Study No. 165

EXECUTIVE SUMMARY

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

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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 executive summary of the individual centre's 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.

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 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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1: INTRODUCTION

1.1: INTRODUCTION

Rice has long been the staple food for two-thirds of the population in our country, India, and caters 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. Among the states, West Bengal, the state concerned under the present study, is the leading producer of paddy in the country accounting for about 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. It is here that hulling and milling of rice is the oldest and largest agro-processing activity under which hulls and bran is removed from the paddy grain to convert it into polished rice. Almost the entire production of about 100 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 West Bengal. 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 argued that there exists a reasonable scope for augmenting growth in the production of rice in the economy by suitable intervention and modernization drives for upgrading the milling techniques, thereby reducing the post-harvest loses to the economy.

It is here that the present study tries to deal with the very essence of the aforesaid problem in the leading paddy producing state of 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 West Bengal-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 claiming the highest position in terms of production (15.04 million tones) and second highest position in terms of area (5.94 million hectares) among the major paddy growing states in India during 2008-09. 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.

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 and in the districts of Burdwan, Midnapore and Bankura using crude milling techniques.

However, the modern rice mills in West Bengal began to lose their importance during the 1970s and 1980s, as the number of modern rice mills drastically dropping from 711 units in 1965 to as low as 373 in 1989. 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) with/without liscence performing identical tasks performed by the modern rice mills. 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.

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.

Within the state, the district of Burdwan has the largest concentration of modern rice mills, while the other districts having good concentration are Hooghly, and Birbhum. In fact, the district Burdwan hosts about 43 percent of all rice mills in West Bengal. The major product of these mills has been parboiled rice, although there are only a few 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.

1.5: OBJECTIVES OF THE STUDY

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 filed-level investigations. In fact, the specific objectives of the study are-

I) to analyze the trends and patter 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 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 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.

1.7: ORGANIZATION OF THE STUDY

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.

2: HULLING AND MILLING RATIO FOR PADDY

2.1: INTRODUCTION

In India processing of paddy can be categorized into the following two broad methods – viz. Traditional Method and Mechanical Methods. In the traditional method, techniques like hand-pounding was in practices using implements like Dhenki, Chakki, etc, which have become obsolete at present. 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 modern rice mills, while shellers and huller-cum-shellers are hardly found in the state.

The conventional rice hullers are usually of very low capacity mills, where both shelling and polishing operations of rice 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. In sharp contrast, 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.

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.

The advent of rice milling industry in West Bengal can be traced back to 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 more rice mills were started in and around Kolkata, and 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. Later, faced with the serious food crisis in the early sixties, a joint study team of the Government of India and the Ford Foundation recommended an overall modernization of the paddy-rice system in April 1963. 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 MT 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. 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.

Since the 1990s onwards, the modern rice milling industry exbihibited a turnaround as the number of mills increased from less than 400 units in 1989 to more than 1100 units in 2010. 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

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. Data relating only to a few years are available with the Ministry of Food Processing Industries, G.O.I.

From whatever available data there is, it come out that the major players in the rice milling industry in West Bengal are the age-old huller units as against the ever-improving modern rice mills, though the former outnumbers the later by about every 10 to1only. Moreover, if we consider the data available with the Central Pollution Control Board, we find that West Bengal has the largest number of Rice Mills (16,925 no.s, including the tiny rice mills) among all other states in India.

2.4: BASIC CHARACTERISTICS OF THE SELECTED 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 of the two districts, thereby making the sample size to be100 paddy-processing units. 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 fractions of paddy processed in the selected districts. It is to be noted here that all the sample modern rice mills selected for the study are of owner-cum-trader type units. In fact, in West Bengal, an overwhelming majority of modern rice mills function as owner-cum-trader units, and custom hiring operations amounts only to a fraction of their paddy processing activity. 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.

There is a fair distribution of modern rice mills belonging to different phases of technological advancement among the selected modern rice mills from the two districts. In particular, while 40 percent of the selected sample modern 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.

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 for the different milling techniques has been presented here. It should be noted here that we define out-turn ratio as conversion ratio of paddy to fine rice obtained through particular milling technique applicable. Again, 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 among the sample rice mills.

Hulling and Milling Ratio in Modern and Traditional Rice Mills		
Type of Unit / Particulars		**Average (2007-08 to 2009-10)**
Phase I	Paddy Processed (Th. Ton.)	60.57
	Fine Rice (Th. Ton.)	37.67
	Out Turn Ratio	62.19
Phase II	Paddy Processed (Th. Ton.)	61.84
	Fine Rice (Th. Ton.)	39.02
	Out Turn Ratio	63.10
Phase III	Paddy Processed (Th. Ton.)	135.36
	Fine Rice (Th. Ton.)	86.11
	Out Turn Ratio	63.62
All Modern	Paddy Processed (Th. Ton.)	257.77
	Fine Rice (Th. Ton.)	162.80
	Out Turn Ratio	63.16
Hullers	Paddy Processed (Th. Ton.)	24.81
	Fine Rice (Th. Ton.)	14.20
	Out Turn Ratio	57.22
All	Paddy Processed (Th. Ton.)	540.35
	Fine Rice (Th. Ton.)	339.80
	Out Turn Ratio	62.89
Source: Field Survey		

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 industry (including both traditional and modern rice mills) stands at 62.89 percent.

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, while this survey encompasses modern rice mills using both sun-drying system and mechanical drying system simultaneously, at the same time the survey also encounters highly sophisticated and fully automated imported milling units with silky polish and colour sorter machines, which can only be traced in some of the leading rice mill cluster in India like Karnal, Kalady, etc. In particular, 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. Hence it clearly follows that among the modern rice mills, the out-turn ratio exhibits a positive relationship with the level of improvement in the milling technology.

3: Economics of Paddy Processing

3.1: Introduction

The processing of paddy forms an industry, where paddy serves to be the raw material, processed to form the finished product, polished fine rice. It is interesting to observe that 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 interesting to observe that at present both types of paddy processing units co-exist sharing the entire paddy processed in the state.

Here, we will try to examine the economics behind the functioning of two completely different types of paddy processing units, viz. the traditional huller units and the modern rice mills. By treating the paddy processing units as strict business units, we are to examine economics aspects like market incidentals, processing costs, marketing of final products, etc.

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

As has been mentioned earlier, the huller units run purely on a custom-hiring basis, where the task of parboiling of raw paddy is done by the farmers themselves at home. Only 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. At times, even the farmers (customers) themselves 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, 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,

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.

Again, if we examine the market incidentals separately for the modern rice mills belonging to different phases of modernization, we find out that the total market incidental costs do not differ significantly. Nevertheless, 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 increasing levels of modernization.

3.3: PROCESSING COSTS AMONG MODERN AND TRADITIONAL RICE MILLS

The costs incurred during processing of paddy by the modern and traditional rice mills remains central to the analysis of the economics of paddy processing industry. Paddy processing activity involves multiple stages and for each of these stages there are number of costs involved in the processing activity. Now, there exist significant differences in costs of processing of paddy, as different milling techniques demand different combination of inputs at different stages of production.

In case of modern rice mills, the cost of paddy processing by the modern rice mills turns out to be Rs.60.98. Among the different phases of modernization, it has been observed that while 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 this respect. In fact, it is observed that modern rice mills belonging to Phase III are less labour-intensive. However, as these modern mills belonging to Phase III are heavily capital intensive and extremely mechanized, the costs of electricity, maintenance, depreciation, etc remains much higher than those belonging to Phase I and to Phase II.

Now, in contrast to the modern rice mills, the costs of paddy processing by the traditional rice mills, i.e. the hullers units, turns out to be Rs.12.18, which remains much below than that for its competitive rivals, the modern rice mills. Hence, the traditional paddy processing units enjoy a comparative advantage in terms of processing costs, especially on account of electricity, fuel for parboiling, depreciation and other fixed costs.

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. 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. However, 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.

It is here that an analysis the economics behind the modern rice mills reveals that net return per quintal of paddy processed by the modern rice mills comes out be Rs.16.23 on an average. However, owing to differences in economics of modern rice mills belonging to different phases, it has been observed that net return per quintal of

paddy processed differs significantly over the different phases of modern rice mills. In particular, net return per quintal of paddy turns out to be the highest for the modern rice mills belonging to Phase II at Rs.19.98, followed by Phase I at Rs.17.74 on an average. Net return per quintal of paddy interestingly turns out to be the lowest for the highly modern rice mills belonging to Phase III at Rs.14.27.

Economics of Modern Rice Mills (All) Running on Owner-cum-Trader Basis	
Particulars	**Average of Aggregate Values (2007-08 to 2009-10)**
Quantity of Paddy Processed (Th. Ton.)	257.77
Value of Paddy Processed (Rs.Crore)	210.59
Conversion Ratio of Fine Rice (Kgs /Qt)	63.16
Quantity of Fine Rice Produced (Th. Ton.)	162.80
Value of Fine Rice Produced (Rs.Crore)	219.75
Conversion Ratio Broken Rice (Kgs / Qt)	2.02
Quantity of Broken Rice Produced (Th. Ton.)	5.20
Value of Broken Rice Produced (Rs.Crore)	4.06
Conversion Ratio of Bran (Kgs per Qt)	4.68
Bran Produced (Th. Ton.)	12.08
Value of Bran Produced (Rs.Crore)	9.04
Conversion Ratio of Husk (Kgs per Qt)	20.02
Husk Produced (Th. Ton.)	51.62
Value of Husk Produced (Rs.Crore)	0.99
Total Value of By-Product (Rs.Crore)	14.09
Gross Returns (Rs.Crore)	233.85
Total Market Incidentals (Rs.Crore)	2.33
Total Electricity Cost (Rs.Crore)	4.52
Total Bio-fuel Cost (Rs.Crore)	1.15
Total Labor Cost (Rs.Crore)	4.42
Total Depreciation, and Other Costs (Rs.Crore)	6.64
Total Cost (Rs.Crore)	19.07
Net Returns (Rs.Crore)	4.18
Net Return (Rs/Qt)	16.23
Note: (Sample Size = 50); *Source: Field Survey*	

3.5: ECONOMICS OF HULLERS RUNNING ON CUSTOM HIRING BASIS

In case of traditional huller units 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, while net return per quintal of paddy processed remains slightly higher at Rs.21.18 on an average. 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.

3.6: MARKETING OF PROCESSED RICE BY MODERN AND TRADITIONAL MILLERS

The traditional rice milling units under the purview of the present run purely on a custom hiring basis, as has been mentioned earlier. 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. Beginning with the main product viz. the fine rice, all by-products like broken rice, bran, and husks obtained separately in the milling process is sold by the modern rice mills. In fact, the survey reveals 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.

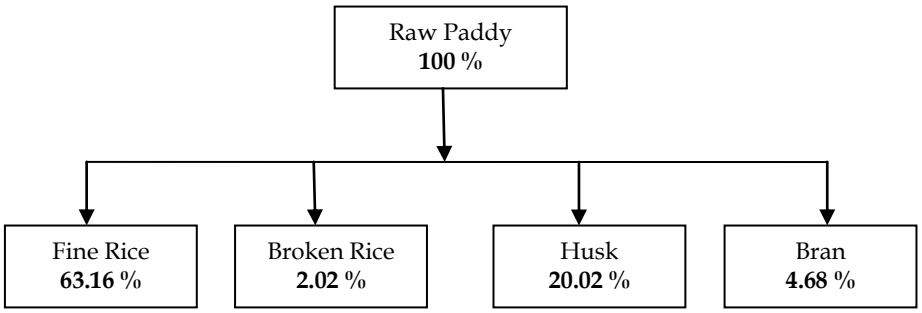
3.7: STANDARDS MAINTAINED IN PROCESSING AND QUALITY OF END PRODUCT OBTAINED

There is no doubt in the fact that aspects like average moisture content in raw paddy, in paddy for final processing, etc. significantly affect the quality as well as the quantity 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, 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 extremely poor quality of paddy to the sample rice mills. 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

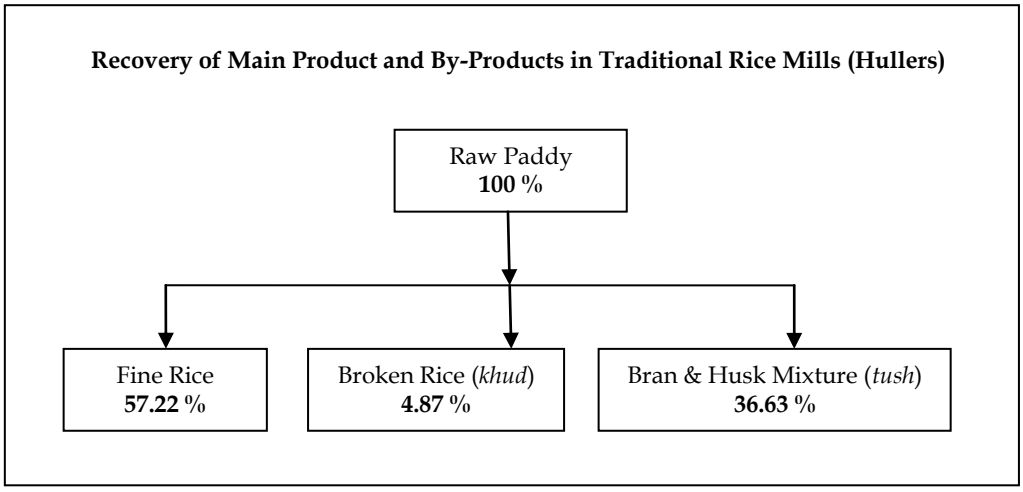
The major products and the by-products produced at different stages of processing of paddy in the modern rice mills are the fine rice, broken rice, bran and husks, which play important roles in the economics of paddy processing units. In fact, the earning from production and sell of bran serves to be extremely important with great financial significance for the modern rice mills, as pure bran serves to be the raw material for the solvent extraction plants and has reasonable value in the market depending upon the oil-content.

Recovery Ratio of Main Product and By-Products in Modern Rice Mills (All)



It has been observed during the survey that the proportion of fine rice and broken rice turns out to be 63.16 percent and 2.02 percent respectively, while the proportion of husk and bran turns out to be about 20.02 percent and 4.68 percent respectively on an average over all the modern rice mills taken together. The rest/residue accounts for the refraction / foreign materials and loss of moisture in processing. Again, among the sample modern rice mills, the modern rice mills belonging to Phase III records the highest out-turn ratio and lowest ratio of broken-rice, while at the same time accounting 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 some extent. The recovery of broken-rice appears to fall as we move from Phase I to Phase III.

As against the modern rice mills the rate of recovery 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 arrive 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 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.

3.9: RELATIVE SHARES OF DIFFERENT MILLING TECHNIQUES

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 consequently the relative share of traditional units is far higher (about 50 percent) in reality.

Relative Shares of Different Milling Techniques in Total Paddy Processed	
Type of Unit	**Average % Share (2007-08 to 2009-10)**
A. Modern Rice Mills	91.22
Modern Rice Mills – Phase I	21.43
Modern Rice Mills – Phase II	21.88
Modern Rice Mills – Phase III	47.90
B. Traditional Rice Mills	8.78
Huller	8.78
All (A+B+C)	100.00
Source: Field Survey	

4: CONSTRAINTS IN PROCESSING OF PADDY

4.1: INTRODUCTION

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, 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 on the other hand, purely human factors. 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 we try to identify the present state of capacity utilization of the modern vis-à-vis traditional rice mills and enumerate factors behind it, as also summarily present the constraints in the processing of paddy by 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 for the modern as well as traditional paddy processing units the installed capacity and its utilization serve to be an important indicator in gauging performance. Hence, a detailed analysis of installed capacity and its utilization by the paddy processing units reveal that on an average, while the actual capacity installed by the modern rice mills stands at 3.67 TPH (tones per hour) as against 0.89 TPH for the traditional rice mills, viz. the huller units, the capacity utilized stands at 2.17 TPH for the modern rice mills, as against 0.24 TPH for the traditional rice mills. Thus the percentage utilization of capacity by the modern rice mill comes out at 56.17 percent on an average, as compared to an average of mere 26.77 percent for the traditional rice mills. Among the modern rice mills, those belonging to Phase III record the highest utilization ratio of more than 79 percent on an average.

It thus comes out that the modern mills outweigh the traditional rice mills both in terms of capacity installed and capacity utilized to a great extent, while higher mill-closed days can be an explanatory factor for the lower utilization of installed capacity by the huller units. It should be noted that 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.

Capacity Utilization of Traditional Rice Mills		
Particulars	**Traditional Rice Mills**	**Modern Rice Mills**
Actual Capacity (Tones)	.89	3.67
Capacity used (Tones)	.24	2.17
Percentage capacity utilization (%)	26.77	56.17
Mill-closed Days (in Days)	108.13	68.55
Average value of 2007-08 to 2009-10 *Source: Field Survey*		

4.3: REASON FOR UNDER-UTILIZATION OF CAPACITY

The major reasons behind the low utilization of capacity by the modern rice mills are found to be – a) Shortage or inconsistent supply of raw materials,; b) Break-down of machinery; c) Unavailability of skilled labourers and d) Power interruption. On the other hand, the prime causes responsible 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.

4.4: SUBSIDY/ASSISTANCE OBTAINED

It remains disturbing to find 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 the Central Government during the reference years, viz. 2007-08 to 2009-10. Only 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.

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 highlighted here as follows –

(a) Lack of availability of raw material,
(b) Bad quality electricity, irregular cuts, and voltage fluctuations,
(c) High refraction ratio,
(d) Unorganized market for raw material,
(e) Lack of international standard machinery and technical knowhow,
(f) Untrained/Unskilled staff, and
(g) Lack of proper road infrastructure.

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.

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 in brief. In fact, the suggestions, as has been pointed out by the respondents from the traditional and modern rice mills, may be broadly categorized into three sections regarding the nature and area of the suggestions. These are –

(a) First, about a half of the sample rice mills (both traditional and modern) suggested of improving the marketing of paddy to overcome the constraints in the paddy processing industry. In particular, while there are suggestions to organize the paddy market to make the availability of paddy convenient for the rice mills, a few others suggest to introduce of *mandy* system to the paddy market like in Punjab, Haryana, etc. At the same time suggestions are also there to regulate both the paddy and rice market, and to abolish intermediaries like local paddy traders, commission agents, etc.

(b) Secondly, about two-thirds of all the sample rice mills suggested to subsidize partly or entirely the paddy processing industry by means of subsidizing power, technological up-gradation, tax-cut, relaxation in levy norms, etc.

(c) Lastly, there have been suggestions to arrange training facilities, which came primarily from the modern rice mills facing major difficulties owing to lack of trained maintenance staff.

5: CONCLUSIONS AND POLICY IMPLICATIONS

5.1: CONCLUSIONS

After a detailed analysis of results obtained from primary field investigations and available secondary data, a few specific concluding remarks can be highlighted here as follows –

- 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, though the huller units 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 63.16 percent of modern rice mills. It thus follows that on an average, the conversion ratio of paddy to fine rice in traditional mills (huller units) remains about 6 percent lower than that in the modern rice mills. At the same time,
- The out-turn ratio increases steadily by about 1.5 percent points as we move to higher phases of modern rice mills, indicating improvements in the out-turn ratio with the improvement in milling techniques adopted.
- The modern rice mills belonging to Phase III appears to bear the highest cost per unit of paddy processed as being heavily capital intensive and extremely mechanized. In contrast, the processing costs of paddy for the traditional rice mills (hullers) 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, 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, viz. broken-rice, bran and husk 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 in value terms. In comparison, the by-products *khud* (broken-rice) and *tush* (mixture of broken, bran & husk) in case of the huller units is handed over to the paddy owner farmers.
- Only 24 percent of the fine rice produced by the modern rice mills serves as levy to the government, while the rest 76 percent is sold in open markets. For the huller units running on custom hiring basis, the issues relating to the marketing of rice do not arise at all.
- The average moisture content in raw paddy comes out to be 16.73 percent e, which falls 2.70 percent further to about 14.03 percent for final processing. The average refraction ratio in raw paddy stands at 9.78 percent, revealing the quality of raw paddy to be extremely poor.
- In modern rice mills, the recovery ratio for broken rice, husk and bran stands at 2.02 percent, 20.02, and 4.68 percent on an average. In sharp 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.
- More than 90 percent of paddy covered under the present study has been processed by the modern rice mill (especially belonging to Phase III with 47.9 percent share) as against less than 10 percent by the traditional rice mills, viz. the hullers.
- The major factors behind lower utilization of capacity for the modern rice mills are found to be – a) Shortage or inconsistent supply of raw materials; b) Break-down of machinery; c) Unavailability of skilled labourers; and d) Power interruption. 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 area.
- The major constraints in processing of paddy turn out to be lack of availability of raw material, bad quality electricity, irregular cuts, and voltage fluctuations, high refraction ratio, and unorganized market for raw material. Other constraints include lack of international standard machinery and technical know-how, untrained/unskilled staff, and lack of proper road infrastructure.

5.2: POLICY RECOMMENDATIONS

The major findings 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 subside the modernization programmes by the existing rice mills on a regular basis*. **(Attention: Ministry of Food Processing Industries, Government of West Bengal)**