THE NIGERIAN RICE ECONOMY IN A COMPETITIVE WORLD:
CONSTRAINTS, OPPORTUNITIES AND STRATEGIC CHOICES

Rice Processing in Nigeria: A survey

By

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1 Introduction

The Nigerian rice sector has seen some remarkable developments over the last quarter-century. Both rice production and consumption in Nigeria have vastly increased during the aforementioned period. Notwithstanding, the production increase was insufficient to match the consumption increase - with rice imports making up the shortfall. With rice now being a structural component of the Nigerian diet and rice imports making up an important share of Nigerian agricultural imports, there is considerable political interest in increasing the consumption of local rice. This has made rice a highly political commodity in Nigeria. However, past policies have not been successful in securing the market share for local rice. There is a need to draw lessons from these past policies – particularly by finding out was is really happening on the ground in terms of rice production and processing. This is the more urgent in view of the recent resurgence of an active interest to develop the rice sector in Nigeria[3].

The Nigerian rice sector is special within the West African context. First, as rice sector is to a large extend market-based. This reflects the combined effect of Nigeria - as a country - being a relatively non-traditional rice producer/consumer[4] with a rapid recent increase - and still increasing – demand for rice. Second, as rice is primarily consumed in its parboiled form. Parboiling adds value to rice in the production and consumption chain, but together with the prevalent milling practices also has major implications for the quality of Nigerian rice (particularly vis-à-vis imported rice). Third, the sheer relative size of the current rice sector in Nigeria with respect to West Africa as a whole – both in terms of rice production and consumption.

Despite the importance of Nigerian rice production within the West African context, a comprehensive and up to date picture of the rice sector in general and rice production and processing in particular was lacking (Akpokodje et al., 2001). The present study tries to address this information gap through a rice processors survey.

Amongst the stakeholders consulted, it is generally agreed that one of the major constraints that affect the development of Nigerian rice sector is the inability of the local rice to match the quality of imports. Paddy processing into rice is considered as the critical point for the determination of the rice quality. Therefore, it was decided to focus the limited resources available to cover Nigerian rice post-harvest operation on the rice millers. The pivotal role of millers in the paddy-rice commodity chain was also viewed as a good entry point to cover issues related both to the paddy market upstream, and downstream to the rice market.

The specific objectives of the miller survey were to investigate the different types of operators with regards to the technology used, procurement and sale arrangements, profitability, managers' opinions on constraints faced and prospects for the development of the milling business.

The present rice processor survey is a component of a larger effort to update knowledge on current conditions under which rice is produced and processed in Nigeria. Complementary reports address rice consumption (Lançon et al, 2003) and rice production in general (Erenstein et al, 2003) and irrigated rice (Kebbeh et al, 2003). The study and the larger project it contribbeh et al, 2003). The studyecn. illers. ThS41

2 Methodology

In line with the producer survey (Erenstein et al, 2003), the processors survey covered the five states selected as being representative of the Nigerian rice sector, namely: Niger, Kaduna, Benue, Taraba and Ekiti. Beyond the logistic rationale for the choice (particularly enumerators' time and cost), the focus on these states also allowed to get a more comprehensive understanding of the rice commodity chain and rice producers' environment in the locations selected for the producer's survey. However, rice-processing being at the interface of the supply and demand, its location is not solely determined by production location. Therefore it was decided to extend the selection of mills beyond the Local

- Sections H to K deal with paddy and rice procurement looking at the type of customers, the type of products available for rice and paddy and criteria used for their identification, marketing costs involved, storage practices and marketing constraints;
- Sections L to M include a series of open questions related to the miller's perceptions of various constraints and prospects.

3 Rice milling in Nigeria

3.1 Type of rice millers

Rice milling in Nigeria is a 'cottage industry'. No operational industrial mills were found. Still, substantial diversity exists within these relative small-scale operations. Rice mills are very diverse according to their milling capacity, ways of operation (combining milling and trading), range of processing operations performed and so forth. An attempt to build a typology through principal component and cluster analysis on selected variables has not been satisfactory due to the limited size of the sample. We propose therefore to present mill characteristics along different criteria in sequence.

3.1.1 Milling capacity

The milling capacity is a common criteria used to classify workshops. The milling capacity in the sampled workshops varies from 50 kg of rice per hour in the smallest up to 5000 kg in the largest. Milling capacity varies according to the type of equipment (engine power and type of huller), but the number of machines operating in the workshop is the major determinant. The largest workshops can have up to 4 or 6 engines working simultaneously.

From the distribution of workshop capacity, four main groups emerge (Table 2):

1. 'Small size mill' - milling capacity below 150 kg of rice per hour.
2. 'Medium size mill' - milling capacity between 150 and 300 kg of rice per hour.
3. 'Big size mill' – milling capacity between 300 and 500 kg of rice per hour.
4. 'Large size mill' – milling capacity between 500 and 5000 kg of rice per hour.

The most frequent type of mill encountered is the 'medium size' (150 to 300 kg/hr), which represents half of the sample, followed by the 'small size', the less frequent type of mills being the 'big size' and 'large size'. In terms of total processing capacity[5] as expected the weight of the smallest mills is inferior to their weight in workshop sample. For instance, the small mill represents 26% of the sample while they offer only 8% of the total annual capacity. Conversely, the biggest type of mills represents only 8% of the sample and offers almost half of the total capacity. If we consider the actual volume of rice processed during the 2001-2002 campaign, the share of large mills declined to one third of the total production of the sample. This is due to a lower utilization of processing capacity for the bigger workshops than for the smaller ones. Therefore the distribution of the production is less skewed in favor of the largest workshops than the distribution of capacity (Figure 1).

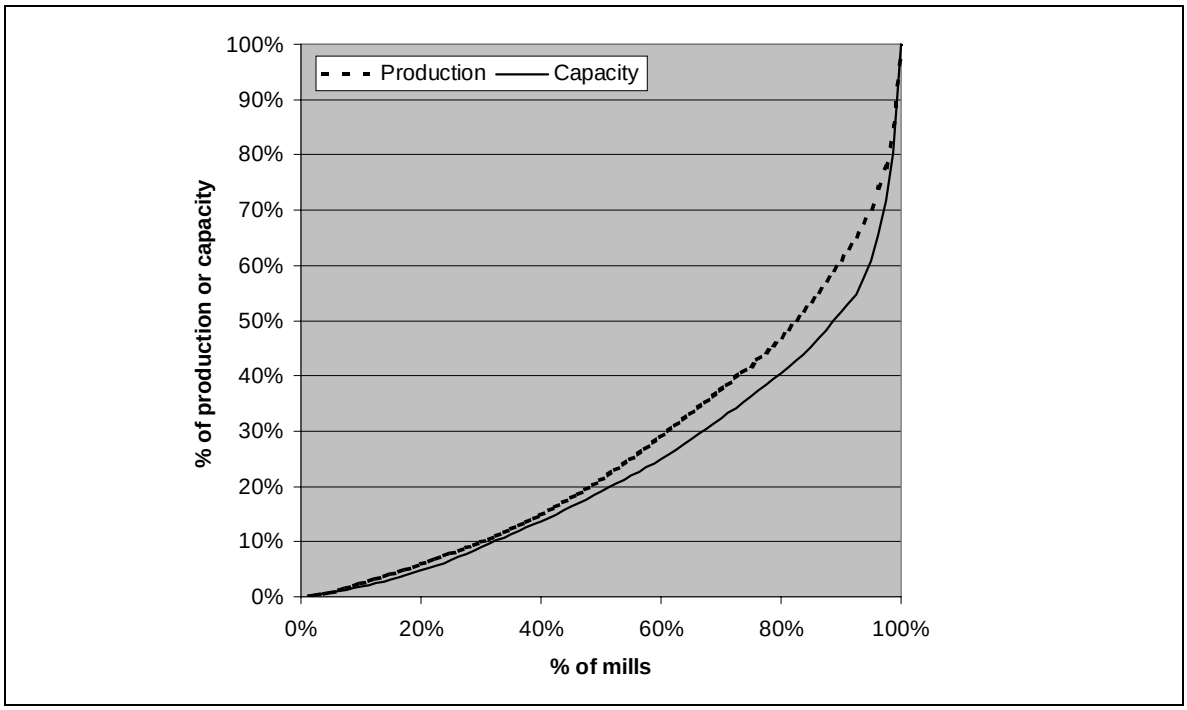
Table 2: Distribution and selected capacity indicators by mill size

Mill size	Workshop		Annual capacity		Rice produced		Capacity utilization
(Kg of rice/hr)	n	%	Tot vol (ton)	%	Tot vol (ton)	%	%
[0 - 150[	21	26%	4 542 281	8%	2 820 360	11%	62%
[150 – 300[	44	55%	19 650 583	34%	10 365 832	41%	53%
[300 – 500[	9	11%	7 707 648	13%	3 913 680	15%	51%
[500 - 5000]	6	8%	26 356 608	45%	8 477 039	33%	32%
Overall	80	100%	58 257 120	100%	25 576 911	100%	44%

Source: Processor survey

[5] Total annual capacity is arbitrarily defined as the production that would be reached if the workshop operates for 8 hours during 24 days by month for the whole year.

Figure 1: Gini curve for capacity and actual production.



Source: Processor survey

This distribution should be further corrected due to the over representation of the large mills in the sample. The priority being given to investigate the widest range of mills operating we purposely targeted large mills in each survey areas. For instance in Niger state only two large mills have been identified in the entire state and only one was operating, therefore a random selection of processors would have likely not included this type of workshop in our sample.

If we exclude the 'large size mills' from the sample we obtain relative shares of total production which are probably closer to the reality (Table 3); the smaller mills (below 150kg/hr) producing 16% of the total rice output, the medium mills, by far the largest group with more than half of the sample, providing two thirds of the total production, while the big mills produce 23% of the total production.

Table 3: Distribution and selected capacity indicators by mill size excluding largest mills

Mill size	**Workshop**		**Annual capacity**		**Rice processed**		**Capacity utilization**
(Kg of rice/hr)	n	%	kg of rice	%	kg of rice	%	%
[0 - 150[	22	30%	4 542 281	14%	2 820 360	16%	62%
[150 - 300[	43	58%	19 650 582	62%	10 365 832	61%	53%
[300 - 500[	9	12%	7 707 648	24%	3 913 680	23%	51%
Overall	74	100%	31 900 511	100%	17 099 872	100%	54%

Source: Processor survey

In summary, rice-milling business is dominated by medium size workshops with a processing capacity of 150 to 300 kg/hr – i.e. rather small-scale workshops that process less than 6 bags per hours. The largest mills, which have the largest capacity, do not hold a leading position on the market due to their inability to better utilize processing capacity.

The distribution of the different size of workshops across the survey sites (Figure 2) gives some preliminary insights into relations between workshop characteristics and their working environments. The distribution is more homogenous in Kaduna and Benue state where more than 80% of the

workshops produce between 150 and 300 kg of rice per hours and in Ekiti state where all the workshops have a low production capacity, below 150 kg of rice per hour. The same remark applies to Lafia and Abakaliki sites. On the contrary the range of type of mills encountered in Niger and Taraba state is wider.

For Lafia and Abakaliki the homogeneity of the type of mills within each location corresponds to the limitation of the survey sites to the towns of Lafia and Abakaliki, which are well known rice processing centers in Nigeria. Therefore, this homogeneity can be explained by the homogeneity of the environment in which workshops operate. Differences in average size of the workshops between Abakaliki and Lafia might be related to the availability of paddy in their respective state and the capacity of each processing center to expand their procurement area to other production sites (determined by their location and accessibility). The lower capacity of Ekiti's workshops compared to other survey sites can be linked to the type of rice producers encountered and the dynamics of rice production development in the state. Ekiti rice production systems are mainly upland and small-scale, which means a lower and more erratic and seasonal supply of paddy compared to other zones. This does not provide a conducive environment to operate larger mills. Historically rice has been produced for several decades in Ekiti state, like in other southwest Nigerian states. Still, the region has been gradually overtaken by the rapid development of rice production in other states during the eighties, which did not motivate local operators to invest in processing capacity.

The higher diversity of workshop sizes encountered in Niger state compared to Benue and Kaduna state can also be related to historical factors. Traditional rice producing areas can be found in Niger state (like Gwari and Nupe) on the bases of which small scale processors targeting the local market have gradually developed. In addition, there is substantial production for the market in Niger state – including intensive and irrigated production systems - that offers potential for larger size workshops . On the contrary the more recent development of rice production in Benue and Kaduna has resulted in a more homogenous size of workshops. Also, Benue and Kaduna state are relatively close to the major rice processing hubs, particularly Lafia, where most of the surveyed large size mills are located. In contrast, millers in Niger state are more insulated from such competition – although the current state of the rice sector did not allow the largest mill in Niger state to remain in business.

The relatively similar distribution of mill sizes in Benue and Kaduna state masks an important difference in terms of location. In Benue state, rice consumption in rural areas is relatively limited and mills were reportedly absent in the rice producing villages surveyed (Erenstein et al, 2003). In Benue state, rice millers were located in neighboring towns or further a-field. In Kaduna state, rice consumption is more widespread and rice producing villages typically had one or more mills. Furthermore, Benue state is at the cross-roads between the two major rice processing hubs (Lafia to the north and Abakaliki to the south).

The slightly different pattern of mill size distribution in Taraba state likely reflects a combination of factors. Compared to Benue and Kaduna, Taraba state takes an intermediate position in terms of rural rice consumption and availability of mills within rice producing villages (Erenstein et al, 2003). Similar to Benue, a substantial share of paddy produced within the state is reportedly processed in the processing hubs.

The two rice processing hubs also show an interesting difference. The surveyed Lafia workshops showed a prevalence of large-size workshops, located within a rice processing neighborhood within the city limits. The surveyed Abakaliki workshops all fell within the medium-size – a reflection of the local organization of rice milling, with numerous similarly sized individual workshops in one large compound outside the city limits.

Figure 2: Workshops distribution by processing capacity (kg of rice per hour) and survey sites.

Table 4: Selected paddy procurement indicators by mill size (kg rice per hour).

Indicator \ Size of mill	[0 - 150[n=21	[150 - 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Type of mill					
- Miler-only	82%	42%	78%	33%	56%
- Miller-trader	18%	58%	22%	67%	44%
- Overall	100%	100%	100%	100%	100%
Share of volume procured through purchase for miller trader	35%	36%	65%	79%	43%

Source: Processor survey

3.1.3 Pattern of activities

Another dimension of miller characteristics is the importance of the rice milling activities per se within alternative sources of incomes. Given the seasonality of the paddy production and storage costs, rice milling is typically a seasonal activity too. Almost half of the total volume of paddy processed occurred during the last three months of the year. The rest of the year the level of operation is limited and 41% of the millers close their workshop for three months on average. This seasonality is therefore an incentive to diversify the sources of income by combining rice milling with other activity.

The first type of alternative activities is the processing of other agricultural products, mainly maize and cassava. This allows the miller to respond to the diversified need of his customers and to maximize the use of his engine to power the various types of mills or grinders used for processing the crops. However this type of diversification is also exposed to the seasonality of the production of the alternative crop. The second type of diversification combines rice milling with non-processing activity such as trade, transport or even civil servant positions. A gradient of diversification can be identified, based on the types of alternative activities concomitantly undertaken by the millers and the weight of the rice milling in the range of business.

As shown in Table 5, 41% of the total sample relies exclusively on rice as a source of income, which means that the majority of the millers have another activity. Combining rice milling with non-processing activities is the major pattern of diversification (41%) while only 26% of the workshops combines rice milling with the processing of other agricultural products. A minority of millers (9%) combines the three types of activities. When the miller diversified his activity by processing a new range of crops, paddy remains the main crop to be processed, followed by maize, guinea corn (sorghum), and cassava. For those who have other source of income than agricultural product processing, the dominant alternative activity is farming (39%), followed by trading (24%) and civil servant position (12%).

Table 5: Sample distribution by degree of diversification.

		Other products processing		Overall
		No	Yes	
Non-processing activity	No	41%	18%	59 %
	Yes	33%	9%	41%
Overall		74%	26%	100%

Source: Processor survey

Looking at the correspondence between the workshop size and their degree of diversification (Table 6), it is observed that smaller workshops tend to diversify by extending the range of agricultural product processed, while the larger ones are more involved in non-processing activities. This pattern

Gender wise, the profession is still dominated by men, only 20% of the workshops belong to a woman. However it is important to note that while women represent only 8% of the owners for the workshop established before 1990 they represent more than 20% of the owners for the workshops established after 1990. The expansion of the rice processing activities in the nineties' went along with a more balanced distribution of gender. It is also worth noting that the majority of the women miller purchase paddy while it is contrary for workshops managed by men. In terms of capacity, most of the workshop managed by women belongs to mid-size category.

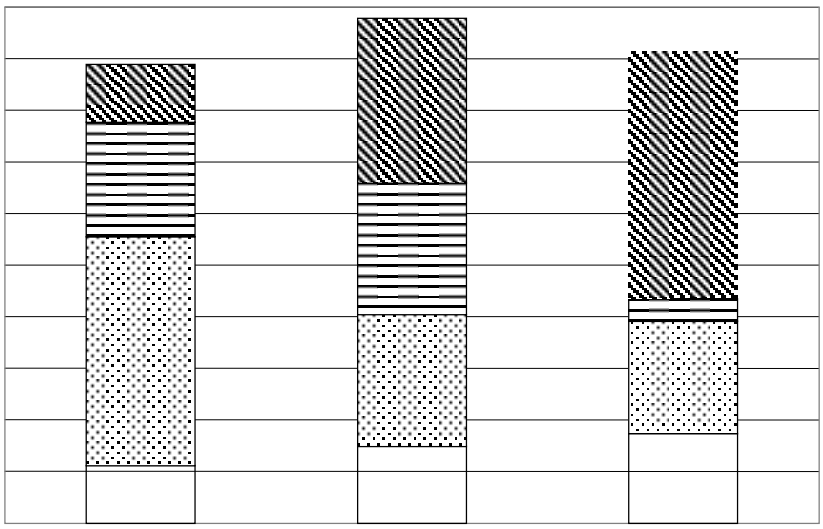
Considering the motivations that lead millers to start rice processing will help to understand the status of rice milling in the respective households (Table 7). Motivations for starting with milling are varied. A third (34%) of the millers started to mill rice to extend their activity along the rice commodity chain beyond their original area of intervention. This vertical integration concerns mainly farmers (52%), followed by rice traders (22%) and other agents providing services to rice mills (technicians, mill operators). The goal is to have a better control of the product flow along the commodity chain and to maximize the use of acquired knowledge and information on the product or its market. The second most frequent motivation (28%) to start a rice mill is the case of persons who abandoned their former activities and redeployed into rice milling. In this case rice milling is considered as a substitute to a former job that is not any more available or that did not generate enough income. This group is mainly formed of employee and civil servant and traders. The third type of motivation (19 %) concerns millers who has developed their business with another type of activities and want to diversify their sources of income. This horizontal diversification concerns mainly people who are involved in trade or who wish to increase their income, such as employees or civil servants. The last major motivation to become a rice miller is to have inherited the workshop from a parent (15%). Three millers explained that they opted for this activity after school without any previous linkage to the rice sector and one owner who has retired considered it as a financial investment.

Table 7: Motivation to enter the rice milling business

Motivation	**Pattern of activities**		
	Rice milling only	Rice milling and other agricultural production	Rice milling and

expansion of the rice economy triggered by the booming consumption, which attract new players in the milling business. The share of vertical diversification increased during the ban period and became the dominant one after the ban removal. It indicates that rice milling became less attractive to outsiders during the last decade and that operators already involved in rice production or trade tried to maintain their income by extending their activities along the commodity chain.

Figure 4: Changes in millers' motivation over the years.



milling business. Nonetheless, both rice processing hubs (Abakaliki and Lafia) had an active processor association to represent millers' interests and regulate processing activities.[6]

3.2 Rice millers practices

3.2.1 Rice milling technology.

Given the wide range of subjects tackled during the interviews with the millers and the limited expertise of the observers in milling technology, the survey didn't investigate in detail technical particularities across the different workshops and the distinction between milling technologies – which are not straight forward. In most cases it is more accurate to talk about *hulling* rather than *milling*, since no workshop is using a rice polisher to completely remove the bran. However, here we will stick to the more widely used term. The major type of mill used is called "horizontal disk", which is probably close to the basic Engleberg type. Among the 80 workshops visited, only 17 are using a higher technology: 7 workshop are using the abrasive mill, and 9 vertical cono-disk, while only the largest mill of the sample based in Bida (Niger state) is using Japanese made machines with rubber rolls.

The majority of the mills (85%) are powered with fuel engines while 10% are using electric engines and four mills (5%) have invested in both types. Operators recognize that it is cheaper to run electric-powered mills than fuel-powered equipments but the erratic supply of electricity jeopardizes the workshop operations. Electric powered mills are only found in Niger state where electric supply appears more constant and in workshops that can afford to have two sources of power.

3.2.2 Pre and post-milling operations

The quality of the local rice is a major concern for the future of the Nigerian rice sector. While part of the issue relates to the biophysical properties of the varieties locally produced, the major problem is the appearance and the cleanliness of the rice delivered to the market. While the milling technology has a great incidence on the technical performance, it is recognized that these attributes are greatly affected by the attention given to pre-milling and post-milling operations. These operations include winnowing paddy, drying, destoning, parboiling and eventually packing.

Parboiling paddy is the most important processing operation besides milling. It consists in soaking paddy in hot or cold water in a drum, followed by a rapid exposure of the soaked paddy to steam and a gradual drying for at least one day. The purpose of the operation is to respond to consumer preferences while it also has a positive effect on the grain milling properties (high recovery ratio) and on its nutritious properties. In Nigeria, all paddy processed is parboiled. Rice farmers, millers and specialized operators providing the service to producers or traders can equally take care of parboiling operation. It is recognized that the quality of the parboiling operation has a great influence on the technical performance of milling and therefore on the quality of rice. Accordingly, miller-traders generally preferred to parboil the purchased paddy themselves, while millers-only generally do not parboil themselves. In the whole sample we found only one miller-only that also parboiled paddy for his customers and two miller-traders that contract out parboiling operations.

Millers-only do not carry out any of the other pre- or post-milling operation, while almost half of the miller-traders winnow and dry the paddy they purchase, to ensure a better conservation and/or to increase the quality of the product (Table 9).

[6] For instance, in Abakaliki the daily operational time of mills is regulated by the millers association.

Only two miller-traders are destoning paddy before milling. The largest workshop located in Bida is the only one who owns two destoners to clean the paddy while the second one in Lafia uses the equipment of a neighbor on a fee basis. This low utilization of destoning device is rather odd, since the presence of stones in local rice is systematically presented as one of the major reasons that refrain Nigerian consumers to buy local rice.[7]

Table 9: Pre- and post-milling operations actually carried by mill size for miller-traders.

Operations	[0 – 150[n=4	[150 – 300[n=25	[300 - 500[n=2	[500 - 5000] n=4	Overall N=35
Winnowing paddy	25%	40%	50%	75%	43%
Drying paddy	25%	40%	50%	50%	40%
Destoning paddy	0%	4%	0%	25%	6%
Parboiling	75%	100%	100%	75%	94%
Packing rice	50%	28%	100%	100%	43%

Source: Processor survey

3.2.3 Labor requirements and organization.

Labor use varies according to the size of the workshop and the type of workshop, which determines the number of processing operations carried out (Table 10). The average number of employees, including the manager, varies from 2 people in the smaller workshops up to 12 for the largest ones. The number is higher for the miller-traders because they also have to parboil paddy, a time and labor-consuming task. The difference between miller-only and miller-trader is negligible for the smaller workshop sizes because paddy purchase represents only a minor part of their procurement.

Table 10: Labor use per workshop size and type (average nb of employees).

Type of mill	[0 – 150[n=21	[150 – 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Miller-trader	2.0	2.7	7.5	16.7	4.4
Miller-only	2.0	2.7	2.2	6.0	2.6
Overall	2.0	2.7	3.5	12.4	3.4

Source: Processor survey

Labor productivity is also affected by the size and type of workshop (Table 11). On average, the ratio of rice milled per active is 88 kg/hr/person and ranges from 50kg/hr/person in the smaller workshops up to 200kg/hr/person in the largest ones. The productivity is reduced by 40 to 60 % for the miller-traders who perform additional operations (i.e. parboiling …).

Table 11: Labor productivity (kg of rice per hour per employee) per workshop size and type

Type of mill	[0 – 150[n=21	[150 – 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Miller-trader	46	78	76	138	82
Miller-only	52	79	171	203	94
Overall	51	78	147	164	88

Source: Processor survey

In general the owner of the workshop is also the manager, however for 35% of the sample the owner of the workshop recruits a manager. In smaller workshops managers operate the mill with the

[7] Some consumers refer to local rice as 'Oh God'-rice, in view of the common exclamation when biting yet another stone while eating.

assistance of one attendant who takes care of product handling around the machine. For the larger units in addition to basic laborers in charge of handling, managers recruit operators to look after the milling operation, a cashier to handle relations with customers and guards to look after the premises. It is worth noting that only one third of the workshops declared keeping records of their operations, most of them belonging to the largest size of mills and miller-trader groups.

There are three main types of labor contract under which employees are recruited (Table 12). The owner of the mill may pay his personnel on a monthly basis or on a daily basis – the latter either with a fixed daily wage or by giving a percentage of the daily income. In several cases the wage rate varies according to the level of activity, increasing during the peak period and decreasing when the milling campaign is over. The largest share of employees is paid on daily or profit share bases which allow the owner to adjust his labor cost to the level of milling operation. Positions with the lowest qualifications are generally paid on daily basis while positions that require higher skills and confidence are paid on a monthly basis. The high percentage of managers paid on a daily or share profit basis is explained by the fact that the profit share systems are generally adopted by workshop operating on a fee basis.

Table 12: Distribution of employee by position and type of labor contract.

Type of position / Indicator	Manager	Cashier	Operator	Guard	Attendant	Overall
Type of labor contract						
- Monthly contract	42%	100%	62%	100%	2%	38%
- Daily or share profit contract.	58%	0%	38%	0%	98%	63%
Total	100%	100%	100%	100%	100%	100%
Share of total employees	11%	6%	38%	3%	43%	100%

Source: Processor survey

provide a proxy of the actual geographical coverage of millers' business, because millers do not systematically know from where their customers are coming, or/and where they are going to deliver the rice produced. It is particularly true for the case of Lafia where traders are almost the only customers (Table 17) of millers-only and where they declared that there customers are coming from the same location (range of 0 km). It actually means that rice traders based in Lafia move from there to producing areas to collect paddy, process it in Lafia before shipping it further to consumer areas. The same applies to the case of Abakaliki and to a certain extent to the case of Niger and Benue. In the case of Taraba and Ekiti the longer distances indicate that traders are coming from other states to procure paddy locally and process it before returning to their home base to sell it. The average distance from origin for the farmers provides some insight into the density of mills across each survey site and their accessibility for farmers. The larger distances observed for Taraba and Benue than the other survey producer states suggest a lower density of mills forcing farmers to travel longer distances to mill their produce. The substantial distance recorded for farmers milling their product in Abakaliki is probably due to the reputation of Abakaliki as rice trading center.

Table 16: Average distance of customer milling paddy for fee origin and survey site (in km)

Type of customers	Niger N=15	Kaduna n=15	Ekiti n=10	Benue n= 15	Taraba n=14	Abakaliki (Ebonyi state) n=6	Lafia (Nassarawa state) n=5	Overall n=80
Traders	10	19	38	11	145	3	0	33
Farmers	1	0	25	26	191	86		43
Consumers	0	0	19	13	2	3	0	7
Total	5	10	27	17	125	47	0	30

Source: Processor survey

Table 17: Share of volume processed by type of customer of miller-only and survey sites.

Type of customers	Niger n=15	Kaduna n=15	Ekiti n=10	Benue n= 15	Taraba n=14	Abakaliki (Ebonyi state) n=6	Lafia (Nassarawa state) n=5	Total n=80
Traders	85%	87%	21%	47%	74%	26%	99%	64%

Table 18: Distribution of paddy suppliers to miller-traders by mill size

Type of supplier	[0 – 150[n=4	[150 – 300[n=25	[300 - 500[n=2	[500 - 5000] n=4	Overall n=35
Farmers	90%	75%	50%	57%	74%
Traders	10%	25%	50%	43%	26%
Overall	100%	100%	100%	100%	100%

Source: Processor survey

Table 19: Share of paddy purchases by type of supplier and mill size

Type of supplier	[0 – 150[n=4	[150 – 300[n=25	[300 - 500[n=2	[500 - 5000] n=4	Overall n=35
Farmers	93%	89%	50%	47%	60%
Traders	7%	11%	50%	54%	40%
Overall	100%	100%	100%	100%	100%

Source: Processor survey

Table 20: Share of paddy purchases by type of supplier and state

Type of supplier	Niger n=2	Kaduna n=11	Ekiti n=4	Benue n= 7	Taraba n= 1	Abakaliki (Ebonyi state) n= 6	Lafia (Nassarawa state) n=4	Overall 1.299..6(Tw[t5[(Overall 1.29

Table 21 Share of total volume of paddy purchases per location of transaction and type of supplier

Type of supplier	Farm gate	Market place	Workshop	Total
Farmers	38%	15%	7%	60%
Traders	0%	39%	1%	40%
Total	38 %	54%	8%	100%

Source: Processor survey

Table 22: Average distance for paddy procurement (km) by place of transaction and by survey sites.

Place of transaction	Niger n=2	Kaduna n=11	Ekiti n=4	Benue n= 7	Taraba n= 1	Abakaliki (Ebonyi state) n= 6	Lafia (Nassarawa state) n=4	Overall n= 35
Farm gate	-	0	5	27	-	10	385	46
Market place	10	2	-	61	5	130	272	93
Total	10	1	5	43	5	93	300	75

Source: Processor survey

Table 23 Share of total volume of paddy purchases by frequency of purchase and type of supplier

Type of supplier	Weekly	Monthly	Seasonally	Irregularly	Total
Farmers	29%	1%	31%	0%	60%
Traders	5%	1%	0%	34%	40%
Total	34%	1%	31%	34%	100%

Source: Processor survey

Even if farmers represent a significant share of paddy supply to miller-traders, it does not imply that these two categories of stakeholders developed privileged relationship to better coordinate supply and demand of paddy in both volume and quality terms. Only 33% of the miller-traders, corresponding to 14% of the whole sample, declared having privileged relationships with farmers (Table 24) indicating the limited influence that millers have on the up-stream part of the rice commodity chain. Smaller miller-traders give more importance to developing privileged contacts with farmers than the largest ones, which is consistent with the higher share of farmers in paddy procurements for smaller miller-traders compared to the largest ones. The most common type of relationship is the provision of credit by miller-traders to the farmer followed by seed supply and more occasionally fertilizer. Miller-traders who support rice farmers aim primarily to secure or increase their access to paddy (73%) and to improve the quality of the paddy (64%).

Table 24: Privileged relationships with farmers by size of miller-traders

	[0 – 150[n=4	[150 – 300[n=25	[300 - 500[n=2	[500 - 5000] n=4	Overall n=35
% of total miller-traders having privileged relation	100%	30%	0%	20%	33%
Type of relationships*					
Providing credit	100%	57%		100%	73%
Providing seeds	33%	71%		100%	64%
Providing fertilizer	33%	29%		0%	27%
Reasons for having privileged relationships*					
To increase paddy supply	100%	57%		100%	73%
To improve paddy quality	67%	57%		100%	64%

*% of miller-traders having privileged relationships with farmers
Source: Processor survey

4.1.3 Rice sales for miller-traders

Looking at the other side of the processing business, rice traders represent the largest category of rice buyers for miller-traders in both frequency (45%) and volume (80%) (Table 25 and Table 26), followed by consumers far behind in volume terms with only 15 % of the total volume of sale. A few miller-traders mentioned other types of outlets like restaurant or public agencies, but they represent a minor share of the business. In volume terms there are no significant differences across mill size.

Table 25: Distribution of types of rice buyer from miller-traders by mill size

Type of buyer	[0 – 150[n=4	[150 – 300[n=25	[300 - 500[n=2	[500 - 5000] n=4	Overall n=35
Trader	35%	46%	67%	38%	45%
Consumer	35%	31%	33%	50%	33%
Restaurant*	29%	23%	0%	13%	22%
Overall	100%	100%	100%	100%	100%

* In Niger state for the largest mill Restaurant refers to pu(nt r)1T nn1T n53i100% (s)6.(lic a8(Re)g)1in7(t)-0.2(aur)it pu(.9(N)17(to)1.2(o)13.1(r)10.3(t]TJ dif(

In terms of frequency 80% of the rice is sold on weekly basis (Table 29) while daily and monthly sale are less important. The timing of rice sales, mostly on weekly basis, contrasts with the timing of paddy purchases, which are less frequent (cf. Table 23). This underlines the contribution of miller-traders in smoothing rice supply throughout the year.

Table 28: Average distance of place of origin of rice buyers per state (km)

Type of buyers	Niger n=2	Kaduna n=11	Ekiti n=4	Benue n= 7	Taraba n= 1	Abakaliki (Ebonyi state) n= 6	Lafia (Nassarawa state) n=4	Overall n= 35
Trader	119	20	140	109	1000*	23	200	90
Consumer	69	0	11	3		5	25	10
Restaurant		7	4	1		2		3
Publ. agencies	100							100
Overall	95	12	52	38	1000	12	113	45

* one answer only from one respondent only
Source: Processor survey

Table 29 Share of total volume sales by buyer and frequency of sale

Type of buyers	Daily	Weekly	Monthly	Irregular	Overall
Trader	5%	70%	0%	6%	81%
Consumer	6%	9%	0%	0%	15%
Restaurant	1%	1%	0%	0%	2%
Publ. agencies	0%	0%	2%	0%	2%
Overall	11%	80%	2%	6%	100%

Source: Processor survey

4.2 Market fluctuations and flows

4.2.1 Seasonality and storage

Paddy production is seasonal as all agricultural production – whereas double-cropping is limited in Nigerian rice production systems. Paddy and rice storage therefore offer a means to smoothen rice supply to consumers. Rice producers, traders or consumers, can perform this function at any stage of the commodity chain. For millers a smoother supply of paddy throughout the year also permits a more rational and better use of the equipment.

While millers-only are entirely dependent upon their customers' marketing plan, 41% of miller-traders declared storing paddy to smoothen their activity (Table 30). The share of miller-traders storing rice is higher for the largest size of mill, which corresponds to higher financial and physical storage capacity. Correspondingly, on average, larger mills store paddy for a longer period of up to 6 months against 4 months for the smaller ones. However the capacity of miller-traders to smoothen paddy supply throughout the year remains limited as the storage capacity can only cover one month of operations at full capacity in the best case. In fact, miller-traders store paddy to facilitate milling operation rather than to speculate on market changes between peak and lean periods.

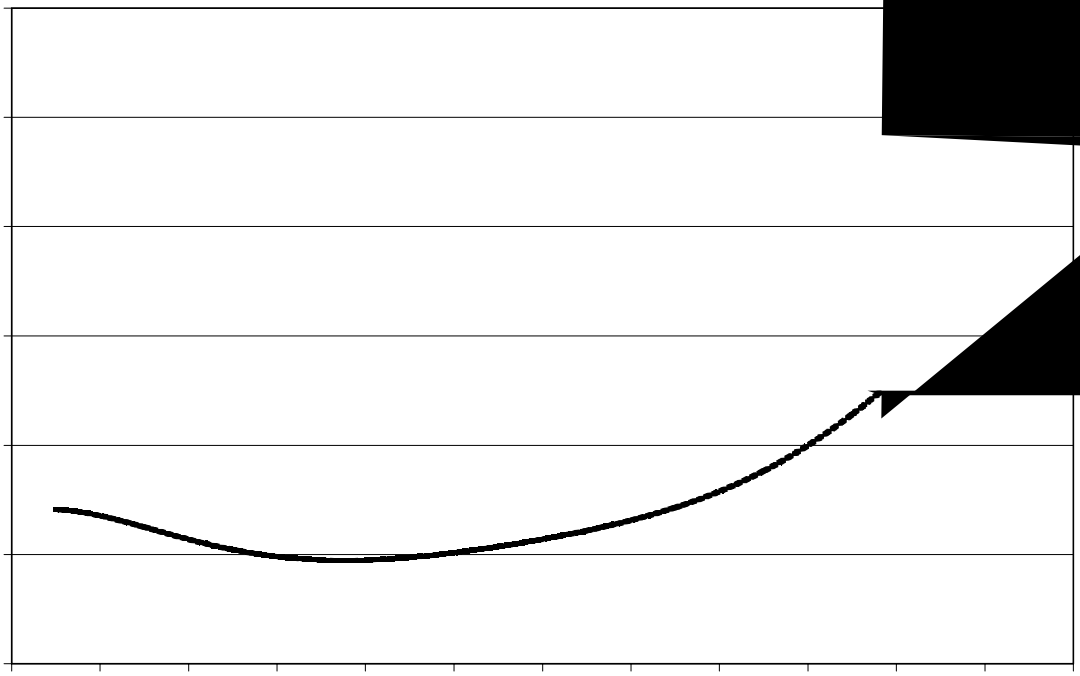
Table 30: Paddy storage indicators by mill size

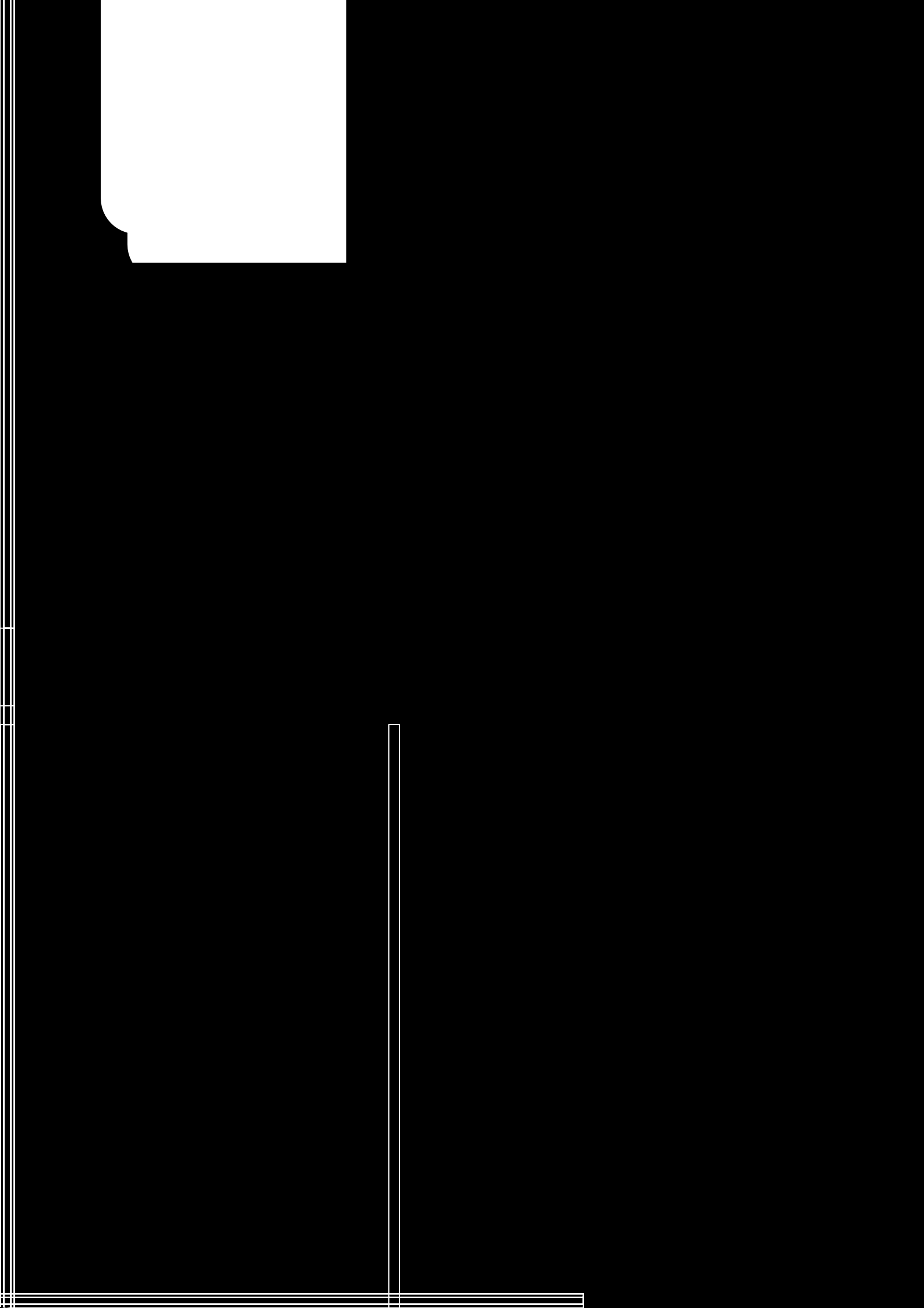
Indicators	[0 – 150[n=4	[150 – 300[n=25	[300 - 500[n=2	[500 - 5000] n=4	Overall n=35
% of miller-trader storing paddy	14%	53%	22%	83%	41%
Average storage capacity (Ton)	10	8	104	185	41
Average storage capacity in days of operation (day)	10.3	4.9	33.2	19.4	9.3
Average storage duration (months)	4	5	6	6	5
Average highest stock of last year (ton)	9	3	22	142	26
Average current stock (ton)	1	2	8	55	10

Source: Processor survey

Rice storage on the output side is even more limited (Table 31) as only 23% of the miller-traders

Figure 5: Seasonality in processing activity standard pattern





the type of paddy they process and bear the risks of selling a type of rice that does not respond to the market's requirements. Almost all processors did recognize that different types of paddy and rice are available on the market. The survey was not designed to assess price reward to quality, however many miller indicated that a given type of paddy or rice received a particular price on the market. The survey addressed the issue of paddy and rice types identification to get a better grasp on quality management along the marketing chain. Millers were asked to name the different types of product available on the market and the different grades in use on the market for each type of product.

Whereas, naming the variety appeared to be rather straightforward and easy, differentiating different grades for a given type of paddy or rice appeared more difficult. This shortcoming may be either due to difficulties in administrating the questionnaires (enumerators and/or respondents didn't clearly understand the difference between types and grades) or it may reveal weaknesses and variation across sites on the efficiency of the grading system.

The actual use of criteria, to identify the different types of product indicates that miller-traders do care about the type and the quality of the product they handled (Table 32 and Table 33). However, the system remains rather subjective, as visual identification is the main method for identifying and grading paddy and rice. The most common criteria are shape and appearance of the product, while hardness and moisture content are rarely used for selecting the product.

Table 32: Criteria for paddy type identification and grading and grading method (% of respondents**)**

Identification			**Grading**			
Criteria	1st	2nd	Criteria		Method	
Shape	84%	59%	Appearance	47%	Visual	82 %
Color	16%	31%	Brightness	18%	Hand	16 %
Odor	0%	10%	Cleanliness	19%	Biting	2 %
			Color	6%		
			Hardness	2%		
			Moisture	4%		
			Shape	4%		
Total	100%	100%	Grand Total	100%	Total	100%

Source: Processor survey

Table 33: Criteria and method for rice identification and grading (% of respondents)

Identification criteria	**1st**	**2nd**	Grading method	
Length	54%	26%	Visual	80%
Color	21%	26%	Hand	20%
Broken	10%	9%		
Cleanliness	8%	6%		
Thickness	7%	32%		
Others	0%	1%		
Total	100%	100%	Total	100%

Source: Processor survey

Paddy and rice type names are very diverse across locations. The names may refer to the agronomic name of the variety or the geographical origin of the crop or a specific attribute of the grain. A

complete list of the 53 names indicated by millers is presented in Table 34. Forty-six names were recorded for paddy and 40 for rice.

We observed a fairly good level of "vertical consistency" between the name used to call paddy types before processing and rice types after processing within in the same area, as 33 names are common to both paddy and the rice produced from this very paddy. If we look further down the marketing chain, we found that out of 40 different names used for rice, one quarter only were used by rice retailer interviewed in urban markets. Although the sample of retailers interviewed was selected to investigate imported rice retailing chains, and therefore do not represent the whole diversity of the local rice retailing business, especially the smaller ones, the decreasing number of rice names along the marketing chain indicate that rice traders and retailers may further standardize the type of rice proposed to consumers in a smaller number of categories. This reduced number of rice types at the retailing level may also correspond to the actual diversity of rice available on the market, the higher number of names used at the processing level being due to local particularities (languages, customs, location…).

The influence of the location on the name of rice is confirmed when we look at the "horizontal consistency" between paddy names across survey sites. It is far lower compared to the "vertical consistency" as only 8 names of paddy can be found in more than one survey area and only 3 names of rice can be found simultaneously in more than one survey area. This low level of consistency across sites confirmed the influence of local habit on the name of paddy and rice.

These discrepancies in the paddy and rice nomenclatures used across location indicates that even though millers are sensitive to the characteristics of their product and that quality considerations do prevail on the market, the marketing system is still marked by a high complexity. This is a disadvantage for the local rice economy when it competes with a more homogenous imported rice market. In particular the increasing complexity observed from the retailing stage toward the up-stream part of the marketing chain may hinder the capacity of the system to forward the right signals on consumers preferences back to the miller but more importantly back to the producers.

Table 34 List of paddy and rice names by survey sites.

Name	**Paddy**								**Rice**								
	Benue	Abakaliki	Ekiti	Kaduna	Lafia	Niger	Taraba	Present in more than one state	Benue	Abakaliki	Ekiti	Kaduna	Lafia	Niger	Taraba	Present in more than one state	Same name for Paddy and Rice
China*				x	x		x	X				x			X	X	**X**
Mars	X	x			x			X	X	X			X			X	**X**
Abare				x	x			X				x					**X**
Agric			x	x				X			x	x				X	**X**
Dan-tola					x		x	X							X		**X**
Faro 15		x			x			X		X							**X**
Ruwa				x	x			X				x					**X**
Babayangi	x					x		X									
3 month rice			x								x						**X**
Brown rice			x								x						**X**
Canada							x								X		**X**
Cika bulu							x								X		**X**
Dan-kara				x								X					**X**
Dantra	x								X								**X**

Name	Paddy								Rice								Same name for Paddy and Rice
	Benue	Abakaliki	Ekiti	Kaduna	Lafia	Niger	Taraba	Present in more than one state	Benue	Abakaliki	Ekiti	Kaduna	Lafia	Niger	Taraba	Present in more than one state	
Dan-tudu				x								X					**X**
Election							x								X		**X**
Gada Sanmi						x								x			**X**
Gboko			x								x						**X**
Gnessuer		x								X							**X**
Gwari						x								x			**X**
Igbemo			x								x						**X**
Ir8		x								X							**X**
Kano rice					x								x				**X**
Kpakugi						x								x			**X**
Mai-ada				X								X					**X**
Mai-alura				X								X					**X**
Nda Akanni						x								x			**X**
Nupe						x								x			**X**
Proja				X								X					**X**
Santana				X								X					**X**
Sayawa				X								X					**X**
Turn 15	x								X								**X**
Turn 2	x								X								**X**
Zagbandami						x								x			**X**
Biggi					x												
Dan aria					x												
Ebanghisi						x											
Fasa Tukunya						x											
Gwagudu						x											
Jamia							x										
Kilaki						x											
Ladys finger					x												
Lemachi						x											
Mass							x										
WITA 4						x											
Zuakochi						x											
Akanni														x			
Anti											x						
arigeji-												x					
Mai-wit												x					
Pategi											x						
Sagade												x					
White rice											x						

*Underlined type corresponds to names also used by rice retailers in urban market.
X: present in one location, X present in more than one location, **X** common name for paddy and rice.
Source: Processor survey

5 Financial analysis

One objective of the survey was to investigate millers' financial performances in order to assess their financial viability and their ability to invest in improved technology and to identify priorities for increasing the profitability.

5.1 Computation issues

The high diversity of situations encountered, the data collection method followed (i.e. data collected at one point in time) and the instability of the Nigerian economy in the past decades, call for making several assumptions and using proxies to construct the millers' budget.

5.1.1 Fixed cost

The majority of millers (80 %) declared being the owner of the premises occupied by the mill. However it was difficult to enter a realistic figure for the actual value of the infrastructure, given the large variations in price level over the last decades. The depreciation of this type of fixed asset also brings additional challenges in particular in urban areas where land value may increase over time. Therefore, the cost of the infrastructure has been included in the budget on the base of the rent paid by millers who don't own their premises. The price of the rent has been adjusted to take into account variations across survey sites and also differences between the different types of mills. It has been weighted according to the number of machines in the workshop, the availability or not of a drying pavement and storage place and a higher weight has been given to mills where paddy is parboiled to account for the additional space needed.

Regarding the price of equipment (machine, huller, parboiling tank), the replacement value has been used rather than the original price to avoid the actualization problem. Therefore the value of equipment is based on their replacement value and a linear depreciation method is applied on 20 year. To simplify the computation no financing cost has been included in the budget. A sensitivity analysis carried out on a standard budget (cf p 30) shows that this option does not have a significant impact on the financial results of the mill, although the cost of borrowing may explain the incapacity of millers to invest.

5.1.2 Variable costs

The major issues remain the utilization of coherent pricing systems for paddy and rice because prices vary according to a wide range of parameters (season, location, type of rice, type of transaction…) resulting in large variation of price level given by respondents. Rather than substituting a complete different set of prices into the computation we preferred to use the price recorded in the questionnaires. A set of prices for each survey site was computed based on the average prices for the location and weighted on the base of seasonal variation in milling activity to account for seasonal variations across the year. Consistency across mills has been checked for other variable costs after conversion of all cost items on the basis of the processing costs per kg of rice.

5.2 Cost structure

To illustrate the cost structure of the milling business, a standard budget has been developed for a milling unit having a capacity of 200 kg rice hour (Table 35). The budget is build for the case of miller-trader because it is the most complex situation[8]. Based on the overall average the miller is able to use 56% of its total annual capacity and milled 50% of the paddy on a fee basis and purchased the other half. Under the selected price setting of 30 N/kg for paddy and 60N/kg for rice the business is profitable.

[8] Differences in performance between a miller-trader and a miller-only are presented in section 5.4, p 31

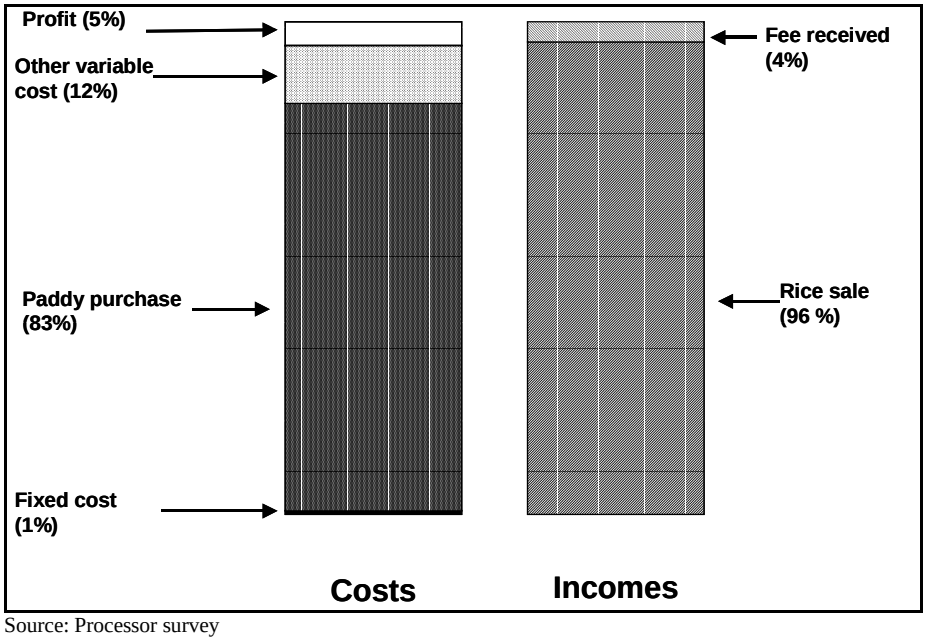
Table 35: Standard budget for a 200 kg/hr capacity mill

Item	Amount	Unit	Observation
Fixed cost per year:			
Machine depreciation	29 893	Naira	Machine cost 200000 N for 200 kg/hr 10 year depreciation including a real interest rate of 8%
Parboiling tank	10 676	Naira	1500 per unit, 20 drums to supply half of the mill capacity depreciation on 3 years
Building rent	20 000	Naira	Building is lease
Building maintenance	1 000	Naira	per year
Total fixed cost	61 569	Naira	
Variable costs (per kg of milled rice, unless otherwise indicated):			
Price of paddyee101 Tmr99.9(Buil)1ra 7paddye			

A simplified balance sheet of the mill, presented on Figure 8, provides the respective share of each major cost item and source of income. Paddy purchases represent the major cost item with more than 80 % of the total value of the production, followed by other variable costs (energy, labor…). It is worth noting that fixed costs do represent only a very limited amount of the total cost (1% of the total value of the production). This very low share of the fixed cost explains why, other parameters being equal, the mill can break even when it use only 7% of its total annual capacity.

This characteristic of small scale workshops (i.e. minimum sunk costs) allows them to overcome high variations affecting the activity of the whole rice economy, and explains why they can sustain their business even with a limited amount of paddy processed or/and with high seasonal variations in raw material supply. Another feature displayed by the graph is the marginal share of the fee received by the miller trader in his total income (4%). However, this marginal income share is highly profitable for the miller, because milling operation for a fee does not mobilize more than 18% of the total costs (only a limited number of mills also parboiled paddy processed for a fee) and generate 38% of the total profit earned by the mill. It offers a higher return to the cash invested compared with the income received from rice sales.

Figure 8: Respective share of budget item in Costs and Income



Source: Processor survey

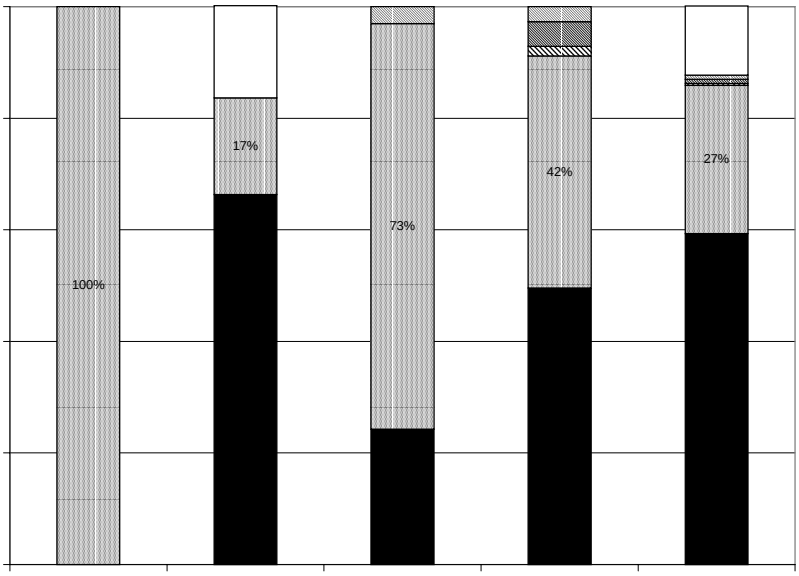
Looking at the average level of cost per operation, parboiling remains the most expensive operation representing more than two thirds of total variable cost for all operations combined (Table 36). This relatively high cost of parboiling is mainly due to the cost of energy required to perform this operation. For mills located in urban or peri-urban areas, access to fuel wood is costly. This is also the case for the water used to parboil the paddy, which may also generate additional costs for the miller, depending on his workshop location and access to cheap sources of water. The relative high costs of parboiling operations born by millers who purchase their own paddy may be one of the reasons why a majority of millers just operate on a fee basis and why most of the parboiling operations are carried out in rural areas where the access to fuel wood and water is likely to be less costly. Figure 9 shows that energy and labor represent the major cost for milling with respectively 50% and 42% of the total variable cost (excluding paddy purchase). Once again it is important to note that millers who have access to electric supply are able to slash their energy cost for milling 6-fold - down from 0.63 Naira to 0.10 Naira per kg of rice produced.

Table 36 Average variable costs per operations (Naira/kg/rice).

Operations	Energy	Labor*	Lubricant	Maintenance	Spare part	Water	Overall
Pre-parboiling	-	0.19	-	-	-	-	0.19
Parboiling	3.29	0.86	-	-	-	0.82	4.96
Destoning	0.08	0.24	0.00	0.00	0.01	-	0.33
Milling	0.56	0.47	0.02	0.05	0.03	-	1.13
Overall	3.92	1.76	0.02	0.05	0.05	0.82	6.61

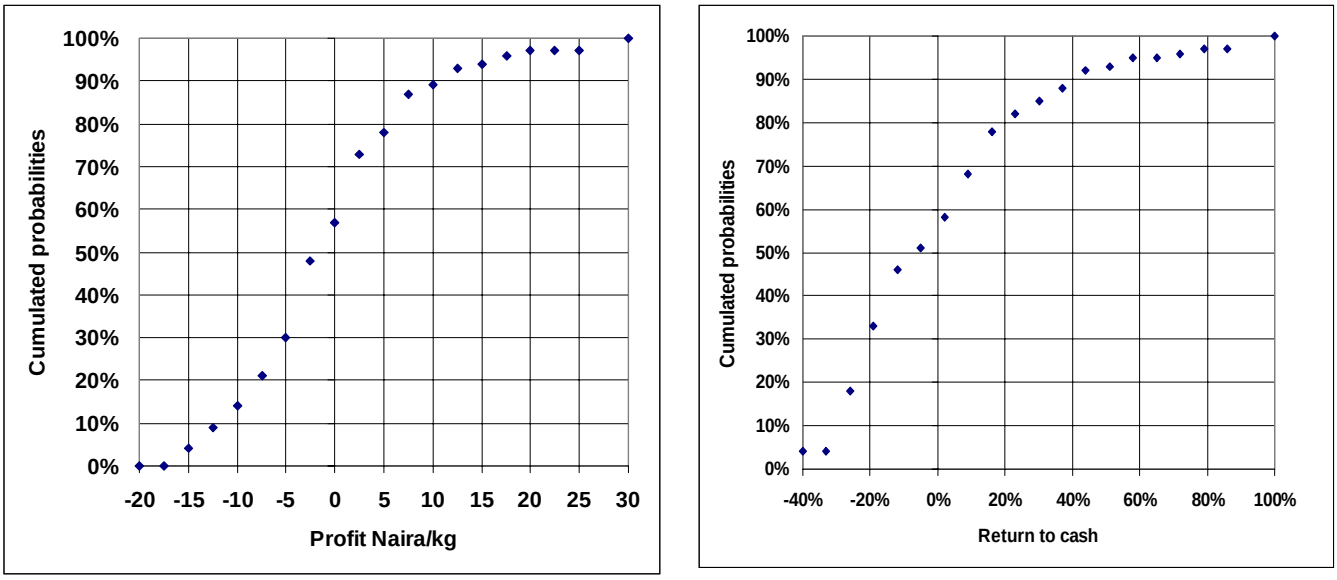
* does not include fixed labor cost.
Source: Processor survey

Figure 9: Respective shares of variable cost per operation



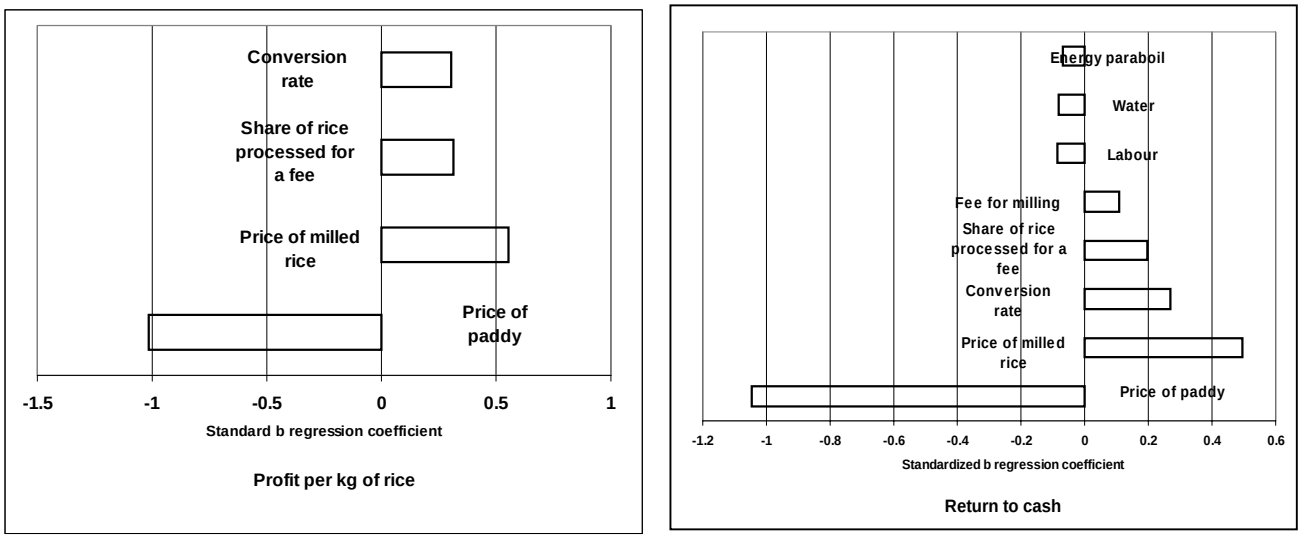
carried out by workshop owners (cf. p 8). The sensitivity of the profit and returns to cash to the various cost items are given in Figure 11. This shows that the price of paddy and milled rice have the largest influence on the miller-trader results for both indicators, followed by the share of rice processed for a fee and the conversion rate from paddy to rice. The cost of energy for parboiling paddy, the cost of water and of labor for milling and the milling fee are the other cost items that have a large influence on millers' financial performances.

Figure 10: Cumulative distribution of profit per kg of rice milled and return to cash.



Source: Processor survey

Figure 11 Determinant of miller-trader income and performance



Source: Processor survey

5.4 Financial performance by size and type of mill.

Table 37 presents for miller-traders, the average costs and returns to produce one kilogram of rice by mill size based on the data collected. Overall, miller-traders are not making a profit. This is in line

with the outcome of the sensitivity analysis showing that this type of workshop has a higher probability to make a loss than a profit.

The following observations are in order so as to interpret the variations over mill size for miller-traders. The underlying budgets for miller-traders are build for the total volume of paddy processed, combining paddy purchase and paddy processed for a fee. Consequently, cost of paddy, income from rice sales and fee received per kg of rice produced vary according to the respective share of the two sources of raw material. Therefore, paddy and rice value in the miller-trader budgets can only be compared across groups that have processed for a fee a comparable share of paddy – i.e. the two smaller mill sizes and the two larger ones. In addition it is important to note that given the limited size of the sample for each group, differences in averages are rarely statistically significant. The only significant difference found is the cost of energy between the large size mill (more than 500 kg of rice produced per hour) and the big size mill. This is due to the technology used to power the mill, larger mills using electricity rather than diesel and to the lower cost of fuel wood borne by large mills for parboiling operations (1.40 Naira per kg of rice produced against 3.2 Naira for the smaller mills).

Table 37 Average costs and returns for miller-trader by mill size (Naira/kg of rice)**.**

Mill size	**[0 - 150[n=4**	**[150 - 300[n=25**	**[300 - 500[n=2**	**[500 - 5000] n=4**	**Overall n=35**
Cost indicators					
1. Capital depreciation	0.25	0.26	0.18	0.36	0.26
2. Paddy purchase	19.18	24.24	26.54	40.98	25.71
3. Energy	1.97	2.63	5.21	1.31	2.55
4. Other variable costs	0.3	0.24	0.49	0.6	0.31
5. Salary	0.35	0.58	0.61	0.81	0.58
Income indicators					
6. Milling fee	2.19	2.90	1.49	1.19	2.54
7. Rice sale	17.00	26.04	36.56	35.19	26.65
Ratio indicators					
8. Total processing cost w/o paddy	2.87	3.71	6.49	3.08	3.70
9. Profit / losses	-2.86	1.00	5.02	-7.69	-0.21
Group characteristics					
- Utilization of capacity (%)	55%	49%	44%	42%	48%
- Percentage milled for fee (5%)	53%	52%	13%	11%	45%

Source: Processor survey

Table 38 presents for millers-only, the average costs and returns to produce one kilogram of rice by mill size. The financial performance of the miller-only is far better than the miller-traders. The group as a whole is making an average profit of 1.9 Naira per kg of rice produced. Also for this type of mill differences across mill sizes are rarely statistically significant due to the sample size. The higher cost for energy for the largest mill size is due to the case of one large mill that parboils paddy for a fee. However, the financial performance of the miller-only is not affected by market hazard (i.e. paddy and rice price variations) and access to resources (fuel wood and water for parboiling). Therefore, it provides a more reliable base to compare the performances across mill size than in the case of miller-trader. Even though total processing costs tend to decrease with the size of the mill, except for the larger mills, there is no striking evidence of scale of economy. This is hardly surprising as there are no major changes in the technology used by the different sizes of workshop. Once again, millers increase their capacity by multiplying the number of machines used in their workshop rather than shifting to a machine with a higher capacity per unit. Besides, the limited weight of fixed cost (or sunk cost) in the total processing cost under the current technology do not prompt millers to expand their capacity by

shifting to a different technology, but rather to expand their size of operation by adding new mills within the same technological setting.

Like in the case of mill size, differences across survey sites for mean costs, incomes and milling profitability are rarely significant. Worth highlighting are the high level of losses experienced by millers in the two processing hubs of Lafia and Abakaliki, where return to management is significantly lower compared to all other survey sites with the exception of Ekiti. However, in part this specificity is due to the prevalence of miller-traders in these two sites (100% of the cases in Abakaliki and 80% for Lafia). In addition, the relatively high paddy price in Abakaliki and the relatively low rice price in Lafia weigh heavily on millers' profitability in these two sites.

In contrast to scale and location, the differences between miller-traders and millers-only are statistically significant for almost all the different parameters. This confirms the high risk associated with the combination of trading and processing functions and the higher costs generated by the parboiling operation. Given the rather low sensitivity of milling profitability to the level of capacity utilization, the objectives pursued by millers involved in paddy and rice trade likely go beyond the objective of maximizing the volume of rice processed. These additional objectives can be of a different nature. For instance, miller-traders may attempt to generate additional income by adding value to marketing per se. Miller-traders may also aim to have a better control of the processing chain so as to ensure the quality of the end-product.

Table 38 Average costs and returns for miller-only by mill size (Naira/kg of rice)**.**

Mill size	**[0 - 150[n=18**	**[150 - 300[n=18**	**[300 - 500[n=7**	**[500 - 5000] n=2**	**Overall N=45**
Cost indicators					
1. Capital depreciation	0.14	0.10	0.05	0.16	0.11
2. Energy	0.73	0.47	0.30	1.74	0.60
3. Other variable costs	0.14	0.06	0.05	0.63	0.11
4. Salary	0.41	0.35	0.15	0.74	0.38
Income indicators					
5. Milling fee	2.68	3.34	2.99	4.00	3.06
Ratio indicators					
6. Total Processing cost	1.42	0.98	0.55	3.27	1.2
7. Profit /losses	1.33	2.47	2.51	0.73	1.96
Group characteristics					
Utilization of capacity	67%	64%	52%	34%	62%

Source: Processor survey

6 Constraints and prospects

Beyond the characterization of milling activities and financial performances the survey also recorded millers opinion with regards to their constraints and prospects for development.

6.1 Marketing constraints

Marketing constraints identified by miller-traders can be grouped into three mains themes. The first theme gathers constraints that are related to the current state of the paddy and rice markets and how they operate. The second theme relates to logistical issues and the organization of purchases and sales. The third theme concerns the management of the mills, including operating capital (Table 39).

Constraints related to the paddy and rice market status are the most often quoted by miller-traders. This theme gathers more than 44% of the replies in the case of paddy supply and 87% in the case of rice sale (Table 39 – columns labeled ‘overall’). The overall perception of the status of the two markets is a decrease in the volume traded, that is a decreasing supply of paddy offered (18%) on the market and a low demand (29%) for local rice and competition from imported rice (14%). Beyond the quantitative aspect, respondents also mentioned the issue of the quality of 0 Tcp6 0 Td1(y)1 thqs of(oist)]TJT*0.0022

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recent constraint that reduced demand for local rice and that translates further upstream into a reduced supply of paddy.

Millers were also asked what solutions, if any, they could propose for each of the constraints they identified. The results are presented separately for paddy procurement (Table 40) and rice sales (Table 41). On the supply side, beyond credit availability which is naturally seen as the solution to alleviate the operating capital constraint, the two major solutions proposed by millers are to support production increase and to improve infrastructure. On the demand side, increased control on import is considered as the solution (40% of the responses) to reverse the trend in favor of local rice market share, while more structural or pro-active intervention action addressing the efficiency of rice marketing system received less attention.

Table 40: Paddy procurement related constraints and proposed solutions

Constraints	**Proposed solutions**									
	Production improvement			**Marketing improvement**					**Credit**	Overall
	Production increase	Farmer training	Increase irrigation	Infrastructure	Transport investment	Transaction system	Reduce competition	Law enforcement		
Market	**17%**	**11%**	**6%**	**2%**	**0%**	**0%**	**0%**	**0%**	**9%**	**44%**
- Supply shortage	10%		3%						5%	18%
- Quality		11%		2%						13%
- Price fluctuation	7%								2%	8%
- Seasonality			3%						2%	5%
Logistic	**0%**	**0%**	**0%**	**10%**	**10%**	**5%**	**3%**	**2%**	**7%**	**36%**
- Transport				5%	8%		3%	2%	2%	20%
- Road				5%	2%				5%	11%
- Insecurity						5%				5%
Operating capital	**4%**	**0%**	**0%**	**5%**	**0%**	**0%**	**0%**	**0%**	**11%**	**20%**
Overall	21%	11%	6%	17%	10%	5%	3%	2%	27%	100%

Source: Processor survey

Table 41: Rice sale related constraints and proposed solutions

Constraints	Solution

6.2 Investment in new equipment

One out of two millers declared being interested in investing further into their business. This is particularly the case for the smaller mill sizes and the miller-only types, while the larger millers and miller-traders are much more cautious about investing in new equipment. The major explanation given by millers who do not plan to invest (Table 42) is the low volume of activity (53%), especially for the larger mills while access to the capital needed to purchase new equipment is pointed out by the smaller mills. It is worth noting that only 3% of the respondents referred to the low profitability of the business to justify their reluctance in investing. This is in line with the outcome of the financial analysis showing that paddy processing, at least for the miller-only, is still profitable under the current circumstances.

In case of investment, millers will give priority to a new engine (Table 43), followed by the purchase of a mill that integrates a better milling technology. The major objective targeted by millers who are interested in investing, is to increase the efficiency of their business (50%) either by achieving a higher recovery ratio (kg of rice extracted from a kg of paddy) or by reducing their costs (energy). It is interesting to note that quality improvement is also mentioned as one of the main objectives (28%).

Table 42: Reasons for not planning to invest in new equipment by mill size

Reasons	[0 – 150[n=21	[150 – 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Low volume of activity	67%	39%	50%	100%	53%
Capital constraint	33%	13%	0%	0%	13%
Low profit	0%	4%	0%	0%	3%
No need	0%	43%	50%	0%	32%
Overall	100%	100%	100%	100%	100%

Source: Processor survey

Table 43: Type of equipment considered for those that plan to invest by mill size

Type of equipment	[0 – 150[n=21	[150 – 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Engine	27%	53%	20%	0%	38%
Mill with a new technology	40%	11%	40%	0%	25%
Destoner	33%	16%	0%	100%	23%
Replace the mill with the same system	0%	16%	40%	0%	13%
Grinder to process other product	0%	5%	0%	0%	3%
Overall	100%	100%	100%	100%	100%

Source: Processor survey

Table 44: Reasons for planning to invest by mill size

Reasons	[0 – 150[n=21	[150 – 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Increase milling efficiency	40%	53%	80%	0%	50%
Improve quality	53%	11%	0%	100%	28%
Expansion	7%	32%	20%	0%	20%
Diversification	0%	5%	0%	0%	3%
Overall	100%	100%	100%	100%	100%

Source: Processor survey

6.3 Paddy and rice quality

A limited number of millers do not perceive any differences between the quality of imported rice and local rice, or even stress the better taste of the local rice. However, the majority of millers (56%) related the better quality of the imported rice to the processing technology used in rice exporting countries (Table 45). Along the same line, the largest share (77%) of miller-traders thinks that their milling equipment does not allow them to produce a local rice that could match imported rice quality standards. However, a few of them point out that milling technology is not the only factor explaining the low quality of local rice. They refer to other aspects of the processing chain such as the ability to produce cleaner rice without foreign materials, the influence of the quality of the paddy available (mixing of varieties) and the parboiling method (Table 45). The limited importance attributed to paddy quality contrasts with grain specialists, who usually stress the importance of the quality and homogeneity of the paddy and pre-milling operations on the quality of the rice.

Table 45: Reasons why imported rice is of better quality by mill size

Reasons	[0 – 150[n=21	[150 – 300[n=44	[300 - 500[n=9	[500 - 5000] n=6	Overall n=80
Processing technology	45%	68%	56%	17%	56%
Cleanliness	15%	10%	22%	0%	12%
Parboiling	5%	5%	11%	67%	11%
Paddy quality	20%	8%	11%	17%	12%
No difference	10%	8%	0%	0%	7%
Local rice has better organoleptic quality	5%	3%	0%	0%	3%
Overall	100%	100%	100%	100%	100%

Source: Processor survey

Most miller-traders (86%) agree that the price differential between imported and local rice is large enough to justify investing in improved rice technology and to get a positive return on the investment. As a matter of fact, retail price data collected at rice retailer shops in various urban markets show an average price differential of about 12 Naira/kg between imported and local rice, which represent a potential increase of 25% above the average retail price for local rice. This income opportunity is far from being exploited by millers interviewed, as only one miller in the sample owned a destoner that allows to produce a cleaner rice that can match imported rice standards. Three other millers declared using occasionally the services of another workshop to destone their paddy. On the base of our information, a simple simulation shows that even with a price reward of 2 Naira per kg destoning technology will be profitable (Table 46).

Various factors explain the limited uptake of technologies that would allow millers to compete with imported rice quality standards. Regarding the investment in improved equipment, one third of the miller-traders declared that access to the funds needed is the major constraint (30%). The second constraint is the lack of information on which type of equipment is available and how to purchase them. However, 20% of them believe that the investment is not financially viable, or that the volume of paddy they handle is not large enough to justify investing in new equipment.

Beyond the paramount financial constraint, it is clear that the dissemination of improved milling technology has to deal with various constraints. Improved processing technology, like destoners, have been designed for a larger size of operation than the average one encountered in Nigeria. The dissemination of improved technologies might, therefore, only be attractive to a minority of Nigerian millers or may have to call upon strong institutional arrangements (cooperatives, miller associations) to make it available to a larger number of millers. Furthermore, quality, as already mentioned above, is not determined at the miller stage only. It results from a combination of practices from the farm level to the retailing spot. Even though, the current margin between imported and local rice provides enough room to distribute quality rewards to each stakeholder along the commodity chain, it is also important to underline that all these stakeholders may not be equally sensitive to quality issues.

Table 46: Simulation of costs and returns to paddy destoning to improve local rice quality

Item	Amount	Unit	Break even value*
Fixed cost:			
- Destoner cost	2 000 000	Naira	
- Life time	10	Year	
- Interest rate	10%	Per year	
- Capital opportunity cost	325 491	Naira	
- Total investment cost/year	232 549	Naira	
Volume processed			
- Capacity/hr milled equivalent	600	Kg of rice /hour	
- Total capacity	1 382 400	Kg of rice/year	
- Utilization of capacity	50%		17%
- Volume processed	691200	Kg/of rice year	
Variable cost			
- Variable cost per kg	1	Naira/kg of rice	
- Total variable cost	691200	Naira	
Performance indicators			
Total cost	923 749	Naira	
Total cost per kg of rice	1.34	Naira/kg	
Price reward (i.e. incremental income)	2	Naira/kg	1.33
Profit per kg	0.66	Naira/kg	
Return to cash invested	50%		

* All other parameters being equal.
Source: Processor survey

Half of the miller-traders declared that it was still relatively easy to sell a local rice of lower quality on the market. To explain the resilience of the local rice market in face of the imported one, they refer to several local rice attributes such as its lower price and its taste that respond to the needs of certain groups of consumers (Table 47). Furthermore, they also mentioned several factors that prevent them from putting more effort into the production of local rice of high quality. Beyond their technical capacity to produce a cleaner rice they also stress the absence of price rewards for local rice of high quality. It indicates a strong segmentation between the imported rice and the local rice market, which hinders the capacity of the local rice marketing system to actually translate and to convey prevailing price differences between imported and local rice into a price reward for millers who are ready to produce a local rice of higher quality.

Table 47: Factors affecting the marketability of local rice of low and high quality.

Factors	Positive impact	Negative impact	Overall
Marketability of local rice of low quality			
- Preference for quality	0%	67%	34%
- High quality is available	0%	11%	6%
- Competition imported	0%	11%	6%
- Cooking easiness	0%	6%	3%
- Price	35%	6%	20%
- Preference for local rice	24%	0%	11%
- Price and taste	18%	0%	9%
- Enough demand	18%	0%	9%
- Consumers are indifferent	6%	0%	3%
- Overall	100%	100%	100%
Marketability of local rice of high quality			
- Preference for local rice quality attribute	96%	0%	74%
- Price reward	4%	0%	3%
- No price reward	0%	63%	15%
- Competition imported	0%	25%	6%
- Cleanliness	0%	13%	3%
- Overall	100%	100%	100%

Source: Processor survey

7 Main findings

Rice milling in Nigeria is a 'cottage industry' mainly carried out by small-scale workshops with an average hourly capacity of 200 kg of milled rice. The majority of the millers do not trade produce – i.e. purchase paddy and sell rice – but only process paddy on a fee basis for others (producers, traders or consumers). The limited number of millers involved in paddy and rice trade is due to the high risks attached to the marketing of both products, which may result in financial losses. Furthermore, beyond market instability, miller-traders who purchase paddy also have to bear the high costs of parboiling operations which represent more than half of their total processing costs. The cost of fuel wood is particularly high for workshops located in peri-urban areas. On the other hand, milling operations carried out for a fee by millers-only are financially viable under the current average level of milling fees (2 to 3 Naira per kg of rice) which represent a marginal amount (below 5%) of the rice market price at the retailing spot. In this system, through which 78% of the total production is processed, paddy is parboiled beforehand by the producers or a specialized agent generally located in rural areas benefiting from lower opportunity costs for getting the required inputs (fuel wood and water).

The dissociation of the various processing tasks among different operators confers more flexibility to the post-harvest segment of the rice commodity chain and therefore increases its resilience under very unstable and risky market conditions. However, this system does not provide the awaited mechanism to increase the quality of the milled rice, as millers-only do not have any incentives to improve the quality of their output.

Along the same line, for miller-traders the survey also indicates that, under the current level of price for imported rice, it is worth to invest in improved technology to enhance the appearance and cleanliness of the local rice to match imported rice standards. Investment in improved technologies is actually limited on the one hand by constraints in accessing the capital needed (credit) and availability of the equipment, but on the other hand also by a rice market that does not convey a reward to quality from the consumers to the miller and further up-stream to the producer.

The survey shows that technical changes at the milling stage would not by itself solve the issue of the Nigerian rice quality. The investment in new equipment like destoners is necessary but it would have a real impact only if the quality issue is tackled holistically at the various stage of the commodity chain to establish an enabling marketing environment through the emergence of a shared concern among stakeholders.

References

Akpokodje, G, Lançon, and O, Erenstein, 2001. Nigeria's rice economy: State of the art. Paper presented at the NISER/WARDA Nigerian Rice Economy Stakeholders Workshop, Ibadan, 8-9 November 2001. Bouake: WARDA.

Erenstein, O., F. Lançon, S.O. Akande, S.O. Titilola, G. Akpokodje and O.O. Ogundele, 2003. Rice production in Nigeria : A survey. Abidjan: WARDA.

Kebbeh, M. S. Haefele and S.O. Fagade, 2003. Challenges and opportunities for improving irrigated rice productivity in Nigeria. Abidjan: WARDA.

Lançon, F., O. Erenstein, S.O. Akande, S.O. Titilola, G. Akpokodje and O.O. Ogundele, 2003. Imported Rice retailing and Purchasing in Nigeria: A survey. Abidjan: WARDA.

Annex 1 Distribution used for cost variables in the sensitivity analysis

Variables:	Distribution
Machine depreciation duration in year	Triang(8;10;15)
Machine Price	Triang(180000;200000;250000)
Equipment depreciation / Interest rate	Triang(0.05;0.08;0.12)
Parboiling tank depreciation duration in year	Triang(2;3;5)
Price of paddy	BetaSubj(12.75;37.5;34;52.5)
Labor for pre-parboiling	Normal(0.19;0.1)
Labor for parboiling	Uniform(0;1.5)
Energy parboil	BetaSubj(0;4;3.29;6.5)
Water	BetaSubj(0;0.1;0.8;5)
Labor for milling	Normal(0.47;0.2)
Energy	Uniform(0.38;0.81)
Spare-part and maintenance	BetaSubj(0;0.07;0.087;1.25)
Fee for milling	BetaSubj(1.5;2.5;3.05;5)
Price of milled rice	BetaSubj(45;50;57.3;87)
Capacity utilization	Normal(0.558;0.239)
Share of rice processed for a fee	Histogrm(0;0.88;{1,7,6,5,2,3,3,12})
Conversion rate paddy to rice	BetaSubj(0.5;0.55;0.58;0.88)

A. Identification of the interview

A 1. Questionnaire number:_____

A 2. Enumerator name: _____

A 3. Interview date: _____/_____/_____

A 4. Reviewed by:_____

A 5. Date of review: _____/_____/_____

A 6. State :_____

A 7. LGA :_____

A 8. Town :_____

A 9. Address (location):_____
_____
_____
_____

A 10. Telephone number:_____

B. General information on respondents

B 1. Description of respondents

Function	Owner	Manager	Operator	*Other*_____
Interviewed	Yes/No	Yes/No	Yes/No	Yes/No
Name				
Age				
Male/Female	M/F	M/F	M/F	M/F
Education level P=Primary, S=Secondary, T=Tertiary, C=Coranic	P/S/T/C	P/S/T/C	P/S/T/C	P/S/T/C
Year starting activity				
Previous occupation				

B 2. **How the owner get into the milling business**:_____
_____
_____
_____

B 3. **For how many year the operator operates rice mills:**_____ years

B 4. **How did the operator learn rice milling technique** : _____
_____
_____

C. General information on the owner of the workshop.

C 1. **Own other workshop?** No/Yes *if yes* → C 2. ***Number of workshops***:_____

C 3. ***Where***:_ _____

C 4. **Other activity than milling?** No/Yes *if Yes* → C 5. ***Which type of activity?*** Farming – Trading – Transport – Civil servant – Salaried work – Other (specify):_____

C 6. ***Which activity is the main source of income?***
_____ _____

C 7. **Does the owner belong to a rice miller association ?** Yes/No

C 8. **If yes indicate the name:**_____

D. Milling capacity

D 1. Estimation of milling capacity and paddy to mill conversion rate

1. Identify different types of machine owned by miller based on power of engine

2. Fill up the other columns for each type of machine

Type of mill by class of power		Number of mill	Processing capacity						Equivalent in Paddy or Rice		
			Quantity		Time		Paddy or Rice milled		Quantity		Paddy or Rice milled
			Amount	Unit of ***check N1***	Amount	Unit			Amount	Unit of ***check N1***	
							P / R	=			P / R
							P / R	=			P / R
							P / R	=			P / R
				Kg Bushel Cup Bag…		Hour Day				Kg Bushel Cup Bag…	

D 2. Estimation of variation of in rice processing capacity utilization across the year

1.record the month when rice processing activity is at peak, medium or low

Level of activity	J	F	M	A	M	J	J	A	S	O	N	D
Peak												
Medium												
Low												
Closed												

2.complete this part

Number of hours of operation per day	Volume processed per day		Number of days of operation per week
	Quantity	Unit ***check N1***	

D 3. **Total quantity of rice processed during the last month?** _____ /_____ of P/R
(quantity) (unit) Paddy or Milled rice

D 4. **Total quantity of rice processed during the last year (2001)?** _____ /_____ of P/R
(quantity) (unit) Paddy or Milled rice

D 5. **Do you use the workshop to process any other commodity?** No/Yes *if yes go to D6 if no go to E*

D 6. Relative importance of the various commodity processed by the workshop

Commodity processed including paddy	Rank by importance of volume		Compare the volume processed to paddy		Share of each product in total volume of product process by the workshop		Estimation of quantity processed	
							Quantity	Unit *check N1*
	1= the most important		Expressed in % or ratio		Total = 100 %			

D 7. Are the quantities of paddy processed or milled rice produced recorded in a book? Yes/No

E. Processing operations and techniques

E 1.**Tasks performed on the paddy <u>before parboiling</u> it**

Do you?		If not: why?	If yes:		% of paddy proc.
			Equipment used	Description of the method	
Winnow fresh paddy	No/ Yes				
Dry fresh paddy	No/ Yes				
Destone fresh paddy	No/ Yes				

E 2.**Parboiling**

Do you?		If not: why?	If yes:		% of paddy proc.
			Equipment used	Description of the method	
Parboil paddy	No/ Yes			Soaking (*hot /cold water, duration, source of water, use the same water for many batches*) Steaming: Drying (*method and duration*)	

E 3.**Milling**

Description of the type of equipment used: Horizontal disk, Engelberg,, Vertical disk Cono-disk
Do you pass the rice more than one tine in the machine? No/Yes If yes, why?

E 4.**Milled rice destoning/Packing**

Do you?		If not: why?	If yes:		% of paddy proc.
			Equipment	Description of the method	
Destone milled rice	No/ Yes				
Do you pack milled rice	No/ Yes				

F. Fixed costs

F 1.Infrastructures

Type	Size	Year of construction	Year of Acquisition	Own/ Rent	Cost	Source of funding	Improvement made			Useful life
							Description	Year	Cost	
Unit	(specify)	(date)	(date)	(code)	(Naira)	(code)		(date)	(Naira)	(years)
Land				O/R						

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F 4.Permanent employees

Type of function	Number	Wages	Base of the wage[1]
Manager			
Operator			
Cashier			
Attendant			
……			

[1] monthly salary, daily, lump sum.

F 5.Other fixed expenditures

Item	Amount (Naira)	Base /month, /year
Local government taxes		
Loan reimbursement for equipment		
Other…….		
Other…….		

G. Variable costs for rice milling only

Opera-tions	Input				Cost		Cost estimate based on:			
	Category	Type	Quantity	Unit *check N1*	Unit Value	Total value	Volume/ Time	If volume: Product	Quantity	Unit *check N1*
			Numb	Specify	Naira	Naira	Numb	Pad/Rice	Numb	Specify
G 1. Pre-parboil operation	Labor	Family					V/T	P/R		
		Hired					V/T	P/R		
	Energy						V/T	P/R		
	Lubricant						V/T	P/R		
	Spare part						V/T	P/R		
							V/T	P/R		
							V/T	P/R		
G 2. Parboil-ing	Labor	Family					V/T	P/R		
		Hired					V/T	P/R		
	Energy						V/T	P/R		
	Water						V/T	P/R		
							V/T	P/R		
							V/T	P/R		
G 3. Milling	Labor	Family					V/T	P/R		
		Hired					V/T	P/R		
	Energy						V/T	P/R		
	Lubricant						V/T	P/R		
	Spare part						V/T	P/R		
	Maintenan.						V/T	P/R		
							V/T	P/R		
	[illegible]	[illegible]					[illegible]	[illegible]		
		Hired					V/T	P/R		
	Energy						V/T	P/R		
	Lubricant						V/T	P/R		
	Spare part						V/T	P/R		3028 Tw (Spare pa

H. Source of paddy supply

H 1. Mill paddy for a fee? No/Yes

H 2. Purchase paddy ? No/Yes
(*if no go to section J, J1*)

H 3. Share of total paddy milled processed for a fee:_____%

H 4. Share of total paddy milled directly purchased:_____%

I. Paddy purchase *(only if yes in H2)*

I1. Characteristics of paddy suppliers

Type of sellers	Importance	Origin of the product		Place of transaction	Average volume per transaction		Frequency of purchase
		Name of the location	Distance (km)		Quant.	Unit *Check N1*	

I11. Do you have specific relations with paddy producers? No/Yes

1. How?		2. Why?	
Providing credit	No/Yes	Increase supply of paddy to the mill	No/Yes
Providing fertilizer in kind	No/Yes	Ensure the quality of the paddy purchased	No/Yes
Providing seeds	No/Yes	Other reasons:	
Other support:			

I12. Records of the last three transaction to purchase paddy

Item	Transaction 1	Transaction 2	Transaction 3
Date			
Type of paddy purchase/ Quality/Grade			
Location of purchase (geographic name)			
Type of location (farm, market, workshop)			
Distance from workshop			
Transport cost for reaching purchasing point			
Type of seller (farmer, co-op, trader)			
Quantity purchased and unit (*Check N1*)			
Unit price (Naira)			
Payment mode (cash, delay, credit)			
If credit or delay payment: interest rate, duration			
Handling cost labor (Naira/ …			
Bag price (Naira)			
Shipment cost/ If own truck – fuel cost (Nara)			
Taxes (Naira)			
Other……			
Other …..			

I13. Major constraint in purchasing paddy

Major constraints	Rank from the most severe one	Problem noted since when	Proposed solutions

J. Milling service *(only if yes in H1)*

J1. Customers characteristics

Type of customers	Importance	Origin of the customers		Average volume per transaction		Frequency of transactions
		Name of the location	Distance (km)	Quantity	Unit *Check N1*	

Farmer, Trader, Consumers

% of tot paddy milled for a fee or ranking

Name of the location of production

Daily
Weekly
Monthly

J2. Rice milling fee by type of service provided

Type of operation	Paid in Cash or in Kind	Processing fee			Share of total paddy processed for a fee
		Value (Naira) or in Kind Payment	Quantity Processed	Unit ***(check in N1)***	
Hulling	C/K				
Parboiling	C/K				
Parboiling and hulling	C/K				
Parboiling, hulling and destoning	C/K				
Hulling and destoning	C/K				

If payment in kind go to K1 otherwise go to K11

K. Selling of rice *(only if yes in H2 or in kind payment in J2)*

K1. Rice selling system

Destination of theo

K7. Are there different types of local rice sold on the market? Yes/No *if yes go to K9*

K8. If no, could you explain why they are no different types of rice sold on the market? _____

_____

_____

_____

K9. If yes, could you indicate the different types of rice sold on the market

Types name	Criteria for identification	Grade	Mean for testing	Average Price	
				Value	Unit-0.37 0 TD0 Tw 7.2249 Tf -0.2291

5967 615.7

K11. **Major constraint in selling rice**

Major constraints	Rank from the most severe one	Problem noted since when	Proposed solutions

L. Investing in new equipment

L1. **Are you planning to invest in new equipment?** No/Yes *if yes go to L3*

L2. **If no why?** *(financial constraint, lack of demand, don't know how to use new equipment)* :_____
_____
_____
_____
_____

L3. **Which equipment do you plan to buy ?**_____
_____

L4. **Why do you plan to buy new equipment ?** *(to replace existing one, to improve productivity, to increase quality)*: _____
_____
_____
_____

M. Incidence of quality issues on processing

M. .

M 6. **Is price difference between imported and local rice high enough to justify putting effort in producing local rice of the same quality as imported rice?** No/Yes

M 7. **Could you easily sell local rice of low quality rice ?** No/Yes

M 8. **Why?** _____

_____

_____

_____

M 9. **Is it easy to sell local rice of high quality at a rewarding price?** No / Yes

M 10. **Why?** _____

_____

_____

_____

N. Definition of unit measure

N 1. Conversion of local unit of measure according to respondent

	Name of the unit of measure	Product	Equivalent in other unit			Name of the unit of measure	Product	Equivalent in other unit	
			Quant	Unit				Quantity	Unit
1		Paddy/ Rice			5		Paddy/ Rice		
2		Paddy/ Rice			6				
3		Paddy/ Rice			7				
4		Paddy/ Rice			8				

N 2. Conversion of local unit of measure according to the enumerator

Name of the unit of measure	Product	Equivalent in other unit	
		Quant	Unit
	Paddy/ Rice		
	Paddy/ Rice		
	Paddy/ Rice		
	Paddy/ Rice		