard to the following aspects:

- farmer's reactions following normal and exceptional flooding,
- constraints (with priorities) which they have to face,
- the improvements that they expect from development works, in particular from an embankment.

The analyses of these results guided the project team in choosing the technical solutions to adopt.

The final tables summarising the results of the compilations are given overleaf.

An example of the questionnaire, filled in near Dewanganj, is attached.

JAMALPUR PRIORITY PROJECT STUDY

FARM SURVEY RESULTS
YEAR-1991

(Unit Cost/Return per ha.)

A. "FULL-COST" BASIS CALCULATION

Sl No	Cost Items	INVESTMENTS (COSTS)																			RETURNS:					
		Human Labour with meals			Animal Labour with feed			Seed		Fertilizers						Insecticides		Irrigation cost		Unforseen Cost Tk @10% (a)	Total Cost Tk (b)	Gross Total Cost Tk (a + b)	By-Product		Yield/Price		Gross Total Return	Gross Margin
										Urea		TSP		MP													
	Crops	P Nos	H Nos	Rate Tk	F Nos	H Nos	Rate Tk	Q Kg	Rate Tk	Q Kg	Rate Tk	Q Kg	Rate Tk	Q Kg	Rate Tk	Q Kg	Rate Tk	ha	Rate Tk				Q Md	Rate Tk	Q Md	Rate Tk	Tk	Tk
1	B. AUS	34.58	44.46	33.80	24.70	12.35	43.70	86.45	9.70	29.64	4.96	-	5.50	-	4.90	-	-	-	-	527.62	5276.22	5803.8380	59.28	40.00	32.11	220.00	9435.60	3631.56
2	T. AUS	49.40	74.10	34.00	30.53	29.64	43.00	31.37	10.60	123.50	5.00	61.75	5.60	14.82	4.50	0.62	500.00	-	-	1092.75	10927.53	12020.279	61.75	40.00	66.69	240.00	18475.60	6455.32
3	JUTE	96.03	94.13	34.60	31.62	24.70	43.80	9.88	18.00	61.75	5.00	19.76	5.40	29.64	4.80	1.73	500.00	-	-	1064.64	10646.43	11711.068	86.45	60.00	44.46	275.00	17413.50	5702.43
4	D.W.T. AMAN	37.05	29.64	30.00	27.79	14.82	50.00	95.71	10.00	-	-	-	-	-	-	-	-	-	-	508.82	5088.20	5597.02	29.64	30.00	32.11	250.00	8916.70	3319.68
5	T. AMAN (L)	69.41	65.90	35.20	33.15	18.15	47.50	33.86	11.60	88.72	5.00	60.19	5.70	20.28	4.60	-	-	-	-	847.25	8472.45	9319.6958	135.85	40.00	61.75	225.00	19327.75	10008.05
6	T. AMAN (F)	60.39	70.05	34.96	24.70	20.25	48.80	33.69	11.63	111.64	5.16	74.10	4.90	37.05	5.20	1.24	500.00	1.00	2470.00	1136.51	11365.12	12501.631	86.45	40.00	74.10	261.00	22798.10	10296.47
7	T. AMAN HYV	86.45	86.45	33.20	36.06	27.05	48.00	38.98	11.46	148.20	5.05	49.40	5.20	24.70	4.80	1.24	500.00	1.00	2470.00	1342.75	13427.51	14770.260	98.80	40.00	103.74	240.00	28849.60	14079.34
8	BORO (F)	65.78	69.16	35.40	37.96	25.10	50.00	35.64	10.50	160.87	5.10	59.90	5.40	29.64	4.56	0.49	500.00	1.00	4940.00	1476.97	14769.69	16246.654	148.20	40.00	86.45	240.00	26676.00	10429.35
9	BORO HYV	86.45	86.45	35.98	35.84	22.13	49.00	39.32	10.70	175.25	5.20	74.10	5.50	29.64	4.56	1.24	500.00	1.00	6812.26	1836.60	18366.02	20202.617	98.80	40.00	130.91	250.00	36679.50	16476.88
10	SUGARCANE	100.97	111.77	35.00	38.80	37.99	50.00	5001.75	0.10	197.60	5.00	123.50	5.50	86.45	4.00	2.47	500.00	1.00	8645.00	2367.88	23678.78	26046.656	-	-	1289.34	37.00	47705.58	21658.92
11	WHEAT	34.58	49.40	34.53	24.70	24.70	47.58	136.59	12.56	99.17	5.40	74.10	5.60	24.70	4.76	0.62	500.00	1.00	3705.00	1204.77	12047.67	13252.433	74.10	35.00	56.81	240.00	16227.90	2975.47
12	RADISH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	POTATO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	MUSTARD	24.70	29.64	35.00	19.76	13.76	45.60	10.92	25.00	29.64	5.00	49.40	5.06	14.82	4.60	-	-	-	-	416.96	4169.59	4586.5459	-	-	17.29	450.00	7780.50	3193.95
15	CHILLIES	74.10	98.80	40.00	49.40	37.05	50.00	0.30	250.00	123.50	5.00	197.60	5.50	123.50	4.76	-	-	-	-	1360.48	13604.76	14965.236	-	-	29.64	700.00	20748.00	5782.76
16	OTHER RABI CROPS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All crops Total (Project Avg.)		63.07	70.00	34.74	31.92	23.67	47.46	427.27	30.14	112.46	5.07	76.71	5.41	39.57	4.67	1.20	500.00	1.00	4501.75	1168.00	11680.00	12848.00	87.93	40.50	155.80	279.08	21618.01	8770.01

NOTE:

1. All prices of inputs and outputs are "farm-gate" prices
2. Fertilizer prices are subsized prices paid by the farmers
3. Land value not considered
4. Quantity of by-products, i.e. straw for paddy and sticks for jute, was calculated roughly on the basis of MPO Technical Report no. 14 for North-West region figure
5. Unforseen costs @Tk. 10% includes other variable costs not included in other items

Table - 11

Upazilawise distribution of Land Type, Flood depth and Duration of high water level.

Upazila/ House-hold	Land (acre)	Land Types			Area/PC	Floods	Flood Level (in feet)			
	Cultv. area	High	Medium	Low	Total	Number of Flood per year	Med. Land	Low Land	Av. 1988	Duration of high water level (Days)
Jamalpur (H/H-22)	97.76	26.65 (28.44)	45.65 (48.71)	21.40 (22.83)	93.70 (100)	2	2.40	5.19	3.60	9
Sharishabari (H/H-86)	390.50	70.54 (18.48)	193.63 (50.73)	117.50 (30.78)	381.67 (100)	3	4.80	8.87	6.04	.1
Melandah (H/H-92)	384.47	32.23 (8.71)	224.54 (60.69)	113.30 (30.61)	370.07 (100)	3	2.40	4.40	4.20	.4
Islampur (H/H-36)	149.77	33.43 (23.76)	70.73 (50.27)	36.54 (25.97)	140.70 (100)	3	2.93	6.04	5.44	.0
Dewanganj (H/H- 25)	122.47	40.12 (34.17)	52.59 (44.80)	24.70 (21.03)	117.41 (100)	3	2.00	5.50	5.00	3
Madarganj (H/H-46)	280.41	32.45 (11.80)	142.20 (51.75)	100.18 (36.45)	274.83 (100)	3	4.20	9.00	4.00	-
Project Total (H/H-307)	1425.38	235.42 (17.08)	729.34 (52.91)	413.62 (30.00)	1378.38 (100)	3	3.10	6.50	5.00	.0

1) Data obtained from field survey (Oct.-Nov. 1991)
2) Highland: F0, Med; F1+F2, Low: F2+F3; (Fig. in parenthesis are PC)

JAMALPUR PRIORITY PROJECT

Questionnaire for Agro-Economic survey
(1990 - 1991)

Upazila : DEWANGONG		Area code	: KALIKAPUR
Union : DALIANGONG		Investigator	: MD. ALI AZAM B.S
Village : CHAR KALIKAPUR		Date	: 27 1 91.

1.

Name of farmer :- MD ASRAF ALI	
Age :- 40	Education :- ILLITERATE

2. No. of family members :- 9

3. Land tenure

a. Own land (acres)

i) Cultivated :- 3.50

ii) Homestead :- .20

b. Leased in land(acres) :- 2.50

c. Leased out land(acres) :- -

4. Land :-

Types	Area	Crops with varieties
High land (acres)	1.00	Jute Paddy
Medium land (acres)	4.50	S Coure Paddy, Ground nut
Low land (acres)	.50	Jute

5. **Flood on average year** (recent years except 1974,1987 & 1998) :- Yes

a. Number of flood events a year :- 3 - 5 times

b. Maximum depth of water (feet)

(i) Medium land (feet) :- 2 - 4 ft
(ii) Low land (feet) :- 4 & ft

c. Crop loss(major crops in maunds) :- Paddy 50 mds

d. Duration of high water level (range of days) :- 14 - 15 days

e. Time of recession of flood water from the fields of medium land :- sept to october

f. Time when medium land becomes ready for ploughing for rabi crops :- October

g. When flood water recedes from fields of medium land?

OCT		NOV		DEC	

h. When the same land becomes suitable for ploughing for rabi crops(other than boro)

OCT		NOV		DEC	

6. **What is the depth of flood water on exceptional years ?**

(i) Highland (feet)..... (other by deduction)

1974	1987	1988
2 ft	2 ft	5 ft

(ii) Duration of high water level (range of days) :- 10 - 15 days

(iii) Crop loss (major crops) :-

CROPS	%	CROPS	%
Paddy	90%	S cane	60%
Jute	80%	-	-

7. Soil

Types	Extent	Crop with varieties
Sandy (acres)	1·00	Ground nut
Loamy (acres)	3·00 ·50 1·00	Paddy Jute (Tosha) S. cane.
Clay (acres)	·50	Jute (deshi

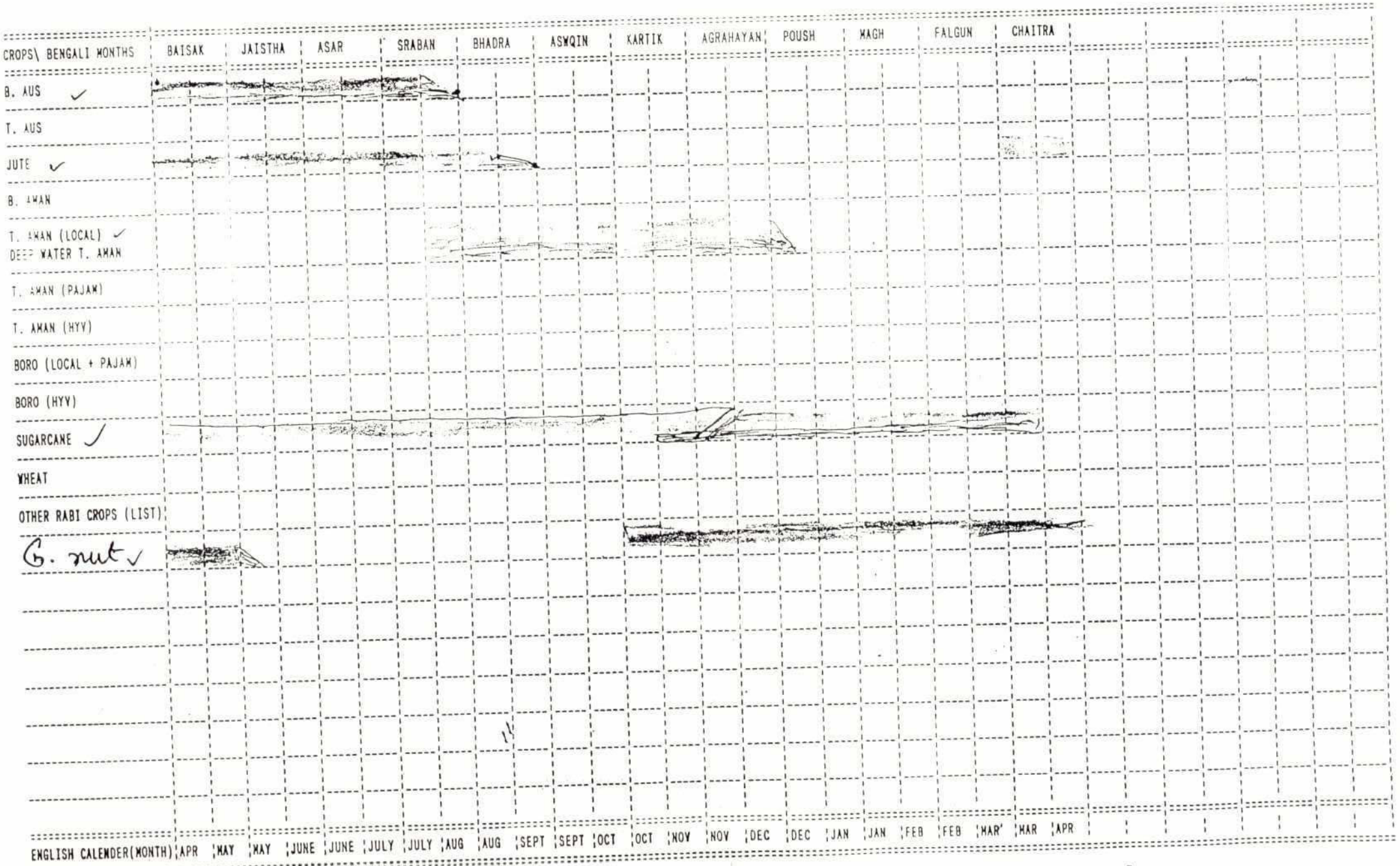
8. Irrigation.

a. Total acreage :- ০

b. Irrigated crops (list) :- ×

c. Irrigation cost (Tk.) :- ×

9. CROPPING CALENDAR (1990-91)



NOTE: Pre Kharif - April, May
Kharif - June, July, August, September

223

11. View of the farmer

a. Main agricultural constraints :- Yes

i) General :- Soil Height low, flood.

ii) Drought (both Karif & Rabi) :- Yes

iii) Irrigation :- Yes

vi) Drainage :- Yes

v) Availability and prices of inputs. :- High price.

vi) Draught animals :- yes.

b. Expected improvements from better flood control and drainage :-

i) General After embankment build it will good.

ii) Change in cropping pattern Something good.

iii) Increase in total crop production Something depends on embankment build.

vi) Security of crops from Flash flood, and Late flood Production of early variety but T Aman late variety.

v) Impact on early Rabi and Rabi cultivation programme including supplementary irrigation. Production increased largely.

vi) Development of fish culture. No scope.

vii) Adaptation of partial mechanization. Good

viii) Increased farm investment and employment generation. Good.

12. Any other relevant information :- The following steps will be taken to improve the condition of farmers in:

1. To build embankment & dreggzing the river Brahmputra.
2. Distribution of credit timely (crops loan).
3. Supply of HYV seed/plants among the growers timely.

JAMALPUR PRIORITY PROJECT

Questionnaire for Agro-Economic survey
(1990 - 1991)

Upazila : DEWANGONG	Area code : KALIKAPUR
Union : DAWAIGONJ	Investigator : MD. ALI AZAM B.S
Village : CHAR KALIKAPUR	Date : 27 1-91.

1.

Name of farmer :- MD ASRAF ALI	
Age :- 40	Education :- ILLITERATE

2. **No. of family members** :- 9

3. **Land tenure**

a. Own land (acres)

i) Cultivated :- 3·50

ii) Homestead :- ·20

b. Leased in land(acres) :- 2·50

c. Leased out land(acres) :- -

4. **Land** :-

Types	Area	Crops with varieties
High land (acres)	1·00	Jute Paddy
Medium land (acres)	4·50	S Cane Paddy, Ground nut
Low land (acres)	·50	Jute

5. **Flood on average year** (recent years except 1974,1987 & 1998) :- Yes

a. Number of flood events a year :- 3 - 5 times

b. Maximum depth of water (feet)

(i) Medium land (feet) :- 2 - 4 ft
(ii) Low land (feet) :- 4 & ft

c. Crop loss(major crops in maunds) :- Paddy 50 mds

d. Duration of high water level (range of days) :- 10 - 15 days

e. Time of recession of flood water from the fields of medium land :- sept to october

f. Time when medium land becomes ready for ploughing for rabi crops :- October

g. When flood water recedes from fields of medium land?

OCT	NOV	DEC

h. When the same land becomes suitable for ploughing for rabi crops(other than boro)

OCT	NOV	DEC

6. **What is the depth of flood water on exceptional years ?**

(i) Highland (feet)..... (other by deduction)

1974	1987	1988
2 ft	2 ft	5 ft

(ii) Duration of high water level (range of days) :- 10 - 15 days

(iii) Crop loss (major crops) :-

CROPS	%	CROPS	%
Paddy	90%	S cane	60%
Jute	80%	-	-

7. Soil

Types	Extent	Crop with varieties
Sandy (acres)	1.00	Ground nut
Loamy (acres)	3.00 .50 1.00	Paddy Jute (Tosha) S. cane.
Clay (acres)	.50	Jute (deshi

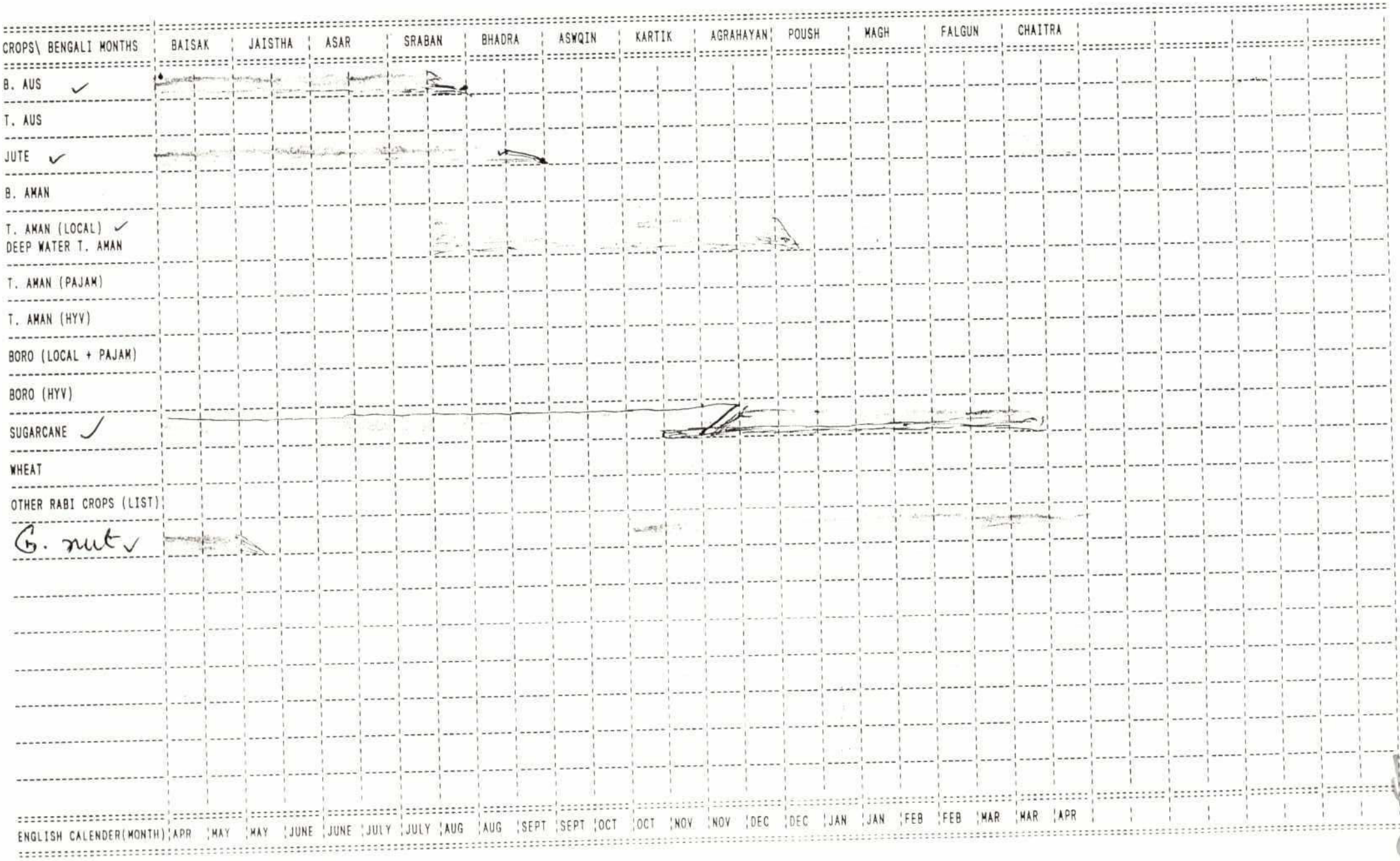
8. **Irrigation.**

a. Total acreage :- ০

b. Irrigated crops (list) :- ×

c. Irrigation cost (Tk.) :- ×

3. CROPPING CALENDAR (1990 ...)



NOTE: Pre Kharif - April May
Kharif June, July, August, September
Early Rabi - October, November

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10. CROP BUDGETS (1990-1991)

** Price/Rate in Taka.(Farmgate)
** Quantity in Maund or KG.
** Area in Acres.
** Labour in man/animal days:

COST ITEMS	Cropped Area	INVESTMENTS: Land Cost	Human labour with meals			Animal Labour			Seed		Fertilizers Urea		TSP		MP		Manure		Irrig. (Cost)		Insecti-cides		Credit		Tools/ machine	RETURNS: (1990-91) Yield per area		(1987-88) Yield per area		(1988-89) Yield per area	
CROPS			F	H	Rate	F	H	Rate	Q	Rate	Q	Rate	Q	Rate	Q	Rate	Q	Rate	A1	Rate	Q	Rate	A	Int	Tk.	Q	Price	Q	Price	Q	Price
B. AUS	1·00	1000/=	15	15	30/=		10	50/=	30	10/=	20	5/=	30	5/=	10	4/=	100	20/=	-	-	-	50/=	-	-	-	15	200/=	~~-~~	~~-~~	15	200/=
T. AUS																															
JUTE	2·00	2000/=	40	40	30/=		20	50/=	8	10/=	40	5/=	-	-	-	-	400	80/=	-	-	-	-	-	-		30	300/=	~~-~~	~~-~~	30	300/=
B. AMON																															
T. AMON(L) D.W.T. & AMAN	1·00	1000/=	15	5	30/=		10	50/=	15	10/=	20	5/=	-	-	-	-	-	-	-	-	-	-	-	-	-	15	250/=	~~15~~	~~250/=~~	15	250/=
T. AMAN(P)																															
T. AMON HYV.	2·00	2000/=	15	20	30/=		20	50/=	30	10/=	100	5/=	100	5/=	50	4/=	-	-	-	-	-	200/=	-	-	-	80	250/=	~~-~~	~~250/=~~	~~80~~ 90	250/=
BORO (L+P)																															
BORO HYV.																															
SUGARCANE	2·00	4000/=	20	40	30/=		20	50/=	50	30/=	100	5/=	100	5/=	50	4/=	-	-	-	-	-	250/=	-	-	-	2000	30/=	-	-	2000	30/=
WHEAT																															
OTHER RABI CROPS	1·00	1000/=	10	6	30/=	4	4	50/=	40	15/=	20	5/=	-	-	-	-	-	-	-	-	-	-	-	-	-	10	400/=	10	400/=	10	400/=

Notations:-

F = Family, H = Hired, Q = Quantity, A = Amount. A1 = Acres.

11. View of the farmer

a. Main agricultural constraints :- yes

i) General :- Soil Height-low, flood.

ii) Drought (both Karif & Rabi) :- yes

iii) Irrigation :- yes

vi) Drainage :- yes

v) Availability and prices of inputs. :- High price.

vi) Draught animals :- yes.

b. Expected improvements from better flood control and drainage :-

i) General After embankment build it will good.

ii) Change in cropping pattern something good.

iii) Increase in total crop production something depends on embankment build.

vi) Security of crops from Flash flood, and Late flood Produce cond early variety but + Aman late variety.

v) Impact on early Rabi and Rabi cultivation programme including supplementary irrigation. Production increased largely.

vi) Development of fish culture. No scope.

vii) Adaptation of partial mechanization. Good

viii) Increased farm investment and employment generation. Good

12. Any other relevant information :- The following steps will be taken to improve the condition of farmers here

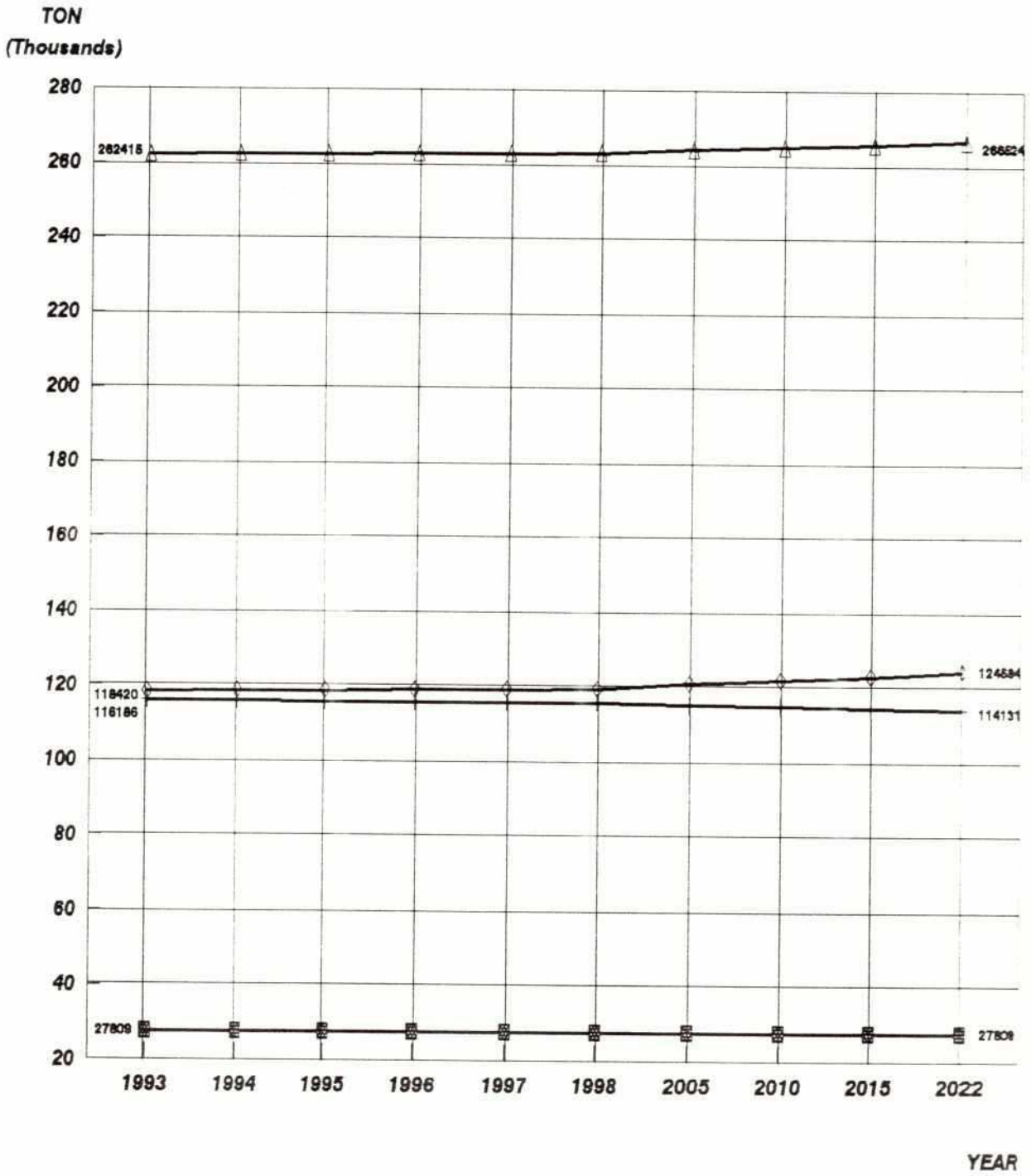
1. To build embankment & dreggzing the river ~~Brahmputra~~ Bromhputra.
2. Distribution of credit timely (crops loan).
3. Supply of HYV seed/plants among the growers timely.

APPENDIX

H RICE AREAS AND PRODUCTION (FIGURES)

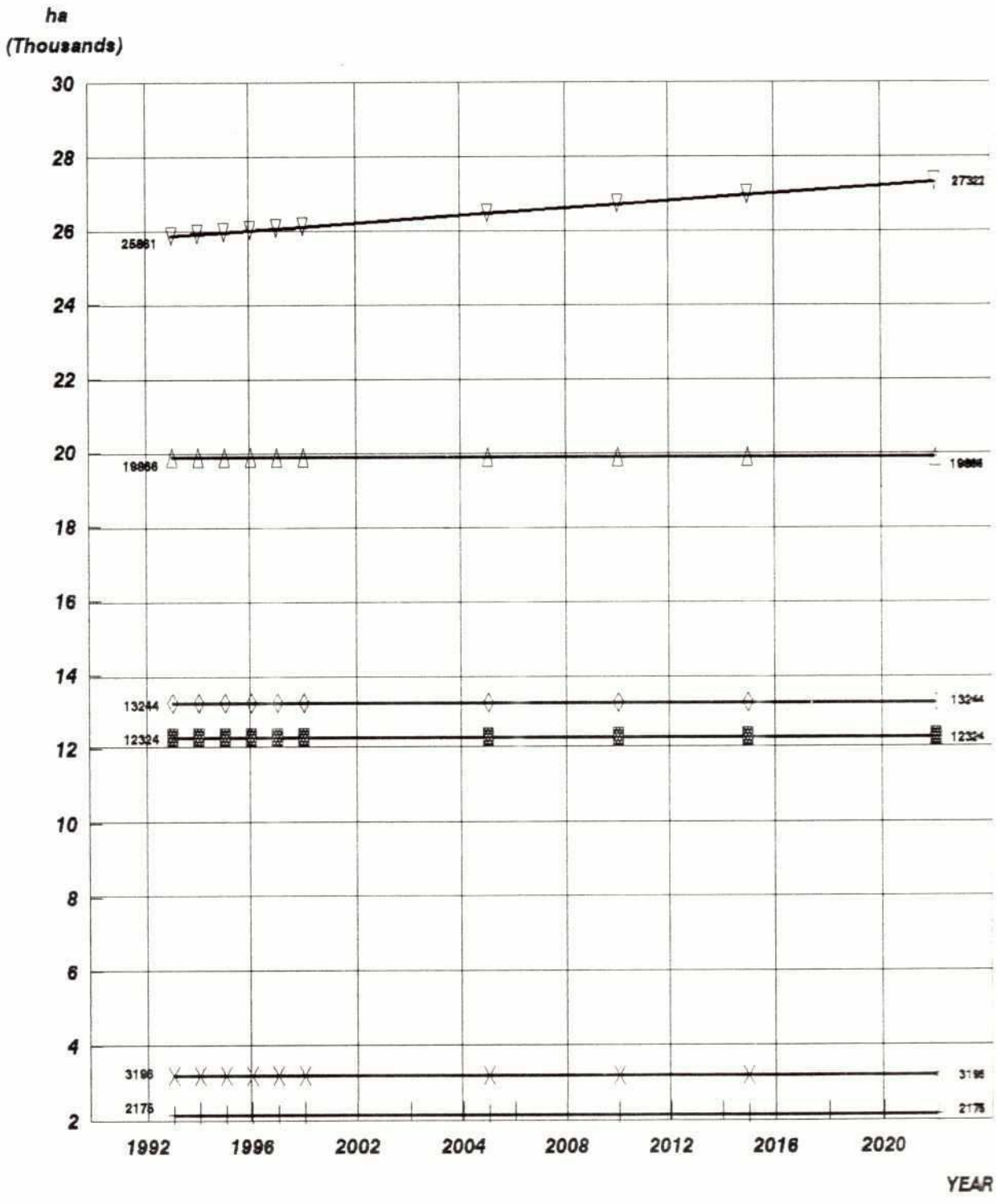
RICE PRODUCTION
[WO]

Figure 5.H.1



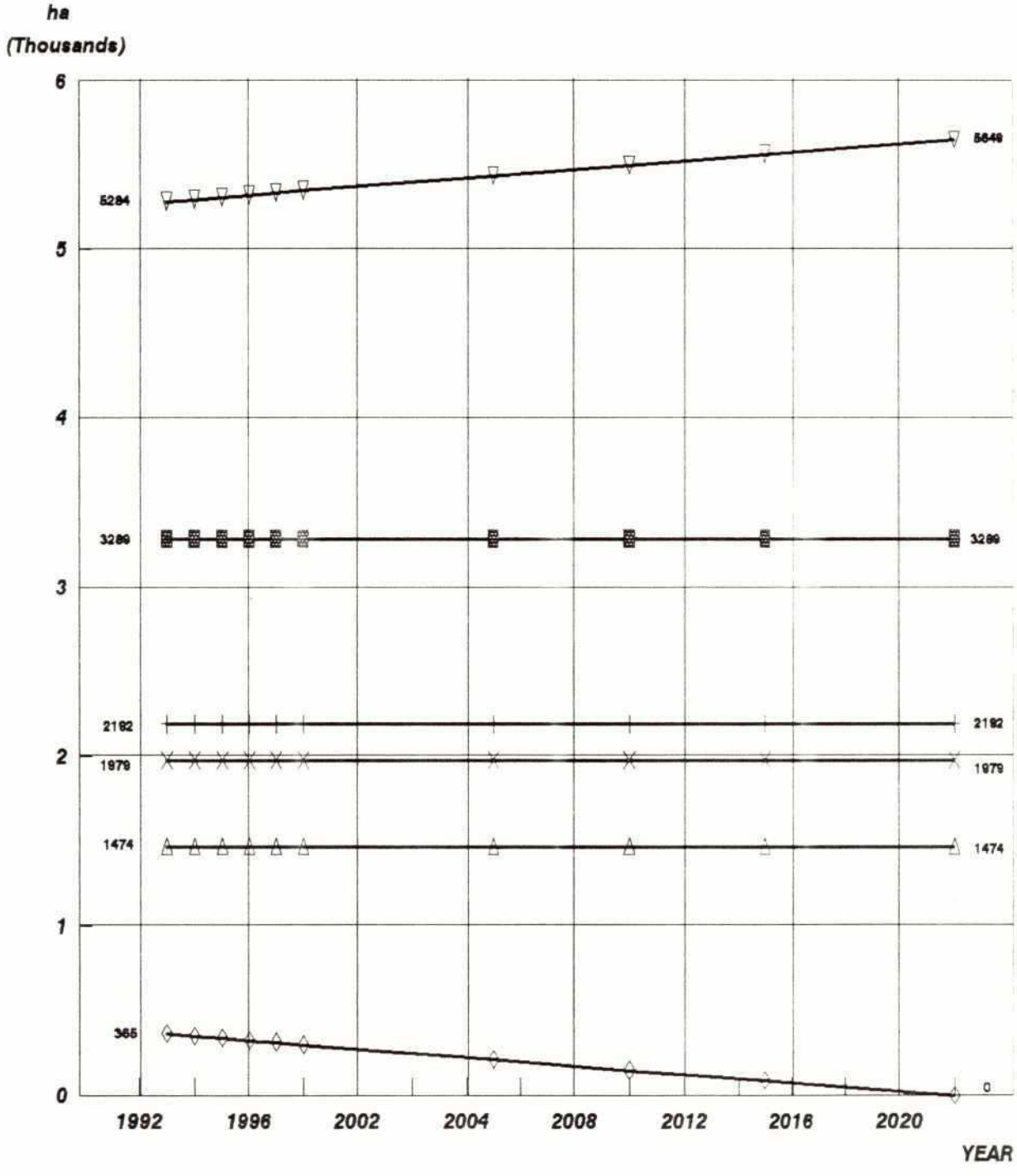
RICE AREAS
[WO]

Figure 5.H.2



DAMAGED RICE AREAS
[WO]

Figure 5.H.3

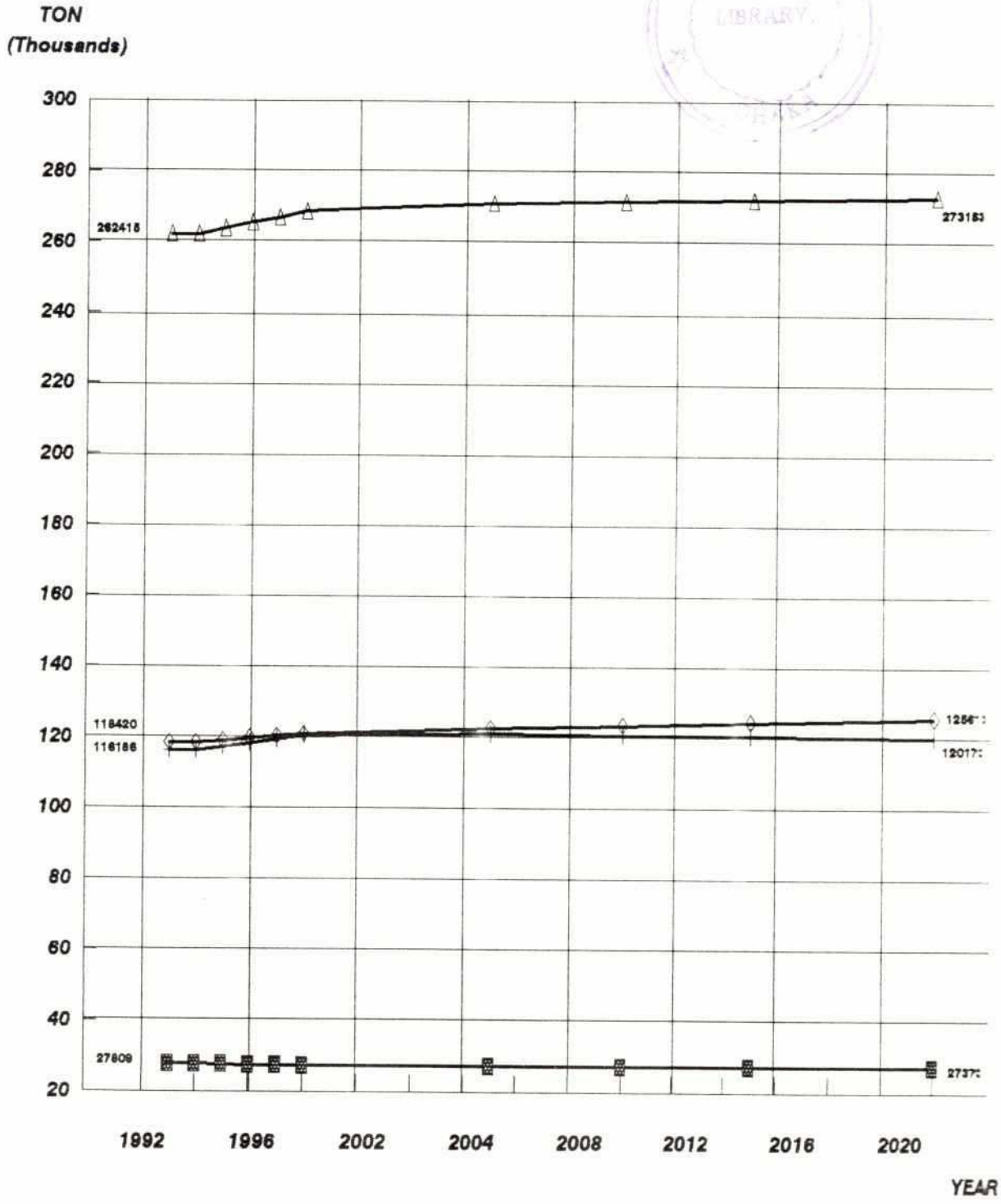


LEGEND

HYV AMAN + L T AMAN ◇ B AMAN △ DWT AMAN × AUS/AMAN
▽ HYV BORO

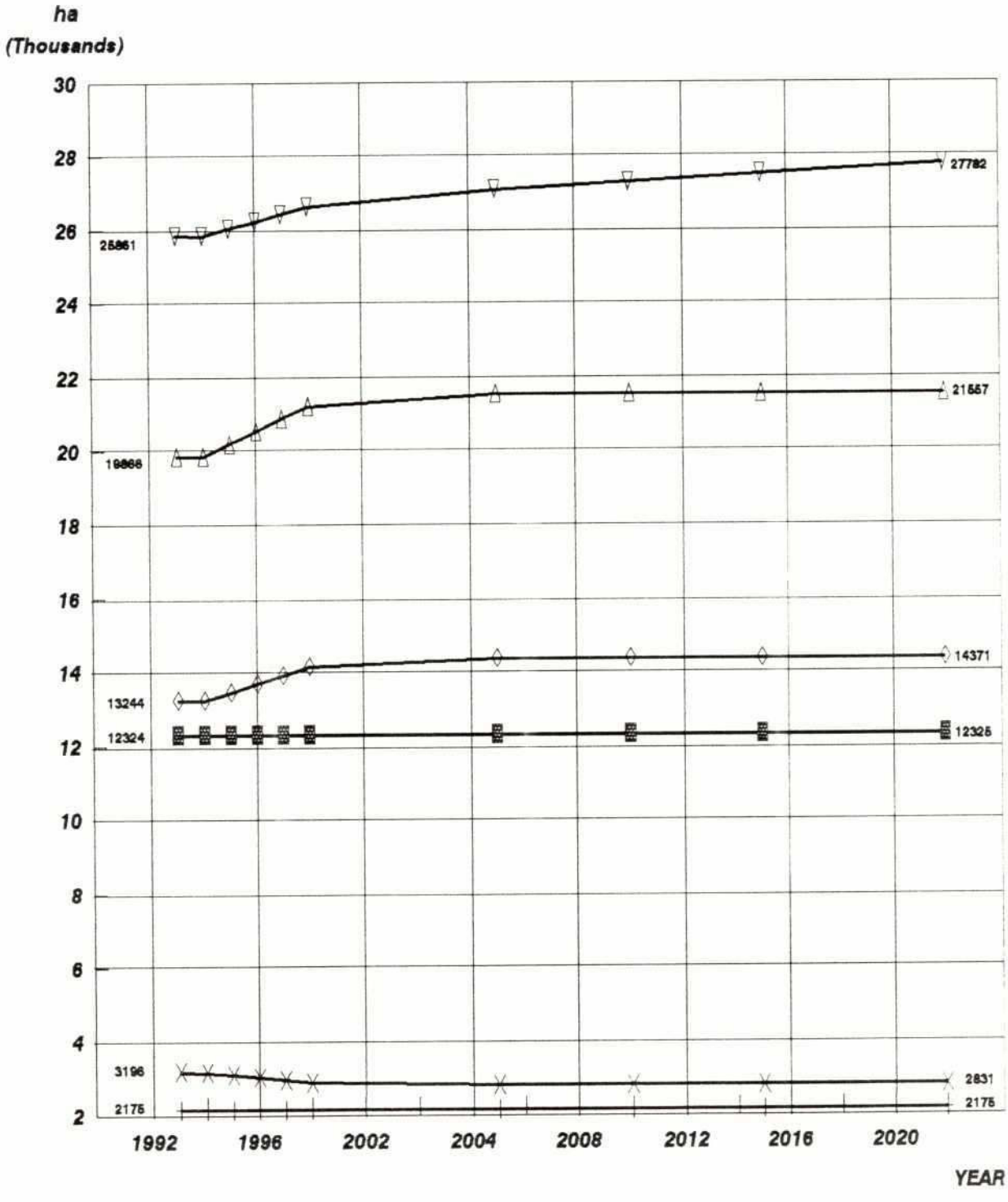
RICE PRODUCTION
[A]

Figure 5.H.4



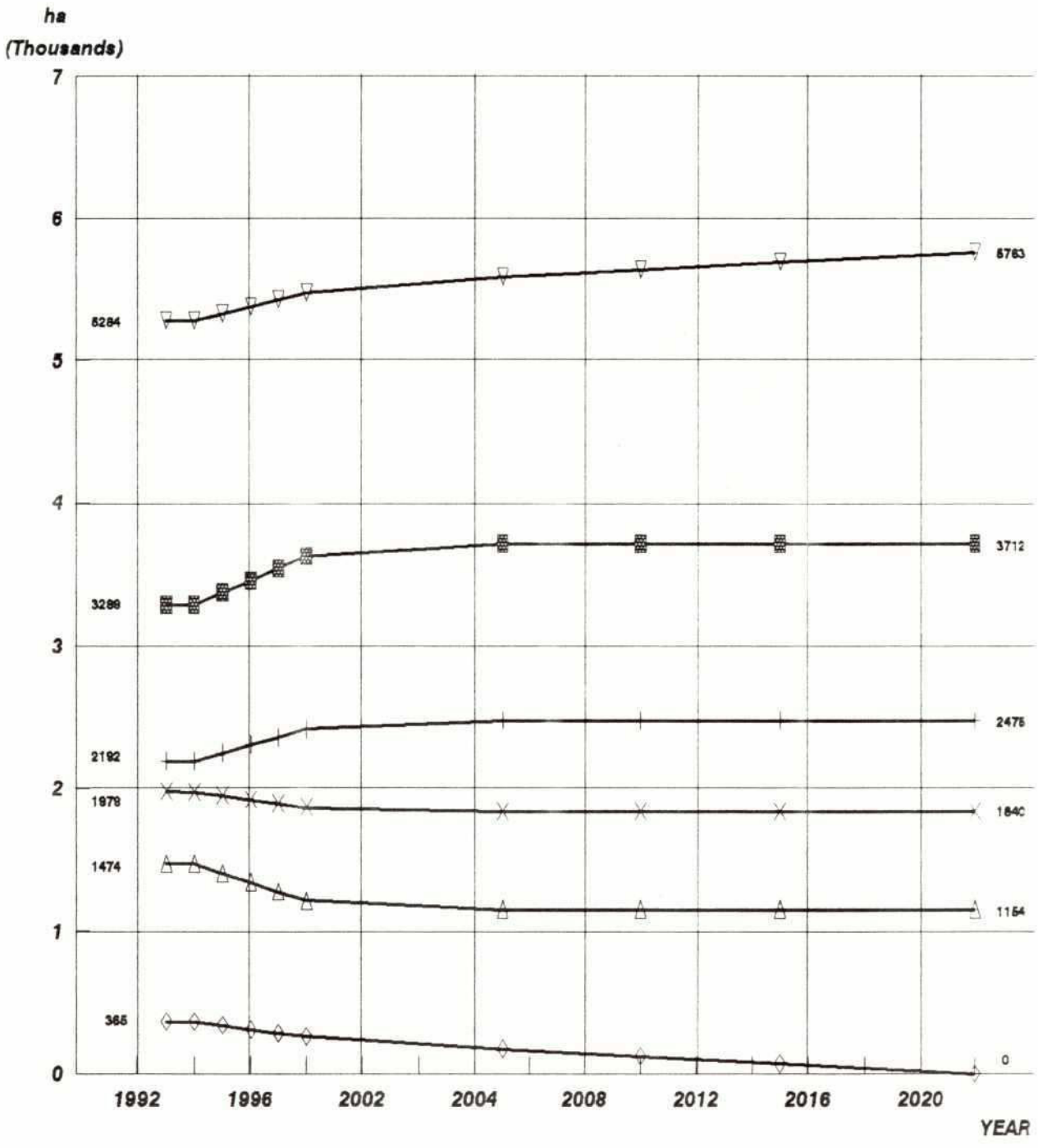
RICE AREAS
[A]

Figure 5.H.5



DAMAGED RICE AREAS
[A]

Figure 5.H.6

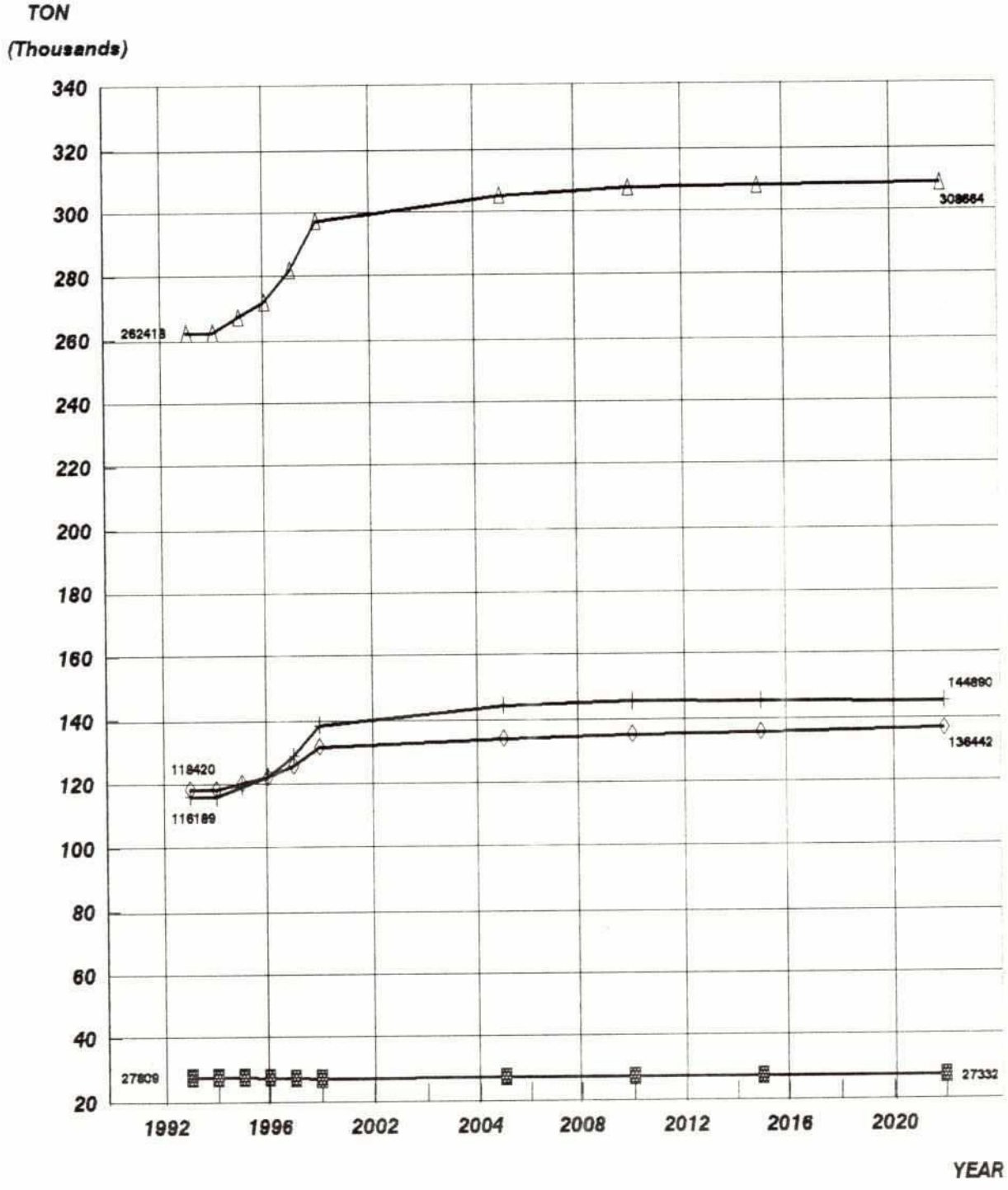


LEGEND

▪ HYV AMAN + L T AMAN ◇ B AMAN △ DWT AMAN × AUS/AMAN ▽ HYV BORO

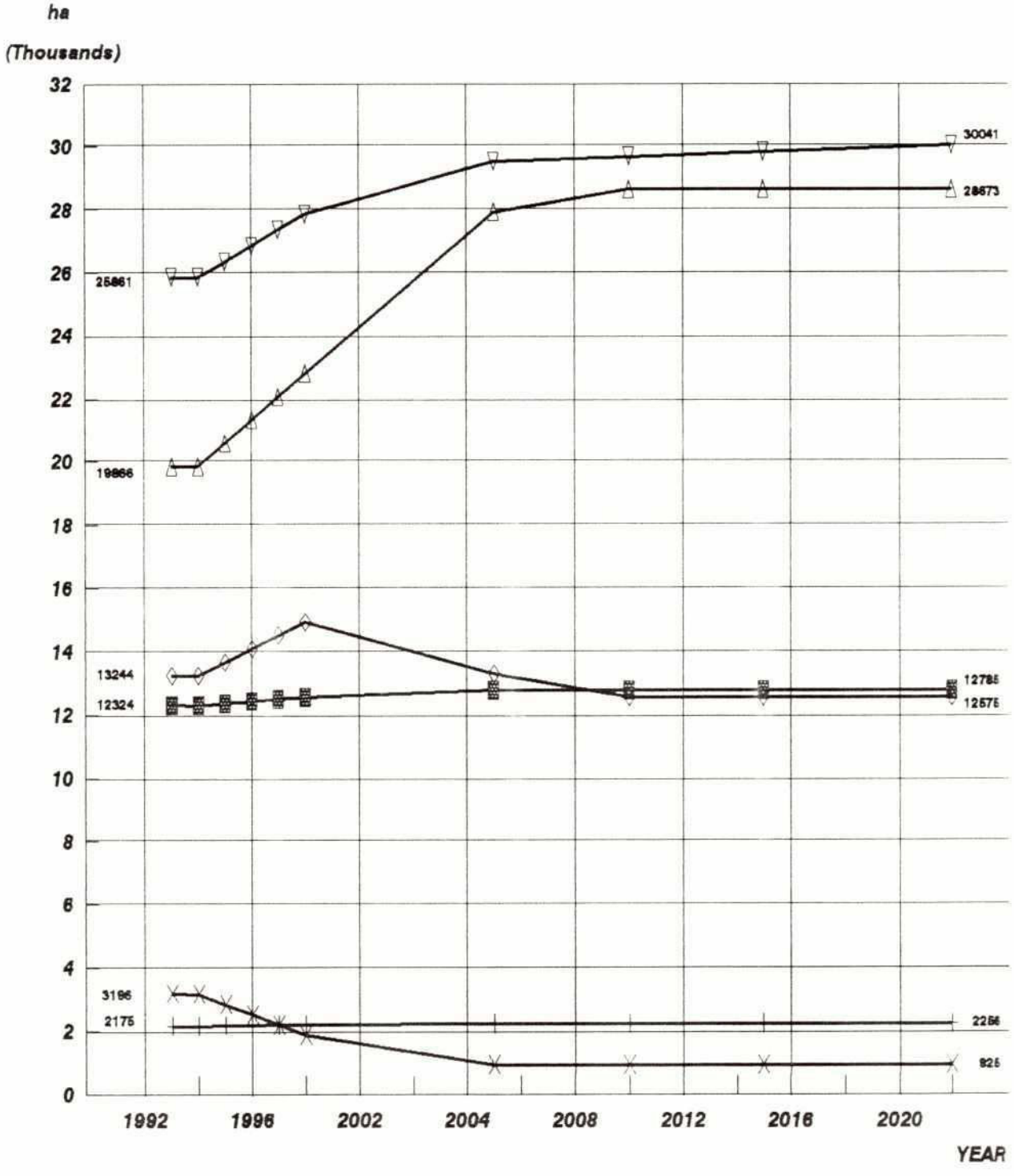
RICE PRODUCTION
[B]

Figure 5.H.7



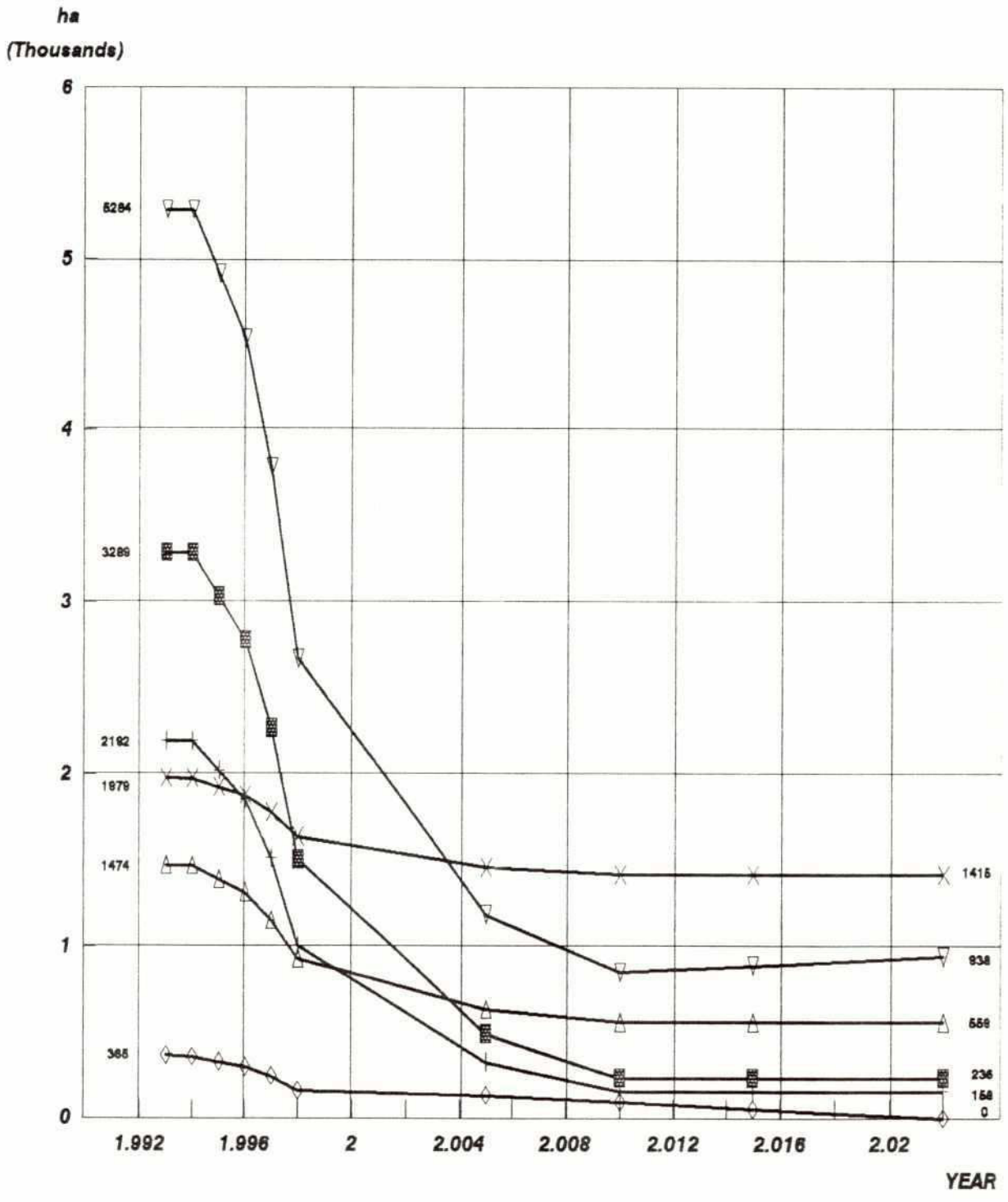
RICE AREAS
[B]

Figure 5.H.8



DAMAGED RICE AREAS
[B]

Figure 5.H.9



APPENDIX

I RECOMMANDED CROP VARIETIES

Table 5.I.1 Recommanded HYV and Conventional Vrieties
Rice (Oryza Sativa)

VARIETY		SEASON	GROWTH DURATION SEED TO SEED (DAYS)	YIELD (TON/HA)	GRAIN TYPE
BR NO.	POPULAR NAME				
BR1	Chandina *	Boro T. Aus	145-150 110-115	5.5-6.5 4.5-5.5	Medium bold
BR3	Biplob *	Boro T. Aman T. Aus	165-170 130-135 120-125	5.5-6.5 5.0-5.5 4.0-4.5	Medium bold
BR4	Brrisail	T. Aman	145-150	5.5-6.5	Medium bold
BR5	Dulabhog	T. Aman	145-150	2.5-3.0	Short fine
BR6	-	Boro T. Aus	135-140 105-110	3.5-4.0 3.0-3.5	Long slender
BR7	Brribalam *	Boro T. Aus	150-155 115-120	4.0-4.5 3.0-3.5	Long slender
BR8	Asha *	Boro T. Aus	155-160 120-125	5.0-5.5 4.0-4.5	Medium bold
BR9	Sufala	Boro T. Aus	150-155 115-120	4.0-4.5 3.0-3.5	Medium bold
BR10	Progati	T. Aman	145-150	5.5-6.5	Medium slender
BR11	Mukta	T. Aman	140-145	5.5-6.5	Medium bold
BR12	Moyna *	Boro T. Aus	160-165 125-135	4.5-5.0 4.0-4.5	Short bold
BR14	Gazi *	Boro T. Aus	155-160 115-125	5.0-5.5 4.0-5.0	Medium bold
BR15	Mohini	Boro T. Aus	150-160 120-125	5.0-5.5 4.0-5.0	Medium bold
BR16	Shahibalam *	Boro T. Aus	160-165 125-130	5.0-6.0 4.0-5.0	Long slender
BR17	Hashi *	Boro	150-155	5.0-5.5	Medium bold
BR18	Shhahjalal *	Boro	165-170	5.0-6.0	Medium bold
BR19	Mangal *	Boro	160-165	5.5-6.0	Medium bold
BR22	Kiron	T. Aman	135-150	4.5-5.0	Short bold
BR23	Dishari	T. Aman	135-150	4.5-5.5	Long slender
-	Purbachi *	T. Aus Boro	110-115 140-150	3.0-3.5 4.5-5.5	Medium bold
-	IRATOM 24*	Boro T. Aus	160-165 120-125	4.5-5.0 5.0-6.0	Medium bold
-	BAU-63 (Bharasha)	Boro	170-200	5.0-6.0	Long slender
-	Binasail	T. Aman	135-145	3.5-4.0	Medium bold
LOCAL	Latisail	T. Aman	150-155	2.5-3.0	Medium bold
,,	Naziersail	T. Aman	155-160	2.5-3.0	Medium fine
,,	DA29	T. Aman	155-160	2.5-3.0	Medium fine
,,	DA31	T. Aman	130-135	2.0-2.5	Medium bold

VARIETY		SEASON	GROWTH DURATION SEED TO SEED (DAYS)	YIELD (TON/HA)	GRAIN TYPE
BR NO.	POPULAR NAME				
LOCAL	Rajasail	T. Aman	140-145	2.2-2.5	Medium bold
,,	Badshabhog	T. Aman	150-155	2.2-2.5	Short fine
,,	Tilokckachari	T. Aman	160-165	2.8-3.2	Short bold
,,	Patnai-23	T. Aman	160-165	2.8-3.2	Long fine
,,	Malia bhangur	B. Aman	225-230	2.2-2.3	Medium bold
,,	Gabura	B. Aman	225-230	2.2-2.3	Medium bold
,,	Habiganj Aman-1	B. Aman	200-250	2.8-3.0	Medium bold
,,	Habiganj Aman-2	B. Aman	200-250	2.8-3.0	Medium bold
,,	Habiganj Aman-4	B. Aman	200-250	2.7-2.8	Medium bold
,,	Habiganj Aman-5	B. Aman	200-250	2.6-2.8	Medium bold
,,	Habiganj Aman-8	B. Aman	200-250	2.7-2.8	Medium bold
,,	Kataktara	Aus	100-105	2.0-2.2	Medium bold
,,	Dharial	Aus	95-100	2.0-2.2	Medium bold
,,	Marichbati	Aus	95-100	2.0-2.2	Medium bold
,,	Hashikalmi	Aus	90-95	1.8-2.0	Medium bold
,,	Panbira	Aus	105-110	2.3-2.8	Medium bold
,,	Dular	Aus	90-95	2.1-2.3	Medium bold
,,	Habiganj Boro-2	Boro	150-155	2.5-2.8	Medium bold
,,	Habiganj Boro-4	Boro	140-145	2.5-2.8	Medium bold
,,	Habiganj Boro-6	Boro	150-155	2.5-2.8	Medium bold
,,	Habiganj Boro-8	Boro	150-155	2.5-2.8	Medium bold

* Photoperiod insensitive.

Source: BRRI.

Table 5.I.2 Recommended Varieties of Other Crops		
Sugarcane (Saccharum officinarum)		
ISD-1/53	:	Growing period 14 months. Tolerant to water logging. Resistant to red rot, smut, red stripe and wilt. Sugar recovery 9.75%. Yield 60-80 tons/ha.
ISD-2/54	:	Duration 15 months. Good tailoring habit, resistant to red not, smut, and wilt. Sugar recovery percents 9.44. Yield 62-90 tons/ha.
ISD-16	:	Duration 14 months. Good for molasses. Tolerant to mosaic and white leaf disease and stem border. Sugar recovery percent 10-20. Yield potential 82-119 tons/ha.
ISD-17	:	Duration 14 months. Good germination capacity Tolerant to white leaf, red rot, mosaic and stem border. Sugar recovery 10%. Yield potential 80-115 tons/ha.
I-112/67	:	Duration 15.5 months. Resistant to red rot, smut, red stripe and wilt. Sugar recovery 11.73%.
L-Jaba-C	:	Duration 15 months. Resistant to red rot, red stripe and wilt. Sugar recovery 9.70%. Yield 60-90 tons/ha.
Mesta (H. Sabdariffa)		
S-24	:	Drought tolerant. Height 5.79 meter. Yield potential 4.54 tons/ha.
White Jute (C.Capsularis)		
C.C. - 45	:	Photoinsensitive. Height 4 meter. Yield potential 5.16 tons/ha.
CVE - 3	:	Duration 105-110 days. Height 4 meter. Yield potential 4.51 tons/ha.
CVL - 1	:	Duration 125-135 days. Height 4 meter. Yield potential 5.16 tons/ha.
D -154	:	Duration 120-125 days. Height 3.5 meter. Yield potential 4.89 tons/ha.

Table 5.I.2 Recommended Varieties of Other Crops		
Tossa Jute (C. Olitorius)		
0 - 4	:	Suitable for high lands. Duration 130-135 days. Height- 4.2 meter. Yield potential 4.51 tons/ha.
0 - 9897	:	Photoinsensitive. Height 4.5 meter. Yield potential 4.61 tons/ha.
Wheat (Triticum Vulgare)		
Kanchan	:	Duration 106-112 days. Yield potential with irrigation 3500-4400 kg/ha; Without irrigation 2200-2800 kg/ha.
Akbar	:	Duration 103-108 days. Yield with irrigation 3500-4200 kg/ha, without irrigation 2100-2800 kg/ha.
Barkat	:	Duration 105-113 days. Yield with irrigation 3400-3800 kg/ha; without irrigation 2100-2800 kg/ha.
Aghrani	:	Duration 103-107 days. Suitable variety for late planting. Yield with irrigation 3400-3800 kg/ha; without irrigation 2100-2600 kg/ha.
Ananda	:	Duration 103-108 days. Yield with irrigation 3400-3800 days. Yield with irrigation 3400-3800 kg/ha; without irrigation 2100-2600 kg/ha.
Sonalika	:	Duration 100-104 days. Yield with irrigation 3200-3400 kg/ha; without irrigation 2250-2700 kg/ha.
Pavan	:	Duration 112-117 days. Yield with irrigation 3670-4220 kg/ha. Suitable for early planting.

Table 5.I.2 Recommended Varieties of Other Crops

Mustard (Brassica Campestries)

Sonali	:	Height 90-105 cm. Duration 90-100 days. Yield potential 1800-2200 kg/ha. Oil content 44%.
Sharisha SS-75 Kalyania	:	Height 75-90 cm. Duration 75-85 days. Yield potential 1450-1650 kg/ha. Oil content 41-42%.
Tori-7 TS-72	:	Height 60-75 cm. Duration 70-80 days. Yield potential 1000-1100 kg/ha. Oil content 40-41%.
Rai-5	:	Height 120-135 cm. Duration 90-100 days. Yield potential 1000-1200 kg/ha. Oil content 40%.

Ground Nut (Arachis Hypogea)

Dhaka-1	Rabi -	Duration 130-140 days, Yield 1850-2030 kg/ha.
	Kharif -	Duration 120-130 days; Yield 1660-1850 kg/ha. Height 30-35 cm. Oil content 48-50%
D.G.-2	Rabi -	Duration 145-155 days; Yield - 2030-2220 kg/ha.
	Kharif -	Duration 130-140 days; yield - 1850-2030 kg/ha. Height 25-35 cm. Oil content 48-50%
D.M.-1	Rabi -	Duration 130-140 days; yield 1850-2030 kg/ha.
	Kharif -	Duration 110-120 days; yield 2030-2220 kg/ha. Height 7.5 cm. Oil content 48-50%

Sweet Potato

Kamala Sundari	:	Yellow fleshed, Yield potential 40 tons/ha.
Tripti	:	Recommended by BARI in 1986. Light yellow fleshed, yield potential 70 tons/ha.