

EXECUTIVE SUMMARY

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

DEBASHIS SARKAR
ASHOK SINHA
DEBAJIT ROY



**AGRO-ECONOMIC RESEARCH CENTRE
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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 summary 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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(D Sarkar)
Director
A.E.R.C., Visva-Bharati

INTRODUCTION

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.

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.

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 2010-11¹. In the next stage two blocks from each district were selected purposively based on secondary data on production of paddy². 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

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

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

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-strata³. 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 size⁴.

Table 1
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-Srimketan	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

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.

OVERVIEW OF FOODGRAINS ECONOMY OF STATE

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 agriculture 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 2: 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

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: 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 decade⁵.

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.

MARKETED SURPLUS, MARKETABLE SURPLUS AND POST HARVESTS LOSSES OF PADDY IN WEST BENGAL: AN EMPIRICAL ANALYSIS

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: 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

Second, 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% of 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.

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.

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.

Table 5: 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

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.

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 6: 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.

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 7: 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.

ESTIMATION OF MARKETING AND MARKETABLE SURPLUS RATIO OF PADDY

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-June⁶. *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.

⁶ In fact, as December is represented by 12 and January by 01, the average has come down to such a figure.

Table 8: 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 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 forced 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.

CROP RETENTION PATTERN

In case of retention pattern of paddy, several important observations come out. *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 9: 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

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 10: 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).

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.

Table 11: 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.

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-

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

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 12: Multiple Regression Estimate: Exercise 1

Dependent Variable: Marketed Surplus Ratio (Y)

R: .595

R²: .354

Adjusted R²: .328

Degrees of Freedom: 288

<u>Independent Variables:</u>	<u>B</u>	<u>SE of</u> <u>B</u>	<u>t statistic</u>
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

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 -

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

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 13: Multiple Regression Estimate: Exercise 2

Dependent Variable: Marketable Surplus Ratio (Y)

R: .598

R²: .357

Adjusted R²: .334

Degrees of Freedom: 317

<u>Independent Variables:</u>	<u>B</u>	<u>SE of B</u>	<u>t statistic</u>
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 exercise 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 proportionately a larger amount of paddy produced. At the same time, factors 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 exhibits 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 exhibit 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.

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 14: 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.

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 14: 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.

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.

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.

Table 15: 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

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.

CONCLUDING OBSERVATIONS AND POLICY IMPLICATION

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, the following specific observations can be made:

- 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% of 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.

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.