Study No. 171

ASSESSMENT OF MARKETABLE SURPLUS, MARKETED SURPLUS AND POST-HARVEST LOSSES OF PADDY IN WEST BENGAL

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PREFACE

The present study entitled "*Assessment of Marketable Surplus, Marketed Surplus and Post-harvest Losses of Paddy in West Bengal*" was undertaken at the instance of the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, Krishi Bhavan, New Delhi as a coordinated study, where the task of coordination has been entrusted with the Centre for Management of Agriculture (CMA), Indian Institute of Management (IIM), Ahmedabad. This report has been an individual centre's report on the study concerned carried out in West Bengal and prepared by our centre, AERC, Visva-Bharati, Santiniketan.

As the available data of marketable surplus based on the surveys during earlier decades has become obsolete, this study largely attempts to estimate marketed and marketable surplus, thereby provide valuable information for formulation of economic policies/decisions by the various ministries of the Government of India.

The study has been primarily entrusted with Mr. D. Roy and Mr. A. Sinha, while Mr. M. A. Khaleque, Mr. Md. A. Fazal, Mr. S. Kulkarni, Mr. K. P. Paul, Mr. S. Banerjee, Mrs. P. Dey and Ms. S. Sadhu provided immensely valuable assistance in data collection and processing under the active supervision of the undersigned. Extensive support has also been obtained from Mr. D. Mondal, Mr. A. R. Patra, Mr. P. Hazra, Mr. N Maji, Mr. S. Sadhu and also Mr. S. Hemram. I offer my deepest thanks to all of them.

On behalf of this centre, the undersigned takes the opportunity to thank the coordinating center (CMA, IIM-Ahmedabad) for their painstaking work on coordination of this immensely important study across the individual centers, especially for organizing the entire study design with detailed chapterization and table formats.

Sd/-

Santiniketan
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CHAPTER 1

INTRODUCTION

1.1: MACRO OVERVIEW OF WEST BENGAL AGRICULTURE

Nearly 72 per cent of the West Bengal's population is living in the rural areas and agriculture is the predominant occupation in the state. The total reporting area of this state is 86.84 lakh hectares, of which 52.96 lakh hectares is the Net Sown Area (61 per cent of the total reporting area). The Gross Cropped Area is 97.52 lakh hectares with a cropping intensity of 184 per cent.

Agriculture in West Bengal is small farmer centric with 90 per cent of the cultivators being small and marginal farmers. Small and marginal farming communities hold 84% of the state's agricultural lands. Marginal operational holding (less than 1 hectare) accounts for 88.8 percent of the total operational holdings as against 69.8 percent at all India level.

The cropping pattern of this state is dominated by food crops which account for about 78 per cent of the area under principal crops. Rice is cultivated in 58.48 lakh hectares (production of 161.48 lakh MT) followed by Cereals (all combined) in 63.49 lakh hectares and oilseeds in 7.14 lakh hectares, Jute in 6.09 lakh hectares and potato in 3.67 lakh hectares. The state is second largest producer of Potato after Uttar Pradesh and one of the highest producers of vegetables in the country. Traditionally, West Bengal has been the highest producer of jute. The State also accounts for 25 per cent of tea production in the country, next only to Assam.

Against the ultimate irrigation potential of 67.43 lakh hectares, the gross irrigation potential created through major, medium and minor irrigation in the State till the end of March 2009 was 55.01 lakh hectares. The percentage utilization of potential created is 81.73 percent in major and medium irrigation structures and 81.64 percent in minor irrigation.

1.2: CONCEPTS OF MARKETED AND MARKETABLE SURPLUS

'Marketable Surplus' is a theoretical concept which represents the surplus which the farmer/producer has available with himself for disposal once the genuine requirements of the farmer for family consumption, payment of wages in kind, feed, seed and wastages have been met. 'Marketed Surplus' as compared to marketable surplus is a practical concept and refers to that part of the marketable surplus which is marketed by producer i.e. not only the part which is available for disposal of the non-farm rural and urban population. The farmer, in case of commercial agriculture is motivated by profit considerations, so he takes his whole produce to the market and purchases his requirement from the market, but in the case of subsistence agriculture the

concept of marketed and marketable surplus becomes relevant as the farmer generally produces for his own subsistence and it is only the remainder left after meeting his own requirements, that is taken to the market for sale. The concept of 'Marketable Surplus' is subjective because the feature of retention of the farmer is a matter of subjective guess. The concept of 'Marketed Surplus', on the other hand, is objective, because it refers specifically to the marketed amount i.e. to the actual quantity which enters the market.

Marketable Surplus is derived from the formula:

MS = A-B

Where A is total production; and B is total retention, plus total purchases and total losses at farm level or producer level.

1.3 RELEVANCE OF THE STUDY

The importance of precise estimation of marketed and marketable surplus has been felt in India since 1947 in the context for planning for agricultural development, distribution programmes and pricing policies for agricultural commodities. The information on marketed surplus and marketable surplus ratios forms the economic database for formulation of economic policies/decisions by the various ministries of the Government of India. The available data of marketable surplus based on the surveys conducted by the Directorate of marketing and Inspection during earlier decades has become obsolete.

Over the years, there is consistent improvement in the post-harvest technology, knowledge and skill of the farmers and development of various post-harvest infrastructures leading to possible reduction in post-harvest losses. Changing farmers' behaviours, cultivation practices and government policies to reduce the distress sale, could have also changed the percentage of marketable surplus. As such, there has been persistent demand from the user organizations for revision and updating of the data to make it more realistic, as the survey throws up information not only on marketable surplus ratios but also on variety of other crucial aspects like farm retention for family consumption, seed, feed and wastages.

1.4: OBJECTIVES OF THE STUDY

The main objectives of the study are:

i) To estimate the marketable and marketed surplus of foodgrains and factors affecting marketed surplus of major foodgrains;
ii) To complete the latest data on farm retention for consumption, seed, feed, wages and other payments in kind; and

iii) To estimate the post harvest losses at the producers' level.

In broader terms, the study aims at providing reliable estimates of marketed surplus, farm retention and post-harvest losses at producers' level for major foodgrain crops in states as well as for the country as a whole.

1.5: LITERATURE REVIEW ON MARKETED AND MARKETABLE SURPLUS

There exist a host of micro-surveys that study marketed and marketable surplus of paddy/rice in the country, as also address the issues of post-harvest losses. These studies largely attempts to provide estimates of marketable surplus ratio and post-harvest losses of paddy in different parts of the country. However, among the various micro-studies conducted throughout the country, only a few may be mentioned here owing to space considerations. Among the studies relating to estimation of marketable surplus of paddy, Reddy, M.J.M. (1987) carried out his study in Chittoor district of Andhra Pradesh and reported the marketable surplus in the tune of 4.59% for small and marginal category, 31.12% for medium category and 52.51% for large category of farmers. A similar study was carried out by Upender et al., who reported that marketable surplus of paddy to be 33.49% in small category, 27.96% in medium category and 38.56% in large category of farmers in Karimnagar district of Andhra Pradesh. For Karnataka, Devaraja, T.S. (1999) reported marketable surplus of paddy to be 45.74% in Hasan district. In case of Assam, Ahmed, et al. (1990) reported marketed surplus of paddy to be 48.56%, on an average, and reported that the marketed surplus of fine winter paddy was higher than coarse winter paddy. More recently, Reddy A. A. (2009) in a study conducted in Orissa estimated marketed surplus ratio in the tune of 65%. However, in Punjab, Rangi, P.S. (1993) reported that the marketable surplus of Paddy in Punjab was 94% of the production, much higher than the average marketable surplus of the country. Parmod Kumar (1999) obtained similar extent of marketed surplus for Haryana reporting marketed surplus of paddy in Haryana to be in the tune of 96.31%.

In case of post-harvest losses, Gill, et al. (1988) reported storage losses to the tune of 1.78% for paddy stored for consumption and 1.48% for the paddy stored for seed purposes. In another study, Krishnamurthy, K. (1973-76) reported total storage losses of foodgrains 9.33%, attributed to threshing yard (1.68%), transport (0.15%), processing (0.92%), rodents (2.50%), birds (0.85%), insects (2.55%) and moisture (0.68%). In his study, Singh, T., et al. (1979-86) have reported estimates of post harvest losses of paddy in India to the extent of 11% (Threshing 2.5%, Transport 0.5%, Processing 2%, Storage 6%).

CHAPTER 2

COVERAGE, SAMPLING DESIGN AND METHODOLOGY

2.1: COVERAGE AND SAMPLING DESIGN

The primary data for the study was collected through a multi-stage stratified random sampling method. In the first stage, out of the eighteen districts for which secondary data is available, three districts (representing 16.67% of the districts) namely Burdwan, Murshidabad and Birbhum were selected purposively as sample districts for the study based on secondary data on production of paddy during triennium-ending year 2010-11[1].

Table 2.1.1: District-wise Area, Production and Yield of Rice for West Bengal during the Triennium Ending (TE) 2010-11

District	Area('000 ha)	Production(,000 tonnes)	Yield(kg/ha)
Burdwan	633.97	1864.45	2941.67
Paschim Midnapur	669.97	1777.27	2658.33
Purba-Midnapur	432.20	1048.98	2418.00
Murshidabad	358.94	1008.63	2811.33
Birbhum	333.48	973.63	2922.33
Hooghly	299.31	880.58	2943.67
South 24 Pgs.	390.64	860.54	2203.67
Bankura	315.49	846.07	2663.33
Nadia	250.59	704.95	2809.00
North24-Pgs.	244.47	667.33	2732.00
Malda	213.12	633.91	2978.67
Uttar-Dinajpur	263.49	624.80	2375.67
Coochbehar	286.38	572.76	2016.00
Purulia	239.85	534.90	2146.00
Dakshin Dinajpur	195.14	508.68	2611.33
Jalpaiguri	229.01	440.07	1926.00
Howrah	114.92	234.31	2037.33
Darjeeling	32.34	73.96	2287.33
State Total	5503.31	14255.82	2596.00

Source: Evaluation Wing, Ministry of Agriculture, Govt. of West Bengal 2012

[1] Note: districts Purba Medinipur and Paschim Medinipur were left out purposively as being politically disturbed Maoist infested areas.

In the next stage two blocks from each district were selected purposively based on secondary data on production of paddy[2]. From each block, appropriate numbers of villages were selected purposively bearing particular characteristics features representing the blocks/districts.

In the next stage, an appropriate number of farm households were selected from the sample villages belonging to different size strata from the exhaustive list of farmers available with the State Agriculture Office in concerned blocks. In total 318 farm households were selected from over 3 districts as sample units for the study, such that each district contains at least 100 households while at the same time each size strata contains at least 20 farms. In all about, 38.99%, 30.50% 20.44% and 10.04% of the farms belong respectively to marginal (>0-1 ha.), small (>1-2 ha.), semi-medium (>2-4 ha.) and medium (>4-10 ha.) size-strata[3]. It should be noted however that while the sample pool satisfies the condition that each size-stratum contains at least 20 farms, it deviates from a distribution of probability proportional to size[4].

Table2.1.2
Distribution of Sample Farms across Districts/Blocks by Size-Class

Size-strata	District: Burdwan			District: Birbhum			District: Murshidabad			All (%)
	Block: Bhatar	Block: Golsi-I	Sub-Total	Block: Bolpur-Sriniketan	Block: Nanoor	Sub-Total	Block: Kandi	Block: Khargram	Sub-Total	
Marginal	18	23	41	18	20	38	23	22	45	124 (38.99)
Small	16	14	30	16	19	35	17	15	32	97 (30.50)
Semi-medium	15	10	25	11	11	22	11	7	18	65 (20.44)
Medium	13	6	19	5	1	6	3	4	7	32 (10.04)
All	62	53	115	50	51	101	54	48	102	318 (100.00)

Figures in parenthesis indicate percentages
Source: Field Survey

[2] Block-wise secondary data on production of rice has been presented in the annexure.

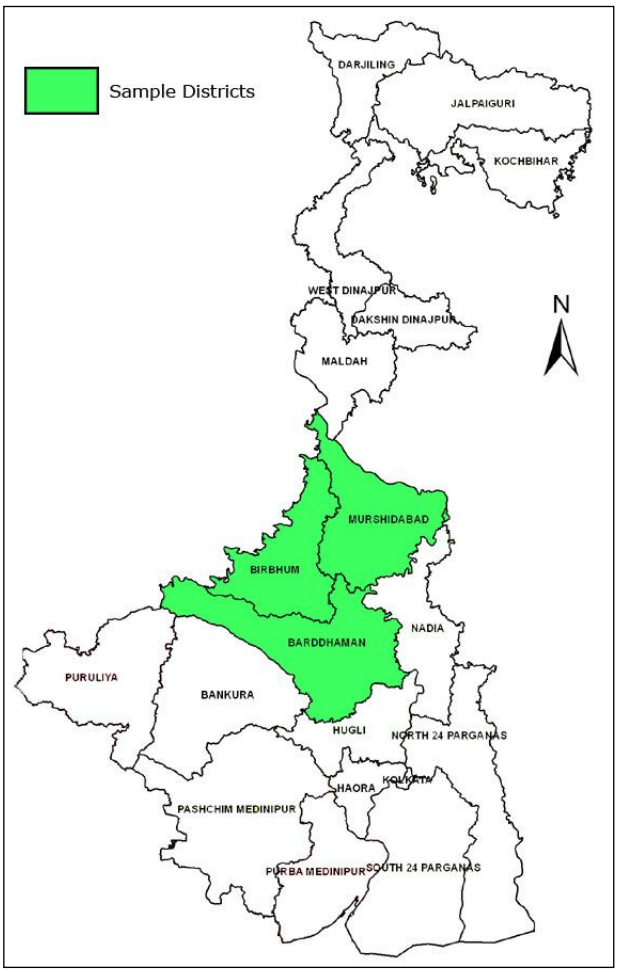
[3] The large category (more than 10 ha.) was not considered for survey, as farms belonging to large category are hardly found in West Bengal.

[4] In fact, in a highly marginalized farming economy like West Bengal with more than 95% farms belonging to the smallest two categories, probability proportional to size distribution of sample farms can hardly be carried out.

2.2: STUDY AREA

The present study has been conducted covering three purposively selected districts in West Bengal, as has been described elsewhere. Before we proceed to analyze the outcome of the survey, it remains customary to present a brief description of the study area- its location, and some key socio-economic characteristics. It is here that this chapter of the study attempts to present a brief description of the selected districts, viz. Burdwan, Murshidabad and Birbhum, as follows.

Figure 2.2.1



DISTRICT BURDWAN:

Burdwan district extends from 22°56' to 23°53' north latitudes and from 86°48' to 88°25' east longitudes. Lying within the Burdwan division, the district is bounded on the north by Jharkhand, Birbhum and Murshidabad, on the east by Nadia, on the south by Hugli, Bankura and Purulia and on the west by Jharkhand. The river Barakar forms the state boundary to the west, the Ajay separates Birbhum and Jharkhand to the north with the exception of a portion of Katoya subdivision that lies to its left bank. The Damodar forms the natural

southern boundary with Bankura and Purulia and Bhagirathi forms the main eastern boundary with a few exceptions. The total length of the district from Barakar to the Bhagirathi below Kalna is 208 km. while its maximum breadth from east to west is only 112 km. Barddhaman (or Burdwan)district is the 3rd in West Bengal in respect of its area in the State covering 7,024 sq. kms. The elevation of the district from the mean sea level is 296 metres.

DISTRICT MURSHIDABAD:

The district Murshidabad lies in between 24°50'20" and 23°43' 30" North, latitude 87°46'17'' and 88°46'00'' East longitude. It is bounded by Malda in the North, on the West by the Birbhum district, on the South by the District of Bardhaman and Nadia and on the East the Bangladesh. This district has a total area of 5,324 Sq. Kms and it ranks 5th among all the districts in land area.

DISTRICT BIRBHUM:

The Birbhum district extends between 23°32′30″ and 22°35′40″ North latitudes and between 87°05′25″ and 88°01′40″ East longitudes. The district is bounded by the Santhal Parganas division of Bihar now 'Jharkhand' on the north and west, by the districts of Barddhaman and Murshidabad on east and by Barddhaman on the south. Birbhum is like an isosceles, triangle in shape. It is the 8th largest district in West Bengal, covering about 4,545 sq. km. area.

Table 2.2.1: Brief Socio-Economic Profile of Burdwan District, West Bengal

Number of Households	1,390,072	Average Household Size(per Household)	5.0
Population-Total	6,895,514	Proportion of Urban Population (%)	36.9
Population-Rural	4348466	Sex Ratio	922
Population-Urban	2547048	Sex Ratio(0-6 Year)	956
Population(0-6Years)	903,438	Sex Ratio (SC)	949
SC Population	1,860,754	Sex Ratio (ST)	992
ST Population	441,832	Proportion of SC (%)	27.0
Literates	4,205,146	Proportion of ST (%)	6.0
Illiterates	2,690,368	Literacy Rate (%)	70.0
No. of Cultivators	361,687	Proportion of Cultivators (%)	15.0
No. of Agril. Labourers	734,022	Proportion of Agril. Labourers (%)	30.0
HHI (Main+Marginal)	121,271	Proportion of HHI (%)	5.0
OW (Main+Marginal)	1,234,261	Proportion of OW (%)	50.0

Source: Website of Office of The Registrar General & Census Commissioner, Govt. of India; 2010-11

Table 2.2.2: Brief Socio-Economic Profile of Murshidabad District, West Bengal

Number of Households	1,140,095	Average Household Size(per Household)	5.0
Population-Total	5,866,569	Proportion of Urban Population (%)	12.5
Population-Rural	5133835	Sex Ratio	952
Population-Urban	732734	Sex Ratio(0-6 Year)	972
Population(0-6Years)	1,044,534	Sex Ratio (SC)	951
SC Population	703,786	Sex Ratio (ST)	972
ST Population	75,953	Proportion of SC (%)	12.0
Literates	2,620,538	Proportion of ST (%)	1.0
Illiterates	3,246,031	Literacy Rate (%)	54.0
No. of Cultivators	375,172	Proportion of Cultivators (%)	19.0
No. of Agril. Labourers	561,874	Proportion of Agril. Labourers (%)	28.0
HHI (Main+Marginal)	408,974	Proportion of HHI (%)	20.0
OW (Main+Marginal)	659,154	Proportion of OW (%)	33.0

Source: Website of Office of The Registrar General & Census Commissioner, Govt. of India; 2010-11

Table 2.2.3: Brief Socio-Economic Profile of Birbhum District, West Bengal

Number of Households	598,429	Average Household Size(per Household)	5.0
Population-Total	3,015,422	Proportion of Urban Population (%)	8.6
Population-Rural	2757002	Sex Ratio	950
Population-Urban	258420	Sex Ratio(0-6 Year)	964
Population(0-6Years)	488,193	Sex Ratio (SC)	948
SC Population	889,894	Sex Ratio (ST)	995
ST Population	203,127	Proportion of SC (%)	30.0
Literates	1,553,852	Proportion of ST (%)	7.0
Illiterates	1,461,570	Literacy Rate (%)	61.0
No. of Cultivators	260,955	Proportion of Cultivators (%)	23.0
No. of Agril. Labourers	416,949	Proportion of Agril. Labourers (%)	37.0
HHI (Main+Marginal)	73,073	Proportion of HHI (%)	6.0
OW (Main+Marginal)	377,520	Proportion of OW (%)	33.0

Source: Website of Office of The Registrar General & Census Commissioner, Govt. of India; 2010-11

CHAPTER 3

OVERVIEW OF FOODGRAINS ECONOMY OF STATE

3.1: STRUCTURAL TRANSFORMATION OF THE STATE ECONOMY: CHANGING SECTORAL SHARES OF THE ECONOMY

West Bengal's economic history over the last three decades has been a moderate one. Growth rates have increased and per capita incomes have gone up. However, agriculture continues to be the backbone of the economy of the state of West Bengal. Agriculture remains the most crucial sector of the state economy as around 72% of the total population lives in rural areas and agricultural continues to be their mainstay. West Bengal agriculture is highly marginalized in nature. In particular, A size-class-wise breakup of operational holding reveals that both number of operational holding and area under operation increased sharply in favour of the smaller size-classes, especially the marginal farms. In particular, area operated under marginal farms accounted for about 9.2% of total operated area during 1970-71, which increased to about 22.6% in 2002-03 (refer to annexure). Again, the continuous marginalization of farms has been more prominent in states like West Bengal, where the Land Reforms process has been carried out successfully. In West Bengal, the proportionate share of marginal farms increased sharply from 61.2% during 1970-71 to as high as 88.8% during 2002-03, while its share in total operated area also increased from 24.8% to 58.3% over the same period.

However, along with the structural transformation of the economy of the state, the contribution of agriculture in State Domestic Product (SDP) is observed to follow a declining trend. In fact, West Bengal economy has undergone structural transformations since 1980s. The State's NSDP comes mainly from 13 economics activities which are grouped into 3 broad sectors: (a) Primary Sector (PS) consisting of agriculture, fishing, forestry and logging, mining and quarrying; (b) Secondary Sector (SS) containing manufacturing, construction, electricity, gas and water supply; and(c) Tertiary Sector (TS) consisting of trade and commerce, transport and communication, banking and insurance, real estate and business services, public administration and other services. Inter-sector as well as intra-sector distribution of NSDP has changed over time. The PS has the prime share in NSDP of the State though the share has been declining.

The development pattern of NSDP is subject to period variations in the shares of different activities of NSDP. The activity patterns of NSDP in West Bengal are heterogeneous in both pre-reform and post-reform periods. The inter-sector as well as intra-sector heterogeneities in the distribution of NSDP

are also prominent. Among the sectors, the TS is the prime sector in NSDP. Its share in NSDP has, continuously increased from 38.12% in 1980-81 to 40.5% in 1990-91 to 49.25% in 2000-01 and to 60.28% in 2010-11 at the cost of the PS and the SS. On the other hand, the share of the SS has significantly declined from 29.28% in 1980-81 to 26.03% in 1990-91 to 18.45% in 2000-01 and to 15.60% in 2010-11. The share of the PS has also decreased from 32.60% in 1980-81 to 33.47% in 1990-91 to 32.30% in 2000-01 and to 24.12% in 2010-11.

In case of the intra-sectoral patterns of NSDP, we observe that within the PS, agriculture has remained dominant all through, though its share has been declining: 27.52% in 1980-81 to 28.37% in 1990-91 to 26.37% in 2000-01 and to 19.54% in 2010-11. The share of forestry has continuously fallen from 1.14% in 1980-81 to 1.11% in 1990-91 and to 0.82% in 2000-01, though with a slight increase in its share of 1.04% in 2010-11. But the reverse trend has happened in case of fishing: 2.96% in 1980-81 to 3.25% in 1990-91 to 3.55% in 2000-01, then registering a marginal decrease in its share to 3.00% in 2010-11. Also, manufacturing within the SS has retained the prime share all through, though its share has been continuously declining: 21% in 1980-81 to 17.6% in 1990-91 to 11.84% in 2000-01 and to 8.39% in 2010-11. Trade and Commerce have the lion's share in the TS registering a late increase in its share after. The shares of transport, real estate, public administration and others have increased during the reform period.

Table 3.1.1: Percentage Distribution of NSDP by Industry in West Bengal during 1980/81-2010/11

Industry	1980-81	1990-91	2000-01	2010-11
Agriculture	27.52	28.37	26.37	19.54
Forestry	1.14	1.11	0.82	1.04
Fishing	2.96	3.25	3.55	3.00
Mining	0.98	0.74	1.20	0.54
PS	32.60	33.47	32.30	24.12
Manufacturing	21.01	17.60	11.84	8.39
Construction	7.67	7.45	5.34	6.21
Electricity etc.	0.60	0.98	1.27	1.00
SS	29.28	26.03	18.45	15.60
Transport	3.50	5.85	5.46	8.85
Trade etc.	12.31	12.43	11.40	17.00
Banking etc.	5.35	5.74	11.27	6.08
Real Estates etc.	7.80	4.46	7.37	9.02
Public Admn.	2.78	4.66	5.37	4.96
Others	6.38	7.36	8.38	14.37
TS	38.12	40.50	49.25	60.28
Total	100.00	100.00	100.00	100.00

Source: Economic Survey, Various Issues, Govt. of West Bengal

3.2: CHANGING STRUCTURE OF STATE AGRICULTURE: CROPPING PATTERN AND COMPOSITION OF VALUE OF OUTPUT FROM AGRICULTURE

The agriculture and allied activities (livestock, forestry and fisheries) play a vital role in the Indian economy. Important developments in this sector have taken place over the years particularly after the green revolution, white revolution and blue revolution. Over the years the share of different sub-sectors in agriculture and allied activities has changed dramatically. West Bengal too experienced such changes in the value of output from agriculture over time. In fact, as per NSSO estimates total value of output has risen sharply from Rs. 49928.86 crore in 2000-01 to Rs. 65513.97 crore in 2005-06 in 1999-00 prices.

However, within the agriculture and allied sector, it is seen that at the all India level the share of cereals in the value of output from agriculture is the highest (around 30%) followed closely by fruits & vegetables (around 24%). The share of various crops have shown marginal decline over the years, while the shares of condiments & spices and fruits & vegetables have shown an increase.

In West Bengal, the share of cereals declined over the years, while those of fruits & vegetables increased from their 1980-81 levels. In particular, the share of cereals decreased from 52.76% in 1980-81 to 32.82% in 2005-06, while the share of fruits & vegetables registered a massive increase from 17.74% in 1980-81 to 44.84% in 2005-06. The share of condiments & spices showed marginal increase from 0.92% in 1980-81 to 2.07% in 2005-06, while pulses, sugarcane and fibre showed marginal decline. The share of oilseeds fluctuated over the years, and somehow succeeded to retain its relative importance more or less same over time.

Table 3.2.1: Share of Crop Sector in the Value of Output from Agriculture (%) in West Bengal

Crops	1980-81	1990-91	2000-01	2005-06
Cereals	52.76	49.60	31.95	32.82
Pulses	1.93	1.69	0.01	0.01
Oilseeds	2.57	6.00	3.01	2.83
Sugarcane	1.18	0.44	0.53	0.41
Fibres	5.26	5.99	3.60	3.58
Condiments & Spices	0.92	2.08	1.73	2.07
Fruits & Vegetables	17.74	17.64	44.53	44.84

Source: Source: Central Statistical Organisation, National Accounts Division

Thus, it is seen that in West Bengal, rapid changes have taken place within the agriculture sectors with growing importance of horticulture products in terms of value of output. Foodgrain crops like cereals and pulses have lost its importance in terms of value added over the years.

3.3 TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN WEST BENGAL

West Bengal experienced the impact of Green Revolution with a time lag as compared to the western states of India. In fact, from a situation of low and less than the All India average rate of growth to high agricultural growth rates, occurred especially since the 1980s. A notable feature of the accelerated growth performance in the eighties and early nineties is the striking performance of foodgrains, especially rice recording a growth rate of more than 6% per annum during the period. Studies by Saha and Swaminathan (1994), Rawal and Swaminathan (1998) reveal that the rapid growth in rice production in West Bengal was brought about primarily by an expansion in the boro (summer) crop (which is an irrigated crop based on HYV's of seeds). It is often argued that initiation of some institutional and technological changes mainly the Operation Barga and the introduction of high yielding varieties during the eighties have turned West Bengal into a progressive food grain producing state. Over the period, the share of boro rice production increased in total rice production, primarily due to an expansion in area under cultivation, the yield growth was modest. Yield increases were significant for the aman (kharif) crop as well; however, the aus (rabi) crop saw a decline in the area under cultivation. Though the state performed well in foodgrain production among the states of India, in recent years there is evidence of the stagnancy in foodgrain production growth rate. In particular, productivity growths of most of the important crops were stagnated in the 1990s, which followed similar trend in the 2000s.

Table 3.3.1: Growth* Pattern of Rice in West Bengal: 1980-81 to 2008-09

	Area				Production				Yield			
	Autumn	Winter	Summer	Total	Autumn	Winter	Summer	Total	Autumn	Winter	Summer	Total
1980-81 to 1989-90	-0.32	0.11	11.71	1.12	4.85	5.46	14.16	6.85	5.18	5.35	2.20	5.67
1990-91 to 1999-00	-3.88	-0.31	5.85	0.55	-2.07	1.27	6.41	2.50	1.88	1.58	0.53	1.94
2000-01 to 2008-09	-4.94	0.38	0.87	0.18	-4.09	1.96	0.42	1.15	0.89	1.60	-0.44	0.97

** Growth rates area based on semi-log time-trend*
Source: Evaluation Wing, Dir. Of Agriculture, Go. of West Bengal

In fact, it can be observed that during the last decade, viz. 2000-01 to 2008-09, the growth rate of area under rice cultivation dropped to as low as 0.18 % p.a. This was accompanied with a similar decline in production as well as in yield rate of rice. In particular, it is observed that boro rice, the engine of

growth in the 1980s, sharply declined in area and production in the 1990s, and further in the last decade. In fact, the yield rate of boro rice registered a negative growth of -0.44 % p.a. during the last decade[5].

In case of a district-wise analysis of the selected districts for the study, viz. Burdwan, Birbhum and Murshidabad districts, we find that in Burdwan district, there has been a sharp decline in the production and yield rate of paddy over the years. In fact, production grew at an impressive rate during the 1980s at 6.66%, which dropped to 4.03% during the 1990s and further to 1.21% during the last decade. Similarly, yield rate of paddy also declined from 5.51% during the 1980s to 1.34% in 1990s and further to only 0.18% in the last decade. However, area under paddy in Burdwan district increased from 1.09% during 1980s to 2.65% in 1990s, and kept similar pace in the last decade. This sharp decline in the growth of production and yield rate in Burdwan district is surely a cause of concern as the district is known as the granary of West Bengal.

Table 3.3.2: Growth* of Area, Production & Yield of Rice in Selected Districts

Year	Burdwan			Birbhum			Murshidabad		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1980-81 To 1989-90	1.09	6.66	5.51	0.29	6.99	6.67	1.57	7.49	5.82
1990-91 To 1999-2000	2.65	4.03	1.34	1.24	4.16	2.89	0.56	2.19	1.62
2000-01 To 2009-10	2.63	1.21	0.18	0.58	0.19	0.90	2.75	3.76	0.29

** Growth rates area based on semi-log time-trend*
Source: Computed from Statistical Abstract, Various Issues, Govt. of West Bengal

In Birbhum district also, we observe a sharp fall in the growth of production and yield over time. In particular, growth rate of production dropped from 6.99% in 1980s to 2.89% in the 1990s and further to merely 0.19% during the last decade. Growth of yield rate also exhibited a similar pattern, falling from 6.67% in the 1980s to 2.89% in the 1990s and further to 0.90% during the last decade. Though from low of 0.29% in 1980s, growth rate of area under paddy picked up momentum during the 1990s and achieved 1.24% during the 1990s, it again dropped to 0.58% during the last decade.

In case of Murshidabad, we observe the same declining trend in growth rate in case of yield of paddy, from 5.82% in 1980s to 1.62% in 1990s and further to 0.29% in the last decade. However, it is observed that growth of production of paddy, though registering a sharp decline from 7.49% in 1980s to 2.19% in the 1990s, exhibited an increase in the last decade to 3.76%. This is particularly caused by a corresponding increase in growth of area under paddy, which also increase from 0.56% in 1990s to 2.75% during the last

[5] Secondary data on area, production and yield rate of rice in West Bengal for the period of 1951-52 to 2008-09 has been presented in annexure.

decade. As such, with increased area under cultivation, production grew positively; even there has been a decline in yield rate.

It is thus observed that growth of yield rate dropped drastically in all the districts concerned over the decades[6]. This is accompanied with sharp decline in the growth of production in districts where growth in area kept similar pace (Burdwan) or where growth in area declined over time (Birbhum). Growth of production increased only where there has been a sharp increase in the growth of area under cultivation of paddy (Murshidabad) even with declining yield rates.

3.4: MARKETED SURPLUS RATIO OF MAJOR CROPS IN THE STATE IN PAST FOUR DECADES

The available micro-studies undertaken with regard to marketable surplus and post harvest losses seem to be confined to regional estimates, focusing on one crop or the other. The first instance of a comprehensive estimate in independent India may be traced back to the 'Market Report 1951', which estimated the marketable surplus ratio of rice at 32.2 percent[7]. Later, the a more comprehensive study in this regard has been conducted by the Directorate of Marketing & Inspection (D.M.I.) under the Ministry of Agriculture, Government of India during the year 1972-73[8]. They conducted a nation wide survey for estimation of marketable surplus and post harvest losses of foodgrains including paddy, which revealed that the estimated farm-family requirement was 91.13 percent of estimated production; while the marketable surplus was only 8.87 percent. It may be noted however that during the year, 1972-73, the country was facing the problem of deficit.

More recently, the D.M.I. conducted another nation wide survey for estimation of marketable surplus and post harvest losses of foodgrains including paddy for the period of three years i.e. 1996-97, 1997-98 and 1998-99, covering 25 States, 100 districts and 15,000 cultivator households in the country[9]. The estimates of marketed & marketable surplus and post-harvest losses for other foodgrain items have been presented here in table. In sharp contrast to their earlier findings, the study observed that the total farm-family requirement including the losses at farm accounted for 44. 54 percent of the total estimated production, while the marketed and marketable surplus stood at 51.97 percent and 55.46 percent respectively. This meant that the carry over stocks with the producers stood at 3.49 percent of the total production. The total post harvest losses of paddy at producers' level were estimated at 2.71

[6] Secondary data on area, production and yield rate of rice in selected districts have been presented in annexure.

[7] Directorate of Economics and Statistics U.O. No. 8-8/76-AWPT-ES dated 22.11.1976

[8] Marketable Surplus & Post Harvest Losses of Paddy in India, Ministry of Agriculture, GoI, 1979

[9] Marketable Surplus and Post Harvest Losses of Paddy in India, Ministry of Agriculture, GoI, 2002

percent of the total production. A state-wise quantitative analysis shows that West Bengal contributed the highest amount of marketed surplus of paddy with a share of 17.9% of the national total, followed by Punjab (15.8%) and Andhra Pradesh (15.6%). In case of marketable surplus, the same ranking of states holds.

Table 3.4.1: Estimates of Marketed & Marketable Surplus and Post-Harvest Losses West Bengal (1996-97 to 1998-99)

S. NO	Name of Crop	Total production	Marketed surplus		Marketable surplus		Total post-harvest losses	
			Qty.	%	Qty.	%	Qty.	%
1	2	3	4	5	6	7	8	9
1	Paddy	19655.86	11379.10	57.89	13253.12	67.43	407.63	2.07
2	Wheat	793.77	310.08	39.06	338.77	42.68	42.60	5.37
3	Jower	0.12	0.00	0.00	0.00	0.00	0.00	0.00
4	Bajra	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Maize	107.40	45.53	42.39	46.99	43.75	1.48	1.38
6	Barley	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Ragi	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Red Gram	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Bengal Gram	14.12	8.31	58.85	8.49	60.13	0.48	3.40
10	Green Gram	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Black Gram	50.20	35.55	70.82	37.52	74.73	1.24	2.47
12	Lentil	30.89	18.25	59.08	18.67	60.44	2.02	6.54

Source: Ministry of Agril; D.M.I; Marketable Surplus and Post-Harvest Losses of Foodgrains in India; 2005.

Table 3.4.2: Estimates of Total Production, Marketed Surplus, Marketable Surplus of Paddy (in '000 tonnes) (T.E.: 1998-99)

Name of the state	Total production	Marketed surplus		Marketable surplus	
		Qty.	%	Qty.	%
West Bengal	19655.86	11379.10	57.89	13253.12	67.43
Punjab	10920.03	10052.36	92.05	10311.76	94.43
Andhra Pradesh	16556.55	9935.30	60.01	10159.63	61.36
All India	122270.3	63541.65	51.97	67805.00	55.46

Source: Ministry of Agriculture, GoI, 2002

However, in case of marketable surplus ratio, the survey indicated that West Bengal stood only 5th preceded by Punjab, Haryana, Rajasthan and Gujrat.

Table 3.4.3: Post Harvest Losses of Paddy (% to Total Production) – TE 1998-99

States	Filed to threshing floor	During threshing	During winnowing	Threshing floor to storage	During storage	Total Loss
West Bengal	0.62	0.64	0.33	0.24	0.24	2.07
Punjab	0.15	1.32	0.40	0.02	0.00	1.89
Andhra Pradesh	1.43	0.80	0.51	0.09	0.39	3.22
All India	0.79	0.89	0.48	0.16	0.40	2.72

Source: Ministry of Agriculture, GoI, 2002

In case of estimates of post-harvest losses, it was observed that post-harvest losses in paddy in case of West Bengal stood at 2.07% as against the national average of 2.72%.

3.5: TRENDS IN CONSUMPTION OF MAJOR INPUTS SUCH AS HYVS, IRRIGATION, FERTILIZERS, ETC.

With adoption of HYVs, West Bengal agriculture has witnessed a sharp increase in the application of fertilizers as part of the seed-fertilizer package. Available data on fertilizer consumption shows that the total consumption of chemical fertilizers (N, P and K) in the state increased from 2.8 lakh tonnes in 1980-81to as much as 15.7 lakh tonnes in 2010-11. This rampant increase in the use of fertilizers has been especially prominent in the 1980s after the delayed spread of HYV cultivation in West Bengal. In the 1990s, however, the rate on increase in fertilizers application slowed down marginally, but picked up momentum again in the last decade, viz. 2000s.

It is expected that the use of modern inputs like fertilizers to be greater under conditions of high incidence of the adoption of HYVs, as there is a strong complementarity between the two. Rice and wheat are the two principal crops for which area under HYVs data are available intertemporarily in West Bengal. If we look into the figure on the spread of HYV in crop cultivation, it is evident that during the period from 1980-81 to 2003-04 proportion of rice area under HYVs increased consistently from 29.60 per cent in 1980-81 to 91.75 per cent in 2010-11. In contrast, HYVs coverage under wheat constitute cent per cent. Thus the proportion of HYVs for both the crops taken together increased from 33.24 per cent in 1980-81 to 92.24 per cent in 2010-11. It is also seen from Table – 3 that in West Bengal area under high yielding varieties of rice and wheat together has risen from 1814.9 thousand hectares in 1980-81 to 4853.1 thousand hectares in 2010-11. It should

be noted, however, that area under rice and wheat recorded a sharp decline in 2010-11 as compared to 2009-10. Even though, the consumption of fertilizer recorded substantial increase, indicating that the intensity of fertilizer use has increased significantly over time. This might be because of the fact that large quantities of fertilizers are required for realizing the high potential of the HYVs. Probably due to this, the consumption of fertilizers in West Bengal has risen sharply over time.

Table 3.5.1: Consumption of chemical fertilizers in West Bengal
(Quantity in tonnes)

Year	Nitrogenous	Phosphatic	Potassic	Total
1980-81	167321	70844	44669	282834
1981-82	156927	62470	39060	258457
1982-83	165765	56211	40233	262209
1983-84	238655	77315	53176	369146
1984-85	246244	91893	67592	405729
CAGR-I	**3.94**	**2.64**	**4.23**	**3.67**
1985-86	256826	92312	59616	408754
1986-87	304023	113827	81827	499677
1987-88	347763	128916	84661	561340
1988-89	370925	164205	115578	650708
1989-90	381625	175756	113714	671095
CAGR-II	**4.04**	**6.65**	**6.67**	**5.08**
1990-91	411896	206782	134330	753008
1991-92	387689	210433	157364	755486
1992-93	424680	212644	93962	731286
1993-94	425308	183212	136576	745096
1994-95	451911	177711	123960	753582
CAGR-III	**0.93**	**-1.50**	**-0.80**	**0.01**
1995-96	512187	195221	140308	847716
1996-97	528172	224558	143368	896098
1997-98	546320	259859	169497	975676
1998-99	579698	305769	192483	1077950
1999-00	638748	355634	237389	1231771
CAGR-IV	**2.23**	**6.18**	**5.40**	**3.81**
2000-01	561880	296954	226252	1085086
2001-02	586841	329785	261556	1178182
2002-03	562998	341244	263377	1167619
2003-04	581965	304177	230080	1116222
2004-05	630945	339615	290899	1261459
CAGR-V	**1.17**	**1.35**	**2.55**	**1.52**
2005-06	611400	357800	270500	1239700
2006-07	678432	386256	300467	1365155
2007-08	684543	385761	304434	1374738
2008-09	698000	415000	406000	1519000
2009-10	713000	467000	446000	1644000
CAGR-VI	**1.55**	**2.70**	**5.13**	**2.86**

Source: Directorate of Agriculture, Government of West Bengal

Table 3.5.2: Area under high yielding variety of crops in West Bengal
(Area in thousand hectares)

Year	Rice		Wheat		Total (Rice & Wheat)	
	HYV area	% total area	HYV area	% total area	HYV area	% total area
1985-86	2001.0	39.40	305.1	100.00	2306.1	42.83
1986-87	2224.0	41.74	397.7	100.00	2641.7	45.75
1987-88	2685.0	49.04	374.2	100.00	3059.2	52.30
1988-89	2789.5	49.62	300.1	100.00	3089.6	52.17
1989-90	2969.2	52.89	326.7	100.00	3295.9	55.48
CAGR-I	**4.03**	**2.99**	**0.69**	**0.00**	**3.64**	**2.62**
1990-91	3256.9	56.03	269.0	100.00	3525.9	57.97
1991-92	3341.6	58.95	248.1	100.00	3619.7	60.66
1992-93	3424.8	60.14	272.1	100.00	3696.9	61.96
1993-94	3711.6	63.17	306.9	100.00	4018.5	65.00
1994-95	4179.3	72.40	325.6	100.00	4504.9	73.87
CAGR-II	**2.53**	**2.60**	**1.93**	**0.00**	**2.48**	**2.45**
1995-96	4353.5	73.13	337.8	100.00	4604.9	74.57
1996-97	4463.8	76.95	351.1	100.00	4814.9	78.27
1997-98	4834.1	81.93	367.4	100.00	5201.5	82.99
1998-99	4971.3	84.20	367.4	99.97	5338.7	85.13
1999-00	5369.3	87.30	364.2	100.00	5733.5	88.01
CAGR-III	**2.12**	**1.79**	**0.76**	**0.00**	**2.22**	**1.67**
2000-01	4813.9	88.57	426.0	100.00	5239.9	89.40
2001-02	5408.4	89.11	434.0	100.00	5842.4	89.84
2002-03	5210.2	89.18	405.3	100.00	5615.5	89.88
2003-04	5234.2	89.37	425.7	100.00	5659.9	90.00
2004-05	5168.1	89.35	400.1	100.00	5567.7	90.04
CAGR-IV	**0.71**	**0.09**	**-0.63**	**0.00**	**0.61**	**0.07**
2005-06	5245.8	90.71	366.7	100.00	5612.5	91.26
2006-07	5163.4	90.81	350.6	100.00	5514.0	91.30
2007-08	5124.8	91.48	352.5	100.00	5477.3	91.99
2008-09	5433.5	91.54	307.0	100.00	5740.6	91.95
2009-10	5630.0	91.54	315.8	100.00	5945.8	91.95
CAGR-V	**0.71**	**0.09**	**-1.48**	**0.00**	**0.58**	**0.08**

Source: Economic Review, Government of West Bengal

Hence it comes out that among the different factors explaining growth of fertilizer consumption; spread of HYV technology is obviously an important factor. Similarly the use of fertilizer can be expected to have risen with a steep increase in the availability of assured and controlled irrigation which raises the profitability of fertilizer use. However, with regard to irrigation, there exists scanty data in West Bengal. In the absence of inter-temporal source-wise data for irrigation, it is better to use the data furnished by water irrigation and development department, Government of West Bengal.

Table 3.5.3: GCA, percentage of irrigated area and yield rates of major crops in West Bengal

Year	Gross cropped area (GCA) ('000ha)	Total irrigated area ('000ha)	Percentage of irrigated area to GCA	Yield (Kg. per ha)		
				Rice	Potato	Jute
1995-96	8972.54	4304.00	47.97	1996.64	24455.87	1979.13
1996-97	9032.94	4424.54	48.98	2178.53	26956.09	2178.81
1997-98	9233.03	4520.54	48.96	2243.38	20948.59	2118.06
1998-99	9309.64	4658.60	50.04	2255.45	21023.26	2168.35
1999-00	9545.36	4793.70	50.22	2237.20	23702.66	2226.53
CAGR-I	**0.62**	**1.08**	**0.46**	**1.14**	**-0.31**	**1.18**
2000-01	9116.60	4941.95	52.82	2286.53	24786.12	2181.26
2001-02	9778.80	5096.95	52.12	2514.00	26090.00	2440.00
2002-03	9510.40	5178.43	53.40	2463.00	19761.00	2407.00
2003-04	9661.30	5251.20	54.35	2504.00	24711.00	2428.00
2004-05	9522.93	5318.71	55.85	2574.00	22170.00	2484.00
CAGR-II	**0.44**	**0.74**	**0.56**	**1.19**	**-1.11**	**1.31**
2005-06	9532.61	5374.71	56.38	2509.00	21053.00	2572.00
2006-07	9634.54	5188.72	53.86	2593.00	12384.00	2545.00
2007-08	9751.51	5501.12	56.41	2573.00	24704.00	2425.00
2008-09	9801.52	5574.64	56.88	2533.00	10677.00	2426.00
2009-10	9530.28	5641.28	59.19	2547.00	35768.00	2573.00
CAGR-III	**0.00**	**0.49**	**0.49**	**0.15**	**5.44**	**0.00**

Source: Economic Review, Government of West Bengal

The latest available data relating to percentage of irrigated area has been presented here for specific points of time viz., 1980-81, 1990-91 and 2001-01 and 2010-11. It can be seen that percentage of operated area irrigated constituted 61.39 per cent in 2010-11 which was 20.10 per cent in 1980-81. Thus during the thirty years periods, the proportion of irrigated area increased substantially in West Bengal. It has been observed that greater part of the increase in irrigated area is brought about by the development of tube-well irrigation, mainly shallow tube-well. The proportion of area served by public canals has also increased during the period, alongside with an increase in the coverage of area under tube-well irrigation. Probably all these factor help toward substantial increase in consumption of different fertilizers over the periods in West Bengal.

CHAPTER 4

MARKETED AND MARKETABLE SURPLUS OF PADDY IN WEST BENGAL: AN EMPIRICAL ANALYSIS

4.1: MAIN FEATURES OF AGRICULTURE IN SELECTED DISTRICTS

4.1.1: BIRBHUM DISTRICT

The economic condition of Birbhum district is dominated by agriculture. The land of Birbhum is divided into 13 classes, viz. - (1) *do* (2) *suna* (3) *sali* (4) *ola* or *olan* (5) *jedanga* or *danga* (6) *pat-jami* or mulberry land (7) *jangal bhumi* (8) *paner baraj* (9) *ghas* (10) *sarbera* (11) *bastu* (12) *salghor* and (13) *patit*. Out of these 13 classes of land, mainly the first three classes of land are most fit for rice cultivation. *Do* land has a rich soil, on which aus or aman rice is generally grown, besides gram, masuri, peas, wheat, linseed, khesari, til, sugarcane and occasionally cotton.

The various types of soil as observed in the district and their suitability for growing different crops are described below. In Bengali language, the brownish clay is called *Entel*. It is wholly unsuitable for rabi cultivation and needs manuring to produce rice. *Metel* is the clay soil, can retain moisture and is capable of producing aman rice and winter crops like gram, wheat, etc. *Palimati* is alluvial deposition. Such soils are very rich and generally are used for growing wheat, potato, vegetables, etc. With adequate irrigation such soils can produce rabi crops in abundance. *Bindi* is friable, loose sandy soil with very little water holding capacity. It can grow rice and is quite capable of growing rabi crops with irrigation. *Doansh* is friable loose blackish soil. It is very rich in fertility and can grow almost all crops. *Bele* is friable loose whitish soil, poor in fertility, oridinarily unsuitable for rabi cultivation, but can grow rice and to some extent some vegetables. *Kankar* is friable loose reddish soil and considered as a very poor type of soil. However, it can grow crop like mahua, bajra, maize, etc. and with irrigation facilities can grow some rabi crops. *Bastu* is rich blackish soil with low water holding capacities which with proper manuring and irrigation can grow fine rice, wheat, tobacco, sugarcane, etc. In the Brahmani-Mayurakshi basin Aman paddy is the principal crop. With the help of irrigation Rabi crops are also grown. In Suri-Bolpur plain , along with paddy, wheat, peas, sugar cane and tobacco are grown. The soil of the Bakreswar upland is not fertile but the crops are grown in irrigation schemes of the Mayurakshi canal project and Hingla project.

Major source of irrigation in this district is the rivers and the streams. Mayurakshi and Hijli projects are helpful for irrigation of the district. Apart

from that, the other rivers like, Ajoy, Brahmani, Kuskurni, Dwarka, Hingla and Kopai are also helpful for irrigation of the district. Out of total cultivable land, 273,600 hectares is under irrigation by different sources. There are 21,230 shallow tubewells, 103 deep tubewells and 108 river lift irrigations for watering the field under crop.

Table: 4.1.1: Production of Paddy in the District of Birbhum

Crops	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Aus	16.80	12.20	13.20	13.00	15.80	14.20
Aman	902.10	878.10	855.30	948.40	960.30	908.84
Boro	227.70	220.10	219.50	154.90	223.30	209.10
Total Rice	1146.60	1110.40	1088.00	1116.30	1199.40	1132.14

Source: District Statistical Handbook 2007; Directorate of Agriculture; Govt. Of WB

4.1.2: BURDWAN DISTRICT

The district may be divided into two main sub-tracts, one completely differing from each other in natural characteristics. The eastern portion is a delta consisting of wide plains highly suitable for cultivation but the western portion consists mostly of rocky and rolling country scattered with coal pits and factories though not altogether barren, especially at places with alluvial deposits of the washed up silt from the hills of the erstwhile Santal Parganas, Singbhum, Manbhum and Chhotanagpur plateau, now Jharkhand. This area requires heavy irrigation to make agriculture successful. Rice is the most important crop of the district and in the alluvial plains to the east little else is grown. The rice grown with its numerous varieties can be broadly grouped under the three primary classes - the *aus* or autumn, the *aman* or winter and the boro or the summer rice. Paddy covers about 83 per cent of the gross cropped area. Apart from rice, other cereals grown in the district are wheat, barley and maize. Total foodgrains include gram and pulses also. Rape, seed, mustard and linseed are among the oilseeds. Potatoes, chillies, fruits and vegetables are among the other subsidiary crops. Among the commercial crops jute, mesta and sugarcane are grown in the district.

Aus paddy is the principal crop of this region. Sugarcane, oilseeds and pulses are also grown in this area. Paddy, pulses, oilseeds and other vegetables are grown in the Kaksa-Ketugram Plain. Aman paddy is the principal crop grown in the Barddhaman Plain. Sugarcane, oilseeds, pulses and potatoes also are grown in this region. Silts in the beds and banks of the rivers in the Bhagirathi Basin are very much suitable for the growth of wheat, pulses, oilseeds and vegetables. Pulses, wheat, oilseeds etc. are grown in the Khadaghosh Plain.

The Damodar Valley Corporation and the intensive Agricultural District Programme, commonly known as the Package Programme which has been in operation in the district since 1962-63 has a great role in the extensive cultivation of the district. Besides, there is Mayurakshi Project which mainly serves the Birbhum district, also irrigates a vast tract of arable land of Ketugram Police Station of Barddhaman district. Apart from these, several small and minor irrigation schemes were implemented in the district in recent years. Out of the total area under crop, 320,320 hectares of land is under irrigation including the area under river lift irrigation. 292,680 hectares of land receives water from Government Canals, 18,740 hectares of land is irrigated by wells and 8,900 hectares of land by other sources. There are 581 deep tubewells, 282 river lift irrigations and 408 shallow tubewells (out of which only 72 STWs are functioning at present).

Table 4.1.2: Production of Paddy in the District of Burdwan

Crop	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Aus	76.20	51.80	52.10	44.60	43.70	53.68
Aman	1204.90	1257.10	1231.40	1365.50	1201.30	1252.04
Boro	650.30	699.20	609.40	558.40	722.00	647.86
Total Rice	1931.40	2008.10	1892.90	1968.50	1967.00	1953.58

Source: District Statistical Handbook 2007; Directorate of Agriculture; Govt. Of WB

4.1.3: MURSHIDABAD DISTRICT

Murshidabad is mainly an agricultural district. The main source of livelihood of the people is cultivation. The principal agricultural crops of the district are Paddy – 548.2 (thousand tonnes) under 224.2 in '000 hectares of lands, Wheat 373.5 (thousand tonnes) in 135.5 '000 hectares, Pulses – 56.4 (thousand tonnes) in 59.3 in '000 hectares, Oilseeds –72.1 (thousand tonnes) in 71.1 '000 hectares, Potato – 213.7 (thousand tonnes) in 8.9 in '000 hectares and Jute – 1904.5 000 Bale (1 Bale =180 kg.) in 141 '000 hectares of land in the year 2000-2001. For the improvement and development in the agricultural sector, many Block seed farm (18), Modal Farm (1), Soil Testin Laboratory (1) and Cold Storage (4) are found in the district.

The soil is very fertile for growing aus, paddy, jute and rabi crops. In the south eastern portion of the district lies the Kalantar tract. It is a low lying area. The surface soil is stiff dark clay and supports mainly broadcast aman paddy, which depends on flood for successful cultivation. The left flank of Bhagirathi is a lateritic tract intersected by numerous bills and old beds of rivers. The soil is hard clay. It is very suitable for growing good "aman" rice and sugarcane. Mulberry grows well and hence sericulture is developed well. Several types of soil are found in the district of Murshidabad. "Mathal" or "methal" is clayey soil and dark in colour but "Bagha Methal" is brown and "Ranga Methal" is reddish in colour. Loamy soils are known as "*do-ans*h" soil

which are very much fertile and can produce good crops while sandy loam or "metebali" and higher sand contained "domabali" are not good for cultivation. The line of low-lying area in the north up to the basin of the river Bhagirathi in the Nabagram Plain is very fertile and suitable for growing of paddy, wheat and gram etc. The Mayurakshi-Dwarka Plain is also very fertile and more suited for winter paddy crop. The climate here is drier than the eastern tract and apart from paddy, wheat, gram, sugarcane, pulses and mustard are also cultivated in this region. Ganga- Bhagirathi Basin is actually a long and narrow strip of river-valley area and more suitable for cultivation of paddy, jute and other rabi crops. Paddy is the main crop of this region. Paddy is the principal crop of Jalangi-Bhagirathi interfluve also. Besides, potato, pulses and oilseeds are grown abundantly. Soil of Raninagar Plain is alluvial and fertile and very much suitable for cultivation of paddy, jute and other rabi crops.

The total cultivable land of the district is 365000 hectares. With the provision of good irrigation facilities certain areas have been covered by multiple crop cultivation. In the district total area under irrigation is 227,850 hectares. The departments mainly engaged for the irrigation purpose are Agri-Irrigation Division I & II, Agri-Mechanical Division I & II, WBMIC, CADC and Irrigation & Waterways Department. (Source : District Statistical Hand Book, W.B., 2001).

Table 4.1.3: Production of Paddy in the District of Murshidabad

Crop	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Aus	104.40	84.20	85.80	78.80	62.20	83.08
Aman	607.90	598.30	595.20	637.10	492.80	586.26
Boro	36.50	431.10	513.40	473.70	475.60	386.06
Total Rice	1072.80	1113.60	1194.40	1189.60	1030.60	1120.20

Source: District Statistical Handbook 2007; Directorate of Agriculture; Govt. Of WB

4.2: MAIN FEATURES OF SAMPLE HOUSEHOLDS:

The main features of the sample households as obtained from our empirical analysis are presented here as follows:

4.2.1: GENERAL CHARACTERISTICS OF SAMPLE HOUSEHOLDS

As a prerequisite to our main analysis, it remains customary to briefly describe some characteristic features of the sample households we deal with in this study, which in turn facilitates greater understanding of the socio-

economic backdrop of the study. Here table describes the key general characteristics of the sample households where we observe that average age of the decision makers of the sample households tends to increase with increase in farm-size. This may be because of the fact that most of the larger farms are owned by joined-families, instead of nuclear families, where the senior members take crucial decisions regarding farming activities. This is also supported here by the fact that the average family size (both male and female members) also tends to increase with increase in farm-size. It may also be noted here that the sample pool is dominated by households primarily engaged in crop farming, while engagement in other occupations is quite low. This confirms that farmers still stick to their traditional occupation of farming in agriculturally prosperous tracts in West Bengal.

Table 4.2.1: Characteristics of Sample Farmer Households

Characteristics	Marginal	Small	Semi-Medium	Medium	All Farms
Avg. Age of decision maker (yrs)	47.40	51.33	54.05	55.94	50.82
Main Occupation (%)					
Crop Farming	95.16	96.91	95.38	96.88	95.91
Dairy	-	-	1.54	-	.31
Service	2.42	2.06	3.08	3.13	2.52
Farm labour	.81	-	-	-	.31
Others.	1.61	1.03	-	-	.94
Avg. Education (years of schooling)	7.65	9.77	10.58	10.50	9.18
Avg. Family Size* (no.)	5.05	6.58	7.80	10.03	6.58
Male	2.70	3.60	4.17	5.38	3.54
Female	2.35	2.98	3.63	4.66	3.03
Social Grouping (%)					
General	77.42	83.51	86.15	100.00	83.33
SC/ST	17.74	11.34	3.08	-	11.01
OBC	4.84	5.15	10.77	-	5.66
Others	-	-	-	-	-
Gender of head of household (%)					
Male	99.19	100.00	98.46	100.00	99.37
Female	.81	-	1.54	-	.63

** Including Children and Family Labour*
Source: Field Survey

In case of caste composition of sample farm households, it is observed that most of the farms belong to the general category (including Muslims) followed by the schedules castes/tribes and other backward castes. In fact, it is interesting to note that as we move to higher size-classes, a greater percentage of households belong to general category. This in turn indicates towards subjugation of landed property by the upper castes in most prosperous tracts in West Bengal, though it requires further detailed study to

confirm the phenomena. As expected, it is also observed that the head of the households are mostly male, as it has been in other parts of the country in a male dominated society.

4.2.2: CHARACTERISTICS OF OPERATIONAL HOLDING

As the present survey is carried out in some of the most advanced tracts of paddy cultivation in West Bengal, it is not very surprising to find that less than 3 percent of operational area is not irrigated from any source. In fact, most of the un-irrigated land has been left as wasteland or non-cultivable land by all size classes. Interestingly, the land that entered into the lease market (leased-in and leased-out land) has come out to be irrigated tracts. This is also understandable considering the fact that the irrigated tracts will have a greater demand in the lease market as compared to the un-irrigated tracts. It is to be noted in this context that against popular belief, the larger farms in these highly productive land stretches are observed to lease-in land instead of leasing-out. In fact, the leasing-out land has been observed the lowest for the largest size-class of farms, which in turn indicates towards development of capitalist type of farming on large plots of land. For confirmation, this requires further study on the aspects, which is beyond the scope of the present study.

Table 4.2.2: Characteristics of Operational Holding (area in ha.)

Size Class of Farm	Avg. Owned Land (A)		Avg. Waste Land /Non-cultivable Land (B)		Avg. Leased in Land (C)		Avg. Leased out land (D)		Avg. Operational Holding* (E)	
	Irr.	Unirr.	Irr.	Unirr.	Irr.	Unirr.	Irr .	Unirr.	Irr.	Unirr.
Marginal	0.55	0.02	0.00	0.02	0.04	-	0.02	-	0.57	0.01
Small	1.37	0.09	-	0.04	0.04	-	0.02	-	1.38	0.05
Semi-Medium	2.61	0.28	-	0.14	0.20	-	0.09	-	2.72	0.15
Medium	5.01	0.18	-	0.12	0.52	-	0.03	-	5.51	0.06
All farms	1.67	0.11	0.00	0.06	0.12	0.00	0.04	0.00	1.75	0.05

* $E = A - B + C - D$
Source: Field Survey

However, a size-class-wise analysis reveals that the marginal farms, though representing about 39 percent of samples, cultivate only on 12.6 percent of operational holding. In contrast, the medium farms, representing about 10 percent of samples farms, commands over more than 31.6 percent of operational holding. This clearly shows the highly marginalized nature of west Bengal agriculture, dominated mostly by the marginal farms.

4.2.3: AVAILABILITY AND SOURCES OF IRRIGATION

As has been mentioned earlier, less than 3 percent of operated land remains un-irrigated, particularly as the study has been carried out in some of the most advanced paddy growing regions in West Bengal endowed with irrigation. In fact, it has been observed that the sample farms are mostly endowed with both groundwater and surface-water sources of irrigation. However, considering their primary source of irrigation in the main (kharif) season, it is found that on the whole, about 57 percent of operated area is irrigated by surface-water sources (government canal), and about 40 percent is irrigated by groundwater sources, while rest 3 percent remains un-irrigated.

Table 4.2.3: Availability & Sources of Irrigation

Size Class of Farm	Un-irrigated Area (%)	Irrigated Area* (%)			
		Surface/Canal	Tube Well/Ground-Water	Tanks	Others
Marginal	1.07	52.09	46.83	-	-
Small	3.44	48.29	48.27	-	-
Semi-Medium	5.15	52.23	42.61	-	-
Medium	1.12	71.50	27.38	-	-
All farms	2.99	57.24	39.77	-	-

** in Kharif Season*
Source: Field Survey

It is interesting here that a size-class-wise analysis reveals that availability of surface/canal irrigation shows an increasing pattern (with minor fluctuations) with increasing size of farms. As such, it comes out that most of irrigated tracts with cheap canal irrigation are concentrated in the hand of the larger farms. The smaller farms, on the other hand, have to depend more on groundwater sources, which involves greater costs and thus expected to negatively impacts profitability of smaller farms. It should also be noted here that other sources like tanks, rivers, etc. has not been observed in the study area, which could act as a substitute for canal irrigation, at least to some extent for the smaller farms.

4.2.4: DETAILS OF TERMS OF LEASE

An analysis of the lease contracts of agricultural land among the sample farmers brings out some interesting features. First, it is interesting to observe that incidence of farms leasing-in is higher for the larger farms as compared to their smaller counterparts. As mentioned earlier this may be due to development of large capitalistic farms in these prosperous tracts of West Bengal. Second, in case of terms of lease, it is observed that leasing-in under conditions of fixed rent (in kind) is more pronounced for the large farms, for

whom the average amount of fixed produce per hectare of land is also high. It is our apprehension that this is a reflection of the fact that the larger farms with greater economic power mostly lease-in better plots of land with assured irrigation for which rent is also high.

Table 4.2.4: Details of Terms of Lease

Size Class of Farm	Incidence		Terms* (%)				Rent		
	% Area leased in	% HHs leasing in	Fixed money	Fixed produce	Share of produce	Others	For fixed money (Rs.)	Fixed produce$ (Qtl.)	Share of Produce# (%)
Marginal	7.39	10.48	-	53.85	46.15	-	-	17.20	37.17
Small	2.93	6.19	-	50.00	50.00	-	-	16.89	27.67
Semi-Medium	7.39	15.38	-	70.00	30.00	-	-	15.42	33.33
Medium	9.49	15.63	-	100.00	-	-	-	15.31	-
All farms	6.98	10.69	-	64.71	35.29	-	-	16.16	33.83

** percentage of farms leasing-in land in Kharif Season*
$ average amount of fixed produce per hectare of leased-in land
 # average share of produce paid for leasing-in land
Source: Field Survey

Lastly, In case of rent paid in actual figures, we observe that a comparatively higher amount is paid out as rent by the smaller farms. In fact, though the proportion of farms leasing-in is lower for the smaller farms, they are larger in actual numbers owing to their much greater representation in the sample pool. In particular, while 15.63% of large farms mean 5 farms in number, 10.48% of marginal farms mean 13 farms.

4.2.5: CROPPING PATTERN AND YIELD RATE

The study region, as mentioned earlier, is primarily a paddy growing region. This is reflected clearly in the cropping pattern followed by the sample farms as represented here in table. It should be noted here that in West Bengal, the common practice is to cultivate paddy twice a year in kharif and summer. As such, if we treat kharif & summer paddy together, we observe that more than 90% of gross cropped area is covered by paddy, which holds true for each of the size-classes concerned. Taking all farms together, it comes out that more than 94% of gross cropped area is under paddy cultivation in the study region, which is not completely unexpected in the prime paddy belts in West Bengal.

In rabi season, however, the dominant crop comes out to be the oilseeds (namely, mustard and sesame) followed by vegetables. In particular, oilseeds contribute to less than 5% of gross cropped area for all the size-classes concerned, especially for the largest farms. In fact, it comes out that oilseeds are cultivated mainly by the small and semi-medium farms. In case of vegetables, requiring greater human labour input, it is observed that

proportionately higher amount of cultivated area is devoted to vegetables cultivation by the marginal farms. Cultivation of wheat is confined to less than 1% of gross cropped area for the size-classes, at least in these parts of West Bengal.

Table 4.2.5: Cropping Pattern: Area (Area in hectare)

	Marginal	Small	Semi-Medium	Medium	All Farms
Kharif					
Paddy (Absolute)	70.89	139.06	186.45	178.37	574.77
% to GCA	56.32	57.40	59.37	57.03	57.77
Rabi					
Wheat (Absolute)	0.10	0.21	0.00	0.67	0.98
% to GCA	0.08	0.09	0.00	0.21	0.10
Oilseeds (Absolute)	5.83	11.79	15.47	8.40	41.49
% to GCA	4.63	4.87	4.93	2.69	4.17
Vegetables and others (Absolute)	3.40	2.87	5.35	3.31	14.93
% to GCA	2.70	1.18	1.70	1.06	1.50
Summer					
Paddy (Absolute)	45.52	88.09	106.71	122.00	362.32
% to GCA	36.16	36.36	33.98	39.00	36.42
Perennial					
Sugarcane(Absolute)	.13	.24	.06	.04	.47
% to GCA	0.10	0.10	0.02	0.01	0.05
Gross Cropped Area (GCA)	125.87	242.26	314.04	312.79	994.96

Source: Field Survey

In case of yield rate of different crops grown in the study region, it is observed that-

First, on an average, the yield rate of paddy (both kharif paddy & boro/summer paddy) tends to increase with increase in farm-size. Hence, this does not support the 'stylized fact' of an inverse relationship between farm-size and productivity, rather indicates towards a more direct relationship under modern cultivation practices in most advanced paddy growing belts in West Bengal. Second, for each of the size-classes concerned, average yield per hectare is higher in summer (boro) paddy than that in the kharif paddy. This is particularly because of the difference in variety of paddy cultivated in different seasons according to availability of water, weather, and other agro-climatic factors. Third, for wheat also, we observe an increasing trend in yield rate with increase in farm size. However, as instances of wheat cultivation is extremely low, this requires larger studies for confirmation. Fourth, no clear pattern can be observed for vegetables like tomato, potato & onion as well as for the oilseeds like mustard and sesame.

Table 4.2.6: Cropping Pattern: Yield (Yield in kg,/hectare)

	Marginal	Small	Semi-Medium	Medium	All Farms
Kharif					
Paddy (Absolute)	4916.52	5054.51	5136.94	5094.27	5021.55
Rabi					
Wheat (Absolute)	3800.00	4360.58	-	4477.61	4249.69
Oilseeds: Mustard	940.73	906.96	947.18	904.10	927.43
Oilseeds: Sesame	829.70	879.24	904.23	777.39	864.64
Vegetables: Potato	12690.78	12102.23	13160.53	12265.06	12576.58
Vegetables: Onion	11250.00	13800.00	11000.00	13666.67	11938.33
Vegetables: Tomato	-	15189.26	18867.92	-	16108.90
Summer					
Paddy (Absolute)	5175.82	5358.80	5378.57	5386.60	5295.50
Perennial					
Sugarcane*(Absolute)	7045.00	6700.00	7300.00	6450.00	6891.00

** Yield Rate of 'Gur'*
Source: Field Survey

4.2.6: OWNERSHIP OF FARM MACHINERY

As our agriculture develops, we experience greater extent of mechanization of farming activities. West Bengal is not an exception in this regard also, but owing to higher degree of marginalization of farms, mechanization in smaller farms is constrained by financial affordability, among other factors. In general, it is observed that though there are special instances of use of harvester in paddy cultivation (comparatively recent phenomena), none of the farms surveyed own a harvester machine. In fact, those using harvester machines have used them on a hiring-in basis, charged per hour/minute of deployment. Though not directly related to the present study, it may be mentioned here that the farmers using harvester machines confirmed its cost effectiveness against traditional manual harvesting (cheaper by out 3500/- per hectare). As such, it is our apprehension that West Bengal may experience rapid deployment of labour displacing harvested machines in recent future.

Table 4.2.7: Ownership of Farm Machinery

Size of Farm	Average Investment on Farm Machinery* (Rs/Ha.)				
	Tractors	Combined Harvester	Threshing Machine	Tube Well	Avg. Investment (Total) per ha.
Marginal	0.00	0.00	2077.54	1898.78	3976.32
Small	8364.15	0.00	2454.97	7462.23	18281.35
Semi-Medium	4948.41	0.00	1801.20	6622.72	13372.34
Medium	19869.56	0.00	1367.37	8146.04	29382.97
All Farms	9844.92	0.00	1858.96	6708.41	18412.29

** Rs.per Hectare of Gross Cropped Area*
Source: Field Survey

However, it was found that none of marginal farms own tractor, while a very few of them own tubewells. Other size-classes own such implements to considerable extent. Again, in case of ownership of threshing machines, it was observed that except for the smallest farms, average investment on threshing machine tends to decline over the size-classes; which is particularly due to indivisibility of invested capital goods. On the whole, it comes out that average investment per hectare of land (gross cropped area) tends to increase with size-class, with the exception of semi-medium size-class. In fact, average investment per hectare for the largest farms stands more than seven times the average investment of the smallest farms.

4.2.7: OWNERSHIP OF LIVESTOCK

In case of ownership of livestock, it comes out that average number of cattle and buffalo per farm is higher for the larger two size-classes as compared to their smaller counterparts. In fact, ownership of buffalo is hardly observed in case of the marginal and small farms. This, to some extent, indicate that maintaining cattle/buffalo is not a viable proposition for the smaller farms, as their use has become extremely confined in the face of competition from tractors under modern cultivation practices.

Table 4.2.8: Farm Size and Livestock

Size of Farm	Cattle (No.s)	Buffalo (No.s)	Others (No.s)
Marginal	201 (1.62)	9 (0.07)	165 (1.33)
Small	238 (2.45)	17 (0.18)	105 (1.08)
Semi-Medium	267 (4.11)	47 (0.72)	112 (1.72)
Medium	108 (3.38)	16 (0.50)	14 (0.44)
All Farms	814 (2.56)	89 (0.28)	396 (1.25)

Note: Figures in parenthesis indicate average numbers
Source: Field Survey

While this phenomena of decreasing cattle/buffalo ownership by the smaller farms is expected to negatively affect their income from hiring out of bullock labour (for plough/carriage), they seem to compensate for their losses to some extent by owing other livestock assets like goats, sheep and other ruminants. Owning such livestock assets while assuring subsidiary income generation, helps increase nutritional intake of the poorest households also. The largest size-class, however, does not seem much interested in maintaining livestock other than cattle/buffalo, as the average number of ruminants is quite low for the largest size-class.

4.3: ESTIMATION OF CROP LOSSES AT DIFFERENT STAGES

The estimates post-harvest crop losses during various stages of production have been presented here as follows:

4.3.1: CROP LOSSES ON FARM

There exists on a handful of studies regarding crop loss during farming activities, especially in case of paddy cultivation in West Bengal agriculture. Along with attempting to estimate the marketed and marketable surplus of paddy, this study also tries to estimate crop loss at various stages of farming activity in course of the study. It is here we have first tried to estimate the losses at the farm level, particularly in harvesting, threshing and winnowing activities. The outcome of such an attempt may be stated as:

First, the estimated average crop loss during harvesting, on an average, stands at 1.23% of production. Size-class-wise estimates of loss shows that there is an indication of declining proportion of crop lost during harvest over increase in size-classes. However, it should be noted here that crop loss during harvesting depends upon a number of factors, including the mode of harvest, i.e. whether manual or mechanical. Here, we observe that with the increase in size of farms, proportion of harvest by mechanical method increases sharply; which in turn proportionally reduces the amount of crop loss for the larger farms, ceteris paribus. It should also be mentioned here that crop loss in harvesting depends much upon factors like the state of maturity of crops, timing of harvesting, unwanted rainfall in the maturity period, distance of plot from farmhouse, etc. This study does not take into account of such factors separately, and provides the overall estimate of crop loss during harvesting.

Table 4.3.1 Crop Losses on Farm

Size Class of Farm	% of Farms by Mode*	Avg. % Loss in Harvesting@	% of Farms by Mode*	Avg. % loss in Threshing@	% of Farms by Mode*	Avg. % Loss in Winnowing@	Avg. Total % loss@
Marginal	1 = 4.03 2 = 95.97	1.26 (1.21)	1 = 69.35 2 = 30.65	0.53 (.51)	1 =23.39 2 = 76.61	0.27 (.25)	2.06 (1.98)
Small	1 = 6.19 2 = 93.81	1.21 (1.10)	1 = 75.26 2 = 24.74	0.49 (.45)	1 = 43.30 2 = 56.70	0.24 (.22)	1.95 (1.77)
Semi-Medium	1 = 10.77 2 = 89.23	1.19 (1.02)	1 = 95.38 2 = 4.62	0.46 (.39)	1 = 47.69 2 = 52.31	0.22 (.19)	1.87 (1.60)
Medium	1 = 21.88 2 = 78.13	1.22 (1.08)	1 = 84.38 2 = 15.63	0.44 (.39)	1 = 65.63 2 = 34.38	0.22 (.19)	1.87 (1.67)
All Farms	1 = 7.86 2 = 92.14	1.23 (1.13)	1 = 77.99 2 = 22.01	0.50 (.46)	1 = 38.68 2 = 61.32	0.24 (.22)	1.97 (1.81)

**Mode: 1 = Mechanical;2 = Manual*
@ Percentages in relation to current production during the year
Figures in parenthesis indicate percentage to net availability
Source: Field Survey

S*econd*, in case of average loss during threshing, it is observed that proportion of paddy output lost during threshing declines steadily with increase in farm-size, while the average loss including all farms stands at 0.50% of production. It should also be noted here that threshing of paddy with manual labour power tends to decline (roughly) on an average; which in turn reduces loss during threshing for the higher size-classes. Though loss during threshing also depends upon other factors like maturity of paddy, moisture content, etc. we have not taken into such factors separately, and provided overall loss during threshing activities.

Third, the estimated loss during winnowing also tends to decline over the size-classes, and stands at 0.24% on an average. At the same time, it is to be noted here that proportion of paddy winnowing under mechanical method also tends to increase with increasing farm-size, which in turn reduces the crop loss during winnowing for the larger farms. It should however be mentioned here that winnowing activities is not carried out thoroughly in West Bengal (as compared to other parts of the country), which is why paddy output in West Bengal contains higher refraction than other neighbouring states like Bihar, Jharkhand or Orissa.

Lastly, overall loss on farm during harvesting, threshing and winnowing activities come out to be 1.97% or output produced. At the same time, the combined loss on farm during these activities taken together tends to decline with increase in farm-size. In particular, while crop loss on farm for the marginal farms stands at 2.06% of production; that for the medium farms stands at 1.87% on an average. At the same time, there are indications that this declining trend in crop loss on farm is mainly due to increased mechanization for the larger farms.

4.3.2: CROP LOSSES DURING TRANSPORT

Crop losses also occur during transport of crop output. This happens mainly during transporting harvested crop from field to threshing floor and transporting stored crop from farm to market. In this study we have also tried to estimate these losses during transport for different size-classes, which is presented here in table. The key observations regarding transport losses may be brief presented here as:

First, average loss during transportation from field to threshing floor stands at 0.49% for all size-classes taken together. However, there exists considerable variation in the estimation of proportion of crop lost during transportation from field to threshing floor among the size-classes. In particular, we observe that average crop loss during transport from field to threshing floor steadily declines as we move to higher size-classes. In particular, while crop lost during transport from field to threshing floor is estimated to be 0.53% for the marginal farms; that stands at 0.44% for the medium farms. There are indications here that this pattern of declining crop

loss during transport may be a reflection of the fact that the larger farms tend to transport their harvested crops using mechanical methods (like, tractors, etc.), as against bullock or manual methods mostly used by the smaller farms. This indicates in turn that higher degrees of mechanization in transport reduces crop-loss during transport, as it is more convenient for activities like stacking, carrying, loading and unloading, etc.

Table 4.3.2: Crop Losses during Transport

Size Class of Farm	Field to threshing floor		Field/Farm to Market	
	% of Farms by Mode*	Avg. % loss@	% of Farms by Mode*	Avg. % loss@
Marginal	1 = 10.48 2 = 78.23 3 = 11.29	.53 (0.51)	1 = 11.29 2 = 64.52 3 = 7.26 4 = 16.94	.06 (0.05)
Small	1 = 27.84 2 = 69.07 3 = 3.09	.49 (0.44)	1 = 29.90 2 = 61.86 3 = 4.12 4 = 4.12	.06 (0.06)
Semi-Medium	1 = 67.69 2 = 30.77 3 = 1.54	.45 (0.39)	1 = 66.15 2 = 23.08 3 = 6.15 4 = 4.62	.06 (0.05)
Medium	1 = 75.00 2 = 25.00 3 = -	.44 (0.39)	1 = 68.75 2 = 28.13 3 = - 4 = 3.13	.07 (0.06)
All Farms	1 = 33.96 2 = 60.38 3 = 5.66	.49 (0.45)	1 = 33.96 2 = 51.57 3 = 5.35 4 = 9.12	.06 (0.06)

**Mode: 1 = Mechanical; 2 = Animal; 3 = Other/Manual; 4 = Not Sold*
@ Percentages in relation to current production during the year
Figures in parenthesis indicate percentage to net availability
Source: Field Survey

Second, it is however observed that in case of transport from floor to market, the estimated loss in paddy in relation to total production shows somewhat a static pattern over the size-classes. Here too we observe that the means of transport of paddy output from floor to market is more mechanized for the larger farms as against the smaller farms. Even though, the estimated loss is not very different for the size-classes.

In this context, it should be noted here that the estimates of crop loss during transport from farm/floor to market is way below the expected levels. This is particularly because while some part of the paddy output stored is not sold at all, some other part is taken off directly by the village-level traders from farms at their own transportation arrangements. Under such circumstances, the loss during transport from farm/floor to market does not occur at the producers' end; rather the losses are incurred by the village-level traders themselves. Nevertheless, this does not mean a loss to the that the traders, as some amount (say, 2 k.g. per 60 k.g. bag) is excluded from total weight beforehand as loss (locally known as '*dharati*' or '*dharti*' or '*shukti*') and

farmers are paid accordingly. The reason behind purchase at farm-gate by the traders is simply fierce competition among monopolistic traders to grab paddy output earliest in the post-harvest season when prices are the lowest.

4.3.3: CROP LOSSES FROM STORAGE AT PRODUCERS' LEVEL

Apart from estimating crop losses during harvesting, threshing, winnowing, transport from field to floor and transport from floor to market, this study also tries to estimate crop losses from storage at the producers' level. After the losses during harvesting, loss on account of storage constitute one of the major sources of post harvest loss in paddy cultivation process. In fact, a number of interesting observations come up when we estimate size-class-wise crop losses during storage, which are briefly presented below:

First, the average quantity of paddy stored in different storage forms together stands at about 166 quintal per farm. However, a size-class-wise analysis shows that average quantity stored for the marginal farms stands at less than 50 quintals; while that for the medium farms turns out to be more than 10 times the quantity stored by the marginal farms (518 quintals). This pattern is quite understandable as the larger farms with greater economic power holds on their stock to sell in the lean season in expectation of higher price, while the smaller farms are forced to sell off their produce to meet various obligation and expenses. This in turn results in higher stock in storages by the larger farms.

Table 4.3.3: Crop Losses from Storage at Producers' Level

Size Class of Farm	% of Farms by Type of Storage	Avg. Quantity stored (qtl.)	Avg. % Utilization of Total Storage Capacity	Avg. % of Stored Quantity Lost	Avg. Storage Time in Days	Average Cost of Storage Rs/Month/Qtl.
Marginal	1 = 79.84 2 = 6.45 3 = - 4 = 13.71	47.35	98.85	0.75	72.23	2.65
Small	1 = 75.26 2 = 24.74 3 = - 4 = -	131.50	97.05	0.73	67.74	2.47
Semi-Medium	1 = 64.62 2 = 35.38 3 = - 4 = -	269.23	97.18	0.73	84.68	2.27
Medium	1 = 71.88 2 = 28.13 3 = - 4 = -	518.42	96.95	0.72	92.90	2.25
All Farms	1 = 74.53 2 = 20.13 3 = - 4 = 5.35	165.77	97.77	0.74	75.67	2.35

Type of Storage 1=Kutcha storage with Earthen floor, wall, roof, 2= Pucca storage with cemented floor, wall, roof,3= steel storage bin,4= others
Source: Field Survey

Second, it should also be observed though storing paddy in *kutcha* storages tends to decline a bit over the increase in farm-size, there seems to be a strong preference for *kutcha* storages even among the larger farms with adequate financial affordability. In fact, it was revealed by the farmers that paddy as a crop is often stored better in *kutcha* storage with earthen walls and in spiraling straw-made walls with bamboo grids (traditionally known as '*gola*' and '*morai*' respectively); as loss due to loss of moisture as well as loss due to damp is simultaneously minimized in such storages. Further, they are easy to operate (load & unload of paddy), temporary in nature, and involve less maintenance costs; though they are not meant for long-term storage (more than 2-3 years). Another important advantage of these *kutcha* storages is that they are built just to store the required volume/ quantity, so that there is very little excess capacity left over and above the requirement; which in turn helps prevent moisture accumulation and loss of paddy due to damp at the top of storage in bulk. These advantages are the key characteristics of such *kutcha* storages for which they are preferred.

Third, the particular advantages of *kutcha* storages regarding capacity utilization is clearly reflected here, as we observe that the smaller farms are better in terms of capacity utilization than the larger ones. In particular, as the smaller farms store paddy mostly in *kutcha* storage, their utilization of capacity is also high as compared to the larger farms.

Fourth, in case of storage loss, however, we see that the larger farms are better off with lesser quantity lost during storage. This is particular due to the disadvantage of *kutcha* storages, as they are more prone to pest and rodent infestations. In contrast, in *pucca* storages, the problems of pests and rodents are minimized, but damp and moisture loss is not controlled. As such we observe a declining tendency of loss during storage over increase in farm-size. On the whole, the storage loss is estimated to be 0.74 percent of quantity stored, which include carry over quantity of previous stocks in addition to present stock of current production.

Fifth, in case of average storage time, it is observed that the smaller farms do not hold their stock for long periods as compared to the larger farms. This, as mentions earlier, is related to economic situation of the farm households. In particular, while the larger farms can afford to hold back their stock for some time in expectation of higher price in the lean season, the smaller farms cannot hold back stocks for long periods as they have to meet other obligations and expenses. As such, the smaller farms are often forced to sell off their output immediately after the harvest, especially under a system of interlocked agrarian credit markets with credit-output interlinkage. On average, it comes out that the farms store their paddy for about 76 days, i.e. for just over two-and-a-half months in particular. Now, if this is the situation in a multi-cropping framework, the situation in a mono-cropped framework can easily be apprehended.

Lastly, in case of storage costs, it is observed that average storage cost (Rupees per Month per Quintal) tends to decline steadily over corresponding increase in farm-size. This is observed even though there has been a

preference towards *pucca* storages by a few of the larger farms involving greater storage costs. In fact, even incurring higher costs for storage in an aggregative level, average cost of storage of grains actually comes out to be lower for the larger farms.

4.3.4: TOTAL POST-HARVEST LOSS

We have attempted here to estimate the total post-harvest losses as various stages taken together, which include crop losses during harvesting, threshing, winnowing, transport from field to threshing floor, transport from floor/farm to market and storage. The findings of such an attempt have been presented here in table below.

Table 4.3.4: Estimates of Total Post-Harvest Losses

Farm Size	Total Post-Harvest Loss (qtl.)	Average Post-Harvest Loss (qtl.)	% loss in relation to Current Production	% loss in relation to Net Availability
Marginal	195.31	1.58	3.52	3.37
Small	386.70	3.99	3.41	3.05
Semi-Medium	488.39	7.51	3.33	2.82
Medium	489.31	15.29	3.27	2.87
All Farms	1559.70	4.90	3.42	3.11

Source: Field Survey

It is observed from table that total post-harvest losses stands at 3.42% of current year production on an average over the size-classes. The estimated total post-harvest losses in relation to current production for the size-classes show a decreasing trend over increase in size of farm. In particular, while total post-harvest loss comes out to be 3.52% for the marginal farms, that for the small farms stands at 3.05%, followed by the semi-medium and medium farms at 3.33% and 3.27% respectively. This reflect that more mechanized and more developed cultivation techniques adopted by the larger farms in turn results in lesser amount of post-harvest losses as compared to their smaller counterparts.

All these outcomes have immense significance for the study and demands studies in greater detail. Nevertheless, we should be very cautious again in any attempt to generalize these findings for the state of West Bengal as a whole, as these results typically represent the situation of irrigated, multi-cropped and highly productive paddy belts of West Bengal, where paddy is cultivated twice-yearly. At the same time, it should also be noted here that the reference period of the survey, viz. 2011-12, is not a typical year in West Bengal agriculture. It is so not because of any climatic disorder or disaster, rather due to some political factors. First, the newly formed Govt. of West

Bengal attempted to intervene into the paddy market with certain regulations to secure MSP to the farms, and promoted government purchase directly or through rice mills. This consequently was severely contested by the petty traders who refused to purchase paddy from the farmers, simply to take opportunity of the fact that the government neither has the capacity nor required infrastructure to procure all paddy produced in West Bengal. Being refused by the petty traders, the farmers are often forced to hold back their paddy till the problem resolves, else sell at whatever price offered by the traders. All these in turn resulted in accumulating stocks in farms, and might inflate (or deflate) true estimates storage (or marketing). Hence the year 2011-12 may not be considered as a typical representative year in case of West Bengal.

4.4: ESTIMATION OF MARKETED AND MARKETABLE SURPLUS RATIO OF PADDY IN SELECTED DISTRICTS

4.4.1: AVAILABILITY OF PADDY BY FARM SIZE

Among the various aspects of farming economy, one of the key indicators of economic performance of farms can be examined from the availability of output (here, paddy) by the farms. In fact, availability of paddy is influenced by a number of socio-economic factors, including farm-size. However, before we proceed further with our analysis of availability of paddy output by the farms, it should be noted at the outset that in a setup where paddy is cultivated twice-a-year, the stock and sale of output is continuously changing over the year. Hence, estimates of paddy availability at any static point of time is a difficult task requiring detailed understanding of the dynamics of paddy cultivation and marketing. In this study, in its limited scope, coverage and reach, we have attempted to identify the broad pattern availability of paddy by the farm households surveyed, which has been presented here as below.

From our analysis, a few points come out, which may be stated in brief as below:

First, the average quantity of beginning stock for the size-classes tends to increase sharply with corresponding increase in farm-size. This is quite understandable as, on the one hand, the smaller farms with whatever little marketable surplus they possess, are unable maintain a stock throughout the year as they have to meet other obligations and expenses out of it. On the other hand, the larger farms try to maintain a stock in expectation of obtaining higher price of output by marketing them in the lean season when prices are high.

Second, the average current production also tends to increase with increase in farm-size. This is quite obvious as increase in farm-size signifies an increase in total quantity produce, other things held constant.

Table 4.4.1: Availability of Paddy by Farm Size

Farm Size	Availability of Paddy (qtl.)		
	Beginning Stock (1)	Current Production (2)	Net Availability (1+2)
Marginal	337.80 (2.72)	5867.03 (47.31)	6204.83 (50.04)
Small	1720.95 (17.74)	11785.40 (121.50)	13506.35 (139.24)
Semi-Medium	3252.00 (50.03)	15191.94 (233.72)	18443.95 (283.75)
Medium	2047.00 (63.97)	15697.55 (490.55)	17744.55 (554.52)
All Farms	7357.75 (23.14)	48541.92 (152.65)	55899.67 (175.79)

Note: Figures in parenthesis indicate averages
Source: Field Survey

Third, the net result is that the larger farms on an average have higher net availability (previous stock + current production) of paddy output as compared to their smaller counterparts. In particular, average net availability of paddy for the medium farms is more than 11 times than that of the marginal farms.

It thus comes out that in terms of net availability of paddy output for sale (or for consumption); the larger farms are in a much better position than the smaller farms.

4.4.2: SALE PATTERN OF PADDY

Marketing of paddy no doubt constitute an important economic activity of farming. In this study, we have attempted to analyze the sale pattern of paddy by different size classes of farms. A number of important observations can be made here, which are discussed below in brief as follows:

First, it has been observed that in relation to net availability of paddy by all size-classes taken together, about 61.8% of output has been marketed at the aggregative level. It is interesting to observe at the same time that proportion of output sold in relation to net availability at the aggregative level tends to increase sharply with increase in farm-size. That is, at the aggregative level, ratio of marketed output shows a direct relationship with farm-size.

Second, in case of time of marketing of paddy output, it is observed that the farms mostly sell their output during May to June. However, though the figure representing month of sale indicates that most of the sale occurs in May

to June, but in reality, the peak months of marketing are December-January and May-June[10].

Third, the average distance of sale point for the size-classes remains less than 2 kilometers on an average. It should be noted however that average distance of sale point shows a tendency to increase with increase in farm-size, which indicates that the larger farms can afford to transport their produce further for better price than the smaller ones.

Fourth, in West Bengal agriculture, time and again it has been observed that procurement or purchase of paddy output by the government agencies has been quite disappointing. This study too supports such findings as it observes that less than 1 percent of paddy output marketed has been sold to the government agencies. However, such purchases by the government have ensured MSP to the fortunate farmers.

Table 4.4.2: Sale Pattern of Paddy

Size Class of Farms	Net Availability *	Total Sold			To whom and quantity sold in quintals							
					Govt. Agencies		Pvt. Trader or Money Lender		Processor / Miller		Others (Pvt. Co.s)	
		Total qty. sold (qtl.)	Avg. Month of Sales	Distance (in km)	Qty. (% of Total)	Price	Qty.(% of Total)	Price	Qty.(% of Total)	Price	Qty.(% of Total)	Price
Marginal	6204.83	3174.71 (51.17)	5.49	1.10	0.38	1080.00	78.85	821.20	20.77	1080.00	0.00	.00
Small	13506.35	8041.05 (59.54)	5.91	1.96	1.85	1080.00	80.42	822.45	17.73	1047.28	0.00	.00
Semi-Medium	18443.95	11260.60 (61.05)	5.06	3.06	0.22	1080.00	69.31	828.18	29.44	975.72	1.02	900.00
Medium	17744.55	12077.34 (68.06)	3.94	2.81	0.50	1080.00	56.67	829.18	41.84	973.45	0.99	846.53
All Farms	55899.67	34553.70 (61.81)	5.37	1.94	0.71	1080.00	68.36	823.79	30.25	1022.96	0.68	873.27

Figures in parenthesis indicate percentage of net availability
** Net Availability = Current Year Production + Carry Over Stock (if any)*
Source: Field Survey

Fifth, other agencies like private companies buy only a small fraction of paddy output from the farmers (less than 1%), which too is confined only among the larger farms. The average price offered for paddy is modest, though lower than MSP.

Sixth, as in other parts of west Bengal, the paddy market comes out to be overwhelmingly dominated by the village-level petty traders. In particular, more than 68% of total paddy output marketed has been sold to these traders at the village-level. It can also be observed that the smaller farms sell proportionately higher portion of their marketed output to these traders, which declines with increase in farm-size. This is particularly because of a

[10] In fact, as December is represented by 12 and January by 01, the average has come down to such a figure.

number of facts at the village level. On the one hand, while it is often economically unviable for the smaller farms to travel great distances to sale their output where prices are the highest, their product is often tied through interlinked market transactions even before it is harvested. As such, devoid of any alternative, these small farms are often compelled to sell their produce to their prime source of credit, the '*arotdars*' or traders, in the immediate post-harvest low prices. On the other hand, the larger farms are often free of such obligations and can retain some stocks in expectation of better price, which they in turn realize to some extent.

Lastly, the processing units, in particular the rice millers, purchase a good part (about 30%) of the paddy output produced by the farms. However, it should be noted here that proportion of output marketed in mills shows an increasing trend with increase in farm-size, reflecting the fact that rice mills are more accessible for the large farms with much greater quantities to offer. In fact, the smaller farms are often turned down by the millers as they have very little quantity to sale at their disposal; as mills prefer purchasing paddy in bulk.

However, it must be mentioned here that the ratio of sale to miller does not reflect the true picture over time in case of West Bengal. In fact, the rice mills purchase of small quantities directly from the farmers (estimated elsewhere to be less than 5%) that too from the larger farms only. It is only during the year 2011-12 under the changed government and new regulations that the mills are forces to purchase specified quantities directly from the farmers at MSP (less appropriate amount depending upon refraction content). It is for this very reason that we see such a good proportion of paddy being marketed to the rice mills at prices higher than village-traders.

4.4.3: CROP RETENTION PATTERN

In case of retention pattern of paddy, several important observations come out. These may be briefly described as follows:

First, average quantity of retention of paddy (consisting of retention for consumption and/or retention for future sell at higher prices) shows a steep rise with corresponding rise in farm-size. In particular, while the marginal farms are found to retain about 21 quintals of paddy on an average; that for the medium farms stands about 7 times more at 138 quintals. In turn, this indicates that smaller farms, even under multiple cropping systems, find it difficult to retain stocks for future consumption or sell, whatever the purpose may be.

Second, in case of average quantity retained for seed, feed and other purposes, we observed a similar pattern, except for retention for feed by the medium farms. The exception is understandable here as it was observed earlier that the medium farms somehow maintain a comparatively lower

number of livestock as compared to the semi-medium farms, which may be due to increasing mechanization of farming practice with increase in farm-size (refer to table on livestock ownership by farms). In all other instances, retention for seed, feed and other purposes steadily increase with increase in farm-size.

Third, in case of net payments in kind (which *equals* lease income *less* lease payment *less* wage payments in kind in all seasons combined), it is also observed that average quantity of net payments in kind tends to increase with increase in farm-size. This reflects, as mentioned earlier, that in these prosperous paddy growing belts in West Bengal, we observed a tendency for the larger farms to lease-in land for cultivation (refer to table showing lease-in and lease-out of land). This directly increases the payments in kind as they have to pay wages partly in kind as also pay the fixed rental in kind to the lessor farms.

Fourth, these facts and findings mentioned above in turn affect the total retention pattern for the farmers, which also exhibit a direct relationship with farm-size.

Lastly, in case of purchase of rice from the market, we observe also an increasing trend with increase in farm-size. This may be particularly due to the fact that average family size of the larger are found to be greater than the smaller farms (refer table on general household characteristics). In fact, as has been mentioned earlier, in a highly marginalized agriculture like in West Bengal, larger farms are often owned by joined-families; which in turn increases the number of members per farm household. The smaller farms are mostly nuclear families with small land holdings and lower number of members per farm household. This in effect increases the consumption of rice for the larger farms as seen here.

Table 4.4.3: Crop Retention Pattern

Farm Size	Self-consumption			Seed (2)	Feed (3)	Others (4)	Net Payments in kind*	Total retention (1+2+3+4)
	Retention (1)	Purchased#					Qty	
		Qty	Price					
Marginal	2569.17 (20.72)	317.85 (2.56)	2039.72	25.13 (.20)	46.30 (.37)	55.41 (.45)	138.8 (1.12)	2696.01 (21.74)
Small	4534.60 (46.75)	338.75 (3.49)	1999.73	43.20 (.45)	86.00 (.89)	50.40 (.52)	364.4 (3.76)	4714.20 (48.60)
Semi-Medium	6078.81 (93.52)	337.90 (5.20)	2151.24	44.00 (.68)	67.55 (1.04)	49.00 (.75)	455.6 (7.01)	6239.36 (95.99)
Medium	4405.50 (137.67)	236.40 (7.39)	2126.78	42.80 (1.34)	29.50 (.92)	34.30 (1.07)	665.8 (20.81)	4512.10 (141.00)
All Farms	17588.08 (55.31)	1230.90 (3.87)	2069.09	155.13 (.49)	229.35 (.72)	189.11 (.59)	1624.6 (5.11)	18161.67 (57.11)

Figures in parenthesis indicate averages
** equals lease income less lease payment less wage payments in kind (all seasons combined)*
 # quantity and price of rice
Source: Field Survey

However, a distribution of proportionate allocation of total retention further shows that while retention for self-consumption proportionately increase with increase in farm-size, that for animal feed and other purposes exhibit a declining pattern. Retention for seed does not show any systematic pattern with farm-size.

Table 4.4.3 (a): Percentage Distribution of Crop Retention Pattern

Farm Size-Category	Retention for Self-consumption (1)	Seed (2)	Feed (3)	Others (4)	Total retention (1+2+3+4)
Marginal	95.30	0.93	1.72	2.06	100.00
Small	96.19	0.92	1.82	1.07	100.00
Semi-Medium	97.43	0.71	1.08	0.79	100.00
Medium	97.64	0.95	0.65	0.76	100.00
All Farms	96.84	0.85	1.26	1.04	100.00

Source: Field Survey

It should be noted here that these observation are true for the selected regions practicing multiple cropping system, producing paddy consistently twice-a-year under irrigated agriculture. The retention pattern may dramatically change in case of places where paddy is cultivated only once in a year. This is particularly because of the fact that the farms under single cropping system have to depend entirely upon the output produced in kharif under rain-fed conditions. As such they are hardly able to maintain a stock or retain parts of their produce for future sell or consumption.

Hence, we should be very cautious in attempting any generalization of the findings regarding retention pattern of paddy for West Bengal state as a whole. Rather, we should at most generalize these findings only for irrigated multi-cropped tracts in West Bengal.

4.4.4: ESTIMATES OF MARKETED SURPLUS

The estimation of marketed as well as marketable surplus heavily relies on the computational specifications adopted for calculating them. Hence, before proceeding to estimate marketed surplus, we need to clearly specify the concept of marketed surplus here.

'Marketed Surplus' is a practical concept and refers to that part of the marketable surplus which is marketed by producer. In particular, 'Marketed Surplus', is objective, because it refers specifically to the marketed amount i.e. to the actual quantity which enters the market.

Marketed Surplus is derived from the formula:

MS = A-B

Here A is net availability (consisting of previous year's carry over stock and current production); and B is total amount sold in the market.

Table 4.4.4: Estimates of Marketed Surplus Ratio

Farm Size	Birbhum	Burdwan	Murshidabad	All Districts
Marginal	35.22 (36.81)	49.63 (54.11)	46.70 (48.01)	44.15 (46.59)
Small	56.41 (61.77)	59.22 (66.93)	60.61 (67.26)	58.66 (65.18)
Semi-Medium	67.25 (80.13)	59.52 (71.12)	69.02 (72.50)	64.77 (74.55)
Medium	85.04 (91.27)	63.32 (76.80)	71.20 (72.46)	69.12 (78.56)
All Farms	52.50 (58.13)	56.54 (64.90)	56.68 (60.05)	55.30 (61.19)

Note: Figures in parenthesis indicate Marketed Surplus Ratio with respect to Current Production
Source: Field Survey

Our estimates of marketed surplus reveal that the marketed surplus ratio tends to increase steadily with increase in farm-size across all selected districts. Taking all districts together, it is observed that marketed surplus ratio for the marginal farms stands at 44.15% of net availability of paddy, which for the small, semi-medium and medium farms stand at 58.66%, 64.77% and 69.12% respectively. As proportion to current production, the marketed surplus ratio for the marginal farms turn out to be 46.59%, which for the small, semi-medium and medium farms are found to be 65.18%, 74.55% and 78.56% respectively. Average marketed surplus ratio, taking all farms together, stands at 55.30% of net availability of paddy or 61.19% of current production of paddy. There are, however, considerable differences in the estimates marketable surplus ratio among the districts. In fact, the difference between average marketed surplus ratios among the size classes is more prominent in district Birbhum, followed by district Murshidabad and Burdwan. In district Birbhum, the marketed surplus ratio for the marginal farms turns out to be as low as 35.22% of net availability of paddy (36.81% of current production), which for the medium farms stands at as high as 85.07% of net availability (91.27% of current production).

4.4.5: ESTIMATES OF MARKETABLE SURPLUS

In contrast to 'marketed surplus', the concept of 'Marketable Surplus' is a theoretical concept which represents the surplus which the farmer/producer has available with himself for disposal once the genuine requirements of the farmer for family consumption, payment of wages in kind, feed, seed and wastages have been met. The concept of 'Marketable Surplus' is subjective because the feature of retention of the farmer is a matter of subjective guess.

Marketable Surplus is derived from the formula:

MS = A-B

Where A is net availability (consisting of previous year's carry over stock and current production); and B is total retention, plus total purchases and total losses at farm level or producer level.

In particular, B – stands for the following items in the same year;

i) Consumption by the farm family,
ii) Consumption by permanent labour engaged on the farm,
iii) Consumption by the temporary labour occasionally employed on the farm,
iv) Quantity retained for seed,
v) Quantity retained as feed for farm animals,
vi) Quantity retained for barter and other purposes
vii) Payments in kind:
    a) To permanent labour
    b) To temporary labour
    c) For machinery and equipment
    d) For customary payments,
    e) To land owners as rent
    f) To land owners as share of produce,
    g) For re-payment of loan
    h) Land revenue
    i) Irrigation charges and
    j) Others
viii) Physical losses:
    a) In harvesting, threshing and winnowing
    b) In transport from threshing floor to storage, and from storage to market place
    c) In storage at producer's level

However, the term "consumption by the farm family" of the cultivator households has two distinct connotations in so far as it impact on Marketable Surplus is concerned. In one case refers to the quantity actually retained for consumption by the family irrespective of the actual total requirements for the purpose. Another connotation refers to the quantity that ought to be retained by the farm family for its consumption or the quantity required for consumption.

In case of marginal and small farmers the quantity actually retained is usually less than the quantity actually requited for consumption owing to the compulsions or constraints of the size of holding and production. They are, therefore, required to buy back quantities by which they fall short of their consumption requirements. They may make up the deficit with the help of borrowings, wages or gifts, etc. In any case they buy back some quantities from the total stocks, which move out of the farm. The term family consumption, in case of such farmers, therefore, denotes the quantity that ought to be retained by a farm family for its consumption requirements for the whole year. The use of term " Surplus" would thus be justified only if the

quantity actually required for consumption, rather than the quantity actually retained for consumption is taken into account for arriving at the quantity of marketable surplus actually available for non- farm consumption. In case the quantity actually retained for consumption (and not the quantity actually required for consumption) is taken into account, the quantity of marketable surplus gets unduly inflated, because the quantity sold not include the buy backs by the producers. Hence, instead of quantity retained for family consumption, the quantity required for consumption is taken into consideration for calculation of marketable surplus. The quantity required for family consumption has been calculated by adding the "Quantity retained for family consumption + Quantity purchased for family consumption + Total receipts in kind for family consumption".

The marketable surplus will thus be according to the formula:

A – B = MS

Where a stands for production, and B includes all the items mentioned earlier except that "quantity required for consumption" has been treated to include the quantity required for *"family consumption"* as explained above and MS stand for *"marketable surplus"*. This quantity is actually available for non-farm consumption and is, therefore, true marketable surplus.

Table 4.4.5: Estimates of Marketable Surplus

Farm Size	Birbhum	Burdwan	Murshidabad	All Districts
Marginal	9.05 (5.04)	31.86 (25.81)	29.22 (27.76)	23.91 (20.15)
Small	46.61 (39.52)	51.55 (38.72)	52.39 (47.37)	50.05 (41.86)
Semi-Medium	61.40 (52.67)	55.35 (35.66)	64.60 (60.12)	59.96 (48.19)
Medium	81.33 (79.19)	60.22 (50.11)	68.71 (66.59)	66.04 (59.17)
All Farms	37.76 (31.77)	46.79 (35.33)	45.44 (42.29)	43.49 (36.43)

Note: Figures in parenthesis indicate Marketable Surplus Ratio with respect to Current Production
Source: Field Survey

Under such circumstances, our estimates of marketable surplus reveals that taking all farms together, the marketable surplus ratio stands at 43.49% of net availability of paddy. As ratio to current production, the marketable surplus ratio comes down further to 36.43%. Just as in case of marketed surplus, the estimates of marketable surplus also tend to increase sharply over in crease in size classes. In particular, the marketable surplus ratio for the marginal farms is estimated at 23.91% of net availability, which for the small, semi-medium and medium farms turn out to be 50.05%, 59.96% and 66.04% respectively. As ratio to current production, the marketable surplus ratio for the marginal farms stands at 20.15% of current production, which for the small, semi-medium and medium farms turn out to be 41.86%, 48.19% and

59.17% respectively. However, there are obvious differences in the estimates of marketable surplus for the size classes across the districts. In particular, the size-wise variation of marketable surplus ratio is more pronouncing in Birbhum district, followed by Murshidabad and Burdwan districts. It is interesting to find that in Birbhum district, the marketable surplus ratio for the marginal farms turns out to be as low as 9.05% of net availability (or 5.04% of current production), which for the medium farms stands at 81.33% of net availability (or 79.19%) of current production.

Comparing the estimates marketable surplus ratio with marketed surplus ratio we find that taking all farms together the average marketable surplus ratio is lower than the average marketed surplus ratio by a good margin, which indicate towards a gross picture of distress sale in case of West Bengal agriculture. In particular, the difference between marketed and marketable surplus ratio stands at about 12% in terms of net availability of paddy or at 25% of current production. At the same time it should be noted here that as ratio to net availability of paddy the difference between the estimates of marketed and marketable surplus ratios is more pronounced among the smaller size-classes, which in turn indicate a higher degree and occurrence of distress sell among the smaller farms in West Bengal.

4.4.6: FACTORS AFFECTING MARKETED SURPLUS RATIO

In this section an attempt has been made to determine the factors that influence the decision of the farm households regarding amount of paddy output to be marketed. This has been done by carrying out a simple regression analysis by treating the ratio of marketed surplus to total quantity produced as the dependent variable, while considering different socio-economic, economic, institutional and technological factors as independent variables affecting ratio of marketed surplus of individual farm households. In particular we may state our simple model as-

MS (Y) = f [farm-size (X_1), age of the decision maker (X_2), education of the decision maker (X_3), household size (X_4), income from non-farm sources *(X_5), gross cropped area (X_6), intensity of cropping (X_7), average price received (X_8), dummy for pucca storage (X_9), dummy for access to credit (X_{10}), dummy for indebtedness of farms (X_{11})]*

Here, the independent variable Y is the Marketed Surplus Ratio (in percentages) of individual farms, and the independent variables are as stated. It should be noted here that the dummy variable for storage type (X_9) assumes the value 1 if the storage type is *pucca* storage, else assumes the value of 0. Likewise, the dummy variable for access to credit assumes the value 1 if the farm has access to credit from any of the sources of credit, else assigned 0. Similarly, the dummy variable for state of indebtedness of farm households assumes the value 1, if the farms are have outstanding loan against them from

any source; else assumes the value 0. It should be noted here that as some of the farm households do not actually market their product (the entire product is retained for home consumption), we have intentionally left them out from our exercise. In particular, out of the total of 318 farm households covered under the study, here we consider 289 farm households who have marketed at least some part of their product.

The result of the regression exercise stated above is presented here in the following table. From the results of our regression exercise reveals that the model developed by us fits to our data only moderately, as the value of R is just about .60. At the same time, the model only partially explains variations in the dependent variable as caused by independent variables considered in the model (as revealed by poor R^2 value).

Nevertheless, considering the model as a moderate fit for raw field level agricultural data, some important results come out. The exercise reveals that farm-size has a significant positive effect on marketed surplus ratio, which means that higher the size of farms, the higher is the proportion of paddy output marketed, which might result from greater economic power for the larger farms. Similarly, average price received also shows a significant positive relationship with marketed surplus ratio, which means that higher realization of higher price for the farms, ceteris paribus, induces them to sell proportionate higher amounts of paddy in the market. Other factors which positively influence marketed surplus ratio include dummy for pucca storage of farms and dummy for access to credit. In fact, those farms with pucca storages hold back their stock mainly for selling at higher prices in future, which in turn is reflected in a significant positive relationship with marketed surplus ratio. Similarly, the farms accessing credit are mostly able to hold back their stock in speculation of higher prices. As such they are often in a position to sell proportionately higher amounts of paddy.

On the other hand, it is important to note that household size shows a significant negative relationship with marketed surplus ratio. This is particularly because of the fact that a larger household size denotes more mouths to feed, which is often met by higher retention of output, which in turn negatively impacts the ratio of marketed surplus. Again, it is interesting to find out that indebtedness of farmer households also exerts negative impact on marketed surplus ratio. In fact, farms which are already indebted with outstanding loans against them prefer to meet their consumption demand first by retaining a proportionately larger amount of paddy. This in turn has been reflected in a significant negative relationship between state of indebtedness of farmer households and marketed surplus of paddy.

Other factors like age of the decision maker, education of the decision maker, income from non-farm sources, gross cropped area and intensity of cropping do not reveal any statistically significant relationship with marketed surplus ratio in the model specified by us.

Table 4.4.6: Multiple Regression Estimate: Exercise 1

Dependent Variable: Marketed Surplus Ratio (Y)
R: .595
R^2: .354
Adjusted R^2: .328
Degrees of Freedom: 288

Independent Variables:	B	SE of B	t_statistic
Constant	-11.061	19.073	-0.580
Farm-size (X_1)	9.514	4.395	2.164*
Age of the Decision Maker (X_2)	-0.112	0.127	-0.882
Education of the Decision Maker (X_3)	-0.131	0.385	-0.340
Household Size (X_4)	-1.480	0.412	-3.596***
Income from Non-farm Sources (X_5)	0.000	0.000	1.611
Gross Cropped Area (X_6)	-1.675	2.391	-0.700
Intensity of Cropping (X_7)	0.096	0.054	1.784
Average Price Received (X_8)	0.041	0.016	2.565*
Dummy for Pucca Storage (X_9)	20.655	3.661	5.642***
Dummy for Access to Credit (X_{10})	20.939	3.914	5.350***
Dummy for Indebtedness of Farms (X_{11})	-13.507	3.905	-3.459***

, ** and * denote significant at .05, .01 and .001 levels*
Source: Computed with Field Survey Data by SPSS Software

4.4.7: FACTORS AFFECTING MARKETABLE SURPLUS RATIO

Apart from factors influencing marketed surplus ratio for the farms, an attempt has been made here to identify factors exerting influence on marketable surplus ratio of the farms. Here, we construct the model just as in case of exercise 1, but we treat marketable surplus ratio as the independent variable. As such, we treat all 318 farm households covered under the survey as out sample pool. In particular, we may state the model as -

MS (Y) = f [farm-size (X_1), age of the decision maker (X_2), education of the decision maker (X_3), household size (X_4), income from non-farm sources *(X_5), gross cropped area (X_6), intensity of cropping (X_7), average price received (X_8), dummy for pucca storage (X_9), dummy for access to credit (X_{10}), dummy for indebtedness of farms (X_{11})]*

Here, MS (Y) is the marketable surplus ratio (%) of individual farm households. The independent variables are the same as considered in our preceding regression exercise. Hence, what we try to explain here is the factors that determine the ratio of marketable surplus. The results of the regression analysis have been presented here as follows:

Table 4.4.7: Multiple Regression Estimate: Exercise 2

Dependent Variable: Marketable Surplus Ratio (Y)
R: .598
R^2: .357
Adjusted R^2: .334
Degrees of Freedom: 317

Independent Variables:	B	SE of B	t_statistic
Constant	-46.282	21.792	-2.124*
Farm-size (X_1)	14.149	4.983	2.839**
Age of the Decision Maker (X_2)	0.039	0.142	0.277
Education of the Decision Maker (X_3)	-0.116	0.448	-0.258
Household Size (X_4)	-1.221	0.486	-2.514*
Income from Non-farm Sources (X_5)	0.000	0.000	1.152
Gross Cropped Area (X_6)	-3.881	2.722	-1.426
Intensity of Cropping (X_7)	0.158	0.060	2.627**
Average Price Received (X_8)	0.046	0.019	2.435*
Dummy for Pucca Storage (X_9)	26.548	4.330	6.131***
Dummy for Access to Credit (X_{10})	26.360	4.551	5.792***
Dummy for Indebtedness of Farms (X_{11})	-16.253	4.569	-3.557***

, ** and * denote significant at .05, .01 and .001 levels*
Source: Computed with Field Survey Data by SPSS Software

In this exercise too, the model appears to be moderately fit (R=.598) with comparatively poor values of R^2 (R^2= .357). However, we accept our model as largely fit, as the regression exercise is carried out on raw field level data.

In this exrecise too, it comes out that farm size has a significant positive influence on marketable surplus ratio for the farms, indicating that the larger farms sell proportionate a larger amount of paddy produced. At the same time, factots like average price received by the farms also shows a significant positive relationship with marketable surplus ratio. As before, factors like access to credit and possession of pucca storage facilities appear to have a significant positive relationship with marketable surplus ratio. It further comes out that intensity of cropping also exibits a statistically significant direct relationship with marketable surplus ratio. This is due to the fact that higher cropping intensity in turn means a higher total output. Now as farm retention for self-consumption remains unchanged, a higher total output through multiple cropping in turn results in a higher marketable surplus ratio.

Here also, the coefficients of household size exibit a significant negative relationship with marketable surplus ratio. This results from the fact that a higher household size means larger number of mouths to feed, which in turn requires a higher amount of paddy output to be retained for self-consumption. This in effect results in a proportionately lower marketable surplus ratio. Again, indebtedness of farm households also shows a negative relationship with marketable surplus ratio, which implies that if the farms are

indebted in nature, they have little marketable surplus left to repay loans after retention for self-consumption.

However, in our model, other factors like age of the decision maker, education of the decision maker, income from non-farm sources and gross cropped area do not reveal any statistically significant relationship with marketable surplus ratio.

4.5: INSTITUTIONS, TECHNOLOGY AND INFRASTRUCTURE CHARACTERISTICS

4.5.1: STORAGE CHARACTERISTICS

During the course of the survey, it was observed that among all 318 farms surveyed, only one farm (belonging to semi-medium size-class) has received subsidy for creation of storage facilities. No other farm has received any subsidy for storage creation/maintenance/up-gradation from either the central or state government. In fact, it was beyond the perception of the farmers that such schemes/programs have been taken up by the government. Even the sole farm who received subsidy considered the amount of subsidy to be inadequate for creation of *pucca* storage facility.

Table 4.5.1: Storage Characteristics

Farm Size	Subsidy Received (% of Farms)	Weighted Average Subsidy in Rs.	Storage Facility Perceived Adequate (%)	Additional Storage to be created	
				Yes (%)	No (%)
Marginal	-	-	52.42	41.13	58.87
Small	-	-	50.52	49.48	50.52
Semi-Medium	1.54	4000.00	61.54	38.46	61.54
Medium	-	-	50.00	50.00	50.00
All Farms	-	-	53.46	44.03	55.97

Source: Field Survey

In case of farmers' perception regarding adequacy of existing storage facilities at their farm, the farmers are clearly divided in their opinion. While 53% perceived existing storage facilities to be adequate, rest 47% complained about inadequacy of storage facilities. However, when asked about the possibilities of creating additional storage facilities, about 56% of farms expresses that they do not wish to create additional storage.

It should be noted here that most of the farms surveyed has *kutcha* storage facilities, which are created on a year to year basis depending upon the quantity of paddy to be stored. Locally these *kutcha* storages are known as '*morai*', which is made of paddy straw and bamboo. Except for the farms with *pucca*, or *semi-pucca* storages, the farms with *kutcha* storages mostly do not wish to expand their capacity. To them, creating additional storage without

adequate paddy to store is not an economically viable proposition. In turn, it may further increase storage losses if empty spaces are left over in such *kutcha* storages due to moisture or pests.

4.5.2: SALE IN MARKET

In case of sale of paddy output in the market, the study observes that none of the farms sold their output in regulated market, while 100% paddy output has been marketed in unregulated markets. In fact, in the absence of regulated market yards in the periphery of villages, it has become a common practice in West Bengal to market paddy output mostly at the village-level, where middlemen like '*arotdars*', viz. petty traders of paddy, dominate the market. As such it is not surprising to find that all paddy output by all size-classes has been sold in the primary market, and not in the secondary market.

Table 4.5.2: Sale in Market

Farm Size	Sale Pattern by Nature of Market: Percentage Distribution							
	Regulated		Unregulated		Primary		Secondary	
	Qty. (%)	Avg. Distance (km)	Qty. (%)	Avg. Distance (km)	Qty. (%)	Avg. Distance (km)	Qty. (%)	Avg. Distance (km)
Marginal	0.00	0.00	100.00	1.50	100.00	1.50	0.00	0.00
Small	0.00	0.00	100.00	2.02	100.00	2.02	0.00	0.00
Semi-Medium	0.00	0.00	100.00	1.95	100.00	1.95	0.00	0.00
Medium	0.00	0.00	100.00	2.38	100.00	2.38	0.00	0.00
All Farms	0.00	0.00	100.00	1.84	100.00	1.84	0.00	0.00

Source: Field Survey

Though it is beyond the scope of the present study, but for the sake of greater comprehension, it must be mentioned in this context that paddy market in West Bengal is largely dominated by these 'arotdars' who act as middlemen between the rice mills and actual producers in the rural grain market. Such traders are largely monopsonistic in nature, and control over two to three villages at most. Often, multiple traders are present in some villages. To control over the output of the farmers, these traders are often found to extend 'interest-free' loan advances to farms (both crop loan and consumption loan) under the implicit contract of repaying the loan in paddy output immediately in the post-harvest period. This, while ensuring control over paddy output, also generates profit as the repayment has to be made preferably in the immediate post-harvest period when prices are the lowest during the year. Even in some cases, these traders advance loans not only in the form of cash but also in the form of fertilizers under similar obligations from the side of the farmers. Is such case, farmers get doubly exploited as they have to pay a higher than market price for inputs like fertilizers while repaying in lower than market price of output.

4.5.3: DISTANCE AND TYPE OF MARKET

As has been mentioned earlier, marketing of paddy in West Bengal is mostly carried out at the village-level, particularly to the petty-traders. Only a few farms (either with good contacts to distant markets or with friends & relatives working in the distant market) opt for sale of produce in the distant markets. This survey also finds that only about 2.5% of farms sale in the distant markets for better price, while others sale in the local market or do not sale at all. In fact, while farms marketing their output consist of farms from all size-classes, the farmers who do not sale their output at all primarily consist of the smaller farms. In particular, the marginal farms have very little marketable surplus left over and above their consumption and retention needs, and hence a number of farms (about 17%) do not enter the grain market at all. The larger farms on the other hand are often found to held back stocks of paddy in expectation of higher price, which essentially is a voluntary detachment from the market.

Table 4.5.3: Distance and Type of Market

Factors	Size of Farm				
	Marginal	Small	Semi-Medium	Medium	All farms
Sale by Farms					
Not Sold (% of Farms)	16.94	4.12	4.62	3.13	9.12
Sale in Local Market (% of Farms)	82.26	92.78	92.31	90.63	88.36
Distant Market (% of Farms)	.81	3.09	3.08	6.25	2.52
Avg. Transport Cost (Rs/Qtl.)	7.33	8.20	8.95	8.25	8.29
Type of market					
Primary (% of Farms marketing)	100.00	100.00	100.00	100.00	100.00
Secondary (% of Farms marketing)	0.00	0.00	0.00	0.00	0.00
Regulated (% of Farms marketing)	0.00	0.00	0.00	0.00	0.00
Unregulated (% of Farms marketing)	100.00	100.00	100.00	100.00	100.00
Avg. Distance to market*					
Avg. Distance with Pucca Road	.90	1.02	1.13	1.61	1.05
Avg. Distance with Kutcha Road	.61	1.01	.82	.77	.79
Avg. Total Distance	1.50	2.02	1.95	2.38	1.84

**Most farms are connected to the market partly by Pucca & Katcha Road*
Source: Field Survey

Under such circumstances, though the larger farms have sufficient marketable surplus over and above their requirements, they intentionally maintain small buffer stocks in expectation of better price in future. As our primary survey reveals, such farms (not marketing their produce even if they have sufficient marketable surplus) belonging to higher size-classes constitute less than 5% of their respective size-classes. However, on the whole, most of the farms (more than 88%) have to sale their output at least partly to meet various obligations, including payment of inputs, daily expenditure, etc. As has been mentioned earlier, it was found that all farm who sale their output

necessarily opt for unregulated primary markets for sale. Even if some farms are found to sale their produce directly to the rice mills, but such transactions do not happen under a regulated framework of markets for agricultural output.

These facts are clearly reflected in the figures indicating average distance to market, which is below 2 kilometers on an average. It should also be observed here that average distance to market tends to increase with increase in farm-size, which reflects that the smaller farms prefer not to complicate their sale of very little surplus to a distant place; and mostly opt for the nearest paddy dealers or 'arotdars'.

4.5.4: CHARACTERISTICS OF STORAGE/WAREHOUSE

It is extremely disturbing to find during the study that there has been an acute scarcity of institutional storage facilities of warehouses in rural West Bengal, even in the most fertile paddy belts. In particular, none of the farmers surveyed under the present study access to institutional storage facilities. Though it is beyond the scope of the present study, it must be mentioned here that the surveyors have not come across any institutional storage or warehouse in the vicinity of the villages, and not even in the nearest towns. However, there are some cold storages in the nearby areas which primarily store vegetables, while paddy is mostly stored at producers' level.

Table 4.5.4: Characteristics of Storage/Warehouse

Characteristics Available	Size of Farms				
	Marginal	Small	Semi-Medium	Medium	All farms
Availability of Storage/Warehouse (%)	0.00	0.00	0.00	0.00	0.00
Agency					
a. Govt.	-	-	-	-	-
b. Pvt.	-	-	-	-	-
c. Cooperative	-	-	-	-	-
Adequate Storage Facility (%)	-	-	-	-	-
Quality of Storage (%)	-	-	-	-	-
Cost of Storage (Rs/Qtl.)	-	-	-	-	-
Awareness of Warehouse Receipt Program (%)	0.00	0.00	0.00	0.00	0.00

Source: Field Survey

4.5.5: POLICY AWARENESS

In case of awareness regarding various state and central policies, it has been observed that while more than 92% farms are aware of the MSP, none is aware of Futures Trading, not to speak of its use and benefits. It is quite surprising also to find that a few do not even know the MSP policy, and

blindly follows the price dictated by the village-level traders. In fact, though the farmers know about MSP, it hardly matters to them as the price they receive is much below the stipulated MSP. It is only during the year 2011-12 that the Govt. of West Bengal decided to intervene in the rural grain market to secure MSP, though the success of such an effort remains highly questionable.

Table 4.5.5: Policy Awareness

Policy	Size of Farms				
	Marginal	Small	Semi-Medium	Medium	All farms
Aware of MSP (%)	86.29	95.88	98.46	90.63	92.14
Aware of Futures Trading (%)	0.00	0.00	0.00	0.00	0.00
Used Futures (%)	-	-	-	-	-
Futures Helped in Price Risk Management (%)	-	-	-	-	-
Sale Possibilities (Qs.10 in Questionnaire.)					
Yes (%)	67.74	84.54	80.00	87.50	77.36
If Yes, Source					
a. Less Retention for seed and feed.	23.81	25.61	36.54	42.86	29.27
b.Less Retention for self consumption.	76.19	74.39	63.46	57.14	70.73
c.Change in Consumption Pattern	-	-	-	-	-

Source: Field Survey

When asked about further sale possibilities, it is interesting to observe that more than 77% of the farmers answered affirmatively, i.e. they wish to sell more if remunerative prices are received. Naturally, while such affirmative answers are proportionately lower from the smaller size-classes (mostly subsistence farms), such answers are higher from the larger size-classes with greater amount of marketable surplus at their disposal. Among the alternatives available for accommodating additional sale from their existing production, none of the farmers opted to make changes in their consumption pattern by consuming less amounts of paddy/rice. Rather the farms mostly opted for less retention for self consumption, as that requirement can also be sufficed by purchasing rice directly from the market. Again, among the size-classes, such an option to opt for less retention of paddy for self consumption is mostly found in case of the smaller farms as compared to their larger counterparts. This might be owing to taste preferences by the larger farms against cash preference by the smaller farms, though such derivatives need confirmation based on detailed studies on the subject.

4.5.6: SOURCE & PURPOSE OF CREDIT

There is no denying the fact that credit serves as a crucial input in agriculture, as it provides farmers with requisite control over other inputs of production, and hence the production process. In our study, within its limited scope, we

therefore has made an attempt to identify the extent to which credit is available to the farmers belonging to various size-classes. It is observed that on the whole, more than 58% of farms are loan takers, even in the highly productive paddy belts in West Bengal. A size-class-wise distribution further shows that access to credit tends to increase with increase in size, i.e. with higher investment requirements for larger farm operations.

Now, a source-wise distribution of credit reveals that the major source of credit (for about a third of those who accesses various credit sources) has been the commercial banks and the cooperative societies, followed by non-institutional sources like friends & relatives, traders and private money lenders. Thus as compared to other parts of West Bengal, it is highly appreciable that in these parts of the state the institutional credit agencies can be seen to play a dominant role in providing farmers with credit. A purpose-wise distribution of loans taken shows that while most of the loans are crop-loans, none of them are meant for pure consumption. Only a fraction of these loans are taken for investment purposes, while the rest are crop-loans. It is also interesting to note here that among the farms accessing institutional credit, more than one-thirds complained about difficulties in getting loan from banks. Such difficulties, as it appears, remains largely size-neutral in the sense that a good proportion of all size-classes concerned confront problems in getting loan from banks.

Table 4.5.6: Source & Purpose of Credit

Factors	Size of Farms				
	Marginal	Small	Semi-Medium	Medium	All farms
Access to Credit (%)	49.19	60.82	67.69	68.75	58.49
Source (% of those accessed)					
Private money lender	13.11	10.17	4.55	0.00	8.60
Commission Agent / Trader	13.11	10.17	13.64	4.55	11.29
Relatives and Friends	22.95	6.78	6.82	9.09	12.37
Commercial Bank	13.11	38.98	40.91	59.09	33.33
Miller	4.92	1.69	0.00	0.00	2.15
Co-operative Society	32.79	32.20	34.09	27.27	32.26
Others	0.00	0.00	0.00	0.00	0.00
Purpose (% of those accessed)					
Crop loan	95.08	100.00	97.73	95.45	97.31
Investment-loan	4.92	0.00	2.27	4.55	2.69
Consumption	0.00	0.00	0.00	0.00	0.00
Credit Amount (Avg.)	5733.87	14101.03	22384.62	39968.75	15134.59
Total Outstanding (Avg.)	3087.90	7880.41	8007.69	20343.75	7291.82
Problem in getting loan from bank (yes % of those accessed)	37.70	23.73	45.45	31.82	34.41
Have Kisan Credit Card (%)	11.29	27.84	30.77	37.50	22.96
If yes, Limit of KCC (Avg.)	28928.57	30592.59	41000.00	65000.00	38780.82

Source: Field Survey

Lastly, it was observed that about 23% of farms have Kishan Credit Card (KCC). In fact in case of distribution of KCC cards among size-classes, it can be observed that enrolment with KCC cards increase directly with an increase in farm-size. This however points out to the fact that the poorer farms are still further from the reach of formal credit institutions, as compared to their larger counterparts. This also holds true when we compare average KCC limit among the size-classes, which also exhibit an increasing pattern with increasing size, i.e. with higher collateral security to offer and lesser risk of default.

4.5.7: CONTRACT FARMING

During the field survey for the present study, it was observed that contract farming as such has not penetrated in these paddy growing regions in West Bengal. Though there are reports of contract farming being introduced in some other parts of West Bengal, but the contracts are confined mostly to the cultivation of vegetables and fruits. In certain cases, various seed companies also go into contract with farmers to grow seeds for them following scientific cultivation techniques; but the present study does not confront such contracting farms during the survey.

Table 4.5.7: Contract Farming

Factors	Size of Farms				
	Marginal	Small	Semi-Medium	Medium	All farms
Use %	0.00	0.00	0.00	0.00	0.00
Crop name	-	-	-	-	-
Beneficial (%)	-	-	-	-	-
Benefits	1. - 2. - 3. - 4. -				

Source: Field Survey

4.5.8: SOURCES OF PRICE INFORMATION

Source of price information in rural economy is vital in the sense that it helps provide necessary information to the farmers in making decisions regarding marketing of their output. In fact, there has been a huge volume of literature, both Marxists and Neoclassicist, dedicated in explaining role of information in alienation or appropriation of surplus away from the actual producers. However, in its limited scope, tries to identify the sources of price information for the farmers in the study region.

Table 4.5.8: Sources of Price Information

Source (%)	Size of Farms				
	Marginal	Small	Semi-Medium	Medium	All farms
Trader	61.29	55.67	55.38	62.50	58.49
Print media	-	-	-	-	-
Radio	-	-	-	-	-
APMC Mandi	-	-	-	-	-
Telephone	-	-	-	-	-
Visit to Market	11.29	17.53	21.54	9.38	15.09
Buyers in Village	-	-	-	-	-
Cooperative Society	13.71	13.40	18.46	18.75	15.09
Others (Fellow Farmers)	13.71	13.40	4.62	9.38	11.32

Source: Field Survey

It is extremely disturbing to note here that the study finds that village-level petty traders play a dominant role in providing price information of paddy for the farmers. This is followed by information from personal visit to market places by the farmers themselves and fellow farmers, where they again obtain information derived mostly from the private traders. In fact, the role of institutional sources and media is extremely confined in such rural setup, as only a few farmers receive price information from cooperative societies.

This no doubt corroborates to our earlier findings that rural grain markets in West Bengal is still dominated by private players (viz. petty village-level paddy traders), who act as major source of price information for the farmers. The impact of such a monopsonistic grain market on grain price under the control of private traders is thus not very difficult to imagine.

4.5.9: AREA COVERED UNDER IMPROVED SEEDS

Coverage of area under improved seeds purchased from the market (not homestead seeds) marks the adoption of modern cultivation practices to some extent. It is in this context that we see farms belonging to all size-classes opt for improved seeds directly purchased from the market in more than half of their operated land under paddy cultivation. In fact, the average coverage under improved seeds of paddy shows roughly an increasing pattern with increase in farm-size, indicating higher motivation for the larger farms in adopting modern cultivation practices in the study region. It was learned during the survey that these farms in the most prosperous paddy cultivation belts in West Bengal do not rely on their homestead seeds, which, according to them, returns lower yield. Rather they opt for better quality seeds purchased directly from the market.

Table 4.5.9: Area Covered under Improved Seed (% to Total Area under Crop)

Name of Crop	Size of Farm				
	Marginal	Small	Semi-Medium	Medium	All farms
Rice	60.16	59.04	69.55	69.39	62.67
Wheat	33.33	18.84	-	26.67	24.42
Jowar	-	-	-	-	-
Bajra	-	-	-	-	-
Maize	-	-	-	-	-
Tur	-	-	-	-	-
Gram	-	-	-	-	-

Source: Field Survey

However, this is not true in case of wheat cultivation in the study region. In particular, we observe that area under improved seeds contribute to less than one-fourths of the area under wheat. Nevertheless, as area under wheat itself is too little for any meaningful analysis, the results for wheat do not carry much significance for the present study.

CHAPTER 5

SUMMARY, CONCLUDING OBSERVATIONS AND POLICY IMPLICATION

5.1: SUMMARY

The summary of major findings of the present study is briefly presented here as follows:

- ✓ *Average quantity of beginning stock tends to increase sharply with corresponding increase in farm-size – from a low of 2.72 qtl. for the marginal farms to as much as 63.97 qtl. for the medium farms.*
- ✓ *Average current production tends to increase with increase in farm-size – from 47.31 qtl. for the marginal farms to 490.55 qtl. for the medium farms.*
- ✓ *Average net availability of paddy also tends to increase with farm-size – which for the medium farms is more than 11 times than that of the marginal farms.*
- ✓ *In relation to net availability of paddy, about 61.81% of output has been marketed.*
- ✓ *Average marketed surplus ratio, taking all farms together, stands at 55.30% of net availability of paddy (or 61.19% of current production of paddy). In contrast, average marketable surplus ratio stands at 43.49% of net availability of paddy (or 36.43%of current production of paddy).*
- ✓ *Marketed surplus ratio for the marginal farms stands at 44.15% of net availability of paddy, which for the small, semi-medium and medium farms stand at 58.66%, 64.77% and 69.12% respectively. As proportion to current production, the marketed surplus ratio for the marginal farms turn out to be 46.59%, which for the small, semi-medium and medium farms are found to be 65.18%, 74.55% and 78.56% respectively.*
- ✓ *The marketed surplus ratio is found to be influenced positively by farm-size, average price received, access to credit and possessing permanent storage facilities, while it is negatively related to household size and indebtedness of farmer households.*
- ✓ *The marketable surplus ratio, too, is positively associated with farm-size, average price received, access to credit, cropping intensity and possessing permanent storage facilities, while it is negatively related to household size and indebtedness of farmer households.*
- ✓ *Marketable surplus ratio for the marginal farms is estimated at 23.91% of net availability, which for the small, semi-medium and medium farms turn out to be 50.05%, 59.96% and 66.04% respectively. As ratio to current production, the marketable surplus ratio for the marginal farms stands at 20.15% of*

current production, which for the small, semi-medium and medium farms turn out to be 41.86%, 48.19% and 59.17% respectively.

- ✓ *The peak months of marketing are December-January and May-June.*
- ✓ *Average distance of sale point remains less than 2 kilometers on an average.*
- ✓ *Paddy market is overwhelmingly dominated by the village-level petty traders with 68% share of total paddy output marketed.*
- ✓ *Average quantity of retention and retention for seed, feed and other purposes of paddy shows a steep rise with corresponding rise in farm-size.*
- ✓ *Total retention pattern for the farmers also exhibit a direct relationship with farm-size; from 21.74 qtl.. for the marginal farms to 141.00 qtl. for the medium farms.*
- ✓ *The estimated average crop loss during harvesting stands at 1.23% of production.*
- ✓ *Estimated average loss during threshing stands at 0.50% of production.*
- ✓ *Estimated loss during winnowing stands at 0.24% on an average.*
- ✓ *Estimated overall loss on farm during harvesting, threshing and winnowing activities stands at 1.97% or output produced.*
- ✓ *Average loss during transportation from field to threshing floor stands at 0.49%.*
- ✓ *In case of transport from floor to market, the estimated loss in paddy in relation to total production stands at .06%.*
- ✓ *The storage loss is estimated to be 0.74 percent of quantity stored.*
- ✓ *Estimated total post-harvest loss stands at 3.42% of current year production on an average; showing a decreasing trend over increase in farm-size.*

5.2: CONCLUDING OBSERVATIONS

The importance of precise estimation of marketed and marketable surplus has been felt in India in view of its crucial role in forming the economic database for formulation of economic policies/decisions by the government. As available data of marketable surplus has become obsolete, the present survey throws up information not only on marketable surplus ratios but also on variety of other crucial aspects like farm retention for family consumption, seed, feed and post-harvest crop losses at various stages of production. In particular, the main objectives of the present study are to estimate the marketable and marketed surplus of foodgrains and factors affecting marketed surplus of major foodgrains; and to complete the latest data on farm retention for consumption, seed, feed, wages and other payments in kind. At the same time, the present study attempts to estimate the post harvest losses at the producers' level. In broader terms, the study aims at providing reliable

estimates of marketed surplus, farm retention and post-harvest losses at producers' level for paddy in West Bengal.

After a detailed analysis of data by conducting primary survey of about 318 farm households in six eminent blocks from over three major paddy producing districts in West Bengal, the study makes a number of crucial observations. Based on those findings, here we try to arrive at the concluding observations carrying immense significance for the study as a whole. In particular, we may present these concluding observations as below:

AVAILABILITY OF PADDY

- The average quantity of beginning stock, average current production and net availability (previous stock + current production) of paddy output tend to increase sharply with corresponding increase in farm-size. In particular, average net availability of paddy for the medium farms is more than 11 times than that of the marginal farms. Hence, *the larger farms are in a much better position than the smaller farms in terms of net availability of paddy output for sale (or for consumption).*

SALE PATTERN OF PADDY

- In relation to net availability of paddy by all size-classes taken together, about 61.8% of output has been marketed. At the same time, proportion of output sold in relation to net availability at the aggregative level tends to increase sharply with increase in farm-size. That is, *the ratio of marketed output (marketed surplus) shows a direct relationship with farm-size*.
- The *peak months of marketing of paddy are December-January and May-June* and the average distance of *sale point for the size-classes remains less than 2 kilometers* on an average.
- Procurement or purchase of paddy output by the government agencies and private companies has been less than 1 percent of paddy output marketed, while *the paddy market comes out to be overwhelmingly dominated by the village-level petty traders and processing units/rice-mills*. In particular, more than 68% of total paddy output marketed has been sold to the traders at the village-level. It can also be observed that the *smaller farms sale proportionately higher portion of their marketed output to these traders*.

CROP RETENTION PATTERN

- Average quantity of retention of paddy (consisting of retention for consumption and/or retention for future sell at higher prices) shows a steep rise with corresponding rise in farm-size, indicating that *smaller*

farms, even under multiple cropping systems, find it difficult to retain stocks for future consumption or sell, whatever the purpose may be.

- At the same time, *retention for seed, feed and other purposes, net payments in kind and hence total retention of paddy steadily increase with increase in farm-size*, which holds for purchase of rice by the farms also.

CROP LOSSES ON FARM

- The estimated average crop loss during harvesting, on an average, stands at 1.23% of production. Size-class-wise estimates of loss shows that *there is an indication of declining proportion of crop lost during harvest over increase in size-classes*. Average *loss during threshing also declines steadily with increase in farm-size*, which stands at 0.50% of production on an average. At the same time, the estimated *loss during winnowing also tends to decline over the size-classes*, and stands at 0.24% on an average.
- On the whole it comes out that *overall loss on farm during harvesting, threshing and winnowing activities come out to be 1.97% or output produced, and tends to decline with increase in farm-size*.

CROP LOSSES DURING TRANSPORT

- In case of losses during transport it is observed that *average loss during transportation from field to threshing floor stands at 0.49% for all size-classes taken together, which steadily declines as we move to higher size-classes*. In particular, while crop lost during transport from field to threshing floor is estimated to be 0.53% for the marginal farms; that stands at 0.44% for the medium farms.
- At the same time, *in case of transport from floor to market, the estimated loss in paddy in relation to total production stands at .06%, which does not seem to vary among different size-classes*.

CROP LOSSES FROM STORAGE AT PRODUCERS' LEVEL

- There seems to be *a strong preference for kutcha storages even among the larger farms with adequate financial affordability*. In fact, it was revealed by the farmers that paddy as a crop is often stored better in *kutcha* storage with earthen walls and in spiraling straw-made walls with bamboo grids (traditionally known as '*gola*' and '*morai*' respectively); as loss due to loss of moisture as well as loss due to damp is simultaneously minimized in such storages.
- *The smaller farms are better in terms of capacity utilization than the larger ones*. In particular, as the smaller farms store paddy mostly in *kutcha* storage, their utilization of capacity is also high as compared to the larger farms.

- In case of storage loss, we see that *the larger farms are better off with lesser quantity lost during storage*. The storage loss is estimated to be 0.74 percent of quantity stored, which include carry over quantity of previous stocks in addition to present stock of current production.
- In case of average storage time, it is observed *that the smaller farms do not hold their stock for long periods as compared to the larger farms*. On average, it comes out that the farms store their paddy for about 76 days, i.e. for just over two-and-a-half months in particular.
- In case of storage costs, it is observed that *storage costs (rupees per month per farm) tend to increase sharply over corresponding increase in farm-size*. This is particularly because of the facts that the larger farms have to maintain a larger stock, which in turn involves greater costs.

MARKETED SURPLUS RATIO

- Marketed surplus ratio tends to increase steadily with increase in farm-size across all selected districts.
- Taking all districts together, it is observed that marketed surplus ratio for the marginal farms stands at 44.15% of net availability of paddy, which for the small, semi-medium and medium farms stand at 58.66%, 64.77% and 69.12% respectively.
- As proportion to current production, the marketed surplus ratio for the marginal farms turn out to be 46.59%, which for the small, semi-medium and medium farms are found to be 65.18%, 74.55% and 78.56% respectively.
- Average marketed surplus ratio, taking all farms together, stands at 55.30% of net availability of paddy or 61.19% of current production of paddy.

MARKETABLE SURPLUS RATIO

- Marketed surplus ratio also tends to increase sharply over in crease in size classes of farms.
- Marketable surplus ratio for the marginal farms is estimated at 23.91% of net availability, which for the small, semi-medium and medium farms turn out to be 50.05%, 59.96% and 66.04% respectively.
- As ratio to current production, the marketable surplus ratio for the marginal farms stands at 20.15% of current production, which for the small, semi-medium and medium farms turn out to be 41.86%, 48.19% and 59.17% respectively.
- Taking all farms together, the marketable surplus ratio stands at 43.49% of net availability of paddy. As ratio to current production, the marketable surplus ratio comes down further to 36.43%.

STORAGE CHARACTERISTICS

- It was observed that *among all 318 farms surveyed, only one farm (belonging to semi-medium size-class) has received subsidy for creation of storage facilities*. Even the single farm who received subsidy considered the amount of subsidy to be inadequate for creation of *pucca* storage facility.
- In case of farmers' perception regarding adequacy of existing storage facilities at their farm, *53% perceived existing storage facilities to be adequate*, rest 47% complained about inadequacy of storage facilities.
- However, when asked about the possibilities of creating additional storage facilities, *about 56% of farms expresses that they do not wish to create additional storage*.

SALE IN MARKET

- In case of sale of paddy output in the market, the study observes that *none of the farms sold their output in regulated or secondary market*, while 100% paddy output has been marketed in unregulated / primary markets.

DISTANCE AND TYPE OF MARKET

- *Only about 2.5% of farms sale in the distant markets for better price*, while others sale in the local market or do not sale at all. In particular, the marginal farms have very little marketable surplus left over and above their consumption and retention needs, and hence a number of farms (about 17%) do not enter the grain market at all. The larger farms on the other hand are often found to held back stocks of paddy in expectation of higher price, which essentially is a voluntary detachment from the market.
- Average distance to market is observed to be below 2 kilometers on an average. *The average distance to market tends to increase with increase in farm-size*, which reflects that the smaller farms prefer not to complicate their sale of very little surplus to a distant place; and mostly opt for the nearest paddy dealers or 'arotdars'.

CHARACTERISTICS OF STORAGE/WAREHOUSE

- It is extremely disturbing to find during the study that *none of the farmers surveyed under the present study access to institutional storage facilities*.

POLICY AWARENESS

- In case of awareness regarding various state and central policies, it has been observed that while *more than 92% farms are aware of the MSP, none is aware of Futures Trading*, not to speak of its use and benefits. It is quite surprising also to find that a few do not even know the MSP policy, and blindly follows the price dictated by the village-level traders. In fact, though the farmers know about MSP, it hardly matters to them as the price they receive is much below the stipulated MSP.
- When asked about further sale possibilities, it is interesting to observe that *more than 77% of the farmers wish to sell more if remunerative prices are received*. Among the alternatives available for accommodating additional sale from their existing production, *none of the farmers opted to make changes in their consumption pattern by consuming less amounts of paddy/rice*. Rather the farms mostly opted for less retention for self consumption, as that requirement can also be sufficed by purchasing rice directly from the market.

SOURCE & PURPOSE OF CREDIT

- The *major source of credit (for about a third of those who accesses various credit sources) has been the commercial banks and the cooperative societies, followed by non-institutional sources like friends & relatives, traders and private money lenders*.
- A purpose-wise distribution of loans taken shows that while *most of the loans are crop-loans, none of them are meant for pure consumption*. Only a fraction of these loans are taken for investment purposes, while the rest are crop-loans.
- It is also interesting to note here that *among the farms accessing institutional credit, more than one-thirds complained about difficulties in getting loan from banks*.
- It was observed that *about 23% of farms have Kishan Credit Card (KCC)*. In fact in case of distribution of KCC cards among size-classes, it can be observed that *enrolment with KCC cards increase directly with an increase in farm-size*.

CONTRACT FARMING

- *Contract farming as such has not penetrated in these paddy growing regions in West Bengal yet*. In certain cases, various seed companies also go into contract with farmers to grow seeds for them following scientific cultivation techniques; but the present study does not confront such contracting farms during the survey.

SOURCES OF PRICE INFORMATION

- It is extremely disturbing to note here that *the study finds that village-level petty traders play a dominant role in providing price information of paddy for the farmers*. This is followed by information from personal visit to market places by the farmers themselves and fellow farmers. The *role of institutional sources and media is extremely confined* in such rural setup, as only a few farmers receive price information from cooperative societies.

AREA COVERED UNDER IMPROVED SEEDS

- Farms belonging to all size-classes opt for improved seeds directly purchased from the market in more than half of their operated land under paddy cultivation. In fact, the *average coverage under improved seeds of paddy shows roughly an increasing pattern with increase in farm-size*, indicating higher motivation for the larger farms in adopting modern cultivation practices in the study region.

5.3: POLICY IMPLICATIONS

Based on the major findings of the present study, a few specific policy suggestions come up, which are briefly stated as below:

- Adequate measures should be adopted to further promote subsidized storage facilities at least at the Gram Panchayat level to make storage facilities available for the smaller farms also. This, if required, may be arranged through formation of storage and marketing cooperatives at the village-level to maximize the reach and coverage of such an attempt. [Attention: Dept. of Agriculture; G.o.I]
- There is an acute need to regularize rural grain market, particularly to free the market from the clutches of intermediaries like village-level petty traders. This, while assuring remunerative prices to the actual producer, may also allow the market to play freely with demand & supply situations in the larger markets. [Attention: Dept. of Marketing; Govt. of W.B.]
- For achieving a free-playing market where actual producers rein supreme, adequate policies should also be taken so as to bring the poorest of the farmers under agricultural credit net. This is particularly to free farmers from various market interlinkages that exist in rural credit and output markets. [Attention: Dept. of Agriculture; G.o.I]
- The government should step-up its efforts to impart scientific knowledge to the actual producers to reduce post-harvest losses at the farm level. Even if this results in a reduction of post-harvest loss by 0.01 percent points, it accumulates to thousands of tonnes of paddy output at the

aggregative level, while assuring greater return to the farmers at the individual level. [Attention: Dept. of Agriculture; Govt. of W.B.]

- In an attempt to promote dynamic outlook of the farmers toward adoption of modern cultivation practices, there is a felt need to further promote farmers' awareness regarding various government schemes and policies. This requires, except for a small budget, a great motivation from the part of the government in achieving its objectives through extension services. [Attention: Dept. of Marketing; Govt. of W.B.]
- Necessary steps are also needed to make the actual producers aware of price of the produce at the larger markets. The existing institutional agencies may maximize its efforts in this regard to make farmers aware of their product's price. [Attention: Dept. of Marketing; Govt. of W.B.]

The suggestions made above can be followed mostly by using existing institutional infrastructure. What it calls for is the motivation and coordination among the various departments of the government to act simultaneously to achieve such goals. The present study in this respect can only make suggestion based on the facts and findings, which are to be carried out successfully by the concerned authorities, subject to their feasibility.

CHAPTER 6
ANNEXURE TABLES

Area, Production & Yield of Rice

Year	BURDWAN			BIRBHUM			MURSHIDABAD		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
	000′ hect	000′ tonnes	Kgs/acre	000′ hect	000′ tonnes	Kgs/acre	000′ hect	000′ tonnes	Kgs/acre
1980-81	549.40	1002.70	1825.00	356.60	585.80	1643.00	302.60	421.80	1394.00
1981-82	493.00	708.80	1438.00	335.60	464.90	1385.00	336.60	450.90	1340.00
1982-83	436.70	717.10	1642.00	308.10	322.60	1047.00	287.20	265.60	925.00
1983-84	536.70	1078.80	2010.00	344.50	619.80	1799.00	331.70	489.40	1476.00
1984-85	545.80	1059.40	1941.00	346.40	619.60	1820.00	303.20	477.70	1576.00
1985-86	538.90	1013.00	1880.00	335.90	578.30	1722.00	275.10	435.60	1583.00
1986-87	524.00	1191.80	2275.00	309.90	583.30	1883.00	301.90	463.80	1537.00
1987-88	563.50	1241.20	2203.00	346.80	735.40	2121.00	356.80	532.60	1493.00
1988-89	542.10	1406.90	2595.00	353.50	870.60	2463.00	366.20	757.70	2069.00
1989-90	545.80	1376.20	2521.00	351.60	807.70	2297.00	348.60	739.38	2121.00
1990-91	560.60	1420.40	2534.00	376.70	813.10	2158.00	353.90	785.30	2219.00
1991-92	560.40	1532.60	2735.00	335.20	768.50	2292.00	338.80	764.40	2256.00
1992-93	543.60	1406.30	2587.00	335.60	784.00	2336.00	360.20	818.80	2273.00
1993-94	605.80	1641.60	2710.00	371.20	832.40	2243.00	357.20	792.20	2217.00
1994-95	605.50	1694.30	2798.00	352.50	799.00	2266.00	345.80	793.20	2294.00
1995-96	615.40	1668.50	2711.00	389.40	823.00	2113.00	341.20	738.10	2163.00
1996-97	626.30	1741.40	2781.00	350.40	858.30	2449.00	337.00	908.90	2697.00
1997-98	653.60	1929.30	2952.00	368.50	1020.10	2768.00	345.30	896.80	2597.00
1998-99	700.10	2145.30	3062.00	399.30	1187.80	2975.00	363.00	994.00	2739.00
1999-00	678.40	1859.10	2740.00	394.10	1042.50	2645.00	388.10	871.30	2245.00
2000-01	582.70	1571.40	2687.00	318.20	796.50	2503.00	224.10	548.20	2446.00
2001-02	660.10	1930.60	2925.00	394.10	1157.40	2937.00	395.10	1085.40	2747.00
2002-03	347.50	1931.40	2983.00	401.50	1146.60	2856.00	406.70	1072.80	2638.00
2003-04	665.50	2008.10	3063.00	376.30	1110.30	2951.00	403.40	1113.60	2760.00
2004-05	634.20	1892.90	2985.00	387.90	1088.00	2805.00	410.70	1194.40	2908.00
2005-06	639.00	1968.50	3273.00	368.50	116.30	3016.00	404.30	1189.60	2766.00
2006-07	642.80	1967.00	2864.00	383.40	1199.40	3070.00	395.10	1030.60	2189.00
2007-08	635.80	1858.60	2719.00	394.00	1220.70	3044.00	398.40	1142.40	2575.00
2008-09	666.50	1876.20	2815.00	393.90	1212.40	3078.00	399.50	1123.70	2813.00
2009-10	672.50	2051.20	3050.00	357.60	960.50	2686.00	373.10	1040.40	2788.00

Source: Statistical Abstract, Various Issues; Govt. of West Bengal

Percentage Distribution of Operational Holdings and Area Operated by Size Categories of Operational Holding

State	Year	Marginal		Small		Semi-medium		Medium		Large	
		no. of holdings	area operated	no. of holdings	area operated	no. of holdings	area operated	no. of holdings	area operated	no. of holdings	area operated
All-India	1970-71	45.8	9.2	22.4	14.8	17.7	22.5	11.1	30.5	3.1	23.0
	1981-82	56.0	11.5	19.3	16.6	14.2	23.6	8.6	30.2	1.9	18.2
	1991-92	62.8	15.6	17.8	18.7	12.0	24.1	6.1	26.4	1.3	15.2
	2002-03	69.8	22.6	16.2	20.9	9.0	22.5	4.2	22.2	0.8	11.8
West Bengal	1970-71	61.2	24.8	22.8	28.9	12.9	31.1	3.0	14.6	0.1	0.6
	1981-82	74.3	29.3	15.8	28.8	8.1	28.3	1.7	11.4	0.1	2.3
	1991-92	80.7	40.0	13.4	30.7	5.0	22.1	0.9	7.3	0.0	0.0
	2002-03	88. 8	58. 3	8.9	26.7	2.1	12.2	0.2	2.7	0.0	0.0

Source: NSS Report No. 492(59/18.1/3), Govt. of India

Block-wise Production of Paddy in Birbhum District: 2006-07

Block	Area (ha.)	Production (mt.)
Sainthia	28492	92.774
Nanoor	30720	92.684
Bolpur-Sriniketan	26394	87.260
Illambazar	22855	80.143
Labpur	28317	77.634
Md.Bazar	21514	73.148
Murarai Ii	20010	68.931
Mayureswer I	20762	67.020
Rampurhat I	22471	66.161
rampurhat II	21288	61.456
Dubrajpur	23658	60.203
khoyrasol	17879	57.150
Suri-II	13557	49.567
Nalhati II	12293	44.746
Mayureswer II	13425	41.828
Murarai I	16648	40.404
Rajnagar	12451	34.061
Suri-I	9230	28.340
Nalhati I	1492	6.533

Source : District Statistical Handbook, Murshidabad-2007, Bureau of Applied Economics and Statistics Government of West Bengal

Block-wise Area & Production of Paddy in Murshidabad District : 2006-07

Block	Area (ha.)	Production (mt.)
Khargram	38043	99.890
Sagardighi	37897	92.441
Kandi	30018	86.346
Burwan	36757	84.863
Nabagram	30089	80.524
Behrampore	28497	68.665
Bharatpur-II	23107	67.143
Bharatpur-I	24515	65.825
Hariharpara	17711	45.517
Beldanga-I	15074	39.602
Domkal	15776	38.153
Msd-Jiaganj	13855	37.676
Nowda	15257	37.185
Beldanga-II	14943	35.429
Raghunathgang-I	9841	21.051
Suti-I	7539	16.132
Raninagar-II	6066	15.967
Bhagwangola-II	6251	15.317
Bhagwangola-I	5753	14.754
Lalgola	4031	13.491
Jalangi	3992	10.505
Raninagar-I	3320	10.122
Farakka	2964	6.059
Suti-II	1936	2.942
Raghunathgang-II	1668	2.537
Samserganj	173	0.299

Source : District Statistical Handbook, Murshidabad-2007, Bureau of Applied Economics and Statistics Government of West Bengal

Block-wise Area & Production of Paddy in Burdwan District : 2006-07

Block	Area (ha.)	Production (mt.)
Monteswar	46466	149.267
Bhatar	53042	143.566
Galsi-I	36580	122.828
Mongalkote	45443	102.823
Jamalpur	28194	95.872
Galsi-II	27369	93.945
Raina-II	26908	91.92
Burdwan-I	24817	90.999
Khandaghosh	28308	83.401
Raina-I	24398	78.178
Memari-II	22272	78.169
Ausgram-I	23581	77.949
Ausgram-II	25177	74.71
Burdwan-II	20453	71.299
Ketugram-I	21031	66.511
Kalna-II	19595	64.815
Katwa-I	21206	64.287
Memari-I	17738	60.181
Katwa-II	18230	53.748
Kalna-I	17917	51.734
Purbasthali-I	15743	47.245
Ketugram-II	15949	39.666
Purbasthali-II	12714	36.96
Faridpur-Durgapur	9657	29.419
Barabani	10058	26.001
Jamuria	9832	24.138
Kanksa	9035	21.5
Salanpur	4582	9.461
Pandabeshwar	3233	8.988
Andal	1704	4.361
Raniganj	1591	3.045

Source : District Statistical Handbook, Burdwan-2007, Bureau of Applied Economics and Statistics Government of West Bengal

Area, Production and Yield of Rice in West Bengal: 1951-52 to 2008-09

Year	Area ('000 ha.)				Production ('000 tonnes)				Yield Rate (kg/ha.)		
	Autumn	Winter	Summer	Total	Autumn	Winter	Summer	Total	Autumn	Winter	Summer
1951-52	472.90	3350.10	16.70	3839.70	365.50	3153.10	15.70	3534.30	772.89	941.20	940.12
1952-53	459.10	3561.90	19.60	4040.60	452.30	3547.60	18.60	4018.50	985.19	995.99	948.98
1953-54	635.30	3615.40	18.00	4268.70	535.20	4754.90	18.70	5308.80	842.44	1315.18	1038.89
1954-55	504.60	3457.70	16.90	3979.20	404.50	3395.20	16.20	3815.90	801.63	981.92	958.58
1955-56	524.50	3568.00	16.70	4109.20	415.80	3778.50	17.90	4212.20	792.76	1059.00	1071.86
1956-57	513.20	3541.20	18.00	4072.40	381.40	4004.80	20.00	4406.20	743.18	1130.92	1111.11
1957-58	546.10	3850.30	18.60	4415.00	410.70	3949.70	15.40	4375.80	752.06	1025.82	827.96
1958-59	515.00	3728.50	19.20	4262.70	335.60	3767.30	19.50	4122.40	651.65	1010.41	1015.63
1959-60	597.70	3779.70	40.00	4417.40	467.30	3727.90	43.50	4238.70	781.83	986.30	1087.50
1960-61	635.80	3935.90	33.10	4604.80	516.90	4899.50	37.70	5454.10	812.99	1244.82	1138.97
1961-62	522.90	3868.80	29.80	4421.50	396.80	4368.80	32.80	4798.40	758.84	1129.24	1100.67
1962-63	547.20	3874.00	23.70	4444.90	410.90	3973.00	26.80	4410.70	750.91	1025.55	1130.80
1963-64	586.80	3920.10	24.40	4531.30	494.80	4810.30	29.00	5334.10	843.22	1227.09	1188.52
1964-65	611.60	4036.90	22.50	4671.00	602.40	6131.10	27.10	6760.60	984.96	1518.76	1204.44
1965-66	587.10	4033.50	30.10	4650.70	470.80	4385.40	36.90	4893.10	801.91	1087.24	1225.91
1966-67	650.90	3970.20	27.60	4648.70	530.00	4254.30	40.00	4824.30	814.26	1071.56	1449.28
1967-68	737.70	3921.90	54.80	4714.40	604.00	4493.70	110.60	5208.30	818.76	1145.80	2018.25
1968-69	860.90	3887.00	90.90	4838.80	728.10	4830.00	221.90	5780.00	845.74	1242.60	2441.14
1969-70	798.40	4117.60	106.30	5022.30	648.80	5089.70	316.70	6055.20	812.63	1236.08	2979.30
1970-71	799.20	3969.90	186.50	4955.60	910.00	4694.70	535.40	6140.10	1138.64	1182.57	2870.78
1971-72	799.80	3887.40	304.20	4991.40	966.40	4608.00	934.00	6508.40	1208.30	1185.37	3070.35
1972-73	824.80	3981.70	262.90	5069.40	795.70	4190.70	728.90	5715.30	964.72	1052.49	2772.54
1973-74	841.70	4048.00	325.10	5214.80	696.10	4373.90	729.20	5799.20	827.02	1080.51	2243.00
1974-75	972.00	4107.10	340.40	5419.50	874.20	4812.80	856.40	6543.40	899.38	1171.82	2515.86
1975-76	864.60	4241.10	320.70	5426.40	785.30	5181.20	899.80	6866.30	908.28	1221.66	2805.74
1976-77	817.90	4148.70	237.90	5204.50	644.70	4589.40	714.80	5948.90	788.24	1106.23	3004.62
1977-78	807.50	4308.50	308.70	5424.70	751.50	5861.10	882.00	7494.60	930.65	1360.36	2857.14
1978-79	695.70	3627.80	441.90	4765.40	569.80	4843.50	1263.60	6676.90	819.03	1335.11	2859.47
1979-80	628.00	4022.90	253.80	4904.70	530.30	4676.00	680.30	5886.60	844.43	1162.35	2680.46
1980-81	615.10	4214.60	346.50	5176.20	576.40	6024.00	865.20	7465.60	937.08	1429.32	2496.97
1981-82	695.00	4216.20	298.80	5210.00	667.40	4408.00	757.20	5832.60	960.29	1045.49	2534.14
1982-83	635.50	3883.40	342.60	4861.50	566.20	3495.30	887.60	4949.10	890.95	900.06	2590.78
1983-84	721.40	4130.90	520.30	5372.60	697.20	5812.90	1330.20	7840.30	966.45	1407.18	2556.60
1984-85	631.40	4096.40	470.70	5198.50	660.60	6161.90	1270.00	8092.50	1046.25	1504.22	2698.11
1985-86	483.10	4083.30	512.30	5078.70	540.60	6023.20	1427.20	7991.00	1119.02	1475.08	2785.87
1986-87	637.40	4059.20	679.40	5376.00	710.10	5694.10	2058.80	8463.00	1114.06	1402.76	3030.32
1987-88	616.20	4067.20	792.20	5475.60	655.30	6127.20	2489.30	9271.80	1063.45	1506.49	3142.26
1988-89	720.60	4180.90	720.50	5622.00	1071.10	7537.50	1951.20	10559.80	1486.40	1802.84	2708.12
1989-90	616.20	4241.20	756.90	5614.30	890.60	7771.80	2261.20	10923.60	1445.31	1832.45	2987.45
1990-91	610.30	4306.50	896.10	5812.90	906.30	6865.80	2664.40	10436.50	1485.01	1594.29	2973.33
1991-92	540.40	4244.50	934.40	5719.30	879.00	8212.70	2862.50	11954.20	1626.57	1934.90	3063.46
1992-93	532.50	4301.40	860.70	5694.60	915.30	7955.10	2575.00	11445.40	1718.87	1849.42	2991.75
1993-94	539.60	4290.90	1045.00	5875.50	908.20	7961.20	3241.50	12110.90	1683.10	1855.37	3101.91
1994-95	518.80	4210.60	1043.30	5772.70	837.90	8385.00	3013.00	12235.90	1615.07	1991.40	2887.95
1995-96	510.50	4282.80	1160.10	5953.40	854.50	7615.20	3417.30	11887.00	1673.85	1778.09	2945.69
1996-97	461.70	4282.40	1056.40	5800.50	775.50	8566.40	3294.90	12636.80	1679.66	2000.37	3118.99
1997-98	423.10	4270.30	1206.90	5900.30	752.00	8915.10	3569.50	13236.60	1777.36	2087.70	2957.58
1998-99	425.00	4028.60	1450.50	5904.10	740.60	7653.80	4922.00	13316.40	1742.59	1899.87	3393.31
1999-00	427.20	4248.90	1474.30	6150.40	828.00	8463.30	4468.40	13759.70	1938.20	1991.88	3030.86
2000-01	394.00	3639.50	1401.80	5435.30	683.90	7202.80	4541.30	12428.00	1735.79	1979.06	3239.62
2001-02	402.50	4211.60	1455.00	6069.10	841.80	10000.00	4414.90	15256.70	2091.43	2374.39	3034.30
2002-03	385.00	4051.00	1406.10	5842.10	796.60	9394.00	4198.60	14389.20	2069.09	2318.93	2985.99
2003-04	339.80	4126.70	1390.10	5856.60	719.20	9653.60	4289.40	14662.20	2116.54	2339.30	3085.68
2004-05	320.80	4086.40	1376.40	5783.60	653.10	9974.70	4257.10	14884.90	2035.85	2440.95	3092.92
2005-06	288.10	4112.80	1381.90	5782.80	605.60	9858.10	4047.00	14510.70	2102.00	2397.00	2928.00
2006-07	283.80	4001.90	1401.20	5686.90	575.20	9649.90	4520.60	14745.70	2027.00	2411.00	3226.00
2007-08	281.60	3926.50	1511.50	5719.60	565.80	9227.50	4926.10	14719.40	2009.00	2350.00	3259.00
2008-09	292.40	4086.50	1556.60	5935.50	604.90	10047.20	4358.00	15010.10	2069.00	2465.00	2800.00

Source: Evaluation Wing, Directorate of Agriculture, Govt. of W.B

CHAPTER 7
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COMMENTS ON THE DRAFT REPORT

I would like to commend Dr. Sarkar and his team for timely completion of the report. I have the following comments/observations on the report, which authors may wish to take into account while finalizing it:

1. Section 1.1 and 1.2 can be expanded to provide broad overview of State agriculture and issues related to marketable and marketed surplus concepts
2. Review of literature with more focus on studies related to marketed Surplus of Rice in West Bengal and other eastern states may be given.
3. Trends in distribution of operational holdings in West Bengal and pattern of lease-in and lease-out area and terms of lease during the last 3-4 decades in the State may be discussed.
4. Chapter 3: While comparing distribution of NSDP by industry (Table 3.1.1.) and changing share of crop sector (Table 3.1.2), authors may wish to use Triennium Ending (TE) averages to take care of year to year fluctuations.
5. You can analyse changing composition of value of output from agriculture, e.g. share of foodgrains, share of high-value agriculture like fruits & vegetables, milk and dairy products, eggs, and poultry, fisheries, and commercial crops during last 3-4 decades.
6. Table. 3.3.2: Trends in growth rates if area, production and yield of paddy in major producing districts in the state may be attempted to provide wider perspective.
7. Tables 3.5.1 to 3.5.3: Rather than giving raw data, compute averages/CAGR for comparison during different time periods. If possible, do similar analysis for major districts of the State.
8. Table 4.2.2: It would be better it average figures are presented instead of total area under different size classes for comparison purpose. Unit needs to be mentioned in the Table.
9. Table 4.3.3: Average cost of storage in Rs/month/qtl may be computed rather than per farm and compare across different farm categories.
10. Table 4.4.3: Per cent shares of self-consumption, seed, feed, etc. may be calculated on different farm classes.
11. One table on changes in acreage, production and yield of paddy in different seasons (absolute change and CAGR) in the State vis-à-vis all-India during last 3-4 decades may be included and discussed.
12. Empirical Analysis of household data requires further additions in terms of possibly Regression Analysis of Factors Affecting Marketed Surplus.

    MS = f (socio-economic variables, institutional factors, economic factors, infrastructure, technological variables, etc.)

Sd/-

(Prof. Vijay Paul Sharma)

ACTION TAKEN REPORT

Though the draft report strictly follows the table design prepared by the coordinating centre itself, specific changes have been made in finalizing this report considering the lately received comments on the draft report from the coordinator. Attempts have been made to incorporate suggested modifications/inclusions subject to time constraint and availability of data:

1. Section 1.1 and 1.2 may be expanded to provide broad overview of State agriculture, but it might unnecessarily make the report bulky with notes on distantly related issues, and hence left unchanged.
2. Review of literature related to marketed surplus of rice in West Bengal and other eastern states is fairly limited, as far as the authors are concerned. Hence, some key literatures are discussed only.
3. Trends in distribution of operational holdings in West Bengal has been incorporated and discussed in the final report. However, data on pattern of lease-in and lease-out area and terms of lease during the last 3-4 decades in the State is not available.
4. Availably of data on distribution of NSDP by industry and changing share of crop sector is not readily available, hence no changes have been made.
5. Changing composition of value of output from agriculture during last 3-4 decades is not readily available; and hence kept unchanged.
6. Trends in growth rates of area, production and yield of paddy in major producing districts in the state has already been incorporated and analyzed in table 3.3.2. In fact, the districts Burdwan, Murshidabad and Birbhum are among the top 5 major producers of paddy in West Bengal (refer table 2.1.1). The other two major paddy producing districts, viz. Purba Medinipur and Pashchim Medinipur, are recently formed (time-series data is not available)..
7. In addition to raw data, CAGRs have been presented for comparison during different time periods subject to availability of time series data (3.5.1 to 3.5.3).
8. Average figures are presented instead of total area under different size classes for comparison purpose and units are also mentioned (table 4.2.2).
9. Average cost of storage in Rs/month/qtl has been computed rather than per farm, and compared across different farm categories (table 4.3.3).
10. Per cent shares of self-consumption, seed, feed, etc. has been calculated for different farm classes, and presented in a newly included table 4.4.3 (a)
11. Data on changes in acreage, production and yield of paddy in different *seasons* in the State during last 3-4 decades is not readily available. Hence no additional tables have been included.
12. Further additions have been made in terms of regression analysis of factors affecting marketed surplus.

Sd/-

(Prof. Debashis Sarkar)