

Study No. 165

**HULLING AND MILLING RATIO IN MAJOR  
PADDY GROWING STATES: WEST BENGAL**

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2011**

## PREFACE

The present study entitled as “*Hulling and Milling Ratio in Major Paddy Growing States*” 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 ADRT Centre, Bangalore. This report has been an individual centre’s final report on the study concerned carried out in West Bengal and prepared by our centre, AERC, Visva-Bharati, Santiniketan.

As many studies in the past have indicated that the overall supply of rice could be augmented substantially with additional conversion of paddy to rice through modernization of the existing paddy processing techniques, the present study tries to arrive at prevailing state of hulling and milling ratios from field level data in West Bengal. The study assumes immense relevance considering the fact that only about a half of total paddy production in the country is processed by the modern rice mills, while the other half is processed through hullers, shellers and huller-cum-shellers, which are generally considered inefficient as compared to the modern rice mills with lower conversion ratio.

It is here that the, the present study tries to analyze the trends and pattern of modern rice mills with existing problems and prospects of the paddy processing industry. At the same time the study tries to arrive at the hulling and milling ratios of paddy by comparing the processing activities of hullers and modern rice mills with their relative market shares.

The study is based on both secondary and primary data. As far as secondary data is concerned, on the one hand, the study has used various published databases at the state and as well as at the national levels from authentic sources like Directorate of Agriculture, Bureau of Applied Economics & Statistics, Directorate of Food & Supply – all under the Government of West Bengal, and certain published reference books and articles as has been acknowledged in bibliography.

In case of primary data, two districts from West Bengal, namely Burdwan and Bibhum, have been selected based on concentration of rice mills and area under paddy cultivation. While the district Burdwan is the highest paddy producing district with the highest area under paddy cultivation in West Bengal, it also has the highest concentration of rice mills in the state. On the other hand, the district of Birbhum stands third with respect to production of rice as well as concentration of rice mills among other districts in the state.

From each selected district, namely Burdwan and Birbhum, a total number of 25 modern and 25 traditional rice mills have been selected for obtaining detailed information through primary survey with pre-tested rigorous questionnaire as prepared by the coordinating center. Among the traditional rice mills, namely huller, sheller and huller-cum-sheller, only the huller units have been surveyed as the sheller units and huller-cum-sheller units are practically hardly be traced in the two districts. In fact, the huller units (locally known as

husking-mills) are found in good number in both the sample districts, though there has been a steady strong presence of modern rice mills.

The scheme of chapters in this study has been designed so as to maintain the logical development of facts and findings, and to fulfill the particular objectives of the study. In particular- *Chapter 1* introduces us with the very objectives and methodology of the present study, while *Chapter 2* tries to analyse the trends and characteristics of sample units and works out the hulling and milling ratios as found during the field survey. *Chapter 3* essentially tries to enumerate the economics of the paddy processing techniques prevalent in the study area, as *Chapter 4* tries to bring forth the constraints in the rice milling industry. Lastly, *Chapter 5* attempts to draw the conclusions from the facts and findings emerged from the study, and suggests policy recommendations accordingly.

The study team associated with the present study consisted of Mr. Kali Sankar Chattopadhyay and Mr. Debajit Roy under the active supervision of the undersigned. Extensive support has also been obtained from Mr. Munshi Abdul Khaleque and Mr. Deb Shankar Das in field investigation for collecting primary data. The secretarial assistance was received from Mr. D. Mondal, Mr. P. Das, Mr. A. R. Patra, Mr. P. Hazra, and Mr. N Maji. Also, Mr. S. Sadhu assisted in office maintenance works. I offer my deepest thanks to all of them.

On behalf of this centre, the undersigned takes the opportunity to thank the coordinating center 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.

I take this opportunity to thank Mr. Sushil Chowdhury (General Secretary, All India Rice Millers Association & Acting President, West Bengal Rice Millers Association, and Mr. Deb Kumar Mondal (President, West Bengal Rice Millers Association), Subrato Mondal (Secretary, Burdwan Rice Millers Association), Deepak Pramanik (President, Birbhum Rice Mills Association) and Biswavijay Ghosh (Secretary, Birbhum Rice Mills Association) who proactively supported our study team to carry out the study by providing immensely valuable assistance. I would also like to express my heartiest thanks to all the sample rice mill owners and hulling unit owners interviewed in this study, who patiently answered all the tedious questions asked while conducting the primary data survey at the cost of their boredom and valuable time.

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# CHAPTER 1

## INTRODUCTION

### 1.1: INTRODUCTION

Rice has long been the staple food for more than 65% of the population in our country, India. It is the largest consumed calorie source among the food grains catering to the needs of about 70 percent of the world population and about 90 percent of Asian population. India is the second largest producer of rice in the world next to China with a share of more than 20 percent of the total rice production in the world. The all India area, production, and yield of rice in the year 2008-09 were 45.54 million hectares, 99.18 million tonnes and 2178 kg/ha respectively.

In India paddy occupies the first place both in terms of area and production. The crop occupies more than one-thirds of total cropped area and a little less than a half of total production of food grains in India. Among the states, West Bengal is the leading producer of paddy in the country. It accounts for 15.16% of the total production in 2008-09, and the other leading states are Andhra Pradesh (14.36%), Uttar Pradesh (13.20%), Punjab (11.09%), Orissa (6.87%) and Bihar (5.64%).

India is also one of the leading exporters of rice in the world market with a global share of about 15 percent. India is the largest producer and exporter of Basmati Rice in the world, which has been a favorite among international rice buyers. Following liberalization of international trade after World Trade Agreement, Indian rice is expected to become highly competitive and has been identified as one of the major commodities for export.

However, paddy itself cannot be consumed in its raw form and it needs to be suitably processed into rice to enable it for human consumption, which forms the basic need for the paddy processing industry to come into existence. As such, the hulling and milling of paddy is the oldest and largest agro-processing industry in our country. Almost the entire production of over 90 million tonnes of paddy is being converted into rice every year by paddy processing units of varying sizes and capacities spread all over the country, which are especially concentrated in the paddy producing states like Uttar Pradesh, Punjab, Haryana, West Bengal, etc.

Rice milling thus is the primary processing activity under which hulls and bran is removed from the paddy grain to convert it into polished rice. Hence, rice forms the basic primary processed product obtained from paddy, which may further be processed for obtaining various secondary and tertiary products. This

provides us with ample opportunity for development of rice based value-added products for earning more foreign exchange. Apart from rice milling, processing of rice bran for oil extraction is also an important agro processing activity for value addition, income and employment generation.

However, to process this enormous quantity of paddy to convert into rice, we find different types of paddy processing units in India using different techniques in varying capacities. By and large, many of these rice-processing units are of the traditional huller type and are considered to be inefficient. On the other hand, Modern rice mills are of high capacity and highly capital intensive, although they are considered to be efficient.

The crux of problem is in the very fact that in India modern rice mills process only about half of the entire paddy output every year, whereas the other half is processed by the allegedly inefficient huller-type paddy processing units. As such, it is easily apprehensible that there exists a reasonable scope for augmenting growth in the processed rice in the economy by suitable intervention and modernization drives, thereby reducing the post-harvest losses to the economy at the same time.

It is here that the present study tries to deal with the very essence of the aforesaid problem in a state, which has been the leading producer of paddy in the country, namely West Bengal. In fact, the present study tries to reassure the highly debated out-turn ratio of paddy in the modern rice mills as against the traditional huller type paddy processing units in two of the historically known paddy-growing and rice-milling districts in the state- viz. Burdwan and Birbhum. At the same time the present study makes an attempt to provide a glimpse of the economics of the traditional vis-à-vis modern rice mills to discuss over the problems and prospects of the rice milling industry in the state as a whole.

## *1.2: AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN THE STATE*

West Bengal is predominantly a paddy-growing state with the highest production of 15.04 million tonnes and second highest area of 5.94 million hectares among the major paddy growing states in India during 2008-09. The state of West Bengal thus contributes to 15.16 percent of the all India production of rice and 13.03 percent of all India area under rice during 2008-09. The productivity of rice in West Bengal has always been higher than the all India average though it is much below the productivity of the states like Punjab, Andhra Pradesh, and Haryana.



**Table 1.2.1**  
**Area, Production and Productivity of Rice in Major Paddy Producing States during 2008-09**

State	Area (Million Hectares)	% to All - India	Production (Million Tonnes)	% to All - India	Productivity (Kg./Hectare)
West Bengal	5.94	13.03	15.04	15.16	2533
Andhra Pradesh	4.39	9.63	14.24	14.36	3246
Uttar Pradesh	6.03	13.25	13.10	13.20	2171
Punjab	2.74	6.01	11.00	11.09	4022
Orissa	4.45	9.78	6.81	6.87	1529
Bihar	3.50	7.68	5.59	5.64	1599
Tamil Nadu	1.93	4.24	5.18	5.23	2683
Chattisgarh	3.73	8.20	4.39	4.43	1176
Assam	2.48	5.46	4.01	4.04	1614
Karnataka	1.51	3.32	3.80	3.83	2511
Jharkhand	1.68	3.70	3.42	3.45	2031
Haryana	1.21	2.66	3.30	3.33	2726
Maharashtra	1.52	3.34	2.28	2.30	1501
Madhya Pradesh	1.68	3.69	1.56	1.57	927
Gujarat	0.75	1.64	1.30	1.31	1744
Kerala	0.23	0.51	0.59	0.60	2519
Others	1.75	3.85	3.56	3.59	n.a.
All India	45.54	100.00	99.18	100.00	2178

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation

Though the productivity of rice in West Bengal remains much lower than states like Punjab, Andhra Pradesh and Haryana, there has been an increase in the yield rate from 1795 kg/ha in 1990-91 to 2287 kg/ha in 2000-01 and further to 2573 kg/ha in 2007-08 in West Bengal at an annual average rate of growth of 2.27 percent over 1990-91 to 2007-08. At the same time production of rice grew at a compounded annual average rate of 2.02 percent, while there has been a marginal decline in the total area under rice cultivation over the same period.

Among the districts in West Bengal, Burdwan turns out to be the district with the highest production of rice (1858.6 thousand tonnes) followed by West Midnapore and Birbhum, Bankura and Murshidabad. However, in terms of area under rice cultivation, West Midnapore stands highest, followed by Burdwan, Bankura Murshidabad and Birbhum. However, the highest productivity of rice can be traced to the district of Jalpaiguri, followed by Bankura and Birbhum.

**Table 1.2.2**  
**Area, Production & Productivity of Rice in West Bengal: 1990-91 to 2007-08**

Year	Area ('000 Ha.)	Production ('000 Tons.)	Productivity (Kg/Ha.)
1990-91	5812.9	10436.5	1795
1991-92	5713.3	11954.2	2090
1992-93	5694.6	11445.4	2010
1993-94	5875.5	12110.9	2061
1994-95	5772.7	12235.9	2120
1995-96	5953.5	11887.0	1997
1996-97	5800.6	12636.8	2179
1997-98	5900.3	13236.8	2243
1998-99	5094.095	13316.444	2255
1999-00	6150.439	13759.680	2237
CAGR	0.91	1.46	0.97
2000-01	5435.323	12428.038	2287
2001-02	6069.099	15256.664	2514
2002-03	5842.127	14389.238	2463
2003-04	5856.607	14662.240	2504
2004-05	5383.613	14884.889	2574
2005-06	5782.949	14510.792	2509
2006-07	5687.028	14745.892	2593
2007-08	5719.755	14719.520	2573
CAGR	1.24	2.02	1.24

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

**Table 1.2.3**  
**District-wise Area, Production & Productivity of Rice in West Bengal for the Year 2007-08**

District	Area ('000 ha.)	Production ('000 tonnes)	Productivity (tonnes/ha.)
Burdwan	635.8	1858.6	2573
Midnapore (W)	650.2	1798.9	2074
Birbhum	394.0	1220.7	2923
Bankura	416.8	1173.6	3098
Murshidabad	398.4	1142.4	2837
Hooghly	301.8	845.1	2199
Midnapore (E)	396.4	821.8	2815
24-Parganas (S)	392.5	796.8	2722
Purulia	313.7	768.2	1768
24-Parganas (N)	273.6	744.6	2800
Uttar Dinajpur	281.1	683.5	2867
Nadia	240.7	683	2030
Cooch Behar	293.5	518.8	1844
Dakshin Dinajpur	197.9	492	2432
Malda	147.3	480.4	2486
Jalpaiguri	236.1	372.4	3261
Howrah	117.8	259.2	2767
Darjeeling	32.2	59.5	1578
West Bengal	5719.8	14719.5	2449

### *1.3: HISTORICAL PERSPECTIVE OF RICE MILLING IN THE STATE*

The historical perspective of rice milling in West Bengal can be traced back as early as to the pre-Independence era of the 1920s, when one of the first rice mills in India came into existence in the district of Burdwan. During the 1930s and 1940s, a few rice mills were started in and around Kolkata (the then Calcutta) mainly based on the supply of paddy from Bangladesh (the then East Pakistan). At the same time, a few mills were in existence in the districts of Burdwan, Midnapore and Bankura using the crude milling technique.

However, available data on the number of rice mills in the state reveals that the number of modern rice mills in West Bengal drastically dropped from 711 units in 1965 to as low as 373 in 1989. At the same time, the capacity utilization of the rice mills also declined from 42.5 percent in 1969-70 to 22.8 percent in 1980-81. This indicates to the fact that the rice mills in West Bengal began to lose their importance during the 1970s and 1980s, which in turn resulted in the shut-down of a number modern rice mill units in the state.

The major threat in the declining importance of modern rice mills can be attributed to a phenomenal growth of traditional rice processing units (like hullers) performing identical tasks performed by the modern rice mills. At the same time, the advent of petty traders of paddy around the hullers also contributed significantly to the shortage of supply of paddy to the modern rice mills by providing a steady supply of raw materials to these traditional units. Other important contributing factors behind the declining importance of modern rice mills include exogenous factors like imposition of levy on rice mills and fixation of price of levy rice at much below the market price.

In particular, the husking machines of traditional huller type began to penetrate the rural areas of West Bengal in the early 1950s onwards. From the very next decade, viz. 1960s, the number of such machines increased sharply and became competitive with the rice mills. In fact, the number of licensed husking machines increased manifold, from 500 units in 1951 to more than 10000 units in 1989. Along with this, there were a huge number of un-licensed husking machines (about five times the licensed ones), which were operating in a much wider scale in the rural West Bengal. With this quantum growth in husking machines, petty trading in rice and paddy proliferated in the state. This led to a situation in which there had been a significant diversion of the marketed surplus paddy away from the normal market to the hands of the petty traders, and the government and the rice mills had no control over it. Neither the state administration could curb this undesirable development in the petty paddy trading, nor the rice mills could adapt themselves to the changed scenario, resulting into drastic fall in the number of rice mills and capacity utilization.

Year	No. of Modern Rice Mills	Capacity Utilization of Modern Rice Mills	No. of Husking Machines (licensed)	No. of Husking Machines (unlicensed)
1951	-	-	500	-
1965	711	-	-	-
1966	-	-	6000	6000
1969	-	42.5	-	-
1970	707	31.8	6148	-
1980	360	22.8	7436	18000
1987	388	-	9614	-
1988	377	-	9948	-
1989	373	-	10068	-

*Source: 1. Department of Food & Supply, Government of West Bengal, 2. Abstract of Statistics of Food & Other Essential Commodities, Government of West Bengal*

Thankfully enough, the situation got a reversed momentum with active Government intervention since the 1990s, which has been reflected in increasing number of modern rice mills in the state during the last two decades. In fact, the number of modern rice mills increased from 373 in 1989 to about 1109 in 2010, while the number of hullers (or husking machines) remained almost the same.

#### **1.4: STATUS OF RICE MILLING INDUSTRY IN THE STATE**

West Bengal, being the leading paddy producers in the country, has quite a large concentration of rice mills with more than 1100 modern rice mills at present. These mills are usually of low capacities, where the capacity in terms of paddy throughput varying between 0.25 TPH to 16.0 TPH. The average paddy throughput capacity of these modern rice mills in the state stands about 2.5 TPH or 40 TPD per unit based on operation in 2 shifts (16 hrs./ day), thereby making an aggregated annual paddy throughput capacity of more than 15 million tonnes.

Rice milling industry in India has undergone different phases of technological transformations related to winning, parboiling and drying systems; although it lags far behind the countries like USA, UK, Germany, Japan, Taiwan, etc. There are only a few fully automatic plants in India (like in Karnal, Kalady, etc.) who have installed colour sortex machine imported from Japan, USA, UK, etc. In West Bengal, the Burdwan and Bolpur (Birbhum) clusters have installed colour sortex machine and silky polishing machine, and the parboiled rice produced by these units may compete in national and international market.

Within the state, the district of Burdwan has the largest concentration of modern rice mills, while the other districts having good concentration are Hooghly, Birbhum, Bankura, Paschim Midnapur, etc. The rice produced by these mills caters to both domestic and export markets. The major product of these mills has been parboiled rice, although there exists some rice mills producing raw rice as their principal product. At the same time, only a few small mills produce the aromatic rice, non- aromatic rice being the main produce.

As regarding the available data on the modern rice mills from the Directorate of Food and Supply, Government of West Bengal, it can be seen that at present Burdwan district has the highest number of rice mills in the state, followed by Hooghly and Birbhum districts. In fact, the district hosts about 43 percent of all rice mills in West Bengal.

However, while considering the number of functioning rice mills in the state, it become clear that only about 85 percent of all the rice mills in West Bengal are actually functional. It should be noted here that though Birbhum has the third largest concentration of rice mills in the state, it also accounts for the third largest proportion of non-functioning rice mills.

District	No. of Rice Mills		No. of Functioning Rice Mills		Proportion of Functioning Rice Mills
	No.s	Per Cent	No.s	Per Cent	
Burdwan	476	42.92	432	45.67	90.76
Hooghly	135	12.17	119	12.58	88.15
Birbhum	88	7.94	58	6.13	65.91
Bankura	82	7.39	61	6.45	74.39
Midnapur (West)	65	5.86	49	5.18	75.38
Midnapur (East)	39	3.52	38	4.02	97.44
Dakshin Dinajpur	47	4.24	28	2.96	59.57
Purulia	12	1.08	9	0.95	75.00
Uttar Dinajpur	21	1.89	16	1.69	76.19
Jalpaiguri	20	1.80	20	2.11	100.00
Murshidabad	21	1.89	21	2.22	100.00
24 Parganas (South)	8	0.72	7	0.74	87.50
24 Parganas (North)	42	3.79	41	4.33	97.62
Nadia	8	0.72	6	0.63	75.00
Howrah	6	0.54	6	0.63	100.00
Malda	23	2.07	23	2.43	100.00
Cooch Behar	8	0.72	5	0.53	62.50
Darjeeling	8	0.72	7	0.74	87.50
Total	1109	100.00	946	100.00	85.30

**Source: Directorate of Food & Supply, Govt. of West Bengal**

## *1.5: OBJECTIVES OF THE STUDY*

The paddy processing activity in India can be broadly divided into two distinct categories, viz. traditional method and modern (mechanical) method. The traditional methods like hand pounding, dhenki, chakki, etc. has become obsolete at present with the advent of modern mechanical milling techniques. The modern mechanical mills in use can be categorized into four main types- viz. hullers, shellers, huller-cum-shellers and modern rice mills.

However, the paddy processing units of the traditional huller type are often considered inefficient as compared to the modern rice mills. In fact, in the hullers, both shelling and polishing operations are carried out simultaneously. Hence there is no control on the polishing of rice, and bran admixed with husk is obtained with a higher breakage of rice grain. On the other hand, the modern rice mills have separate processing mechanism for the de-husking and polishing of paddy, where the husk can be utilized for energy and for industrial products like furfural and the bran for the extraction of edible and non-edible grades of oil.

Now, the crux of the problem is that in India, only about half of total rice produced is processed through the modern rice mills, whereas the entire other half is processed by the hullers, shellers and huller-cum-shellers, who are considered to be inefficient with lower out-turn ratio, and thereby lower value addition. In this regard, a number of studies in the past have indicated that the overall supply of rice could be augmented substantially with additional conversion obtained through modernization of existing rice processing techniques.

It is here that the present study tries to ascertain the doubts raised about the hulling and milling ratios arrived earlier through field-level investigations. In fact, the specific objectives of the study are-

- I) to analyze the trends and pattern in growth of modern rice mills;
- II) to estimate conversion ratio of paddy to rice with or without parboiling in various paddy processing units;
- III) to estimate the relative shares of different milling techniques in paddy processed with various type of processing technologies;
- IV) to examine the problems and prospects in paddy processing industry.

## **1.6: METHODOLOGY**

The present study is essentially based on both primary and secondary data, where the reference year for the collection of primary data pertains to the financial year 2009-10, though data pertaining to 2007-08 and 2008-09 has also been collected to avoid yearly fluctuations.

In case of secondary data, the present study has used various secondary sources like official publications, references, and official data from government offices etc., as also from the Ministry of Food Processing Industries and other State Government Departments.

In case of primary data, two districts from West Bengal, namely Burdwan and Bibhum, have been selected based on concentration of rice mills and area under paddy cultivation. While the district Burdwan is highest paddy producing district with the second-highest area under paddy cultivation in West Bengal, it also has the highest concentration of rice mills in the state during 2007-08. The other selected district of Birbhum also has the third-highest concentration of rice mills among the other districts in the state, with the third-highest production of paddy during 2007-08.

From each selected district, namely Burdwan and Birbhum, a total number of 25 modern and 25 traditional rice mills have been selected for obtaining detailed information through primary survey with pre-tested questionnaire. Among the traditional rice mills, namely huller, sheller and huller-cum-sheller, only the huller units have been surveyed as the huller-cum-sheller units and sheller units can hardly be traced in these districts as well as in the state. In fact, the huller units (locally known as husking-mills) are found in good number in the rural areas with dense concentration.

## *1.7: ORGANIZATION OF THE STUDY*

Before we proceed further it remains customary to briefly describe the organization of the present study for better comprehension and logical development.

The first chapter introduces us the specific objectives and methodology of the present study in the backdrop of the historical perspective and present status of the paddy processing industry in the state alongside with the state of paddy cultivation in West Bengal.

The second chapter tries to describe the growth of rice milling industry in the state from traditional form to its modern form by analyzing the trends and types

of paddy processing units. At the same time, the second chapter describes the basic characteristics of the selected sample units of the study, viz. the paddy processing units, and tries to work out the all important hulling and milling ratios of the units for the traditional as well as different phases of modern rice mills.

The third chapter makes an attempt to analyze the economics of paddy processing units by analyzing the costs incurred at various stages of production, as also the marketing of final products by the paddy processing units. At the same time it also tries to enumerate the standards maintained in the processing activities and the relative market share of the paddy processing units.

The fourth chapter tries to focus upon the constraints in the rice milling industry by incorporating aspects like capacity utilization, reasons behind under utilization of capacity, subsidy aspects, and many such other constraints acting as bottlenecks in the growth of the industry. At the same time, the fourth chapter also tries to describe the steps to overcome the constraints, as has been suggested by the paddy processing units.

Lastly, the fifth chapter tries to draw specific conclusions based on the finding of the present study and attempts to make appropriate policy recommendations.



## CHAPTER 2

### HULLING AND MILLING RATIO FOR PADDY

#### 2.1: Introduction

One of the major indicators of the economics of a paddy processing units can be assigned to the hulling and the milling ratios of paddy. Hence, before we proceed further, it remains more than necessary to briefly describe the basic concepts relevant to the present study.

As has been mention earlier, paddy cannot be consumed in its raw form, and thus needs to be processed suitably to enable it for human consumption. It is here that rice milling is the primary processing activity under which the hull and the bran is removed from the paddy grain to convert it into polished white rice. In India this hulling and milling of paddy, i.e. the processing of paddy, can be categorized into the following two broad methods – viz. Traditional Method and Mechanical Methods.

In the traditional method of paddy processing, methods like hand-pounding was in practice using implements like *Dhenki*, *Chakki*, etc. With the advent of modern mechanical milling techniques, these traditional methods of paddy processing have become obsolete. On the other hand, the conventional mechanical mills can be categorized into four main types – viz. Hullers, Shellers, Huller-cum-Shellers, and Modern Rice Mills. In West Bengal, a majority of the paddy processing units are hullers followed by the modern rice mills, while the shellers and the huller-cum-shellers are hardly found in the state.

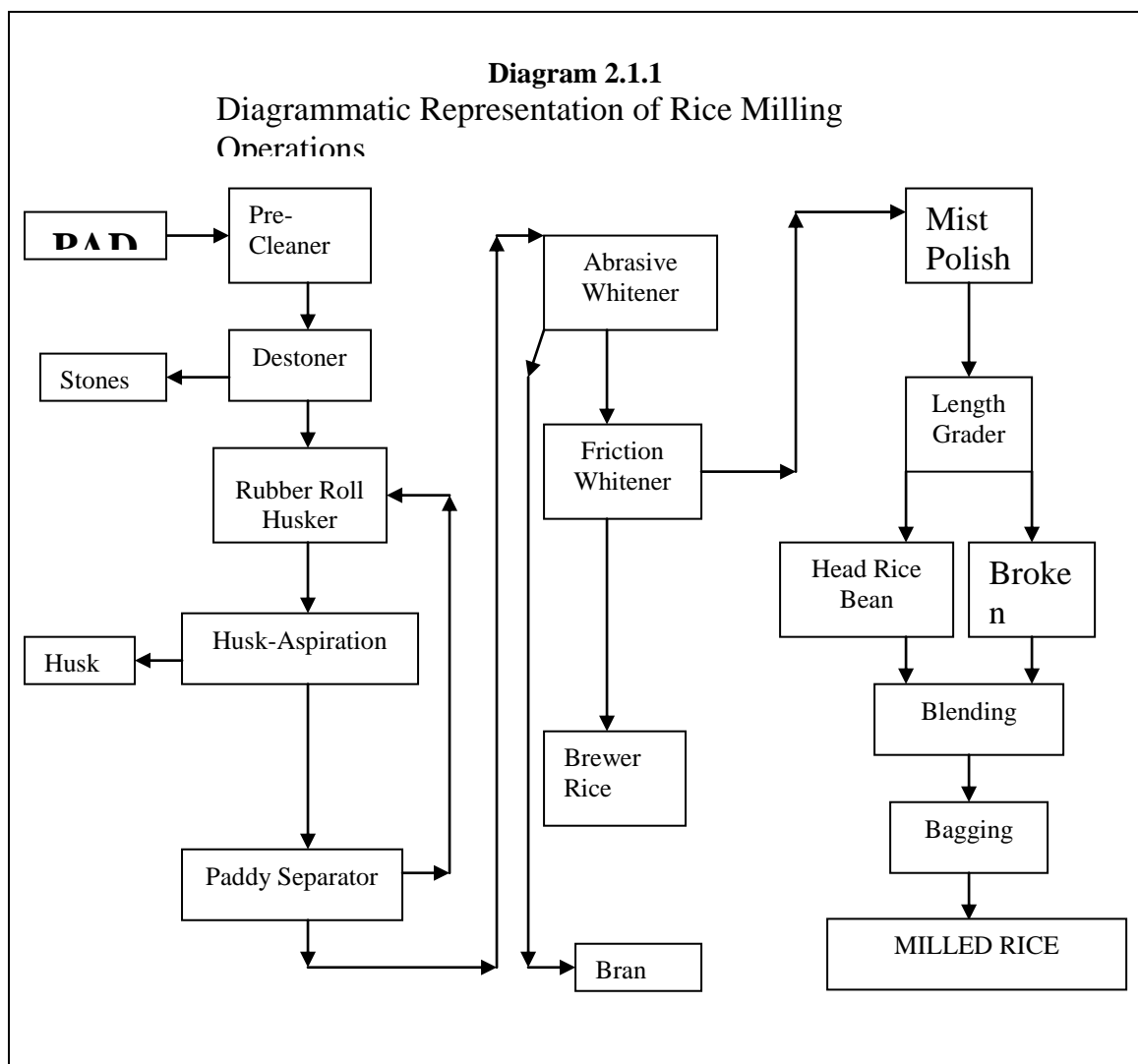
The conventional rice hullers have a seemingly high presence in rural West Bengal, as has been suggested by government data and hand-on field investigations. These hullers are usually of very low capacity mills, where both shelling and polishing operations are carried out simultaneously. Hence, there is no control on the polishing of rice by the hullers, resulting into production of bran admixed with husk with a high broken rice grains.

As compared to the huller operations, the modern rice mills with much higher capacity have separate processing mechanism for de-husking and polishing of the paddy, which makes the by-products like broken-rice, bran, husk, etc. available separately. As such, while by-product like paddy husks can be

utilized to produce energy, furfural, etc., at the same time we can get edible and non-edible oil from the by-product bran.

The basic rice milling process typically consists of the following steps:

- Pre Cleaning: Removing all impurities and unfilled grains from paddy;
- De-stoning: Separating small stones from paddy;
- Parboiling (Optional): Helps in improving the nutritional quality by gelatinization of starch inside the rice grain. It improves the milling recovery percent during deshelling and polishing / whitening operation;
- Husking: Removing husk from paddy;
- Husk Aspiration: Separating the husk from brown rice/ unhusked paddy;
- Paddy Separation: Separating the unhusked paddy from brown rice;
- Whitening: Removing all or part of the bran layer and germ from brown rice;
- Polishing: Improving the appearance of milled rice by removing the remaining bran particles and by polishing the exterior of the milled kernel;
- Length Grading: Separating small and large brokens from head rice;
- Blending: Mixing head rice with predetermined amount of brokens, as required by the customer;
- Weighing and Bagging: Preparing the milled rice for transport to the customer.



For the sake of the study, it needs to be noted here that we treat hulling ratio as the ratio of brown rice to paddy and milling ratio as the ratio of processed rice to paddy. This is because of the fact that certain rice mills can be found, which follow a two-step process in which the first step involves hulling of paddy to get brown rice and the second process includes polishing of the brown rice to fine white rice.

## 2.2: Growth of Rice Milling in the State from Traditional to Modern

Starting with 3.55 MT of rice production during 1950- 51, West Bengal has come a long way to produce more than 15.04 MT of rice in the year 2008-09. Similarly, in the processing sector, the technology has undergone significant changes to keep pace with the manifold increase in production of paddy output. Earlier, hand pounding, pedal operated system and Engleberg huller units were common for milling of paddy. By the year 2009-10, there were more than a thousand modern rice mills with parboiling facility using rubber rolls for paddy dehusking, while some of them also have colour sorters for removal of discoloured rice for export market. Obviously enough, the advent of modern rice mills over the traditional rice mills have been a result of decades of development, which is briefly discussed here.

The history of rice milling in West Bengal can be traced back to as in the 1920s when one of the first rice mills in India came into existence in the district of Burdwan. During the 1930s and 1940s, a few rice mills were started in and around Kolkata, and a few mills in the districts of Burdwan, Midnapore and Bankura. During the 1950s, the development of agricultural activities in Burdwan district enhanced the process of formulation up of Rice Mills Industries Act (RMI Act) 1958. During this period the rice mills were run mostly by motorized hullers, and partly by sheller machines, with lower out-turn ratios.

It was, however, the serious food crisis in the early sixties, which highlighted the desperate need for a proper policy towards the paddy processing industry. This led to a joint study of the industry by the Government of India and the Ford Foundation. In April 1963, the Ford Foundation team pointed out certain problems of the traditional rice milling industry in India. In particular, the Ford Foundation observed that- a) The paddy received from farmers is low in milling quality, b) The traditional storage in India was not adequate enough, and c) The milling machinery manufactured in India was backdated with lower out-turn ratio. In short, the study pointed out that the overall supply of rice could be augmented substantially with additional yield obtained through

modernization of the existing rice processing techniques. The team, therefore, recommended an overall modernization of the paddy-rice system beginning from improved production practices by cultivators to establishment of mechanical driers, rubber roll sheller mills and bran extraction plants coupled with improved storage facilities at all levels of handling. As a consequence, the process for modernization of rice milling industry in the state was initiated in 1970s with the amendment of the Rice Milling Industry (Regulation) Act 1958 and the Rice Milling Industry (Regulation and Licensing) Rules 1959.

In the initial phase of modernization, shellers-cum-hullers and multiple hullers were brought under purview of modernization. Prior to 1970 the rice mills in West Bengal used motorized hullers for milling operations. Since 1970, the modernized rice mills came into existence with an average production capacity of 5 – 6 metric tones per day. These mills parboiled paddy in mild steel vessels and dried the same in yards under sunlight, and then milled this dried paddy in the motorized hullers. During this phase, these mills were unable to produce good quality of rice, as the mills did not possessed adequate paddy cleaning, parboiling, mechanical drying and milling facilities. Moreover, these mills used to remain closed during the monsoon period, in absence of adequate sunlight for drying of paddy in the yards.

Since the year 1990 adoption of mechanical drying system in rice mills started taking place in West Bengal. The system of mechanical drying got a good acceptance from majority of the old rice mills, and conversion of sun-drying system to mechanical drying system started taking place in the state. However, in a few of the old rice mills, the sun-drying system could not be phased out on employment ground. The new mills, which came up during the period have incorporated mechanical drying system in their mills.

Since the 1990s onwards, the number of mills increased from less than 400 units to more than 1100 units in 2010 with financial assistance from commercial banks and state financial corporation. During this phase, a more modernized and mechanized parboiling and drying system of paddy have been introduced. The technology adoption of the modern rice mills in the state is reflected in the fact that a few of the modern rice mills have incorporated colour sortex machine and silky polishing machine for producing superior quality of rice, mainly for the export market. Consequently, the production of byproducts like rice bran and rice husk has increased substantially along with the quantum jump in the production of rice, the main product.

### 2.3: Trends in Type of Rice Mills

To enable the paddy grain suitable for human consumption, it is milled either in raw condition or after par-boiling. The milling of rice in West Bengal is primarily carried out in small and medium sized rice mills, most of which are

huller mills. The other existing types of rice mills in West Bengal are the Battery of Huller mills, Huller-cum-Sheller mills, Sheller mills and Modern Mills. Most of the tiny huller mills are of about 250-300 kg/hr capacities, which are operating mainly for custom milling of paddy. Apart from it, a few double hulling units, underrun disc shellers cum cone polishers and rubber roll shellers cum friction polishers are also present in the state. Over the years there has been a steady growth of improved modern rice mills in the state with capacities ranging from .25 tonnes /hr to 16 tonnes/ hr.

While trying to analyze the trends in the type of rice mills in West Bengal, it sadly comes out that a ‘*comprehensive/up to date list of rice mills working in different states is not readily available with any organization*’, as has been put by the ‘*Comprehensive Industry Document on Pulse, Wheat and Rice Mills*’ published by the Central Pollution Control Board in 2008. Only data relating to a few years are available with the Ministry of Food Processing Industries, G.O.I.

Year	Huller	Sheller	Huller-cum-Sheller	Modern Rice Mills	Total
1992	9404	2	71	980	10457
1995	9554	3	72	926	10555
2002	9554	3	72	926	10555
2010	n.a.	n.a.	n.a.	1109*	n.a.

*Source: a) Ministry of Food Processing Industries, G.O.I. ; b) Department of Food & Supply, Government of West Bengal*

From whatever available data there is, it come out clear that over the last two decades, the sheller and huller-cum-sheller mills have lost their importance in the paddy processing industry. Presently the major players in the industry are the age-old huller units as against the ever-improving modern rice mills. On the one hand, the huller mills have the advantage of being cheap and simple to operate but are very inefficient in converting paddy into rice. On the other hand, the modern mills give the highest yield of rice with least broken and better quality of by-products like bran. Normally the huller mills yield bran having lowest oil content as it contains appreciable amount of husk and broken rice. But the oil content in bran from modern mills is far better in this respect.

Again, if we consider the data available with the Central Pollution Control Board, we find that West Bengal has the largest number of Rice Mills (including the tiny rice mills, which may not be registered with the State Pollution Board) among all other states in the Table 2.3.1.

<b>Table 2.3.2</b> <b>State-wise Total number of Rice Mills &amp; Major Form of Rice: 1997</b>
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State	No. of Rice Mills	Major form of Rice
West Bengal	16925	Parboiled
Uttar Pradesh	16610	White
Andhra Pradesh	16410	White
Bihar	11675	Parboiled
Tamil nadu	10950	Parboiled
Punjab	10500	White
Orissa	10240	Parboiled
Madhya Pradesh	10000	White
Assam	5560	Parboiled
Maharastra	4625	White
Karnataka	4500	White
Haryana	3065	White
Kerala	2500	Parboiled
Gujarat	1440	White
Total	125000	-

*Source: CPCB Document “ COINDS on Rice Mills ”;  
2008*

#### **2.4: BASIC CHARACTERISTICS OF THE SELECTED SAMPLE UNITS**

As a prelude to our specific questions that we intend to verify in this study, it remains customary to describe the nature of the sample units. In this study, the sample units are the paddy processing units selected over two districts viz. Burdwan and Birbhum. The sample consists of 25 modern rice mills and 25 traditional rice mills from each district, thereby making the sample size to be 100 paddy-processing units, 50 units from each of the two districts. Table 2.4.1 briefly summarizes the distribution of sample paddy processing units in this study.

It should be noted at the outset that all 50 modern rice mills and 50 traditional rice mills in our sample size process parboiled paddy only. Processing of raw paddy / raw paddy mill does not appear in our sample pool as it forms only a very little fraction of paddy processed in the selected districts. In fact, parboiled paddy is the predominant form of paddy processed in eastern India, especially in West Bengal (refer to Table 2.3.2 above).

It is easy to find from Table 2.4.1 that all the sample modern rice mills selected for the study are of owner-cum-trader type units. In fact, in West Bengal, almost all the modern rice mills function as owner-cum-trader units, where custom hiring amounts only to a fraction of their paddy processing operations. Modern rice mills running purely on a custom hiring basis can hardly be traced in West Bengal.

On the other hand, all the sample traditional paddy-processing units turn out to be the huller units, running purely on a custom-hiring basis. The other forms of

traditional units, viz. the sheller, the huller-cum-shellers, etc. can hardly be traced in the selected districts, as there is an overwhelming presence of hullers and modern rice mills in the selected districts, competing out the other traditional paddy-processing units. The concentration of huller units, even in districts with the highest concentration of modern rice mills (viz. Burdwan), is such that one can find a huller unit almost every 4 to 5 kilometers in the rural areas.

Type of Unit	Owner Cum Trader		Custom Hiring		All
	Non-parboiled	Parboiled	Non-parboiled	Parboiled	
Modern Rice Mills – Phase I	-	20	-	-	20
Modern Rice Mills – Phase II	-	17	-	-	17
Modern Rice Mills – Phase III	-	13	-	-	13
Hullers	-	-	-	50	50
Shellers	-	-	-	-	0
Huller Cum Shellers	-	-	-	-	0
Others (Specify)	-	-	-	-	0
Total	0	50	0	50	100

*Source: Filed Survey*

Again, it is to be noted here that among the selected modern rice mills from the two districts, there remains a fair distribution of modern rice mills belonging to different phases of technological advancement. In fact, 40 percent of the selected sample rice mills belong to Phase I, 34 percent belong to Phase II and 26 percent belong to the Phase III of Modernization of Rice Mills with highly sophisticated and advance milling techniques. Note also that the survey has been carried out in such districts that are historically renowned for paddy processing activities, being the districts of Burdwan and Birbhum. As such this survey encompasses, on the one hand, rice mills that are established as early as in the 1920s and 1930s who are upgraded time to time over the decades, as also the latest rice mills with up-to-date agro-engineering technologies using fully automated paddy-processing units with imported color-sorter machines.

Type of Unit	Avg. Investment (Rs. in lakhs)	Avg. Size of Units (Tons Per Hr.)	Avg. No. of Employees	Avg No. of Daily Wage Laborers
Modern Rice Mills	115.67	3.83	21.16	17.74
Traditional Rice Mills (Hullers)	.56	.89	.90	.10
All	58.11	2.36	11.03	8.92

In this context we can compare the sample units side by side with respect to the size of sample units, average investment and the number of employees engaged. As has been mentioned earlier, the huller units are usually much cheaper as compared to the modern rice mills, which require much larger investment. The fact has been clearly reflected in Table 2.4.2, which shows that while the average investment for the sample huller units stands at Rs. 0.56 lakh only, that for the modern rice mills stands more than 200 times that of the hullers- at Rs. 115.67 lakhs on an average. In terms of capacity also, while the average capacity for the huller units stands at 0.89 TPH (tonnes per hour), that for the modern rice mills stand at 3.83 TPH. With such a high investment and high installed capacity, the employment of human labour in the modern rice mill is also high quite understandably. In fact, while the huller units are mostly run by the owner himself or by an assistant (or manager), the modern rice mills on an average employ more than 21 permanent staffs and 18 daily wage labourers in their units. It thus turns out that the modern rice mills serve to create good employment opportunities in the agro-processing industry. Nevertheless, as has been observed during the study, with the advancement of milling technology the fully automated milling machines have replaced human labour, at least to some extent.

## 2.5: HULLING AND MILLING RATIOS IN MODERN AND TRADITIONAL RICE MILLS

As the central focus of the present study is the hulling and the milling ratio of paddy, a comparative analysis of the out-turn ratio (OTR) of modern vis-à-vis traditional rice mills remains to be one of the most important aspects. It should be noted here that we define the out-turn ratio as the conversion ratio of paddy to fine rice obtained through specific milling technique applicable. However, the present study relates to common variety of paddy only, as Grade A and (or) export quality variety of paddy is processed only in two/three Phase III modern rice mill in negligible quantities.

Indeed, a comparative analysis of the out-turn ratio arrived separately for the hullers (viz. the traditional rice mills) and the modern rice mills remains extremely significant considering that a number of studies in the past have indicated that the overall supply of rice could be augmented substantially with additional conversion of paddy to rice obtained through modernization of the existing paddy-processing techniques. This observation, however, is based the assumption that the out-turn ratio for the huller units (processing about one-fourth of the nation's paddy output) is comparatively lower than the modern rice mills. It has been argued by a number of past studies that the out-turn ratio in the hullers remains more than 5 percent lower than the modern rice mills, with a higher ratio of broken rice. It is here that in this section, we want verify



the out-turn ratio of the traditional vis-à-vis modern rice mills on a comparative basis.

Type of Unit / Particulars		2007-08	2008-09	2009-10	Average
<b>Phase I</b>	Paddy Processed (qt)	595991.90	587199.89	633841.41	605677.73
	Fine Rice (qt)	370495.70	366032.30	393428.46	376652.15
	Out Turn Ratio	62.16	62.34	62.07	62.19
<b>Phase II</b>	Paddy Processed (qt)	601414.25	582713.24	671162.62	618430.04
	Fine Rice (qt)	379187.18	369379.73	422176.23	390247.71
	Out Turn Ratio	63.05	63.39	62.90	63.10
<b>Phase III</b>	Paddy Processed (qt)	1362104.20	1271194.60	1427475.00	1353591.27
	Fine Rice (qt)	867003.65	810200.11	906151.21	861118.32
	Out Turn Ratio	63.65	63.74	63.48	63.62
<b>All Modern</b>	Paddy Processed (qt)	2559510.35	2441107.73	2732479.03	2577699.04
	Fine Rice (qt)	1616686.53	1545612.14	1721755.90	1628018.19
	Out Turn Ratio	63.16	63.32	63.01	63.16
<b>Hullers</b>	Paddy Processed (qt)	287354.50	254358.50	202703.75	248138.92
	Fine Rice (qt)	164494.19	145389.80	116074.92	141986.30
	Out Turn Ratio	57.24	57.16	57.26	57.22
<b>All</b>	Paddy Processed (qt)	5406375.20	5136573.96	5667661.81	5403536.99
	Fine Rice (qt)	3397867.25	3236614.08	3559586.72	3398022.68
	Out Turn Ratio	62.85	63.01	62.81	62.89

*Source: Field Survey*

The out-turn ratio arrive at in the present study separately for the different milling techniques has been presented here in Table 2.5.1 above. It remains highly significant to observe here that –

- a) The out-turn ratio for the hullers stands at an average of 57.22 percent as compared to the modern rice mills with an average turn-out ratio of 63.16 percent. It thus follows that, on an average, the out-turn ratio of the hullers remains near about 6 percent less than the modern rice mills.
- b) For all the three years and on an average, the out-turn ratio in modern rice mill belonging to Phase III remains higher (63.62 percent) than Phase II (63.10 percent), which again remains higher than Phase I (62.19 percent). In turn, this indicates that among the modern rice mills, the out-turn ratio increases with the adoption of advanced milling techniques.
- c) On an average, the out-turn ratio for the paddy processing units under the purview of the present study taken together (including both traditional and modern rice mills) stands at 62.89 percent.

Though all these observation remains highly significant to note in the context of the present study, one should first consider the observation that the out-turn ratio for the hullers remains much lower than the modern rice mills. Thus it can be safely said that the outcome of the present study remains in tune with the findings of earlier studies that the out-turn ratio of the traditional paddy processing units remains much lower than the modern rice mills using improved milling techniques.

## 2.6: DIFFERENCE IN RICE MILLING RATIO AMONG DIFFERENT PHASES OF MODERN RICE MILLS

Among the modern rice mills, there exists a huge difference in the milling technology applied for the processing of paddy, depending upon the mode and nature of technological advancement and technological up-gradation of the paddy processing units. In fact, this survey encompasses rice mills, which were established as early as in the 1930s in the traditionally renowned rice-milling cluster of Burdwan. These age-old rice mills in Burdwan got them up-graded time and again to keep pace the technological advancement in the paddy processing industry. However though, some of these old rice mills use both sun-drying system and mechanical drying system simultaneously owing to various socio-political reasons. At the same time, the survey encompasses highly sophisticated and fully automated imported milling units with silky polish and colour sorter machines. Such advanced paddy processing units present in Burdwan and Bolpur cluster under the present study can only be traced in some of the leading rice mill cluster like Karnal, Kalady, etc.

It thus remains understandable that with the out-turn ratio if the paddy modern rice mills depends much on the level of technological up-gradation and level of modernization of the concerned rice mill. As has been said earlier, in this study while 40 percent of the modern rice mills fall under the Phase I of modernization, another 34 percent belongs to Phase II. Only a quarter (26 percent) of the modern rice mills fall under the Phase III of modernization category.

The differences in the out-turn ratio among the different phases of modern rice mills have been depicted in Table 2.5.1. In fact, it can be observed from Table 2.5.1 that on an average, the out-turn ratio in modern rice mills belonging to Phase III remains the highest at 63.62 percent, followed by Phase II with 63.10 percent and then by Phase I with 62.19 percent. This particular phenomenon holds true for all the three years 2007-08, 2008-09 and 2009-10; as also for the average outturn ratio over the three years. This indicates that among the modern rice mills, the out-turn ratio exhibits a positive relationship with the level of improvement in the milling technology. In particular, improved paddy

processing technology turns out to have resulted into higher out-turn ratio for the selected sample paddy processing units.

## 2.7: CONCLUSION TO CHAPTER 2

The history of rice milling in West Bengal can be traced back to as in the 1920s when one of the first rice mills in India came into existence in the district of Burdwan. However, the technology of paddy processing has undergone significant changes to keep pace with the manifold increase in production of paddy output. With the advent of modern mechanical milling techniques in the state, the traditional methods (like *Dhenki*, *Chakki*, etc. and later the *Engleberg* huller units) of paddy processing have become obsolete. Among the mechanical mills, the shellers and the huller-cum-shellers are hardly found in the state, while the hullers dominate the paddy-processing industry followed by the modern rice mills. These hullers are usually of very low capacity mills, where both shelling and polishing operations are carried out simultaneously. On the other hand, the modern rice mills with much higher capacity have separate processing mechanism for de-husking and polishing of the paddy, which makes the by-products like broken-rice, bran, husk, etc. available separately. However, at present in West Bengal, while there are about 1100 modern rice milling units in 2010, the number of registered huller units is expected to be more than 10 times the number, not to speak of the unregistered ones.

The central focus of the present chapter is to reassure the hulling and the milling ratio of paddy. In this study, the sample units are the paddy processing units selected over two districts viz. Burdwan and Birbhum. The sample consists of 25 modern rice mills and 25 traditional rice mills from each district, thereby making the sample size to be 100 paddy-processing units, 50 units from each of the two districts.

Among the modern rice mills, there exists a huge difference in the milling technology in the paddy processing units. The study encompasses a few old but up-graded rice mills use both sun-drying system and mechanical drying system simultaneously. At the same time, the survey encompasses highly sophisticated paddy processing units with imported and fully automated milling units with colour sorter machines, comparable only to rice mill clusters like Karnal, Kalady, etc.

A comparative analysis of the out-turn ratio (OTR) of modern vis-à-vis traditional rice mills reveals some observations of high significance, which can be summarized as follows-

- First, the out-turn ratio of the hullers remains much lower than the modern rice mills,

- Second, among the modern rice mills, the out-turn ratio increases with the adoption of more advanced milling techniques,
- And lastly, the out-turn ratio for the paddy processing industry as whole in general stands at 62.89 percent, taking all types of paddy processing units together.

Thus, on the one hand, the outcome of the present study remains in tune with the findings of earlier studies that the out-turn ratio of the traditional paddy processing units remains much lower than that of the modern rice mills with improved milling techniques. On the other hand, it is found that among the modern rice mills, the out-turn ratio exhibits a positive relationship with the level of improvement in the milling technology, i.e. the modern rice mills belonging to advanced stages of modernization are found to have higher out-turn ratio on an average.

## **CHAPTER 3**

### **ECONOMICS OF PADDY PROCESSING**

#### **3.1: Introduction**

The basic need for the processing of paddy remains in the fact that paddy itself cannot be consumed in its raw form. Thus to enable the paddy grain suitable for human consumption, it needs to be milled either in raw condition or after parboiling. Hence, the very essence of economics of paddy processing remains with the fact how the paddy is processed. The processing of paddy thus forms an industry, where paddy serves to be the raw material, processed to form the finished product, polished fine rice. In fact, this paddy processing industry is the largest and the oldest agro-processing industry in India.

It is interesting to observe that the milling of rice in West Bengal is primarily carried out in small and medium sized rice mills, most of which are huller mills. At the same time, there has been a steady growth of improved modern rice mills in the state with much higher capacities. Nevertheless, it remains the fact that at present both types of paddy processing units co-exist. While the hullers claim a share of about half of the paddy processed in the state, the other half of the entire paddy output is processed by the modern rice mills.

In this chapter, we will try to examine the economics behind the functioning of two completely different types of paddy processing units. By treating the paddy processing units as strict business units, here we are to examine aspects like market incidentals, processing costs, marketing of final products, etc. to arrive at a conclusion on the economics of paddy processing in the huller units and in the modern rice mills belonging to different phases of development.

It should be noted here that the economics of the modern rice mills have been analyzed separately for the different phases of modernization of rice mills, as there exists significant differences in the process of production, i.e. processing of paddy. For example, while a few modern rice mills belonging to Phase I use methods such as sun-drying for the drying of paddy, some other use both sun-drying and mechanical driers run by diesel, while some other use electrical driers. Understandably, the costs of production may not be the same for every unit. Again, with advancement of milling technology, the milling process has become less labour intensive. As such, the more advanced units are expected to have lower labour costs as compared to the less advanced modern rice mill units. For this, we have treated the different phases of modernization separately for a better understanding of the economics of paddy processing.

### 3.2: Market Incidentals in Procuring Raw Materials by Modern and Traditional Rice Mills

As has been mentioned earlier, the huller units under the purview of the present survey purely run on a custom-hiring basis in both the districts surveyed. In fact, the task of parboiling of raw paddy is done by the farmers themselves at home, while the hulling operation is carried out by the huller units against a fixed charge/rental per unit of parboiled paddy. As such there are virtually no market incidentals for the huller units. Even the clients of the huller units, viz. the farmers who brought the parboiled paddy to convert it into rice, often help in the tasks of loading/unloading and feeding of paddy/rice in huller machines. Hence, costs like transportation, handling, storage, drying costs, packing, weight-loss, etc. does not arise in case of the huller units.

On the other hand, these market incidentals are very much present in case of the modern rice mills. As these modern mills are of much higher capacity, the costs of transportation, handling, etc. are very much present for the rice mills. In particular, as Table 3.2.1 reveals, the total market incidental costs stands at around Rs.8.63 per quintal of paddy processed on an average for all the modern rice mills taken together. Among the various market incidental costs, the costs of packing materials stand to be the highest at around Rs.2.45 per quintal of paddy processed.

<b>Year</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>AVERAGE</b>
Handling/Cleaning/ Packing (Rs./Qtl)	0.60	0.82	0.93	0.77
Packing Material (Rs./Qtl)	2.11	2.53	2.73	2.45
Drying Labour/Material Charges (Rs./Qtl)	1.01	1.28	1.45	1.25
Weight loss (Rs./Qtl)	1.26	1.48	1.62	1.45
Transportation (Rs./Qtl)	1.12	1.42	1.66	1.40
Storages Charges (Rs./Qtl)	0.46	0.51	0.61	0.53
Other Specify (Rs./Qtl)	0.70	0.78	0.86	0.78
Total (Rs./Qtl)	7.22	8.82	9.86	8.63
<i>Source: Field Survey</i>				

It should, however, be noted here that a large number of modern rice mills revealed that they do not have much market incidental costs as these costs are partially borne by the farmers/paddy dealers/commission agents themselves. Costs like handling, transportation, and packaging do not arise under such cases as the paddy is purchased at the mill gates and the costs are largely borne by the farmers/agents themselves.

Again, if we examine the market incidentals separately for the modern rice mills belonging to different phases of modernization, as has been depicted in Table 3.2.1(a), 3.2.1(b) and 3.2.1(c) respectively for the modern rice mills belonging to modernization Phase I, II and III, we find out that the total market incidental cost does not differ significantly over the phases of modernization.

<b>Year</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>
Handling/Cleaning/ Packing (Rs./Qtl)	0.48	0.67	0.84
Packing Material (Rs./Qtl)	1.82	2.11	2.37
Drying Labour/Material Charges (Rs./Qtl)	1.12	1.36	1.54
Weight loss (Rs/Qtl)	1.47	1.75	1.91
Transportation (Rs./Qtl)	0.95	1.18	1.36
Storages Charges (Rs./Qtl)	0.54	0.60	0.72
Other Specify (Rs./Qtl)	0.81	0.88	1.02
<b>Total (Rs/Qtl)</b>	<b>7.19</b>	<b>8.55</b>	<b>9.75</b>
<i>Source: Field Survey</i>			

However, the tables indicate that drying labour and material costs are higher for the rice mills belonging to Phase I of modernization as compared to those belonging to Phase II and Phase III. This remains understandable considering the fact that the modern rice mills belonging to Phase I of modernization are often found using both sun-drying and mechanical drying techniques run by diesel, which in turn makes both the labour and material costs for drying higher than the modern units using advanced drying techniques.

<b>Year</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>
Handling/Cleaning/ Packing (Rs./Qtl)	0.62	0.94	0.94
Packing Material (Rs./Qtl)	2.34	2.86	2.93
Drying Labour/Material Charges (Rs./Qtl)	0.97	1.28	1.40
Weight loss (Rs/Qtl)	1.22	1.43	1.51
Transportation (Rs./Qtl)	1.26	1.59	1.89
Storages Charges (Rs./Qtl)	0.39	0.43	0.54
Other Specify (Rs./Qtl)	0.60	0.68	0.75
<b>Total (Rs/Qtl)</b>	<b>7.40</b>	<b>9.20</b>	<b>9.95</b>
<i>Source: Field Survey</i>			

Again, the costs in terms of value of weight-loss during handling, packing, drying, storage, etc. (along with normal loss of moisture), tends to be higher with lower levels of modernization. This may be attributed to the overall efficiency of the advanced milling units as compared to their counterparts. At

the same time, the costs of transportation tend to be higher with higher levels of modernization.

<b>Table 3.2.1 (c)</b>			
<b>Market Incidentals Incurred by Modern Rice Mills – Phase III</b>			
<b>Year</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>
Handling/Cleaning/ Packing (Rs./Qtl)	0.61	0.90	1.06
Packing Material (Rs./Qtl)	2.24	2.73	3.04
Drying Labour/Material Charges (Rs./Qtl)	0.89	1.15	1.37
Weight loss (Rs/Qtl)	0.99	1.16	1.31
Transportation (Rs./Qtl)	1.21	1.57	1.82
Storages Charges (Rs./Qtl)	0.43	0.48	0.54
Other Specify (Rs./Qtl)	0.66	0.74	0.77
Total (Rs/Qtl)	7.03	8.74	9.92
<i>Source: Field Survey</i>			

On the whole, it comes out that the total market incidentals do not differ much among the different phases of modernization of rice mills. While drying labour/material costs and costs owing to weight-loss appears to be higher with lower phases of modernization, the costs of transportation seems to increase with increase in the level of modernization of rice milling technique.

### 3.3: Processing Costs among Modern and Traditional Rice Mills

The costs incurred during processing of paddy by the modern rice mills remains central to the analysis of the economics of modern rice milling. The modern rice mills run as individual commercial business units, who purchase paddy from the farmers, paddy traders, local stockists (*arotdars*), etc. and converts the raw material paddy into finished good as fine rice. The fine rice is then sold to the whole-sellers and to the retailers of rice. In the process, profit is accrued for the value added in processing of raw paddy into fine rice.

Now, processing paddy involves multiple stages (as has been described earlier), and for each of these stages there are number of costs involved in the processing activity. However, we can broadly sub-divide these processing costs into two major components of variable costs and fixed cost. On the one hand, the fixed costs include costs like insurance of the processing unit, depreciation of capital goods and machineries, administrative expenses, etc., it also includes fixed rent or lease rent amount, rent of hired machineries etc. On the other hand, the variable costs for processing activities include costs like labour costs, energy charges (viz. electricity, fuel, etc.), storage & maintenance charges, etc., including the other variable costs like packing, transportation, handling, etc.



As has been mentioned earlier, there exist significant differences within the modern rice mills depending upon the advancement of the milling technique adopted by the unit. As different milling techniques demand different combination of inputs, there exists a fair amount of variation in the input application of modern rice mills, which understandably influences different costs in the processing activity. Hence for a better understanding, we have analyzed the processing costs of the modern rice mills separately for the different phases of modernization as also for all the rice mills taken together, as has been briefly described below.

Costs	Year	2007-08	2008-09	2009-10	Average
<b>Variable Cost</b>	Labor Cost (Rs/Qtl)	17.56	19.39	20.91	19.29
	Electricity charges (Rs/Qtl)	12.64	14.07	15.25	13.99
	Fuel Charges for Parboiling (Rs/Qtl)	4.19	5.26	5.96	5.14
	a. Petrol/Disel (Rs/Qtl)	3.34	4.22	4.88	4.15
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.85	1.04	1.08	0.99
	Packing Material Cost (Rs/Qtl)	0.59	0.67	0.72	0.66
	Maintenance/Repair Cost (Rs/Qtl)	4.02	4.37	4.88	4.42
	Storage Cost Specify (Rs/Qtl.)	0.60	0.68	0.76	0.68
	Other Cost Specify (Rs/Qtl)	3.50	3.78	4.17	3.82
	<b>Sub-total</b>	43.10	48.23	52.65	47.99
<b>Fixed Cost</b>	Insurance (Rs/Qtl)	1.16	1.29	1.33	1.26
	Depreciation (Rs/Qtl)	4.58	5.06	5.16	4.93
	Administrative Expenses (Rs/Qtl)	2.73	3.26	3.58	3.19
	Other Specify (Rs/Qtl)	3.22	3.61	4.00	3.61
		<b>Sub-total</b>	11.68	13.22	14.07
<b>Total</b>	<b>Variable + Fixed Costs</b>	54.79	61.44	66.72	60.98

*Source: Field Survey*

Table 3.3.1 describes the costs of paddy processing for the modern rice mills taken together, irrespective of the phases of modernization adopted by the respective rice mills. A number significant observations come out from Table 3.3.1, which may be briefly pointed out below –

- a) On an average over the three years 2007-08 to 2009-10, the costs of paddy processing by the modern rice mills stands at around Rs.61/- per quintal of paddy.
- b) About 80 percent of paddy processing cost is variable in nature, while fixed costs like insurance, depreciation, administrative expanses, etc. forms only about 20 percent.
- c) Among the different variable costs in processing of paddy by the modern rice mills, labour costs accounts for more than 40 percent of the

variable cost and more than 30 percent of total paddy processing cost including fixed costs.

- d) The costs incurred for electricity turns out to be the second high enough forming about 30 percent of the variable costs and more than 20 percent of total paddy processing costs.
- e) The costs of paddy processing by the modern rice mills has increased substantially (about 22 percent) over the last three years, the cause of which may be attributed to increase in almost every cost components of the processing activity, especially the electricity, fuel and labour costs.

Note here that the observations made above are based on the averages of all the modern rice mills taken together. As has been argued earlier, there remains a noticeable difference in the paddy processing techniques of the rice mills belonging to different phases of modernization, which significantly affect the costs involved in processing of paddy for the respective rice mills.

To further analyze the differences in paddy processing costs, Table 3.3.1(a) present the processing costs of paddy exclusively for the modern rice mills belonging to Phase I of modernization.

Costs	Year	2007-08	2008-09	2009-10	Average
<b>Variable Cost</b>	Labor Cost (Rs/Qtl)	21.42	22.97	24.39	22.93
	Electricity charges (Rs/Qtl)	8.26	9.09	9.74	9.03
	Fuel Charges for Parboiling (Rs/Qtl)	5.50	7.05	8.34	6.96
	a. Petrol/Diesel (Rs/Qtl)	4.13	5.43	6.66	5.41
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	1.37	1.62	1.68	1.56
	Packing Material Cost (Rs/Qtl)	0.57	0.66	0.73	0.66
	Maintenance/Repair Cost (Rs/Qtl)	3.32	3.58	4.09	3.67
	Storage Cost Specify (Rs/Qtl.)	0.54	0.63	0.71	0.63
	Other Cost Specify (Rs/Qtl)	3.43	3.81	4.05	3.77
	<b>Sub-total</b>	43.05	47.79	52.05	47.63
<b>Fixed Cost</b>	Insurance (Rs/Qtl)	0.51	0.61	0.68	0.60
	Depreciation (Rs/Qtl)	3.51	3.78	4.07	3.78
	Administrative Expenses (Rs/Qtl)	1.63	2.13	2.49	2.09
	Other Specify (Rs/Qtl)	2.88	3.28	3.61	3.26
		<b>Sub-total</b>	8.53	9.80	10.85
<b>Total</b>	<b>Variable + Fixed Costs</b>	51.58	57.59	62.90	57.36

*Source: Field Survey*

The observation made Table 3.3.1 (a) may be briefly stated as follows–

- a) For all the years and on an average, the paddy processing costs for the modern rice mills belonging to Phase I remain lower at Rs. 57.36 than that of the overall average of all rice mills taken together.
- b) The labour cost in modern rice mills belonging to Phase I of modernization remains significantly higher than the overall average of all rice mills taken together.
- c) While the costs on account of electricity remains lower, the costs borne out for fuels like diesel, biomass, etc. remains much higher than the overall average of all rice mills taken together.

The observations made above are based exclusive upon the modern rice mills belonging to Phase I of modernization. It comes out that in modern rice mills belonging to Phase I, the labour costs and the fuel costs remain high, while the electricity charges remains comparatively low. This remains particularly true as a number of modern rice mills belonging to Phase I of modernization have been found using labour-intensive sun-drying system alongside with mechanical driers. At the same time, the milling machines are often found void of automated conveyer system for feeding of raw materials to the machines, which in turn makes the paddy processing activity more labour-intensive for these units.

However, we may present here the following Table 3.3.1(b), which shows the processing costs exclusively for the modern rice mills belonging to Phase II of modernization. In fact, we may point out certain observation from Table 3.3.1(b) as follows –

- a) On an average, the costs of processing of paddy stands at Rs.59.44 per quintal of paddy for the modern rice mills belonging to Phase II of modernization, which remains less than the overall average of Rs. 61/-.
- b) The costs on account of electricity for paddy processing for the modern rice mills belonging to Phase II remains much higher than the modern rice mills belonging to Phase I.
- c) The paddy processing costs on account of fuel charges for parboiling remains significantly lower in modern rice mills belonging to Phase II than that in Phase I, which holds true for both costs on account of diesel and bio-mass fuel.

From the observation made above on the paddy processing costs borne out by the modern rice mills belonging to Phase II, it appears that the modern rice mills belonging to Phase II has a reduced amount of fuel charges for parboiling, while they have a greater costs incurred on account of electricity. This has perhaps been owing to fact that with the advancement of modernization, a number of paddy processing activities, which earlier used diesel fuel, are present run on electricity, like the more advanced parboiling and drying techniques.

Costs	Year	2007-08	2008-09	2009-10	Average
<b>Variable Cost</b>	Labor Cost (Rs/Qtl)	18.14	20.34	21.93	20.14
	Electricity charges (Rs/Qtl)	11.97	13.12	14.32	13.14
	Fuel Charges for Parboiling (Rs/Qtl)	3.98	4.76	5.10	4.62
	a. Petrol/Disel (Rs/Qtl)	3.29	3.90	4.21	3.80
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.69	0.87	0.90	0.82
	Packing Material Cost (Rs/Qtl)	0.54	0.60	0.64	0.59
	Maintenance/Repair Cost (Rs/Qtl)	4.15	4.44	4.70	4.43
	Storage Cost Specify (Rs/Qtl.)	0.51	0.58	0.65	0.58
	Other Cost Specify (Rs/Qtl)	3.65	3.75	4.23	3.88
	<b>Sub-total</b>	<b>42.95</b>	<b>47.59</b>	<b>51.57</b>	<b>47.37</b>
<b>Fixed Cost</b>	Insurance (Rs/Qtl)	0.87	0.96	1.04	0.95
	Depreciation (Rs/Qtl)	4.40	4.63	4.75	4.59
	Administrative Expenses (Rs/Qtl)	3.14	3.55	3.77	3.48
	Other Specify (Rs/Qtl)	2.70	3.05	3.37	3.04
	<b>Sub-total</b>	<b>11.10</b>	<b>12.18</b>	<b>12.92</b>	<b>12.07</b>
<b>Total</b>	<b>Variable + Fixed Costs</b>	<b>54.05</b>	<b>59.77</b>	<b>64.50</b>	<b>59.44</b>

*Source: Field Survey*

Costs	Year	2007-08	2008-09	2009-10	Average
<b>Variable Cost</b>	Labor Cost (Rs/Qtl)	10.87	12.65	14.20	12.58
	Electricity charges (Rs/Qtl)	20.27	22.98	24.96	22.74
	Fuel Charges for Parboiling (Rs/Qtl)	2.47	3.17	3.41	3.02
	a. Petrol/Disel (Rs/Qtl)	2.21	2.80	3.02	2.67
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.26	0.37	0.40	0.34
	Packing Material Cost (Rs/Qtl)	0.68	0.76	0.82	0.76
	Maintenance/Repair Cost (Rs/Qtl)	4.91	5.50	6.32	5.58
	Storage Cost Specify (Rs/Qtl.)	0.78	0.90	1.00	0.90
	Other Cost Specify (Rs/Qtl)	3.40	3.77	4.27	3.81
	<b>Sub-total</b>	<b>43.38</b>	<b>49.74</b>	<b>54.99</b>	<b>49.37</b>
<b>Fixed Cost</b>	Insurance (Rs/Qtl)	2.53	2.77	2.71	2.67
	Depreciation (Rs/Qtl)	6.45	7.59	7.39	7.14
	Administrative Expenses (Rs/Qtl)	3.88	4.61	5.00	4.50
	Other Specify (Rs/Qtl)	4.43	4.85	5.42	4.90
	<b>Sub-total</b>	<b>17.29</b>	<b>19.82</b>	<b>20.52</b>	<b>19.21</b>
<b>Total</b>	<b>Variable + Fixed Costs</b>	<b>60.67</b>	<b>69.56</b>	<b>75.51</b>	<b>68.58</b>

*Source: Field Survey*

Lastly, Table 3.3.1(c) presents the costs of paddy processing by the modern rice mills belonging exclusively to Phase III of modernization. A number of interesting and significant observations have been revealed by the Table 3.3.1 (c), which may briefly stated below –

- a) The costs of paddy processing by the modern rice mills belonging to Phase III of modernization has been significantly higher as compared to the modern rice mills belonging to Phase I and Phase II of modernization. In particular, on an average, the cost of processing a quintal of paddy by the modern rice mills belonging to Phase III remains about 20 percent and 15 percent higher than those belonging to Phase I and to Phase II respectively.
- b) Again, the electricity charges for processing of paddy for the modern rice mills belonging to Phase III of modernization remains significantly higher than those belonging to Phase I and to Phase II. In fact, it remains more than 2.5 times the per unit electricity cost borne by the modern rice mills belonging to Phase I.
- c) Interestingly, the labour cost for the processing of paddy by the modern rice mills belonging to Phase III of modernization remains much lower than that those belonging to Phase I and to Phase II. In particular, the labour cost per quintal of paddy processed remains almost half for the modern rice mills belonging to Phase III, as compared to those belonging to Phase I and to Phase II.
- d) The maintenance cost for the modern rice mills belonging to Phase III also remains much higher than those belonging to Phase I and to Phase II.
- e) The fixed cost for the modern rice mills belonging to Phase III remains much higher than those belonging to Phase I and to Phase II. This has been especially true for the depreciation charges, followed by the administrative expenses and the insurance coverage costs.

All these observations in turn reveal that there exist significant differences among the various components of costs for the modern rice mills belonging to different phases of modernization. While the modern rice mills belonging to Phase I have comparative cost advantage in terms of total costs of processing per unit of paddy, those belonging to Phase III has the least advantage in terms total unit costs of paddy processing. In fact, it remains evident that the modern rice mills belonging to Phase III of modernization are less labour-intensive. Again, as they are heavily capital intensive and extremely mechanized, the costs of electricity, maintenance, depreciation, etc remains much higher for these mills belonging to Phase III as compared to those belonging to Phase I and to Phase II.

Now, in contrast to the modern rice mills, it remains necessary to consider the processing costs borne out by the traditional rice mills, viz. the huller units. As such, Table 3.3.2 below summarizes the processing costs per quintal of paddy for the traditional rice mills running on a custom hiring basis in the study.

Costs	Year	2007-08	2008-09	2009-10	Average
<b>Variable Cost</b>	Labor Cost (Rs/Qtl)	3.38	4.23	5.38	4.33
	Electricity charges (Rs/Qtl)	4.42	5.32	6.64	5.46
	Fuel Charges for Parboiling (Rs/Qtl)	0.05	0.06	0.15	0.09
	a. Petrol/Disel (Rs/Qtl)	0.05	0.06	0.15	0.09
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.00	0.00	0.00	0.00
	Packing Material Cost (Rs/Qtl)	0.00	0.00	0.00	0.00
	Maintenance/Repair Cost (Rs/Qtl)	1.23	1.57	2.24	1.68
	Storage Cost Specify (Rs/Qtl.)	0.00	0.00	0.00	0.00
	Other Cost Specify (Rs/Qtl)	0.20	0.24	0.35	0.26
	<b>Sub-total</b>		9.27	11.42	14.77
<b>Fixed Cost</b>	Insurance (Rs/Qtl)	0.00	0.00	0.00	0.00
	Depreciation (Rs/Qtl)	0.30	0.36	0.43	0.36
	Administrative Expenses (Rs/Qtl)	0.00	0.00	0.00	0.00
	Other Specify (Rs/Qtl)	0.00	0.00	0.00	0.00
	<b>Sub-total</b>		0.30	0.36	0.43
<b>Total</b>	<b>Variable + Fixed Costs</b>	9.57	11.78	15.19	12.18

*Source: Field Survey*

The major observation made from the Table 3.3.2 above on the cost of paddy processing by the traditional rice mills (viz. hullers) may be briefly stated below –

- a) On an average of the three years (2007-08 to 2009-10) the costs of paddy processing by the traditional rice mills, i.e. the hullers in this study, turns out to be Rs.12.18, which remains much below than that for its competitive rivals, the modern rice mills with an average processing cost of Rs.61/- per quintal.
- b) As the huller units are run on a custom hiring basis, the costs on account of packing, storage and other market incidentals do not arise at all. Again, as the huller units are run on a very tiny scale with only one or two employees, the costs on account of labour is also extremely low.
- c) The average investment for setting up of huller units is quite low as compared to their counterparts, the modern rice mills (as has been mentioned earlier in the study). This in turn has led to lower depreciation costs, maintenance costs, etc. for the huller units. The electricity charges also accounts for only Rs.5.46 for processing a quintal of paddy in the huller units, which remains to be much lower as compared to the modern rice mills.
- d) As the task of parboiling is almost entirely done by the farmers themselves at their home in case of traditional huller type units, fuel charges for parboiling appears extremely low at a weighted average of 0.05 paisa only over all the sample huller units.

### 3.4: ECONOMICS OF MODERN RICE MILLS RUNNING ON OWNER-CUM-TRADER BASIS

When we speak of ‘modern’ rice mills, the very word *modern* comes with a number of economic specifications with respect to the nature of operations carried out in the paddy-processing unit. In fact, the process of modernization of rice mills is the felt need of paddy growing tracts where the traditional methods of rice milling are in vogue. Modernization is expected to result in higher yield of rice as well it makes the by-products like broken-rice, bran, husk, etc. available separately. It is thus a must for the rice mills irrespective of the quantity of paddy milled, as the economics of modernization is essentially based on better rate of recovery and not on the quantum of production.

Again, a number of studies conducted by government and non-government agencies indicated that even for a completely modernized plant with high capital expenditure (for steps like milling, parboiling, mechanized drying and for storage), the break-even volume of paddy is achieved with the utilization of less than half of the installed capacity for such a unit.

Hence it is widely accepted that for any existing unit, the rate of return would be more with modernization. At the same time, it can be found that the additional cost due to modernization can be duly compensated by the additional recovery of rice by modernization within the first two years, even for a small unit with 2 TPH (tonnes per hour) capacity.

Nevertheless, before trying to analyze the economics of modern rice mills, it is important to make clear the nature of the processing business performed by the sample paddy modern rice mills. This is especially because of the fact the economics of a unit running on trader-cum-owner basis might be completely different from that running on a custom-hiring basis. As such, it needs to be noted here at the outset that the modern rice mills under the purview of the present survey, are run by owner-cum-trader basis. In fact, the modern rice mills running exclusively on custom-hiring basis can hardly be found in West Bengal. At most, custom-hiring operations form only a minor fraction of the entire processing activities done by the modern rice mill. Hence, modern rice mills in this survey essentially means the modern rice mills running on owner-cum-trader basis.

In this section, we have tried to capture the economics behind the modern rice mills belonging to different phases, as well for all the rice mills taken together. The Table 3.4.1, 3.4.1 (a), 3.4.1 (b) and 3.4.1 (c) present the major economic aspects for the modern rice mills under the purview of the present study.

Table 3.4.1 Economics of Modern Rice Mills (All) Running on Owner-cum-Trader Basis				
Year	2007-08*	2008-09*	2009-10*	Average**

Quantity of Paddy Processed (Tonnes)	255951.04	244110.77	273247.90	257769.90
Value of Paddy Processed (Rs.Lakh)	19167.18	20056.33	23953.76	21059.09
Conversion Ratio of Fine Rice (Kgs /Qt)	63.16	63.32	63.01	63.16
Quantity of Fine Rice Produced (Tonnes)	161668.65	154561.21	172175.59	162801.82
Value of Fine Rice Produced (Rs.Lakh)	20028.93	20913.12	24983.74	21975.27
Conversion Ratio Broken Rice (Kgs / Qt)	2.00	2.05	2.01	2.02
Quantity of Broken Rice Produced (Tonnes)	5111.95	5008.72	5479.01	5199.89
Value of Broken Rice Produced (Rs.Lakh)	385.79	393.12	438.73	405.88
Conversion Ratio of Bran (Kgs per Qt)	4.67	4.65	4.73	4.68
Bran Produced (Tonnes)	11962.63	11346.72	12916.08	12075.14
Value of Bran Produced (Rs.Lakh)	755.03	885.18	1072.62	904.27
Conversion Ratio of Husk (Kgs per Qt)	20.03	20.00	20.04	20.02
Husk Produced (Tonnes)	51259.38	48825.28	54761.25	51615.31
Value of Husk Produced (Rs.Lakh)	94.51	93.42	109.65	99.19
Total Value of By-Product (Rs.Lakh)	1235.32	1371.72	1621.00	1409.35
Gross Returns (Rs.Lakh)	21264.26	22284.84	26604.74	23384.61
Total Market Incidentals (Rs.Lakh)	196.44	224.90	277.71	233.02
Total Electricity Cost (Rs.Lakh)	410.24	426.90	519.50	452.22
Total Bio-fuel Cost (Rs.Lakh)	91.62	111.77	142.93	115.44
Total Labor Cost (Rs.Lakh)	390.75	421.23	514.54	442.17
Total Depreciation, and Other Costs (Rs.Lakh)	601.01	630.41	761.65	664.35
Total Cost (Rs.Lakh)	1690.06	1815.20	2216.34	1907.20
Net Returns (Rs.Lakh)	407.02	413.31	434.65	418.32
Net Return (Rs/Qt)	15.90	16.93	15.91	16.23
<i>Note: (Sample Size = 50); * = Yearly Aggregates ** = Average of Yearly Aggregates</i>				
<i>Source: Field Survey</i>				

The major observations that can be made from Table 3.4.1, which presents major economic performance indicators for all the modern rice mills taken together may be briefly pointed out below –

- a) For all the sample modern rice mills in the present survey taken together, the net return per quintal of paddy processed turns out be Rs.16.23 on an average over the three years 2007-08 to 2009-10.
- b) The share of by-products (broken-rice, bran and husk) in value terms stands at 6.03 percent of gross return from milling operations, while that for the main product, viz. fine rice, stands at 93.97 percent of gross return.
- c) The share of total costs (including market incidentals, processing costs) stands at 8.30 percent of gross investment (i.e. total costs and value of paddy purchased for processing), while net return stands at only 1.82 percent of the gross investment.

TABLE 3.4.1 (A)				
Economics of Modern Rice Mills– Phase I Running on Owner-cum-Trader Basis				
Year	2007-08*	2008-09*	2009-10*	Average**



Quantity of Paddy Processed (Tonnes)	59599.19	58719.99	63384.14	60567.77
Value of Paddy Processed (Rs.Lakh)	4415.93	4797.41	5505.27	4906.20
Conversion Ratio of Fine Rice (Kgs /Qt)	62.16	62.34	62.07	62.19
Quantity of Fine Rice Produced (Tonnes)	37049.57	36603.23	39342.85	37665.22
Value of Fine Rice Produced (Rs.Lakh)	4590.66	4950.37	5701.47	5080.83
Conversion Ratio Broken Rice (Kgs / Qt)	2.22	2.29	2.22	2.24
Quantity of Broken Rice Produced (Tonnes)	1325.30	1345.45	1408.07	1359.61
Value of Broken Rice Produced (Rs.Lakh)	99.07	105.40	112.72	105.73
Conversion Ratio of Bran (Kgs per Qt)	4.35	4.48	4.44	4.42
Bran Produced (Tonnes)	2595.13	2628.11	2816.21	2679.82
Value of Bran Produced (Rs.Lakh)	163.96	204.67	234.40	201.01
Conversion Ratio of Husk (Kgs per Qt)	21.64	21.45	21.38	21.49
Husk Produced (Tonnes)	12897.51	12595.10	13554.07	13015.56
Value of Husk Produced (Rs.Lakh)	23.70	24.10	27.21	25.00
Total Value of By-Product (Rs.Lakh)	286.73	334.17	374.32	331.74
Gross Returns (Rs.Lakh)	4877.39	5284.54	6075.79	5412.57
Total Market Incidentals ((Rs.Lakh)	44.93	51.48	61.77	52.73
Total Electricity Cost (Rs.Lakh)	52.28	53.78	61.69	55.92
Total Bio-fuel Cost (Rs.Lakh)	32.16	42.39	54.92	43.15
Total Labor Cost (Rs.Lakh)	128.84	134.06	153.11	138.67
Total Depreciation, and Other Costs (Rs.Lakh)	96.64	104.43	124.32	108.46
Total Cost (Rs.Lakh)	354.85	386.14	455.81	398.93
Net Returns (Rs.Lakh)	106.61	100.98	114.72	107.43
Net Return (Rs/Qt)	17.89	17.20	18.10	17.74
<i>Note: (Sample Size = 20); * = Yearly Aggregates ** = Average of Yearly Aggregates</i>				
<i>Source: Field Survey</i>				

Now, as has been done earlier, we can sub-divide the modern rice mills under the purview of the present survey further to three distinct sub-groups- viz. modern rice mills belonging to Phase I, Phase II and Phase III, and examine the major economic variables separately for the phases. As such, the major observations for the modern rice mills belonging to Phase I, as has been represented in Table 3.4.1 (a) may be briefly pointed below as –

- a) For the sample modern rice mills belonging to Phase I, the net return per quintal of paddy processed turns out be Rs.17.74 on an average over the three years 2007-08 to 2009-10, which remains higher than that obtained for all the modern mills taken together.
- b) The share of by-products stands at 6.13 percent of gross return, while that for the main product, viz. fine rice, stands at 93.87 percent of gross return.
- c) The share of total costs serves to be 7.52 percent of gross investment, while net return stands at only 2.03 percent of the gross investment.

TABLE 3.4.1 (B)				
Economics of Modern Rice Mills – Phase II Running on Owner-cum-Trader Basis				
Year	2007-08*	2008-09*	2009-10*	Average**

Quantity of Paddy Processed (Tonnes)	60141.43	58271.32	67116.26	61843.00
Value of Paddy Processed (Rs.Lakh)	4503.70	4820.06	5887.64	5070.47
Conversion Ratio of Fine Rice (Kgs /Qt)	63.05	63.39	62.90	63.10
Quantity of Fine Rice Produced (Tonnes)	37918.72	36937.97	42217.62	39024.77
Value of Fine Rice Produced (Rs.Lakh)	4689.65	4999.82	6115.60	5268.36
Conversion Ratio Broken Rice (Kgs / Qt)	2.38	2.41	2.31	2.36
Quantity of Broken Rice Produced (Tonnes)	1428.91	1404.90	1551.75	1461.85
Value of Broken Rice Produced (Rs.Lakh)	107.36	110.06	124.58	114.00
Conversion Ratio of Bran (Kgs per Qt)	4.58	4.54	4.52	4.54
Bran Produced (Tonnes)	2751.71	2642.75	3033.90	2809.45
Value of Bran Produced (Rs.Lakh)	173.10	206.53	252.19	210.60
Conversion Ratio of Husk (Kgs per Qt)	19.96	19.96	20.02	19.98
Husk Produced (Tonnes)	12005.06	11633.23	13436.49	12358.26
Value of Husk Produced (Rs.Lakh)	22.15	22.29	26.92	23.79
Total Value of By-Product (Rs.Lakh)	302.60	338.88	403.69	348.39
Gross Returns (Rs.Lakh)	4992.25	5338.70	6519.29	5616.75
Total Market Incidentals (Rs.Lakh)	46.76	56.15	68.85	57.25
Total Electricity Cost (Rs.Lakh)	73.07	76.35	98.12	82.51
Total Bio-fuel Cost (Rs.Lakh)	23.53	25.50	35.16	28.06
Total Labor Cost (Rs.Lakh)	109.09	118.46	147.74	125.10
Total Depreciation, and Other Costs (Rs.Lakh)	122.20	127.71	156.88	135.60
Total Cost (Rs.Lakh)	374.66	404.17	506.75	428.53
Net Returns (Rs.Lakh)	113.89	114.46	124.90	117.75
Net Return (Rs/Qt)	18.94	19.64	18.61	19.04
<i>Note: (Sample Size = 17); * = Yearly Aggregates ** = Average of Yearly Aggregates</i>				
<i>Source: Field Survey</i>				

Again, a similar Table 3.4.1 (b) separately constructed to represent the major economic variables for the modern rice mills belonging to Phase III reveals the following observations as –

- a) The net return per quintal of paddy processed for the modern rice mills belonging to Phase II stands at Rs19.04 on an average over the three years 2007-08 to 2009-10, which remains higher than both the figures for modern rice mill belonging to Phase I (Rs.17.74) and all modern rice mills taken together (Rs.16.23).
- b) As has been worked out before, the share of by-products for the modern rice mills belonging to Phase II stands at 6.20 percent of gross return, while that for the fine rice turns out to be 93.80 percent of gross return.
- c) Similarly, the share of total costs serves to be 7.79 percent of gross investment, while net return stands at only 2.19 percent.

TABLE 3.4.1 (C)				
<b>Economics of Modern Rice Mills– Phase III Running on Owner-cum-Trader Basis</b>				
Year	2007-08*	2008-09*	2009-10*	Average**

Quantity of Paddy Processed (Tonnes)	136210.42	127119.46	142747.50	135359.13
Value of Paddy Processed (Rs.Lakh)	10247.54	10438.86	12560.85	11082.42
Conversion Ratio of Fine Rice (Kgs /Qt)	63.65	63.74	63.48	63.62
Quantity of Fine Rice Produced (Tonnes)	86700.37	81020.01	90615.12	86111.83
Value of Fine Rice Produced (Rs.Lakh)	10748.63	10962.94	13166.67	11626.08
Conversion Ratio Broken Rice (Kgs per Qt)	1.73	1.78	1.76	1.76
Quantity of Broken Rice Produced (Tonnes)	2357.73	2258.37	2519.19	2378.43
Value of Broken Rice Produced (Rs.Lakh)	179.36	177.66	201.42	186.15
Conversion Ratio of Bran (Kgs per Qt)	4.86	4.78	4.95	4.87
Bran Produced (Tonnes)	6615.79	6075.86	7065.96	6585.87
Value of Bran Produced (Rs.Lakh)	417.97	473.98	586.04	492.66
Conversion Ratio of Husk (Kgs per Qt)	19.35	19.35	19.45	19.39
Husk Produced (Tonnes)	26356.81	24596.95	27770.70	26241.49
Value of Husk Produced (Rs.Lakh)	48.66	47.03	55.52	50.40
Total Value of By-Product (Rs.Lakh)	645.99	698.67	842.98	729.22
Gross Returns (Rs.Lakh)	11394.62	11661.61	14009.66	12355.30
Total Market Incidentals (Rs.Lakh)	104.75	117.26	147.10	123.04
Total Electricity Cost (Rs.Lakh)	284.90	296.76	359.70	313.79
Total Bio-fuel Cost (Rs.Lakh)	35.93	43.89	52.86	44.22
Total Labor Cost (Rs.Lakh)	152.81	168.71	213.69	178.40
Total Depreciation, and Other Costs (Rs.Lakh)	382.16	398.27	480.44	420.29
Total Cost (Rs.Lakh)	960.55	1024.89	1253.78	1079.74
Net Returns (Rs.Lakh)	186.52	197.87	195.03	193.14
Net Return (Rs/Qt)	13.69	15.57	13.66	14.27
<i>Note: (Sample Size = 13); * = Yearly Aggregates ** = Average of Yearly Aggregates</i> <i>Source: Field Survey</i>				

As has been analyzed separately for the modern rice mills belonging to Phase I and belonging to Phase II, the Table 3.4.1 (c) above represent the major economic variables for the modern rice mills belonging to Phase III. The major observations may be briefly pointed here as follows –

- a) For the modern rice mills belonging to Phase III, the net return per quintal of paddy processed remains to be the lowest at Rs.14.27 only on an average over the years 2007-08 to 2009-10.
- b) Nevertheless, the modern rice mills belonging to Phase III has the highest out-turn ratio (milling ratio) at 63.62 percent, as well it processes twice as much paddy than the modern rice mills belonging to Phase I and Phase II.
- c) The share of by-products for the modern rice mills belonging to Phase III turns out to be 5.90 percent of gross return, while that for the fine rice turns out to be 94.10 percent of gross return.
- d) Similarly, the share of total costs serves to be 8.88 percent of gross investment, while net return stands at only 1.59 percent.

### **3.5: ECONOMICS OF HULLERS RUNNING ON CUSTOM HIRING BASIS**

It cannot be ignored that at present the huller units in West Bengal commands a lion's share in the paddy processing industry. Though these hullers are typically low in capacity, but they outnumber the modern rice mills almost every 10 to 1. As the West Bengal agriculture has been a highly marginalized economy with more than 80 percent marginal farms, it has become a traditional practice in rural West Bengal for a major proportion of marginal farms to dry it in the sun and parboil the paddy at home. Here, instead of modern rice mills, the hullers units gains popularity for its location nearby the villages, offering convenience in transportation of raw material / parboiled paddy to the unit. At the same time, the hullers act as a cheaper and faster method of getting paddy converted into rice for the marginal farms against a fixed custom charge per unit of paddy, especially for the farmers who face difficulty in selling their paddy directly to the mills at mill gates or through paddy agents, local arotdars, etc. Most importantly, the huller units offer the convenience of witnessing their paddy being converted into rice right before their eyes in ready instant, as against selling paddy to local agents and purchasing rice from open market.

It should however be clearly noted here that as the huller units run on a custom hiring basis, the entire by-product obtained in the production process belongs to the farmers, while the owners of the hullers get a fixed custom charge for every unit of paddy processed through the huller unit. As the fine rice, broken rice (locally known as *khud*) and broken-bran-husk mixture (locally known as *tush*) - all belong to the farmer who brought the parboiled paddy for processing, the profit to the huller units accrues from the custom charges less the costs of running the huller unit. The by-products such as brokens and husks are used by the farmers as poultry-feed or mixed with fodder for cattle. Hence, none of the by-products is wasted; rather they form to be valuable resources for the farmer households. As such, it remains highly interesting to get a glimpse of the economics of huller units running on a custom hiring basis, as has been represented in Table 3.5.1 below.

The major observation that can be made from Table 3.5.1 depicting various economic aspects of the sample huller units surveyed in this study may briefly be stated as follows –

- a) The out-turn ratio for the huller units running on custom hiring basis in the study remains, on an average, about 57.22 percent, while the ratio of broken rice stands at 4.87 percent. The rest of the raw material gets converted into a mixture of low-grade brokens, bran, husks, etc., which account for 36.63 percent of the raw material processed.
- b) The custom charges for the huller units for processing a quintal of paddy stands on an average at Rs.29.60 over the years 2007-08 to 2009-10.
- c) The net return per quintal of parboiled paddy processed by the huller units turns out to be Rs.17.15 on an average over the years 2007-08 to 2009-10.

Table 3.5.1 Economics of Hullers Running on Custom Hiring Basis				
Year	2007-08*	2008-09*	2009-10*	Average**
Quantity of Paddy Processed (Tonnes)	28735.45	25435.85	20270.38	24813.89
Quantity of Fine Rice Produced (Tonnes)	16449.42	14538.98	11607.49	14198.63
Quantity of Broken Rice Produced (Tonnes)	1495.87	1198.80	928.17	1207.61
Conversion Ratio Good Quality (Kgs per Qt)	57.24	57.16	57.26	57.22
Conversion Ratio Broken Rice (Kgs per Qt)	5.21	4.71	4.58	4.87
Any by product obtained (Kgs/Qt)	36.59	36.69	36.61	36.63
Customs Charges (Rs./Qt)	28.02	29.63	31.14	29.60
Total Value of Custom Charges (Rs.Lakh)	78.87	74.45	62.64	71.98
By Products if they Sold (Rs./Qt)	0.00	0.00	0.00	0.00
Total Value of By-Product (Rs.Lakh)	0.00	0.00	0.00	0.00
Total Electricity cost (Rs.Lakh)	10.25	10.52	10.75	10.51
Total Labor Cost (Rs.Lakh)	7.87	8.39	8.54	8.27
Depreciation and Other Costs (Rs.Lakh)	0.67	0.67	0.65	0.66
Gross Returns (Rs.Lakh)	78.87	74.45	62.64	71.98
Total Cost (Rs.Lakh)	18.78	19.58	19.94	19.44
Net Returns (Rs.Lakh)	60.08	54.86	42.70	52.55
<i>Net Returns per Quintal</i> (Rs./Qt)	20.91	21.57	21.07	21.18
<i>Note: (Sample Size = 50); * = Yearly Aggregates ** = Average of Yearly Aggregates</i> <i>Source: Field Survey</i>				

Hence, it turns out that the basic economics principle of the huller units running on a custom hiring basis thrives solely upon the profit accrued to the huller units out of the difference between custom charge earned by processing parboiled paddy brought by the farmer clients and the costs of running the huller units. The huller units remain highly competitive to the modern rice mills, as the processing cost per quintal of paddy is comparatively much cheaper than their counterparts, viz. the modern rice mills. Thus, it appears the huller units running on a custom hiring basis perform similar tasks as the modern rice mill at much greater convenience for the farmers with competitive cost-advantages and comparable profitability.

However, as has been expressed by the owner of the huller units, there has been a shortage in the supply of paddy for the huller units, as the farmers are becoming reluctant in parboiling of paddy at their places owing to shortage of firewood and other means of parboiling. Instead, the hullers units suggest that the farmers are becoming adaptable with modern milling system, as the paddy agents of the modern rice mills purchase paddy output from the farmers immediately after the harvest, and serves as an intermediary between the farmers and the modern rice mills. Hence, instead of parboiling paddy at home and getting the paddy processed at the hullers, the farmer now prefer selling off their product, and buying fine rice from open market. Understandably enough, these explanations from the huller unit owners are subject to verification through further research in the area.

### **3.6: MARKETING OF PROCESSED RICE BY MODERN AND TRADITIONAL MILLERS**

As has been said earlier, all the traditional rice milling units under the purview of the present study turns out to be traditional huller-type paddy processing units running on a custom hiring basis. Understandably, such huller units processing parboiled paddy brought by their client farmers for a fixed custom charge per unit of paddy do not have to market their final product, as they typically offer the service of processing the paddy only. Hence, for traditional huller units running on a custom hiring basis, the issues relating to the marketing of rice do not arise at all.

However, for the modern rice mills, marketing of products and by-products serves to be one of the major business activities. In fact, the simple rule of business for the modern rice mill is to buy paddy at cheap (or at MSP) and sell rice at high, adding value to it by means processing paddy to fine rice in a cost-effective manner. It should be noted here that there is very little waste items in processing paddy to rice, as the by-products produced at every stage of processing the paddy to rice have definite demand in the market. Starting from the main product viz. the fine rice, the by-products like broken rice, bran, and husks are obtained separately and sold by the modern rice mills. Thus the question of marketing is very much present at each and every stage of production for the modern rice mills.

In this section, however, we are concerned only with the marketing of fine rice by the sample modern rice mill units in the study. The details of marketing by the sample paddy processing units has been described in Table 3.6.1, which summarily presents the overall state of marketing for all the sample rice mills taken together. The major observations that come out from Table 3.6.1 is that, on an average, only 24 percent of the fine rice produced by the modern rice mills serves as levy to the government, while the rest 76 percent of fine rice produced is sold in the open market. It should be noted here that though the amount of levy rice is to be charged keeping in view of the installed capacity of the modern rice mills, in reality the government is often unable to procure such a huge amount of levy rice owing a number of factors. As such, less than one-fourth of rice output by the modern rice mills serves as levy to government.

<b>Year</b>	<b>Unit</b>	<b>Wholesaler</b>	<b>Retailer</b>	<b>Levy to Government</b>	<b>Others</b>	<b>Total</b>
<b>2007-08</b>	Quantity (Qt)	1275123.83	-	341562.70	-	1616686.50

	% of Total	78.87	-	21.13	-	100.00
<b>2008-09</b>	Quantity (Qt)	1174229.40	-	371382.74	-	1545612.10
	% of Total	75.97	-	24.03	-	100.00
<b>2009-10</b>	Quantity (Qt)	1263016.45	-	458739.45	-	1721755.90
	% of Total	73.36	-	26.64	-	100.00
<b>Average</b>	Quantity (Qt)	1237456.56		390561.63		1628018.17
	% of Total	76.01		23.99		100.00
<i>Source: Field Survey</i>						

As before, the marketing of the modern rice mills can also be examined separately for the mills belonging to different phases of modernization. The tables 3.6.1 (a), 3.6.1 (b) and 3.6.1 (c) report the marketing details of the modern rice mills belonging respectively to Phase I, II and III of modernization. The important observations from these tables may be briefly described here as –

- a) On an average, rice mills belonging to different phases of modernization exhibit similar feature regarding the proportion of levy rice and rice sold in the open market.
- b) None of the rice mills under the present survey has marketed their paddy to retailers or other sources directly. Apart from levy rice, all other marketable rice has been sold to rice traders (locally known as *godi*).
- c) For the rice mills belonging to Phase III, it turns out that levy rice to government accounts only for about 17 percent of total rice output. This is understandable considering the fact that total rice marketed by the rice mills belonging to III Phase is much higher as compared to those belonging to Phase II and Phase I. In particular, the marketing of rice by the modern rice mills belonging to Phase III accounts for more than double than those belonging to Phase II and Phase I.
- d) However, on the other hand, it turns out that the modern rice mills belonging to Phase II enjoy the privilege of offering about one-thirds of their production as levy rice to government.
- e) Excluding the levy rice to the government, the marketable rice output to be sold in the open market for the modern rice mills belonging to Phase III of modernization remains much higher (almost thrice) than those belonging to Phase II and Phase I.

It thus appears from the observations made above that out of the marketable rice produced by the modern rice mills, levy rice accounts only about one-fourth of rice output, which remains much lower for modern rice mills belonging to Phase III.

**Table 3.6.1 (a)**  
**Marketing of Rice by Modern Rice Mills – Phase I**

Year	Unit	Wholesaler	Retailer	Levy to Government	Others	Total
2007-08	Quantity (Qt)	270981.18	-	99514.52	-	370495.70
	% of Total	73.14	-	26.86	-	100.00
2008-09	Quantity (Qt)	255855.32	-	110176.98	-	366032.30
	% of Total	69.90	-	30.10	-	100.00
2009-10	Quantity (Qt)	265250.46	-	128178.00	-	393428.46
	% of Total	67.42	-	32.58	-	100.00
Average	Quantity (Qt)	264028.99		112623.17		376652.15
	% of Total	70.10		29.90		100.00

*Source: Field Survey*

Table 3.6.1 (b) Marketing of Rice by Modern Rice Mills – Phase II						
Year	Unit	Wholesaler	Retailer	Levy to Government	Others	Total
2007-08	Quantity (Qt)	273802.02	-	105385.16	-	379187.18
	% of Total	72.21	-	27.79	-	100.00
2008-09	Quantity (Qt)	239413.47	-	129966.26	-	369379.73
	% of Total	64.81	-	35.19	-	100.00
2009-10	Quantity (Qt)	267871.93	-	154304.30	-	422176.23
	% of Total	63.45	-	36.55	-	100.00
Average	Quantity (Qt)	260362.47		129885.24		390247.71
	% of Total	66.72		33.28		100.00

*Source: Field Survey*

Table 3.6.1 (c) Marketing of Rice by Modern Rice Mills – Phase III						
Year	Unit	Wholesaler	Retailer	Levy to Government	Others	Total
2007-08	Quantity (Qt)	730340.63	-	136663.02	-	867003.65
	% of Total	84.24	-	15.76	-	100.00
2008-09	Quantity (Qt)	678960.61	-	131239.50	-	810200.11
	% of Total	83.80	-	16.20	-	100.00
2009-10	Quantity (Qt)	729894.06	-	176257.15	-	906151.21
	% of Total	80.55	-	19.45	-	100.00
Average	Quantity (Qt)	713065.10		148053.22		861118.32
	% of Total	82.81		17.19		100.00

*Source: Field Survey*

### 3.7: STANDARDS MAINTAINED IN PROCESSING AND QUALITY OF END PRODUCT OBTAINED



While studying the economics of paddy processing activities of modern rice mills, the standards maintained in processing and the quality of the end product obtained should also be considered for a comprehensive examination. This is particularly because of the fact that the standards maintained in the raw materials possess vital clues for the quality of the end product obtained.

There is no doubt in the fact that aspect like average moisture content in raw paddy, in paddy for final processing, etc. significantly affect the quality of fine rice produced. It is here that this survey observes that the average moisture content in raw paddy comes out to be 16.73 percent on an average for the sample modern rice mills surveyed. Again, in case paddy for final processing, the average moisture content stands at an average of 14.03 percent for all the sample rice mills taken together. It should be noted here that the loss in moisture content has been the maximum at more than 3.5 percent for the modern rice mills belonging to Phase III, which remains more than 1 percent higher loss than mills belonging to Phase I & II of modernization. On an average, the loss in moistures for all the modern mills taken together turns out to be 2.7 percent.

<b>Table 3.7.1</b>				
<b>Standards Maintained in Processing of Paddy in Modern Rice Mills</b>				
Description	Phase – I	Phase – II	Phase – II	All
Avg. Moisture Content of Raw Paddy (%)	16.57	16.69	17.01	16.73
Avg. Moisture Content for Final Processing (%)	14.11	14.39	13.45	14.03
Foreign Material refraction removed (%)	9.42	10.03	10.02	9.78
<i>Source: Field Survey</i>				

Along with the loss in moisture, the refraction content or the presence of foreign materials in raw paddy serves to be one of the most important yardsticks of gauging the quality of raw material. It remains highly significant to note here that this survey finds that the average refraction ratio in raw paddy for the sample modern rice mills stands at an average of 9.78 percent. Even after cross-verifying with sample raw paddy drawn at random from stocks with the mills for a repeated number of times, the study has found that the refraction ratio in raw paddy stands at around 9 to 11 percent for the sample modern rice mills.

In this context, it remains important to recall the findings made earlier on the out-turn ratio of the modern rice mills. In fact, it is widely argued among the scholars and policy makers that the out-turn ratio of paddy for the modern rice mills stands around 67 to 72 percent nation-wide. Interestingly enough, the out-turn ratio for the modern rice mills under the purview of this survey turns out to be quite low at less than 63 percent per quintal of paddy processed, while the selected rice mill clusters (viz. Burdwan and Bolpur) are the best known in the business in West Bengal, the highest paddy producing state. A number past studies carried out in West Bengal by institutes like IIT Kharagpur also reached

at a lower out-turn ratio for the sample modern rice mills under their scrutiny of scientific testing methods. Hence there remains ample opportunity for further research in the area to establish the fact of a lower out-turn ratio for West Bengal and to point out the causes for such a variation in out-turn ratio as compared with the national scenario.

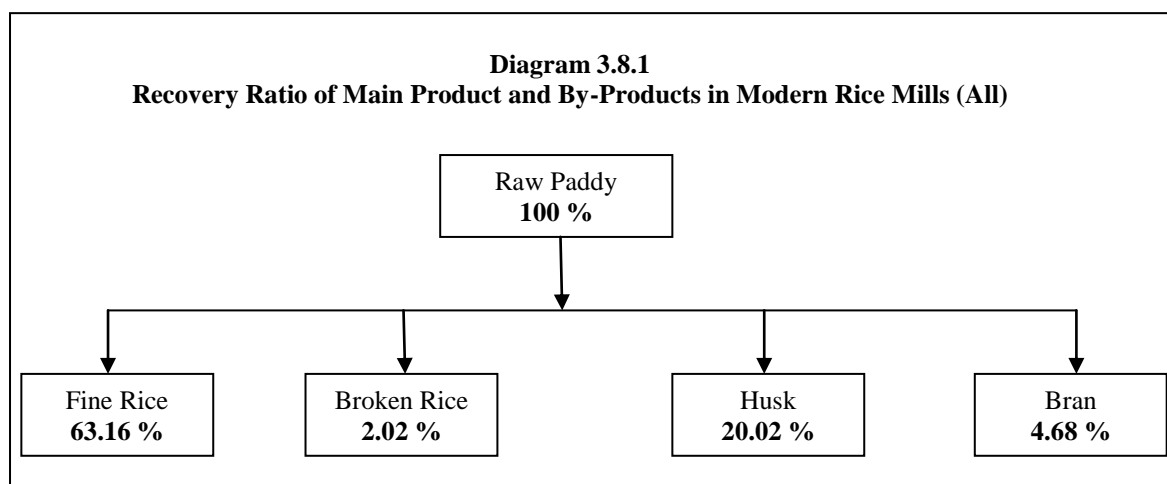
It is here that the higher refraction content in raw paddy can be an explanatory factor for the low out-turn ratio for the modern rice mills under the purview of the study, though it needs further focused research on the subject. For example, a refraction ratio of 10 percent in turn means that only 90 kg of paddy is actually processed for every 100 kg of raw un-cleaned paddy. Hence, 63 kg of rice output means that it has actually been obtained from 90 kg of cleaned raw paddy, which in turn stands at a 70 percent conversion ratio. As such, there is an indication that the proportion of refraction content in raw paddy may act as an important determinant of the out-turn ratio.

On purely based on research interests, the study tried to get an idea about why the refraction ratio is such high in West Bengal as compared to other states. In a meeting conducted with the rice mill owners of Burdwan, in the presence of the ex-Director, Directorate of Agriculture, Government of West Bengal, it came out that the possible causes of such a high refraction ratio for West Bengal may be due to – a) the exposure to sunshine and humidity that paddy as plant requires is not the ideal one for the growth of paddy grains in West Bengal, resulting into poor grain formation; and b) the local norms and practices in threshing, cleaning and storing of paddy, which leads to increased ratio of foreign materials.

### **3.8: PROCESSING OF PADDY AND ITS BY-PRODUCTS IN MODERN AND TRADITIONAL RICE MILLS**

As has been mentioned earlier, the major products and the by-products in processing of paddy are the fine rice, broken rice, bran and husks. It should be noted here that depending upon the coverage and advancement of rice mill, cattle feed / fodder can be produced as a by-product. In fact, the modern rice mills with solvent plants to extract rice oil from bran are generally found to have by-products of cattle feed / fodder. The regular modern rice mills in the study normally sell their by-products in the form of bran and husks to these solvent plants at market prices. However, the percentage distribution of main product and the by-products produced by all the modern rice mills in the in processing raw paddy may be described briefly in the flowing diagram. It can be observed that the ratio paddy to fine rice (i.e. the milling ratio), as has been found earlier turns out be 63.16 percent on an average, while the ratio for broken rice stands at 2.02 percent. The proportion of husk per quintal of paddy turns out to be about 20.02 percent on an average, while the ratio of bran turns

out to be 4.68 percent on an average. The rest of the raw material, viz. uncleaned raw paddy accounts for the refraction / foreign materials and loss of moisture in processing.



Now, among the sample modern rice mills, the distribution of average recovery rates of main products and by-products has been described in Table 3.8.1 below. It comes out from Table 3.8.1 that while modern rice mills belonging to Phase III records the highest out-turn ratio and lowest ratio of broken-rice, it accounts for the highest ratio of bran. In fact, it can be observed that the rate of recovery of fine rice and bran increases as we move from Phase I to Phase III, while the ratio of husk reduces to a certain extent. The recovery of broken-rice, with the exception for modern rice mills belonging to Phase II, also appears to fall as we move from Phase I to Phase III.

**Table 3.8.1**  
**Distribution of Average Recovery Ratio of By-Products in Modern Rice Mills**

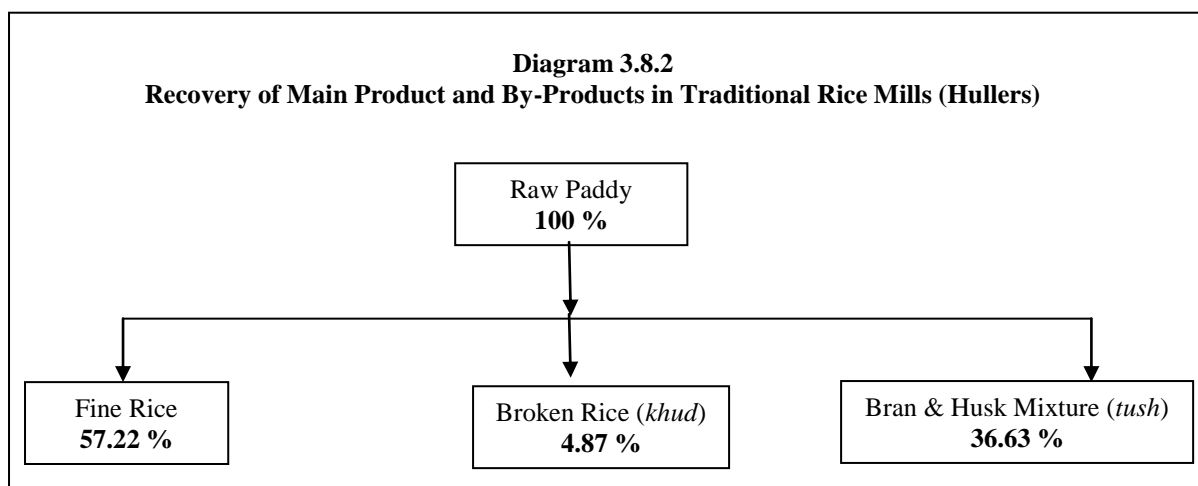
Types of Unit	Fine Rice	Broken Rice	Husk	Bran
Modern Rice Mills (All)	63.16	2.02	20.02	4.68
Modern Rice Mills belonging to Phase I	62.19	2.24	21.49	4.42
Modern Rice Mills belonging to Phase II	63.10	2.36	19.98	4.54
Modern Rice Mills belonging to Phase III	63.62	1.76	19.39	4.87

Source: Field Survey

It should be noted here that the higher recovery of bran remains an important factor for the modern rice mills, as pure bran serves to be the raw material for the solvent extraction plants, and thus has a reasonable value in the market depending upon the oil-content. In fact, the earning from production and sell of bran serves to be the most important by-product of financial significance for the modern rice mills.

As against the modern rice mills the rate of recovery of fine rice and broken rice for the hullers has been shown in the following diagram 3.8.2. As has been shown, earlier, the rate of recovery of fine rice (or the out-turn ratio) in the traditional rice mills, viz. the huller units, turns out to be 57.22 percent – which is about 6 percent less than that of the modern rice mills. The difference in the hulling and milling ratio assumes ever more significance considering the fact that the milling ratio is arrived at as proportion to un-cleaned raw paddy, while the hulling ratio is arrived at as proportion to cleaned parboiled paddy.

It should also be noted here that in case of traditional huller units, the recovery of broken-rice (locally known as *khud*) is much higher than their counterparts, the modern rice mills. In particular, the ratio of broken-rice comes out to be as much as 4.87 kg for every quintal of cleaned and parboiled paddy. Moreover, instead of bran, husk, brokens available separately as in modern rice mills, huller units recover a mixture of bran, husk (and fragments of broken-rice also), which made up a by-product locally known as *tush*. The rate of recovery for this mixture of bran and husk accounts for as much as 36.63 percent on an average for the huller units. As this mixture has a lower oil-content with high level of impurities, it does not command a great demand from the solvent extraction plants as compared to pure bran.



Based on the above results, it can be safely argued that modernization results in higher yield in fine-rice as well it makes the by-products like broken-rice, bran, husk, etc. available separately. It is a must for the rice mills irrespective of the quantity of paddy milled, and hence the economics of modern rice mills is essentially based on better rate of recovery and not on the quantum of production.

<b>Table 3.8.2</b>								
<b>Average Quantity of Paddy Processed and Its By-Products in Modern Rice Mills (All)</b>								
	2007-08		2008-09		2009-10		Average	
	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value
Paddy	51190.21	38334360.39	48822.15	40112665.16	54649.58	47907512.23	51553.98	42118179.26
Fine Rice	32333.73	40057867.78	30912.24	41826243.85	34435.12	49967482.12	32560.36	43950531.25
Broken Rice	1022.39	771580.15	1001.74	786246.09	1095.80	877450.93	1039.98	811759.06
Paddy Husk	10251.88	189010.17	9765.06	186847.57	10952.25	219300.95	10323.06	198386.23
Rice Bran	2392.53	1510051.946	2269.34	1770351.486	2583.22	2145244.497	2415.03	1808549.309
Other Cattle Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Source: Field Survey</i>								

<b>Table 3.8.2 (a)</b>								
<b>Average Quantity of Paddy Processed and Its By-Products in Modern Rice Mills – Phase I</b>								
	2007-08		2008-09		2009-10		Average	
	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value
Paddy	29799.60	22079663.28	29359.99	23987057.68	31692.07	27526339.72	30283.89	24531020.22
Fine Rice	18524.79	22953298.90	18301.62	24751831.81	19671.42	28507326.94	18832.61	25404152.55
Broken Rice	662.65	495363.62	672.72	527008.55	704.04	563588.76	679.80	528653.64
Paddy Husk	6448.76	118480.84	6297.55	120485.84	6777.03	136057.62	6507.78	125008.10
Rice Bran	1297.57	819794.711	1314.06	1023364.870	1408.11	1171977.448	1339.91	1005045.676
Other Cattle Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Source: Field Survey</i>								

<b>Table 3.8.2 (b)</b>								
<b>Average Quantity of Paddy Processed and Its By-Products in Modern Rice Mills – Phase II</b>								
	2007-08		2008-09		2009-10		Average	
	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value
Paddy	35377.31	26492376.05	34277.25	28353314.65	39480.15	34633187.34	36378.28	29826292.68
Fine Rice	22305.13	27586170.92	21728.22	29410690.16	24833.90	35974139.12	22955.75	30990333.40
Broken Rice	840.54	631504.37	826.41	647412.04	912.79	732851.33	859.91	670589.25
Paddy Husk	7061.80	130288.79	6843.07	131133.74	7903.82	158343.23	7269.56	139921.92
Rice Bran	1618.65	1018205.915	1554.56	1214856.375	1784.65	1483445.625	1652.62	1238835.972
Other Cattle Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Source: Field Survey</i>								

<b>Table 3.8.2 (c)</b>								
<b>Average Quantity of Paddy Processed and Its By-Products in Modern Rice Mills – Phase III</b>								
	2007-08		2008-09		2009-10		Average	
	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value	Qty (Qtls)	Value
Paddy	104777.25	78827258.54	97784.20	80298904.28	109805.77	96621894.80	104122.41	85249352.54
Fine Rice	66692.59	82681731.19	62323.09	84330294.13	69703.94	101282092.48	66239.87	89431372.60
Broken Rice	1813.64	1379704.69	1737.21	1366625.28	1937.84	1549407.61	1829.56	1431912.52
Paddy Husk	20274.47	374306.33	18920.73	361799.11	21362.07	427081.55	20185.76	387729.00
Rice Bran	5089.07	3215169.425	4673.73	3645978.347	5435.36	4508007.711	5066.05	3789718.494
Other Cattle Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Source: Field Survey</i>								

### **3.9: RELATIVE SHARES OF DIFFERENT MILLING TECHNIQUES**

The relative share of modern and traditional paddy processing units in the paddy processing industry under the purview of the present survey may be examined here from Table 3.9.1 presented in following page. The major observation from the Table 3.9.1 can be briefly stated below as –

- a) On an average, more than 90 percent of paddy under the purview of the present study has been processed by the modern rice mill as against less than 10 percent of paddy processed through hullers.
- b) Among all types of paddy processing units, almost about half (47.9%) of the paddy has been processed by the modern rice mills belonging to Phase III.
- c) While the relative share of huller units seem to decreasing over the years, that for the modern rice mills as a whole tends to increase.

However, it should be considered here that the present survey comprises only 50 huller units from over 2 districts, out of more than tens of thousands of registered huller units present all over the state, not to speak of the unregistered ones. As such, the relative share in processing of paddy arrived here may be highly misleading to be generalized for the state as a whole. In the absence of any official secondary data on the aspect, we can only say (following the Rice Millers Association of Bengal) that the modern rice mills West Bengal command only over 40 to 50 percent of the paddy processed. The larger share is still processed by the traditional rice mills, especially the hullers.

However, the relative share of modern rice mills belonging to Phase III has reportedly been increasing with time, as all the new modern rice mill set up in West Bengal over the last 5 years are technologically up-to-date with ever higher installed capacities. This has been very much true for districts like Burdwan, and Birbhum where the older Phase I and Phase II units are renovated and up-graded to Phase III units.

Nevertheless, it remains a fact that the traditional huller units are facing steep competition from their counterparts (viz. the modern rice mills) in West Bengal, as has been expressed by the huller unit owners under the present study. In particular, as has been put by the owners of the huller units, the farmers are now reluctant to clean and parboil paddy at home, as there is an acute shortage of firewoods, etc. as well a steep rise in electricity charges and fuel prices. Rather, the farmers are selling off their paddy to the local traders and stockists, who are in turn acting as intermediaries between the rice mills and the farmers.

**Table 3.9.1**  
**Relative Shares of Different Milling Techniques in Total Paddy Processed**

Type of Unit	2007-08		2008-09		2009-10		Average	
	Paddy Processed	Percentage Share	Paddy Processed	Percentage Share	Paddy Processed	Percentage Share	Paddy Processed	Percentage Share
A. Modern Rice Mills	2559510.35	89.91	2441107.73	90.56	2732479.03	93.09	2577699.04	91.22
Modern Rice Mills – Phase I	595991.90	20.94	587199.89	21.78	633841.41	21.59	605677.73	21.43
Modern Rice Mills – Phase II	601414.25	21.13	582713.24	21.62	671162.62	22.87	618430.04	21.88
Modern Rice Mills – Phase III	1362104.20	47.85	1271194.60	47.16	1427475.00	48.63	1353591.27	47.90
B. Traditional Rice Mills	287354.50	10.09	254358.50	9.44	202703.75	6.91	248138.92	8.78
Huller	287354.50	10.09	254358.50	9.44	202703.75	6.91	248138.92	8.78
All (A+B+C)	2846864.85	100.00	2695466.23	100.00	2935182.78	100.00	2825837.95	100.00

*Source: Field Survey*



### 3.10: CONCLUSION TO CHAPTER 3

The basic need for the processing of paddy remains in the fact that paddy itself cannot be consumed in its raw form and it needs to be processed suitably for human consumption. However, there exists a number of processing/milling techniques and the very essence of economics of paddy processing thus remains with how the paddy is processed.

The huller units are run purely on a custom-hiring basis. While the task of parboiling of raw paddy is done by the farmers themselves at home, the hulling operation is carried out by the huller units against a fixed charge/rental per unit of parboiled paddy. As such there are virtually no market incidentals for the huller units. On the other hand, it stands at around Rs.8.63 per quintal for the modern rice mills.

The costs incurred during processing of paddy by the modern rice mills remains central to the analysis of the economics of modern rice milling. It is here we find that there exist significant differences among the various components of costs for the modern rice mills belonging to different phases of modernization. While the modern rice mills belonging to Phase I have comparative cost advantage in processing paddy, as compared to Phase III as being the most cost-inefficient. In particular, modern rice mills belonging to Phase III are heavily capital intensive and extremely mechanized, which in turn makes the costs of electricity, maintenance, depreciation, etc much higher. In contrast to the modern rice mills, the processing costs per quintal of paddy for the traditional rice mills (hullers) running on a custom hiring basis remain much below than that for its competitive rivals, the modern rice mills.

The modern rice mills run as individual commercial business units, who purchase paddy from the farmers, paddy traders, local stockists (*arotdars*), etc. and converts the raw material paddy into finished good as fine rice. The fine rice is then sold to the whole-sellers, retailers of rice. In the process, profit is accrued for the value added in processing of raw paddy into fine rice. However, modernization in so-called 'modern' rice mills is expected to result in higher yield of rice as well the by-products like broken-rice, bran, husk, etc. available separately, and hence as the economics of modernization is essentially based on better rate of recovery and not on the quantum of production. It is here that the net return per quintal of paddy processed turns out be Rs.16.23 on an average, varying from a low of Rs.14.27 for the modern rice mills belonging to Phase III to as much as Rs.17.74 for Phase I and Rs.19.04 for Phase II. The share of by-products like broken-rice, bran and husk in value terms stands at 6.03 percent of gross return, while that for the main product, viz. fine rice, stands at 93.97 percent of gross return. Again, while the share of total costs stands at 8.30 percent of gross investment, that for net return stands at only 1.82 percent.

In contrast, in case of traditional huller units, the fine rice, broken rice (locally known as *khud*) and broken-bran-husk mixture (locally known as *tush*)- all belong to the farmer who brought the parboiled paddy for processing. The profit to the huller units accrues from the custom charges less the costs of running the huller unit. As such, the basic economic principle of the huller units running on a custom hiring basis thrives solely upon the profit accrued to the huller units out of the difference between custom charge earned by processing parboiled paddy brought by the farmer clients and the costs of running the huller units. The huller units remain highly competitive to the modern rice mills as the processing cost per quintal of paddy is comparatively much cheaper than their counterparts, viz. the modern rice mills. Thus, it appears the huller units running on a custom hiring basis perform similar tasks as the modern rice mill at much greater convenience for the farmers with competitive cost-advantages and comparable profitability.

For traditional huller units running on a custom hiring basis, the issues relating to the marketing of rice do not arise at all. However, for the modern rice mills, marketing of products and by-products serves to be one of the major business activities. It is here that we find that only 24 percent of the fine rice produced by the modern rice mills serves as levy to the government, while the rest 76 percent of fine rice produced is sold in the open market.

While studying the standards maintained in processing and the quality of the end product obtained, it is observed that the average moisture content in raw paddy comes out to be 16.73 percent on an average, which falls 2.70 percent further to about 14.03 percent for final processing. Again, it remains highly significant to find that the average refraction ratio in raw paddy stands at 9.78 percent for the sample modern rice mills in the survey, revealing the availability of an extremely poor quality of paddy to the rice mills.

In case of availability of fine rice and by-products, it is observed that in modern rice mills in the ratio paddy to fine rice turns to be 63.16 percent, while the ratio for broken rice, husk and bran stands at 2.02 percent, 20.02, and 4.68 percent on an average. The rest of the raw material, viz. un-cleaned raw paddy accounts for the refraction / foreign materials and loss of moisture in processing. On the other hand, the rate of recovery of fine rice in case of traditional rice mills turns out to be 57.22 percent – 6 percent lower than their counterparts, the modern rice mills. The recovery of broken-rice comes out to be as much as 4.87 percent in traditional hullers, while a mixture of bran and husk comes as a by-product accounting for as 36.63 percent.

In case of the relative share of modern and traditional paddy processing units in the paddy processing industry, it is observed that 90 percent of paddy has been processed by the modern rice mill as against less than 10 percent by the traditional rice mills, viz. the hullers. Again, among all types of paddy processing units, almost about half (47.9%) of the paddy has been processed by

the modern rice mills belonging to Phase III. However, it should be noted here that the huller units outnumber the modern rice mills almost 10 to 1, and the relative share may vary in reality.

## **CHAPTER 4**

### **CONSTRAINTS IN PROCESSING OF PADDY**

#### **4.1: INTRODUCTION**

Processing of paddy has been practiced over centuries to convert it into rice simply because of the fact that raw paddy is not suitable for human consumption. In fact, archeological evidences date back consumption of rice to about 3000 BC. As such, the technology of paddy processing has been perfected over time by centuries of trial and error, which ultimately has resulted into highly sophisticated and technologically advanced modern rice mills we know today.

However, just as in any other industry, there are a number of factors, which act as bottlenecks for the paddy processing industry as whole. These include, on the one hand, technological aspects like utilization of capacity, etc., and purely human factors on the other. As also there are other regional or local factors, which act as constraints in the processing of paddy for the paddy both for the modern and the traditional units.

It is here that this chapter tries to focus upon certain aspects, which act as constraints in the processing of paddy by the modern rice mills and the traditional huller units under the purview of the present survey. In particular, this chapter tries to identify the present state of capacity utilization of the modern vis-à-vis traditional rice mills and tries to enumerate factors behind it. Again, this chapter also tries to examine the scale and magnitude of assistance or subsidy obtained by the rice milling units from different source, if any at all. At the same time, this chapter makes an attempt to summarily present the constraints in the processing of paddy as has been expressed by the authorized representatives of the sample modern and traditional rice mills.

#### **4.2: CAPACITY UTILIZATION OF THE MODERN VERSUS TRADITIONAL RICE MILLS**

There is no doubt in the fact that the installed capacity and its utilization serve to be an important indicator in gauging the performance of the paddy processing units, both modern and traditional. For a comprehensive approach towards the paddy processing industry, it remains necessary to consider the capacity utilization of the units under the purview of the present survey. As such, this section of the study tries to enumerate the installed capacity and its utilization, separately for the different types of paddy processing units.

It should be noted here that the traditional rice mills (hullers) are generally low in capacity installed. In fact, in this survey, the installed capacity by the huller units ranges from as low as 0.31 TPH (tonnes per hour) to as much as 1.50 TPH. On the other hand, the modern rice mills have much larger installed capacity, ranging from as low as 1.23 TPH to 16 TPH, as has been found in this study. In fact, while the total processing capacity of the selected 50 sample hullers stand at 44.38 TPH, that for the modern rice mills stands more than four-times that at 191.38 TPH.

<b>Table 4.2.1</b>				
<b>Capacity Utilization of Modern Rice Mills</b>				
<b>Particulars</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>Average</b>
Actual Capacity (Tones)	3.67	3.67	3.67	3.67
Capacity used (Tones)	2.16	2.05	2.31	2.17
Percentage capacity utilization	55.20	52.94	60.36	56.17
Time period for which plant remained closed in the off-season (in Days)	68.14	68.50	69.02	68.55
<i>Source: Field Survey</i>				

<b>Table 4.2.1 (a)</b>				
<b>Capacity Utilization of Modern Rice Mills – Phase I</b>				
<b>Particulars</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>Average</b>
Actual Capacity (Tones)	2.50	2.50	2.50	2.50
Capacity used (Tones)	1.26	1.24	1.34	1.28
Percentage capacity utilization	48.64	47.77	51.83	49.42
Time period for which plant remained closed in the off-season (in Days)	67.65	68.05	68.80	68.17
<i>Source: Field Survey</i>				

<b>Table 4.2.1 (b)</b>				
<b>Capacity Utilization of Modern Rice Mills – Phase II</b>				
<b>Particulars</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>Average</b>
Actual Capacity (Tones)	3.19	3.19	3.19	3.19
Capacity used (Tones)	1.49	1.44	1.67	1.53
Percentage capacity utilization	45.83	42.73	51.08	46.55
Time period for which plant remained closed in the off-season (in Days)	68.35	69.00	69.88	69.08
<i>Source: Field Survey</i>				

<b>Table 4.2.1 (c)</b>				
<b>Capacity Utilization of Modern Rice Mills – Phase III</b>				

<b>Particulars</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>Average</b>
Actual Capacity (Tones)	6.09	6.09	6.09	6.09
Capacity used (Tones)	4.41	4.11	4.63	4.38
Percentage capacity utilization	77.55	74.23	85.59	79.13
Time period for which plant remained closed in the off-season (in Days)	68.62	68.54	68.23	68.46
<i>Source: Field Survey</i>				

<b>Table 4.2.2 Capacity Utilization of Traditional Rice Mills</b>				
<b>Particulars</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>Average</b>
Actual Capacity (Tones)	.89	.89	.89	.89
Capacity used (Tones)	.27	.25	.20	.24
Percentage capacity utilization	30.34	27.33	22.65	26.77
Time period for which plant remained closed in the off-season (in Days)	99.78	106.64	117.98	108.13
<i>Source: Field Survey</i>				

However, installed capacity does not reveal the entire picture unless we take its utilization into consideration. Hence, focusing our attention towards the utilization of capacity alongside with the average capacity installed for the huller units and the modern rice mills belonging to different types, the following observation can be briefly pointed out as –

- a) On an average, the actual capacity of the modern rice mills stands at 3.67 TPH as against 0.89 TPH for the traditional rice mills, viz. the huller units.
- b) The capacity used, on an average, stands at 2.17 TPH for the modern rice mills, as against 0.24 TPH for the traditional rice mills.
- c) The percentage utilization of capacity by the modern rice mill thus stands at 56.17 percent on an average, as compared to an average of mere 26.77 percent for the traditional rice mills.
- d) Among the modern rice mills, those belonging to Phase III are found to have much higher utilization of capacity at 79 percent on an average, while those belonging to Phase I & II have less than 50 percent utilization of installed capacity.
- e) The average time period for which the paddy processing units remained close during a year comes out to be about 69 days on an average for the modern rice mills, as compared to 108 days for the traditional rice mills (the hullers).

Hence, based on the above observations, it turns out that the modern mills outweigh the traditional rice mills both in terms of capacity installed and capacity utilized to a great extent, while a higher mill-closed days for the huller units appears to have significant contribution towards this lower utilization of installed capacity.

On a comparative basis, the modern rice mills thus appear to come out with considerable better performance regarding the utilization of capacity. In fact, the higher utilization ratio by the modern rice mills turns out to be more encouraging considering the fact that a number of studies in the past conducted by government and non-government agencies indicated that even for a completely modernized plant, the break-even volume of paddy is achieved with the utilization of less than half of the installed capacity for such a unit.

### 4.3: REASONS FOR UNDER-UTILIZATION OF CAPACITY

When asked about the reason behind the lower utilization of capacity to both the modern and the traditional rice mills, the answers that came out varied in nature. In fact, the major factors behind the low utilization of capacity by the modern rice mills are – a) Shortage or inconsistent supply of raw materials,; b) Break-down of machinery; c) Unavailability of skilled labourers and d) Power interruption. Among these, most of authorized representatives of the modern rice mills (82 percent) held shortage or inconsistent supply of raw material as the cause of low utilization of capacity. This remains understandable considering the fact that supply of paddy is highly seasonal in nature, even in districts like Burdwan, which is traditionally known as the *rice bowl* of Bengal with Aman, Winter and Boro paddy cultivations.

<b>Reasons</b>	<b>No. of Respondents</b>	<b>Per cent</b>
Shortage / Inconsistent Supply of Raw Material	41	82.00
Break-down of Machinery	18	36.00
Unavailability of Skilled Labourers	15	30.00
Power-interruption	14	28.00
<b>Source: Field Survey</b>		

On the other hand, the prime reasons for the under utilization of capacity by the traditional rice mills (the huller units) are – a) Shortage of supply of processed paddy by the farmer households; b) Local paddy being channelized to modern rice mills via local traders; c) Unavailability of labourers to run huller units; and d) high concentration of hullers in the same locality.

<b>Reasons</b>	<b>No. of Respondents</b>	<b>Per cent</b>
Shortage of Supply of Processed Paddy from Farmer Households	28	56.00
Local Paddy being Channelized to Modern Mills via Local Traders	31	62.00
Unavailability of Labourers to Run Hullers	24	48.00

High Concentration of Hullers in the Same Locality	13	26.00
<b>Source: Field Survey</b>		

Among these reasons (a) and (b) appear synonymous in the sense that both indicate towards a shortage of supply of raw materials, viz. paddy. In fact, the authorized representatives of the huller units expressed their concern over the situation that a large part of the farmer households now prefer selling their raw paddy to local traders (*arotdars*) and buy processed rice from open market. It is argued by the huller unit owners that these *arotdars* actually advance money to the farmers as loans and purchase off paddy immediately after the harvest, only to channelize the raw paddy to the rice mills on a higher price or on the basis of certain commission. Apart from this, unavailability of labourers to run huller units also comes out as an important factor behind the lower utilization of capacity by the huller units, at least as expressed by the huller owners.

#### **4.4: SUBSIDY/ASSISTANCE OBTAINED**

Now moving away from utilization of capacity, it remains disturbing to note here that none of the modern as well as the traditional rice mills under the purview of the present survey has received any assistance or subsidy from the State Government or Central Government during the reference years, viz. 2007-08 to 2009-10.

However, it should be noted here that a handful of modern rice mills (6 no.s) have received subsidy from the government on loan for purchasing plant machinery for extension / modernization programmes before 2007-08, but not during the reference period specified for the study. Nevertheless, for the traditional rice mills, there has been no assistance/subsidy obtained by the huller units. In fact, a number of huller units were even unable to produce any document relating to its establishment, registration, etc., but electricity bills only. Moreover, it should also be noted here that about 84 percent of the sample huller units do not have any registered name of the huller unit.

<b>Particulars</b>	<b>No. of Beneficiaries</b>	<b>Amount (Rs.)</b>
Central Government	0	0.0
State Government	0	0.0
Small Scale Industry Corporation	0	0.0



APEDA	0	0.0
Commercial Bank	0	0.0
Other sources	0	0.0
Total	0	0.0
<b>Source: Field Survey</b>		

<b>Table 4.4.2</b> <b>Details of Assistance/Subsidy Obtained from Different Sources by the</b> <b>Traditional Rice Mills (Hullers) during 2007-08 to 2009-10</b>		
<b>Particulars</b>	<b>No. of</b> <b>Beneficiaries</b>	<b>Amount (Rs.)</b>
Central Government	0	0.0
State Government	0	0.0
Small Scale Industry Corporation	0	0.0
APEDA	0	0.0
Commercial Bank	0	0.0
Other sources	0	0.0
Total	0	0.0
<b>Source: Field Survey</b>		

#### **4.5: CONSTRAINTS IN PROCESSING OF PADDY**

The major constraints in processing of paddy, as has been expressed by the authorized respondents of the traditional and modern rice mills, may be described here in brief as follows -

- a) *Lack of availability of raw material:* When asked about the constraints in the processing of paddy by the modern and the traditional units, the most common answer (answered by 40 percent of respondents) was unavailability of raw material for processing. However, this remains understandable from the fact that paddy is a seasonal crop, and thus does not have a smooth supply throughout the year even in the districts with highest production. As such, processing of paddy also acquires a seasonal nature, especially for the huller units depending upon custom-milling of paddy. In fact, lack of availability of raw material in turn makes lower utilization of installed capacity, and bears an additional cost as much as Rs. 3.91 per quintal of paddy or 0.68 percent of total cost.
- b) *Bad quality electricity, irregular cuts, and voltage fluctuations:* Power (electrical) interruption stands out to be the second major constraints in processing of paddy, as expressed by the respondents. In fact, power interruption bears an additional cost of Rs.2.37 per quintal of paddy, which is about 0.41 percent of the total cost. The interruption in power as acting as a constraint in processing of paddy holds true both for the traditional and

modern rice mills in the survey region, as none is spared from the grip of regular load-sheddings, voltage fluctuations and power cuts.

- c) *High refraction ratio*: As has been put by the respondents, the quality of paddy that the modern rice mills are supplied with contains high refraction ratio, which amounts to an additional cost of Rs.1.72 per quintal of paddy or 0.30 percent of total cost. The quality of paddy is often such bad that it has to be cleaned a number of times before parboiling, and a lot is wasted as refractions and poorly formed grains.
- d) *Unorganized market for raw material*: It has been argued by the respondents that most of problems relating to the availability and quality of raw materials have been due to the unorganized nature of the paddy market. The additional costs borne by the rice mills owing to this problem stands at Rs.2.36 per quintal, which remains 0.41 percent of the total cost.
- e) *Lack of international standard machinery and technical knowhow*: As has been expressed by the respondents, the lack of technical knowhow and absence of international standard machinery serves to act as constraints in the processing of paddy, accounting for an additional cost of Rs.1.10 per quintal of paddy.
- f) *Untrained/Unskilled staff*: The respondents also held unavailability of trained or skilled staff as constraints in processing of paddy, which remains especially true for the modern rice mills. It is argued by the modern rice mills that at times of breakdown of machineries, it is hard to get skilled maintenance workers to fix the mechanical failures.
- g) *Lack of proper road infrastructure*: Some of the respondents also held the absence of proper road infrastructure for transportation, though this remains applicable only to the remotest huller units surveyed. In fact, the modern rice mills are most located in places with excellent road communication, especially in Burdwan district.

It should be noted here that the first four constraints in the processing of paddy (here- a,b,c & d) accounts for an additional cost of Rs.10.36 per quintal of paddy to the rice millers, while other constraints (here- e, f & g) together accounts for only about Rs.1.48 per quintal, which readily reveals the degree importance of the constraints in processing of paddy.

**Table 4.5.1  
Constraints in the Processing of Paddy as Expressed by Respondents**

Particulars	Number of Respondents	Percent of Respondents	Additional cost in terms of percentage	Additional cost in terms of Rs. Per Qtl	Steps required to ameliorate the problem
Lack of availability of raw material in nearby areas	40	40.00	0.68	3.91	Introduce Mandy system
Absence of proper road infrastructure for transportation	13	13.00	0.01	0.03	Govt. Should Step-in
Bad quality electricity, irregular cuts, voltage fluctuation	37	37.00	0.41	2.37	Govt. Should Step-in
Lack of international standard machinery and technical know-how	25	25.00	0.19	1.10	Subsidize Tech. Up-gradation
Unorganized Market for Raw Material	20	20.00	0.41	2.36	Regulate Paddy Market
Untrained / Unskilled Staff	11	11.00	0.06	0.35	Arrange for Trainings
High Refraction Ratio	16	16.00	0.30	1.72	Govt. Should Consider while fixing OTR
Lack of Govt. Planning	0	0.00	0.00	0.00	None
Lack of Adequate Finance	0	0.00	0.00	0.00	None
Mandi Fee, Transportation Gate Fee, etc.	0	0.00	0.00	0.00	None

**Source: Field Survey**

#### 4.6: STEPS TO OVERCOME THE CONSTRAINTS

The steps to overcome the constraints in processing of paddy and the suggestions to improve the paddy processing industry as a whole have been discussed here, as has been pointed out by the respondents from the traditional and modern rice mill. In fact, the suggestion, as has been described in Table 4.6.1, may be broadly categorized into three sections regarding the nature and area of the suggestions. These are – a) suggestion relating to marketing of paddy, b) suggestions relating to subsidies or assistance, and c) other technical suggestions. We may describe briefly these suggestions to improve the paddy processing industry by means of overcoming the constraints as follows –

- a) First, there has a suggestion from 16 percent of all the 100 rice mills under the present survey (including both modern and traditional rice mills) to organize the paddy market to make the availability of paddy convenient for the rice mills, while another 16 percent suggested introducing *mandy* system to the paddy market like in Punjab, Haryana, etc. At the same time another 13 percent suggested to regulate both the paddy and rice market, while 5 percent asked for measures to abolish intermediaries like local paddy traders, commission agents, etc. Thus in all about 50 percent of sample rice mills (both traditional and modern) suggested improving the marketing of paddy to overcome the constraints in the paddy processing industry. In fact, as has been argued by the respondents, there is an acute need to regulate the entire paddy market so as to make available quality paddy free of refractions in a more predictable manner free of seasonal fluctuations.
- b) Secondly, there has been a strong suggestion from 67 percent of all the sample rice mills to subsidize partly or entirely the paddy processing industry. In fact, while 26 percent suggested subsidizing power for the industry, another 25 percent suggested subsidizing technological up-gradation of the traditional and modern rice mills. At the same time, about 16 percent suggested measures like subsidizing the taxes, relaxing the levy, etc.
- c) Lastly, out of all 100 sample modern and traditional rice mills, about 11 percent suggested arranging training facilities for their workers owing to unavailability of trained or skilled labourers. However, the suggestion has come primarily from the modern rice mills facing major difficulties owing to lack of trained maintenance staff.

**Table 4.6.1**  
**Suggestions to Improve the Paddy Processing Industry as Expressed by Respondents**

<b>Suggestions</b>	<b>No. of Respondents</b>	<b>Per Cent of Total</b>
Organize Paddy Market	16	16.00
Subsidize Taxes, Levy, etc. for Paddy Processing Industry as being Agro-Based	16	16.00
Subsidize Power for Paddy Processing Industry as being Agro-Based	26	26.00
Subsidize Technological Up-gradation	25	25.00
Arrange Training Facilities for Workers	11	11.00
Introduce Mandy System	16	16.00
Abolish Intermediaries	5	5.00
Regulate Paddy & Rice Market	13	13.00
<b>Source: Field Survey</b>		

#### **4.7: CONCLUSION TO CHAPTER 4**

The technology of paddy processing has been perfected over time, which ultimately has resulted into highly sophisticated and technologically advanced modern rice mills we know today. Still though, there are a number of factors including technological factors, human factors and other regional or local factors, which act as constraints in the processing of paddy for both the modern and the traditional rice mills.

It is here that the modern rice mills are found to outweigh the traditional rice mills (hullers) both in terms of capacity installed and capacity utilized to a great extent, exhibiting considerably better performance regarding utilization of capacity. The higher utilization ratio of the modern rice mills turns out to be more impressive considering the fact that a number of studies conducted in the past indicated that even for a completely modernized plant, the break-even volume of paddy is achieved with the utilization of less than half of the installed capacity for such a unit.

Now, the major factors behind low utilization of capacity for the modern rice mills are found to be – a) Shortage or inconsistent supply of raw materials (82 percent); b) Break-down of machinery (36 percent); c) Unavailability of skilled labourers (30 percent); and d) Power interruption (28 percent). On the other hand, the prime reasons for the under utilization of capacity by the traditional rice mills (the huller units) are – a) Shortage of supply of processed paddy by the farmer households (56 percent); b) Local paddy being channelized to modern rice mills via local traders (62 percent); c) Unavailability of labourers to run huller units (48 percent); and d) high concentration of hullers in the same locality (26 percent).

Again, the survey reveals that none of the modern as well as the traditional rice mills have received assistance or subsidy from either the State or the Central Government during the reference years, viz. 2007-08 to 2009-10. Only 12 percent of the modern rice mills have received subsidy from the government for purchasing plant machinery for modernization programmes before 2007-08, but not during the reference year specified here.

It comes out from the study that the four major constraints in processing paddy (viz. the lack of availability of raw material; bad quality electricity, irregular cuts, and voltage fluctuations; high refraction ratio; and unorganized market for raw material) together accounts for an additional cost of Rs.10.36 per quintal of paddy to the rice millers, while other constraints (viz. lack of international standard machinery and technical know-how; untrained/unskilled staff; and lack of proper road infrastructure) together accounts for only about Rs.1.48 per quintal, which readily reveals the degree of importance of the constraints in processing of paddy.

The steps required to overcome the constraints in processing of paddy, as has been pointed out by the respondents, may be broadly categorized into three sections regarding the nature and area of the suggestions for overall improvement in the paddy processing industry. These are – a) suggestion relating to marketing of paddy, b) suggestions relating to subsidies or assistance, and c) other technical suggestions. While about 50 percent of sample rice mills (including both traditional and modern) suggested improving the marketing of paddy, another 67 percent suggested subsidizing the paddy processing industry only partly or entirely. Only about 11 percent suggested arranging training facilities for their workers owing to unavailability of trained or skilled labourers, especially maintenance staff for modern rice mills.

## CHAPTER 5

### CONCLUSIONS & POLICY IMPLICATIONS

#### 5.1: CONCLUSIONS

Rice has long been the staple food for more than 65 percent of the population in India. As such, paddy in India claims the first place both in area and production, as well it accounts for more than 20 percent of the total rice production in the world. Among the states, West Bengal is the leading producer of paddy in the country accounting for 15.16% of the total production in 2008-09. However, paddy itself cannot be consumed in its raw form and it needs to be suitably processed into rice to enable it for human consumption, which forms the basic need for the paddy processing industry to come into existence. Rice milling thus is the primary processing activity under which hulls and bran is removed from the paddy grain to convert it into polished rice. Almost the entire production of over 90 million tonnes of paddy is being converted into rice every year by paddy processing units of varying sizes and capacities spread all over the country, concentrated especially in the paddy producing states like West Bengal, etc. By and large, many of these rice-processing units are of the traditional huller type and are considered to be inefficient, as compared to the modern rice mills. Now, the crux of the problem is that in India, only about half of total rice produced is processed through the modern rice mills, whereas the entire other half is processed by the traditional huller type units, who are considered inefficient with lower out-turn ratio and lower value addition.

It is here that the present study tries to ascertain the doubts raised about the hulling and milling ratios arrived earlier through field-level investigations. Here, after a detailed analysis of observations made from secondary data and primary field investigations, a few specific conclusions can be made here as follows –

- Though the modern rice mills almost reached their extinction during the 1970s and 1980s confronted with a steep competition from the mushrooming of traditional huller units (both registered and unregistered), there has been a remarkable comeback from the modern rice mills since the 1990s onwards from less than 373 in 1989 to 1109 in 2010.
- In West Bengal, the traditional huller type paddy processing units have a much higher presence in rural areas. While the traditional shellers and huller-cum-shellers can hardly be traced in the rural areas, the huller units on the other hand outnumber the modern rice mill about every 10 to 1 only.



- The out-turn ratio for the hullers stands at an average of 57.22 percent as compared to the modern rice mills with an average out-turn ratio of 63.16 percent. It thus follows that the conversion ratio of paddy to fine rice in traditional rice mills (huller units) remains about 6 percent lower than that in the modern rice mills on an average. Needless to say, the observation remains perfectly in tune the findings of the past studies revealing inefficiency of huller units in terms of out-turn ratio as compared to modern rice mills.
- Among the modern rice mills the out-turn ratio increases by about 1.5 percent points as we move from modern rice mills belonging to Phase I to Phase III via Phase II. This in turn indicate towards an improvement in the out-turn ratio with the improvement in milling techniques adopted by the modern rice mills.
- While considering the economics of paddy processing by the traditional rice mills (hullers) and the modern rice mills, it has been found out that market incidental cost for the hullers is non-existent as it runs on a custom-hiring basis, while that for the modern rice mills stands at Rs. 8.63.
- In case of processing costs of paddy, the modern rice mills belonging to Phase III appears to be the most cost-inefficient. In particular, modern rice mills belonging to Phase III are heavily capital intensive and extremely mechanized, which in turn makes the costs of electricity, maintenance, depreciation, etc much higher. In contrast, the processing costs of paddy for the traditional rice mills (hullers) running on a custom hiring basis remains much below than that for its competitive rivals, the modern rice mills.
- The net return per quintal of paddy processed by the modern rice mills turns out be Rs.16.23 on an average, varying from a low of Rs.14.27 for those belonging to Phase III to as much as Rs.17.74 for Phase I and Rs.19.04 for Phase II. In sharp contrast to this, net return per quintal of paddy processed by the tradition rice mills (hullers) turns out to be Rs.21.18 on an average, much higher than that of the modern rice mills.
- The share of by-products in modern rice mills like broken-rice, bran and husk in value terms stands at 6.03 percent of gross return, while that for the main product, viz. fine rice, stands at 93.97 percent of gross return. Again, while the share of total costs stands at 8.30 percent of gross investment, that for net return stands at only 1.82 percent of gross investment. In sharp contrast to this, the huller units do not own the by-products, as the buy-products *khud* (broken-rice) and *tush* (mixture of broken, bran & husk) is handed over to the paddy owner farmers.

- For traditional huller units running on a custom hiring basis, the issues relating to the marketing of rice do not arise at all. However, for the modern rice mills, only 24 percent of the fine rice produced by the modern rice mills serves as levy to the government, while the rest 76 percent of fine rice produced is sold in the open market.
- The average moisture content in raw paddy comes out to be 16.73 percent on an average, which falls 2.70 percent further to about 14.03 percent for final processing. It remains highly significant to find that the average refraction ratio in raw paddy stands at 9.78 percent for the sample modern rice mills in the survey, which shows that extremely poor quality of paddy is locally available with the rice mills.
- In case of recovery of by-products, it is observed that in modern rice mills the ratio for broken rice, husk and bran stands at 2.02 percent, 20.02, and 4.68 percent on an average. In contrast, the recovery of broken-rice comes out to be as much as 4.87 percent in traditional hullers, while a mixture of bran and husk comes as a by-product accounting for as 36.63 percent.
- In case of the relative share of modern and traditional paddy processing units in the paddy processing industry, it comes out that more than 90 percent of paddy has been processed by the modern rice mill as against less than 10 percent by the traditional rice mills, viz. the hullers. Again, among all types of paddy processing units, almost about half (47.9%) of the paddy has been processed by the most advanced high-capacity modern rice mills belonging to Phase III.
- The major factors behind a low capacity utilization for the modern rice mills are found to be – a) Shortage or inconsistent supply of raw materials (82 percent); b) Break-down of machinery (36 percent); c) Unavailability of skilled labourers (30 percent); and d) Power interruption (28 percent). On the other hand, the prime reasons for the under utilization of capacity by the traditional rice mills (the huller units) are – a) Shortage of supply of processed paddy by the farmer households (56 percent); b) Local paddy being channelized to modern rice mills via local traders (62 percent); c) Unavailability of labourers to run huller units (48 percent); and d) high concentration of hullers in the same locality (26 percent).
- It comes out from the study that the four major constraints in processing paddy (viz. the lack of availability of raw material; bad quality electricity, irregular cuts, and voltage fluctuations; high refraction ratio; and unorganized market for raw material) together accounts for an additional cost of Rs.10.36 per quintal of paddy to the rice millers, while

other constraints (viz. lack of international standard machinery and technical know-how; untrained/unskilled staff; and lack of proper road infrastructure) together accounts for only about Rs.1.48 per quintal.

- To overcome the constraints in processing of paddy, while about 50 percent of sample rice mills (including both traditional and modern) suggested improving the marketing of paddy, another 67 percent suggested subsidizing the paddy processing industry only partly or entirely. Again, about 11 percent suggested arranging training facilities for their workers owing to unavailability of trained or skilled labourers, especially maintenance staff for modern rice mills.

## 5.2: POLICY RECOMMENDATIONS

The major findings and the conclusions of the present study necessitate us to outline specific policy recommendations, which have been briefly described below:

- There has been an indication of the fact that in the absence of organized market for raw paddy, the rice mills have lost the control over both the quality and the quantity of marketable surplus paddy from the farmers. In fact, the absence of organized market (like *mandy*) indulges the modern rice mills to compromise on quality of paddy by purchasing paddy with high refraction ratio from local commission agents, traders, etc. Again, the lack of steady supply of paddy from the unorganized market also makes the modern rice mills to compromise on quantity, and suffers from undue shutting down of units leading to lower utilization of capacity. As such, *attempts should be made to organize paddy market by introducing formal market structure for raw paddy*, the all important input for the paddy processing industry. (**Attention: West Bengal Agriculture Marketing Board, Government of West Bengal**)
- It comes out from the study that the entire paddy processing industry, including both the modern as well as the traditional rice mills, suffer from irregular supply of electricity with frequent power cuts, voltage fluctuations, etc. As the nature and the availability of power play a significant role in fostering the growth of the paddy processing industry, *adequate undisrupted availability of electricity should be ascertained for the paddy processing industry*. (**Attention: West Bengal State Electricity Board, Government of West Bengal**)

- The paddy processing industry in West Bengal has witnessed significant increase in the number of modern rice mills, alongside with a rapid technological up-gradation since the 1990s. However, it appears that there has been a shortage of skilled labourers for the industry to cope up with the modernization efforts. Hence, *the government should arrange for training programmes on a public-private-partnership model for existing rice mill workers aiming enhancement of technical skills.* (Attention: Ministry of Food Processing Industries, Government of West Bengal)
  
- It has been observed during the survey that among the modern rice mills, the out-turn ratio improves noticeably with higher levels of modernization. As such, to minimize losses owing to lower out-turn ratio, *the government should subsidize the modernization programmes by the existing rice mills on a regular basis.* (Attention: Ministry of Food Processing Industries, Government of West Bengal)

## CHAPTER 6

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