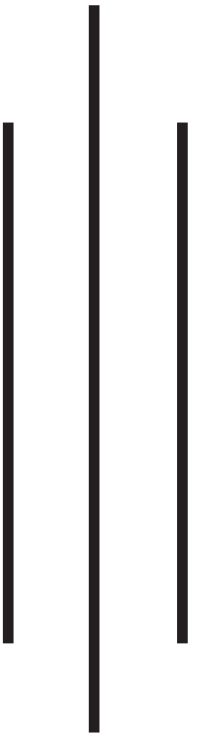
Price Escalation along the Value Addition on Paddy

June, 2013



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A Report on

Price Escalation along the Value Addition on Paddy

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Foreword

Helping farmers in production planning and resource utilization, it is essential to understand farm conditions and household characteristics under which they are operating. In order to assist them substantial information has to be generated and analyzed as far as possible. Keeping these views in mind this "Market Research and Statistics Management Program" under 'Agribusiness Promotion and Marketing Development Directorate' of the Department of Agriculture has analyzed price escalation along with the value addition in paddy using primary data from 50 households and 40 mills survey from selected 19 districts representing agro-ecological regions of Nepal for the year 2012/13. The field level information was collected by the staffs of this programme.

The report serves as a first study carried out by this program at the national level. This report presents the major findings of the study. The major contents are paddy production, price spread and rice recovery percentage.

We would like to thank the staffs involve in this study. Also we would like to thank, Directorate and Department of Agriculture for inspiring this work. Last but not the least; I would like to thank the farmers and mill operators for providing necessary information. Finally, this report is prepared in very short time. Constructive and critical comments and suggestions on this report are always welcome.

Thank You

Study Team

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List of Abbreviation

AGDP	Agricultural Gross Domestic Product
ASL	Above Sea Level
CBS	Central Bureau of Statistics
DADO	District Agriculture Development Office
DoA	Department of Agriculture
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
Ha	Hectare
INGO	International Non Governmental Organization
IRRI	International Rice Research Institute
Kg	Kilograms
MoAD	Ministry of Agriculture Development
MSP	Minimum Support Price
NARC	National Agriculture Research Council
NFC	Nepal Food Cooperation
NGO	Non Governmental Organization
PPP	Purchasing Power Parity
Rs	Rupees
RRA	Rapid Rural Appraisal
SD	Standard Deviation
SLC	School Leaving Certificate
UN	United Nation
USD	United States Dollar
WFP	World Food Programme
WWF	World Wildlife Fund
VDC	Village Development Committee
$	Dollar

Executive Summary

Maintained hypothesis is that middlemen grab much of the benefits from agricultural products paying low to the farmers and charging high to the consumers thereby discouraging the farmers to produce and the consumers to consume. A widening of the marketing margin for rice could potentially discourage production and consumption making it a genuine concern for policy analyst. This market behavior is regarded as the narrowest bottle-neck in agricultural development and market expansion in the country, but at the same time we cannot ignore the contribution of the middlemen in the value addition to agricultural products. This study taking rice as a case, analyzes the price spread along with the value addition in rice. The main objective was to assess rice productivity, rice recovery percentage and price spread in the rice marketing from farm gate to the retail. Primary data were collected from surveys of randomly selected 50 farm households and 41 mills from purposively selected 19 districts representing different development regions and ecological zones of the country. The marketing system for rice was purely private based except the distribution of small proportion milled rice by Nepal Food Corporation. The recovery percentage was found 66.2% for head rice excluding 3.8% broken rice. Brown rice recovery from huller mills was found much higher (73.2%). Rice recovery percentage might get influenced by drying of grain, storage facilities, varieties, mill operators' skill, milling process, and mill types. Average farm gate price of paddy was found to be Rs 20.72 per kg for coarse and 24.29 per kg for medium paddy, while the retail price of milled rice were Rs 35.77 and 43.50 per kg for coarse and medium, respectively.

Policies are necessary for making marketing services such as transportation and milling more efficient especially from farm to retail market level that will help to reduce marketing margin. Encouraging the formation of farmers' cooperatives and establishment of relevant and regular market information to farmers can reduce the involvement of traders such as middlemen and assemblers who exercised more market power to determine the price of paddy. Market information matches rice supply with the demand and stabilize its price for the benefit of both consumers and producers. Formation of farmers' cooperative, reduction in the transportation cost, improving the market information system, and improving the role of farmer in price determination help to reduce the marketing margin on paddy.

If the farmer's have storage facilities, they can retain the paddy during the harvesting season to sell at higher price at the time of shortage. Government need support programs to facilitate storage facilities and the provision of interest subsidy and loan repayment system throughout the year. This can help the farmers to supply their products at the time of shortage at higher

prices compared to the price at the harvesting time. Stocks play a key role in equilibrating markets and smoothing price variations. In addition a clear distinction between providing a buffer against shocks to the rice market and embarking on a hoarding strategy must be clearly defined in order to reduce impacts from external price shocks.

Minimum Support price can assure the farmers if declared before the sowing season so that the farmer be able to prepare a good plan for good harvest. If the farmer has secure market through government sector, they will produce more. In case the price of paddy goes below the minimum support price fixed by government, then the government should be ready to purchase the paddy at minimum support price. This can be done through different agencies like Nepal food cooperation or other. Government intervention at the time of low price helps to minimize the marketing margin and benefits both the producers and consumers with reasonable price.

Key words : *Rice, Price Spread, Milling Recovery, Value addition*

Chapter I

1.1 Introduction

Agricultural markets in developing world are never perfect. Large number of scattered producers is involved in production and the entire populations are the consumers. However, the number of the traders involved in transferring the large chunk of these agricultural products to the consumers, especially at the wholesale level, is naturally much smaller as compared to the number of producers and consumers. The producers in Nepal often complain that they are not getting their due share of the consumers' rupee. At the same time, the consumers sometimes express their dissatisfaction in the way the products are retailed to them, in terms of price, quality and timing. Generally price means unique price at which buyers and sellers agree to trade in an open market at a particular time. Expert elicitations suspect that the wholesale marketing of major agricultural products in the main market centers are oligopolistic in nature. The market imperfections increase price spread[1] from the farm-gate to the consumers. In developing countries where marketing system is inefficient, analysis on farm-retail price spread is useful in assessing unfair pricing practices on marketing services, determining influential factors on marketing margin and estimating economic profit of dominant merchants (Shrestha, 2010).

It is obvious that the price spread depends mainly on the value addition along the value chain from the farm to the consumers. The value added can be in terms of form, space, time or exchange or any combination of them. Grading, cleaning, processing and packaging add value in terms of the form. Transportation increases value in terms space and storage increases the value in terms of the time. The exchange value comes from the transfer of the goods from one hand to other in the market. Understanding the value addition along the supply chain is important to understand whether the price spread is really justifiable or not.

The difference between consumer's price and farmers' price is high in food commodities especially in the areas where inefficient marketing services and higher entrepreneurs profit exist. This food price dilemma, when the marketing margin is high, is inevitably given

1 In formal markets (such stock exchanges) there are two market prices: the offer (selling) price which is higher, and bid (buying) price that is lower. The difference between these two prices is called margin or spread.

attention by the producer, consumer, and policy analyst (Timmer, 1983). Farmers are getting low price but consumers are paying high price of rice. A widening of the marketing margin for rice could potentially discourage production and consumption making it a genuine concern for policy analyst.

We take rice as a case. Rice is the staple food crop that contributes about 50 percent to national food requirement in Nepal. In Nepal the main rice producing area is terai region contributing 75% production followed by hills 23% and mountain 2% (DoA, 2012). The terai region is suitable for its production in terms of agroecological factors. Surplus production in the terai is supplied to food deficit regions in hills and mountains. Rice marketing is an important issue affecting farm income, food security and poverty alleviation. Growing population and rising income of the poor contribute in increasing the demand for rice. It is also reported that the growth in marketed surplus is much more rapid than growth in total rice consumption, as an increasing percentage of the population has been absorbed by urban centers (IRRI, 2012). This has placed pressure on the procurement and processing sector to expand and modernize facilities, and on national governments to maintain sufficient stocks to stabilize urban rice prices. We find several studies on marketing margins, and costs of marketing and storage (Shrestha, 2010, Adhikari, 2011, Joshi et al., 2011). In addition, the price spread and marketing studies are generally focused on fruits, vegetables and other cash crops (Pullabhotla et al., 2011). Such studies, however, very limited in less perishable farm products such as cereals and pulses. Among the cereals and pulses, the rice is the most important one. It is the major staple crop in the country and nearly a half of the agricultural gross domestic product (AGDP) comes from rice alone. The demand for rice is increasing. But, very few studies are available on price spread of rice. Shrestha (2010) studied factors affecting farm-retail price spread in rice but excluded value addition aspects. Therefore, this study was designed to analyze the price escalation along the value addition of paddy. The information on value addition in terms of the form is very limited. This study taking rice as a case, analyzes the price spread along with the value addition in rice.

1.2 Objectives

The general objective of the research was to understand the price escalation along with the value addition on paddy rice. The specific objectives are :

1. To assess the productivity of rice;

2. To assess the milling recovery percentage of rice to update the value of edible rice percentage used for food balance sheet;

3. To compare farmers' profits from paddy and milled rice selling;

4. To analyze the price spread on rice marketing;

5. To compare the price spread and value addition in the rice supply chain.

1.3 Limitation of the Study

The study assesses rice productivity, rice recovery percentage and price spread in the rice marketing from farm gate to the retail. It also re-estimates the edible percentage of rice used to prepare food balance sheet. This study, however, is based on households and mills survey. Since there is no recording system of data at farmers' level and millers do not allow access to their trade records, the data were collected on recall survey of previous activities of the farmers and mill owners.

Chapter plan

The next chapter describes the methodology followed in the study. The third chapter presents detail results of the analysis. The fourth chapter presents summary, conclusion and recommendations.

Chapter II

Methodology

2.1 Selection of Districts and Households

The study was focused on calculation of price spread, rice recovery percentage, and benefit cost ratio and rice productivity of Nepal. Areas with previous evidences and records of rice production and existence of different types of mills (Huller, Sheller and Dhiki) were selected. Nineteen districts in different ecological zones like Chitwan, Rupandehi, Nawalparasi, Kapilbastu, Banke, Bardiya, Kailali, Dhanusa, Mahottari, Morang districts in the Terai and Bhaktapur, Kavre, Nuwakot, Dolakha, Sindhupalchowk, Ramechap, Doti, Achham, Dhading districts in the hills were selected purposively. After district selection, research sites were selected from each district in consultation with the staffs of District Agriculture Development Office (DADO) taking criteria of coexistence of rice producing farmers' and different types of rice mills into consideration.

2.2 Research Design

The research was focused on rice production, price spread, and rice recovery percentage. Primary and secondary data were collected and analyzed using statistical tools. From the collected data, rice production, productivity, rice recovery percentage, price spread, and factors causing the low milling percentage were assessed.

2.3 Data Collection

Primary data: Primary data were collected through household and rice mill surveys by using structured questionnaire.

Sampling procedure and sample size

Simple random sampling was used to select sample households and rice mills from the area where individual rice grower household and rice mill were sampling units. Altogether 50 rice farmers and 40 rice mills were interviewed. More than 80% mills installed in Nepal are found Sheller type (Pullabhotala et al., 2011). In the sample of mills, 75% were sheller mills.

Secondary data: The secondary sources include crop data (production and practices related) from Ministry of Agriculture Development and also from DADO of the respective districts and Central Bureau of Statistics. Journals, seminar/workshop papers and e-materials were also major secondary data sources.

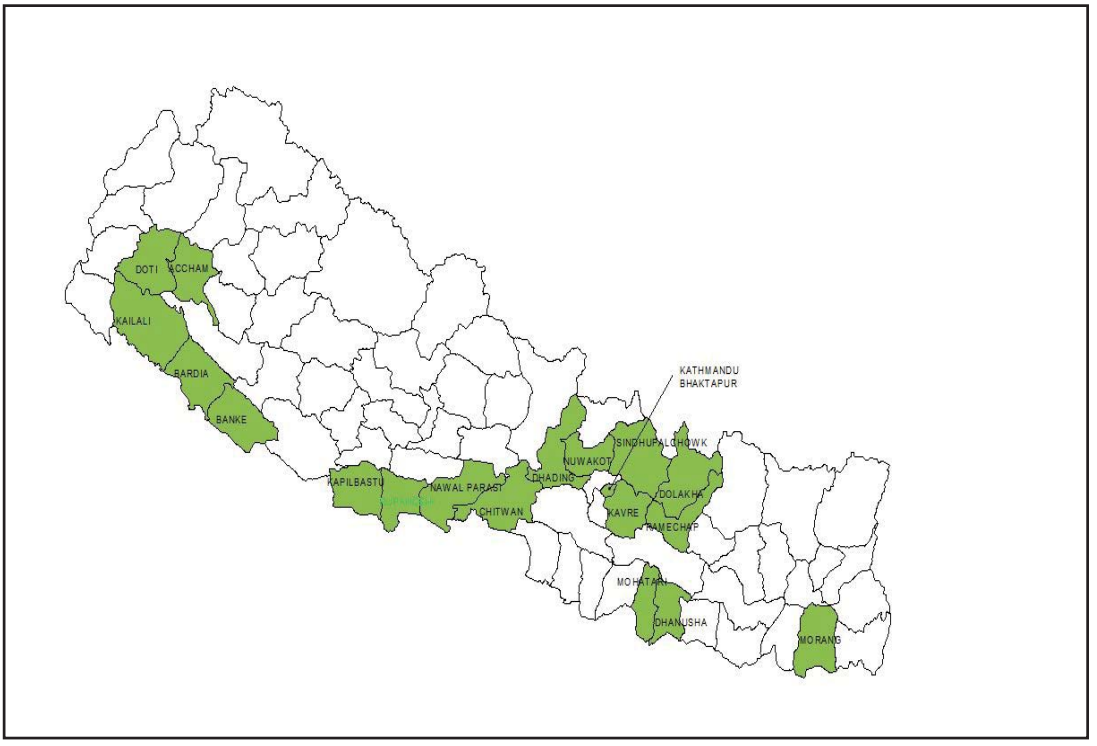
2.4 Data Processing and Analysis

Both descriptive and analytical methods were used to analyze the data collected.

Quantitative analysis

- **Descriptive statistics:** Primary data obtained from field observation, and household surveys were analyzed quantitatively. Simple statistics like sum, mean, percentage, weighted average and standard deviation were used for descriptive analysis of agricultural production, rice recovery percentage, and prices. Standard deviation and weighted average helps to validate the results obtained from analysis. Factors affecting recovery percentage and price were collected through focus group discussion and Key Informants Interview.

2.5 Map of the Sample Districts



Result and Discussion

3.1 Description of the Respondents

Before presenting the results of the study, descriptive statistics of the respondents are discussed (Table 1). Average age of the farmers and mill holders are found around 46 years. The results show that 88% of the farmers and 95% of the mill holders included in the sample are literate. Some 24% of the farmers and 30% of the mill holders have education of SLC or above (Appendix 9 and 10). Overall literacy rate is 65.9% in national level in 2011 (CBS, 2011). The above results were found higher than the national average. This is mainly due to the nature of survey concentrated on farmers and mill holders having more education in order to extract precise information on rice production, milling percentage and price spread.

Average household size of a farmer is found 7.42 with the standard deviation of 2.93 which is quite higher than the national average (4.88) (CBS, 2011). This result is found higher than the national average due to the sample selection from rural areas and rice producers only. A person utilizes rice up to 125kg/year (Khanal, 2013). Higher the family size, higher the food requirement. This fact may affect on food security of a family. Higher demand of rice influences prices in the market also. The average land holding size is 1.59 ha/household, similar to Joshi et al., 2011 which is also higher than the national average of 0.77 ha (MoAD, 2011/12) with rice cultivation of 0.96 ha land (61%). It showed that more than 60% of landholding is used for rice cultivation (Table 1). This is mainly due to the nature of survey concentrated on rice cultivated farmer only. Irrigation is crucial for rice production. The average holding of the irrigated land is 0.8 ha, i.e., 52% of land is under irrigation, which is similar to the national average of 54% (CBS, 2011). Majority of (61%) the respondents were found to be cultivating rice, which is slightly low compared to the national scenario of 75.4% (CBS, 2008). This is mainly due to the expansion of cash crop in the sample areas. Increasing interest of farmers on cash crops like tea, coffee, cardamom, offseason vegetables, fruits and ginger resulted into less interest of farmers towards rice cultivation in to a greater extent. The small size of holding with small scale production limits the farmers from accessing the wholesale markets for fetching higher price. This can lead to spread of the price.

Table 1 : Description about Respondents

S.No.	Particular	Unit	Farmer	Mill Holder
1	Age	Years (mean±SD)	46.16±12.04	46.43±10.17
2	Literate	Percentage	88.00	95.00
	Illiterate		12.00	5.00
3	Family size	Numbers	7.42±2.93	

4	Total cultivated Area	Ha	1.59±1.40	
5	Rice Cultivated Area	Ha	0.96±0.89	

3.2 Farm Gate and Wholesale Price of Paddy

The results show that average farm gate price and retail price of paddy are Rs 20.39 per Kg and Rs 22.90 per Kg. respectively. These results are similar with Shrestha (2010). Basmati rice fetches higher price (farm gate Rs 42.25 and retail 49 per Kg) compared to other non basmati paddy (Table 2). It was due to its aroma and taste preference of the consumers. Besides this, basmati rice is commonly used in different festivals and special days only. The highest price spread is found in Basmati followed by Taichung.

Table 2: Variety-wise Average Farm Gate and Retail Price of Paddy

S.No	Variety	Farm Gate Price (Rs/Kg)	Retail Price (Rs/Kg)	Price spread
1	CH 45	20.25	23.00	2.75
2	Taichung	27.33	31.33	4.00
3	Hardinath 1	18.00	20.00	2.00
4	Local	24.50	26.42	1.92
5	Ram dhan	20.25	23.50	3.25
6	BG44/42	22.00	25.00	3.00
7	OR	20.25	22.25	2.00
8	Sabitri	21.57	23.86	2.29
9	Megdut	20.00	22.00	2.00
10	Krantibold	15.50	17.00	1.50
11	Sawa	20.00	22.00	2.00
12	Sawa sugandh	20.00	22.00	2.00
13	Sarju 52	18.00	20.00	2.00
14	Chandina	15.00	18.00	3.00
15	Khumal 4	26.00	29.50	3.50
16	Hybrid	20.46	23.31	2.85
17	Sona Mansuli	19.67	21.89	2.22
18	Jira Masino	21.33	24.00	2.67
19	Radha 4	20.10	22.60	2.50
20	Makwanpur 1	17.50	20.25	2.75
	Simple Average	20.39	22.90	2.51
1	Jorayal Basmati	42.25	49.00	6.75

3.3 Productivity of Different Rice Varieties

Average yield of the paddy was found 3.88 t/ha which is higher than the national average yield (3.33 t/ha) (MoAD, 2012) (Table 3). The average land area under rice cultivation (0.96

ha) is higher compared to the national average of 0.62 ha (CBS, 2003). This is mainly due to the selection of study area having high rice production potentials. This result is also found similar with Joshi et al. Among different varieties, local has low productivity (2.78 t/ha) and hybrid has much higher productivity (6.62 t/ha). The productivity of a crop depends on different climatic and non climatic factors. Farmers are selling their product regardless of their household demand in order to meet other basic needs and to repay the credit taken at the time of cultivation. This clearly signifies that though government in policy level does not perceive rice as cash a crop, it is deriving significant amount of instant cash to meet the basic household needs (Joshi et al., 2011). Although the basmati rice has higher productivity (3.97 t/ha) but it has some limitations like some basmati varieties are location specific eg. Jorayali Basmati prefers Laxminagar VDC of Doti district, high fertility of soil and irrigation. So, only few farmers are cultivating basmati rice in the location specific areas.

Some varieties of rice such as Local fetch higher gross revenues even with lower yield due to the higher price in the market. On the basis of taste preference and aroma, local rice varieties are cultivating by farmer and also fetch higher price compared to low yield.

Table 3 : Average Productivity and Gross Revenue of Different Varieties of Rice

S.No.	Variety	Productivity (t/ha)	Gross Revenue (Rs'000/ha)
1	CH 45	3.36	77.28
2	Taichung	3.78	118.43
3	Hardinath 1	3.60	72.00
4	Local	2.78	73.45
5	Ram dhan	3.57	83.90
6	BG44/42	4.80	120.00
7	OR	5.33	118.59
8	Sabitri	3.98	94.96
9	Megdut	3.00	66.00
10	Krantibold	4.50	76.50
11	Sawa	3.60	79.20
12	Sawa sugandh	3.60	79.20
13	Sarju 52	3.18	63.60
14	Chandina	3.60	64.80
15	Khumal 4	4.62	136.29
16	Hybrid	6.62	154.31
17	Sona Mansuli	3.92	85.81
18	Jira Masino	2.38	57.12
19	Radha 4	3.89	87.91
20	Makwanpur 1	3.36	68.04
21	Basmati	3.97	194.53
	Simple Average Yield and Revenue	3.88	90.02

3.4 Rice Recovery Percentage

There are several types of milling. Hulling gives brown rice with higher recovery percent whereas Sheller gives white rice with lower recovery percent. The traditional technologies for rice milling are foot pounding (*dhiki*) and hand pounding (*okhal*). These, technologies are however, labour intensive and getting rare in recent years. Average rice recovery of brown rice is found to be 73.15% which is lower than that in developed and even other Asian countries (80%) (IRRI, 2010). The low recovery of brown rice may be due to variety selection, low level of irrigation, unsuitable post harvest handling, inadequate drying, unsuitable storage, unscientific mechanical milling, lack of skilled manpower for milling, and lack of advanced type of mills. These factors are discussed below briefly. The main factor hindering milling percentage was found mill type and milling skill of mill operators (Personnel Communication and stakeholder discussion).

Table 4 : Brown Rice Recovery Percentage

S.No	Varieties	Brown Rice (Percentage)
1	Hardinath 1	71.00
2	Radha 4	74.00
3	Ram	73.00
4	Sabitri	75.50
5	Hybrid	71.00
6	Khumal 4	73.00
7	Sona Mansuli	73.00
8	Local	74.00
9	Basmati	75.00
10	OR	72.00
	Simple Average Percentage	73.15

Sheller milling produces white rice. The white rice recovery is found to be 66.2% (66.08% weighted average) excluding broken rice. Bran and husk are found to be 5.9% and 24.6%, respectively (Table 4). The recovery is found lower than that in other Asian countries 72% (IRRI, 2010 and Malik & Majid, 1980). Krantibold variety has higher milling percentage (71%) followed by Radha 4 and Chandina and Bindeswori has low milling percentage of 63.50% followed by Ramdhan and hybrid. Low rice recovery percentage in Nepal means more losses during milling process and other factors as explained in brown rice processing from paddy. Major factors causing low rice recovery percentage are inadequate skills of the mill operators, unsuitable mills, frequent power cuts, inadequate drying and threshing facilities for the paddy and the varieties used.

Table 5 : White Rice Recovery Percentage from Sheller Type of Mill

S.No	Varieties	Excluding Broken Rice			
		White Rice Percentage	Broken rice Percentage	Rice Bran Percentage	Husk Percentage
1	CH 45	64.00	3.00	6.00	27.00
2	Taichung	68.00	3.33	5.83	22.83
3	Hardinath 1	64.00	4.00	5.00	27.00
4	Local	66.29	3.29	5.43	25.00
5	Ram dhan	63.75	3.25	6.75	26.25
6	BG44/42	68.00	4.00	5.00	23.00
7	OR	64.33	3.67	6.00	26.00
8	Sabitri	68.40	2.80	5.40	23.40
9	Krantibold	71.00	3.00	6.00	20.00
10	Sawa	66.00	4.00	6.00	24.00
11	Sawa sugandh	67.00	3.00	6.00	24.00
12	Sarju 52	66.29	3.14	5.57	25.00
13	Khumal 4	65.63	3.25	5.50	25.63
14	Hybrid	63.85	3.54	6.15	26.46
15	Sona Mansuli	65.00	3.25	6.19	25.56
16	Jira Masino	64.00	3.25	6.50	26.25
17	Radha 4	70.00	4.00	5.50	20.50
18	Makwanpur 1	64.50	3.83	5.67	26.00
19	Kanchan	66.00	4.00	5.00	25.00
20	Bindeswori	63.50	3.50	6.00	27.00
21	Dhanya 478	70.00	3.00	6.00	21.00
22	Mayur	65.00	3.00	6.00	26.00
23	Gorakhnath	66.00	3.00	6.00	25.00
24	Basmati	63.00	3.20	6.40	28.40
25	Megdut	67.00	3.00	6.50	23.50
26	Chandina	70.00	3.50	6.20	20.30
Average		66.20	3.40	5.90	24.60
Weighted Average		66.08			

3.5 Seasonal Variation of the Price of Paddy

Prices of coarse and medium paddy were found Rs 20.72 and 24.29 per Kg respectively. It was found lowest in November (Rs 18.31/Kg) and highest in September (Rs 23.71/Kg) (Table 5). This result is found similar to Shrestha, 2010 (Farm gate: Rs.19.49/Kg, Wholesale: Rs.26.65/ Kg and Retail Rs. 30.23/Kg). There was a bumper production at November so, higher the supply, lower is the price. Farmers were unable to store for future due to limited storage facilities, problem of storage pests, have to sell at the time of harvest to repay loans which is the major source of funding to manage the family expenditure.

Table 6 : Monthly Farm Gate Prices of Paddy (2012)

S.No	Months	Coarse Paddy (Rs/Kg)	Medium Coarse Paddy (Rs/Kg)
1	November	18.31	21.81
2	December	18.55	21.97
3	January	19.04	22.29
4	February	19.94	23.45
5	March	20.19	23.84
6	April	20.64	24.13
7	May	21.46	24.61
8	June	21.79	25.52
9	July	22.77	26.45
10	August	23.53	27.00
11	September	23.71	27.65
12	October	18.69	22.81
	Average Price	20.72	24.29

3.6 Seasonal Variation of Price of Rice, Broken rice, Bran and Husk

The average price of the milled white rice is found to be Rs 35.77 and 43.50 per Kg for coarse and medium varieties, respectively. Broken rice, bran and husk have the mill gate price of Rs 20.52, 18.22 and 1.95 per Kg respectively (Table 6). Pattern of price fluctuation was found similar with the paddy means higher at September and lower at November by its nature of supply fluctuations. Most of the traders and private mill holders purchase paddy at the time of harvest, store in their own storage and supply milled rice at the time of shortage to earn more from the paddy and milled rice marketing. However, the moisture percent in the rice decreases with the storage. The stored rice is liked by the consumers in the name of old rice due to its better cooking quality.

Table 7 : Monthly Retail Prices of Rice, Broken Rice, Bran and Husk (Year 2012)

S.No	Months	Unit Rs/Kg				
		Coarse Rice	Medium Rice	Broken rice	Bran	Husk
1	November	32.06	40.09	18.97	16.88	1.81
2	December	33.29	40.13	19.00	16.85	1.80
3	January	33.97	40.81	19.28	16.85	1.80
4	February	35.03	42.19	19.81	17.46	1.77
5	March	35.60	43.00	20.06	17.99	1.80
6	April	35.91	43.63	20.53	18.40	1.89
7	May	36.54	44.78	21.19	18.59	2.02
8	June	37.76	45.22	21.31	19.10	2.05
9	July	38.34	46.34	21.81	19.53	2.19
10	August	38.71	47.63	22.16	19.94	2.19
11	September	39.06	48.00	22.63	20.06	2.23
12	October	32.94	40.19	19.50	17.00	1.93
	Simple Average	35.77	43.50	20.52	18.22	1.95

3.7 Average Transaction Quantity and Transportation Charge

Table 8 : Average Transaction of Rice per Mill (2012)

S.No	Items	Transaction quantity (Ton)
1	Average	158.79
2	Standard Deviation	398.97

Average transaction of a mill was found 158.8 tons per year with the standard deviation of 399 tons. There is the high deviation of transaction quantity of rice from the average value. The milling charge is found to be 0.8 (Rs/Kg) for Sheller mill and 1.2 (Rs/Kg) for huller mill. In some places, mill holders take the bran produced as the milling charge.

Most of the consumer prefers white rice than brown rice. In some district of mid hill and mountain region, dhikki is commonly used to process the paddy. Dhikki is more popular in the place where no mill is available that's mainly due to the lack of electricity. In ancient time, dhikki used to process the whole paddy. In 18th and 19th century, huller rice mill was more popular to process mill. Nowadays, Sheller mill is used to process rough paddy to white rice in most areas in Nepal. In the case of paddy, almost 70 percent of the rice is sourced by wholesalers from millers (WFP and FAO 2007). Local traders at the village level (locally called *kantawallahs*) serve as the link between farmers and these millers. Informal transit markets along the major trade networks within the country also serve an important role in providing the forward and backward linkages for trade between the Terai and the Hill and Mountain regions (IFPRI 2010). Currently, according to the Federation of Nepalese Chambers of Commerce and Industry (FNCCI), there are an estimated 430 grain mills in the private sector at various scales of operation in Nepal. However, it appears that the food grain trade is mainly controlled by a few large traders and millers (WFP and FAO, 2007). The private sector is also a supplier of food grains, edible oils, pulses, and sugar to state trading agencies involved in public distribution and for institutional buyers such as the military, police, and so on. Its activities have been spread across areas such as support to agricultural marketing and processing (through feasibility studies, business plans, and so on), institutional and program support to commodity associations and groups, and policy advocacy.

3.8 Revenues from Paddy and Milled rice

The profit from the brown and white rice marketing was found Rs. 536 and 564 per 100 Kg compared to rough rice in the market respectively. The profit margin gained by trader and middleman after value addition by deducting marketing cost is found 25% compared to rough rice marketing. This percentage of profit is higher taken by the rice middleman and trader. If we can minimize the profit taken by trader through rice marketing upto 10% which is reasonable in case of non perishable commodity, the remaining 15% will go to either consumer side or producer. This 15% will benefit consumer or producer. If producer gets some percentage, they

will encourage producing more with the use of high yielding varieties and modern technology. This will ultimately benefit consumer. If consumer gets some percentage, they can purchase some more quantity with the same price. This will ultimately benefit the poor people of the villages and improves the food security of the rural and urban poor consumer.

Table 9 : Revenues from Paddy and Milled Rice

		For 100 Kg Paddy (in kg)			Value addition
S.No	Items	Quantity	Rate	Total	
1	Paddy grain	100	22.6	2260	
Brown Rice Marketing					
1	Brown Rice	73.15	35.77	2616.6	
2	Broken Rice	4.35	20.52	89.262	
3	Rice Bran	22.50	18.22	409.95	
	Total Revenues			3115.8	
1	Mill Charge	100	1.2	120	
2	Transportation charge			50	
3	Packaging Charge			150	
	Total costs of milling			320	
	Marketing Margin			2795.8	536(24%)
White Rice Marketing					
1	Milled white Rice	66.2	43.5	2879.7	
2	Broken Rice	3.4	20.52	69.77	
3	Rice Bran	5.9	18.22	107.50	
4	Husks	24.5	1.92	47.04	
	Total Revenues			3104.01	
1	Mill Charge	100	0.8	80	
2	Transportation charge			50	
3	Packaging Charge			150	
	Total costs of milling			280	
	Marketing Margin			2824.01	564(25%)

3.9 Factors Affecting the Rice Recovery Percentage

Rice is so labor intensive tends to keep a lot of the population on the land. Rice is also a water thirsty crop, requiring lots of rain or irrigation water (IRRI, 2010). In Nepal, inclusion of rice in two courses of meal is considered general well being of the people. White rice consumed by most people is made up exclusively of kernels. Brown rice is rice that retains a few nutritious layers of bran. Until 1980, Nepal exported rice but now, it is rice importing country. Lack of irrigation facility, encroachment of human settlements in arable land, lack of incentives on agriculture inputs, poor supply of chemical fertilizer, absence of subsidy are some problems faced in rice cultivation. More than that agriculture technique in Nepal has not improved in 2 decades. The same kind of wooden plough pulled by oxen and driven by human is used in farming. No surprise, why agrarian economy imports food. Tropical climate, water resources,

quality of arable land makes it near to perfect for cultivating almost all kinds of food crops, and specifically rice crop, in Nepal. Rice is the most important and prestigious food crop of Nepal. It is grown in a diverse environment ranging from tropical plains to foot of the mountain at highest elevation (3050 m. asl) in Chhumchure, Jumla.

Milling is a crucial step in post-production of rice. The basic objective of a rice milling system is to remove the husk and the bran layers, and produce an edible, white rice kernel that is sufficiently milled and free of impurities. Depending on the requirements of the customer, the rice should have a minimum of broken kernels. Milling is the process wherein the rice grain is transformed into a form suitable for human consumption, therefore, has to be done with utmost care to prevent breakage of the kernel and improve the recovery. Brown rice is milled further to create more visually appealing white rice.

After harvesting and drying, the paddy is subjected to the primary milling operation which includes de-husking as well as the removal of bran layers (polishing) before it is consumed. In this process the rice which is obtained after milling is called raw rice. Another process through which rice is obtained after milling is called "Parboiling Rice." Nearly 60% of the total rice produced in India is subjected to parboiling. Rice milling losses may be qualitative or quantitative in nature. Quantitative or physical losses are manifested by low milling recovery while low head rice recovery or high percentage of broken kernel reflects the qualitative loss in rice grains.

The characteristics are determined by the environmental weather conditions during production, crop production practices, soil conditions, harvesting, and post harvest practices. Some factors affecting the rice recovery percentage are:

A. Threshing and Drying

Farmer should harvest the paddy at the right time with the right moisture content. They should avoid delays in threshing after harvesting to minimize the threshing loss through shattering and post harvest loss through insects. If the machines are available for threshing, they should use proper machine setting. Cleaning and drying the grains should be done properly and immediately.

Table 10: Minimum Standard of harvested and threshed paddy

Operation	Desired moisture content (%)	Primary cause of losses
Harvesting	20-25	Shattering if grain is too dry
Mechanical threshing	20-25	Incomplete threshing, spillage, grain damage and cracking
Hand threshing	<20	
Drying	• <14 for grains	If drying is delayed: spoilage, fungal damage, discoloration, smell, loss of vigor
	• <13 for seeds • <9 for long-term storage	
	• 14 for milling	

Source : Rice Science for Better World, IRRI, 2003

B. Moisture content: Moisture content has a marked influence on all aspects of paddy and rice quality and it is essential that paddy be milled at the proper moisture content to obtain the highest head rice yield. All the varieties of paddy are at its optimum milling potential at moisture content of 14% wet weight basis (Malik and Majid, 1980). Grains with high moisture content are too soft to withstand hulling pressure which results in grain breakage and possibly pulverization of the grain. Grain that is too dry becomes brittle and has greater breakage. Moisture content and temperature during the drying process is also critical as it determines whether small fissures and/or full cracks are introduced into the grain structure. Aziz and Shafi (1966) reported that the grain should neither be too dry nor too wet at the time milling. The too dry grains possess sun cracks, therefore break during milling, whereas, too wet grains can not withstand milling pressure and break badly during milling. Therefore, optimum moisture content is a prerequisite for good milling to get maximum head rice recovery. Later studies by Malik ad Majid (1973) revealed that maximum head rice recovery was obtained when paddy was milled at 8% moisture on huller type mills.

C. Degree of purity: Purity is related to the presence of dockage in the grain. Dockage refers to material other than paddy and includes chaff, stones, weed seeds, soil, rice straw, stalks, etc. These impurities generally come from the field or from the drying floor. Unclean paddy increases the time taken to clean and process the grain. Foreign matter in the grain reduces milling recoveries and the quality of rice and increases the wear and tear on milling machinery.

D. Varietals Purity: A mixture of varieties causes difficulties at milling and usually results in reduced capacity, excessive breakage, lower milled rice recovery and reduced head rice. Different sizes and shaped grains make it more difficult to adjust hullers, whiteners and polishers to produce whole grains. This will result in low initial husking efficiencies, a higher percentage of re-circulated paddy, non-uniform whitening and lower grade of milled rice.

E. Grain dimensions: Grain size and shape (length-width ratio) is a varietals' property. Long slender grains normally have greater breakage than short, bold grains and consequently have a lower milled rice recovery. The grain dimensions also dictate to some degree the type of milling equipment needed. For instance, the Japanese designed milling equipment may be better suited to short bold, japonica grains whereas Thai made equipment will be more suitable for longer, slender grain types.

F. Cracked grains: Overexposure of mature paddy to fluctuating temperature and moisture conditions leads to development of fissures and cracks in individual kernel. Cracks in the kernel are the most important factor contributing to rice breakage during milling. This results in reduces milled rice recovery and head rice yields.

G. Immature grains: The amount of immature paddy grains in a sample has a major affect on head rice yield and quality. The immature rice kernels are very slender and chalky and this results in excessive production of bran, broken grains and brewer’s rice. The optimal stage to harvest grain is at about 20-25% grain moisture or about 30 days after flowering. If the harvest

is too late, many grains are lost through shattering or dry out and are cracked during threshing, which causes grain breakage during milling.

H. Yellowing: Yellowing is caused by over-exposure of paddy to wet environmental conditions before it is dried. This results in a combination of microbiological and chemical activity that overheats the grain. These fermented grains frequently possess partly gelatinized starch cells and generally resist the pressures applied during grain milling. While the presence of fermented grain does not affect milling yields it does downgrade the quality of the milled rice because of the unattractive appearance.

Insect or mold-damaged grains can be distinguished by the presence of black spots around the germ end of the brown rice kernel which are caused by the microorganisms, insects, or a combination. Mold damage in particular is increased by unfavorable weather conditions. In the process of milling, these black spots are only partly removed which consequently increases the presence of damaged grains.

I. Operators' skill: If the operator is more skillful in milling process, it will recover the higher recovery percentage, otherwise decrease the percentage.

All the varieties of paddy are at its optimum milling potential at moisture content of 14% wet weight basis. Therefore, optimum moisture content is a prerequisite for good milling to get maximum head rice recovery. Purity is related to the presence of dockage in the grain. Foreign matter in the grain reduces milling recoveries and the quality of rice and increases the wear and tear on milling machinery as well. A mixture of varieties causes difficulties at milling and usually results in reduced capacity, excessive breakage, lower milled rice recovery and reduced head rice. Different size and shaped grains make it more difficult to adjust hullers, whiteners and polishers to produce whole grains. This results in lower grade of milled rice. Long slender grains normally have greater breakage ratio than the short, bold grains and consequently have a lower milled rice recovery. The grain dimensions also dictate to some degree the type of milling equipment needed. Over exposure of mature paddy to fluctuating temperature and moisture conditions leads to development of fissures and cracks in individual kernel. Cracks in the kernel are the most important factor contributing to rice breakage during milling. This results in reduces milled rice recovery and head rice yields. The amount of immature paddy grains in a sample has a major affect on head rice yield and quality. The immature rice kernels are very slender and chalky and this results in excessive production of bran, broken grains and brewer’s rice. The optimal stage to harvest grain is at about 20-25% grain moisture or about 30 days after flowering. If the harvest is too late, many grains are lost through shattering or dry out and are cracked during threshing, which causes grain breakage during milling. If the operator is more skillful in milling process, it will recover the higher recovery percentage, otherwise decrease the percentage.

3.10 Factors Affecting Farm Gate Prices of Paddy

Unlike most grains, after rice is threshed to separate it from the straw, it is still covered by a hard inedible coating called the hull or husk. The husk is largely composed of silica and has no feed value. It must be removed by machine milling or, historically, by hand pounding. The product resulting after the removal of the husk is brown rice, the brown color coming from the remaining bran and other thin layers. Brown rice can be consumed directly, but most Asians prefer milled rice from which the bran has been removed. Technically advanced mills can separate bran from the starchy portion quite gently, but the most common type of village mill in many Asian countries results in a high percentage of broken grains. High-income consumers generally are willing to pay a premium price for white unbroken grains known as "head" rice, so milling equipment and rice-handling systems that can produce such rice are associated with a mature marketing system. The development of the rice milling industry in Asia has passed through a number of distinct phases. As transportation and communication improved, and as European gave way to indigenous ownership and management after the turn of the century, small, up-country mills grew rapidly. Location of the mills near the source of supply reduced both transportation and labor costs because during the height of the milling season rural labor was normally abundant. For the local market and home consumption, hand pounding gave way to the single huller-are cent transition in areas of surplus labor and deficit food grain production. The transition from hand pounding to the single huller, and subsequent attempts to modernize the new milling industry by replacing the single huller with a more complete mill, have caused considerable controversy. Opponents of modernization emphasized the labor-displacing features and capital intensity of the modern technology. Advocates of modernization pointed to the higher recovery rates. This research also intends to conduct this research to update the edible percentage of rice that is used to prepare food balance sheet and price escalation of paddy and rice over the years. There are some factors causing fluctuation of farm gate prices paddy. They are :

- **Weather:** Role of weather in rice production is immense. Temperature, rainfall and soil moisture are the important parameters that determine the crop condition. Further, natural calamities can also affect crops. Markets keep watch of these developments.
- **Minimum Support Price:** Changes in the minimum support prices (MSP) by the government also have immense impact on the farm gate price of paddy.
- **Government policies:** Exchange rates, Fiscal policies, Export incentives and export promotion also influence price.
- **Substitute Product:** Availability of substitute products at cheaper rate may lead to weakness in demand. This situation happens especially when the main products price tends to become higher.

- **Consumption:** Rice consumption depends on two factors - population and Income. Rice is the staple food of Asia. Low-income groups consume more rice according to the per capita income increase. But as the income increases, there arrives a point when the consumption starts to dip. Income growth and reduction in population result in a low consumption of rice.
- **Seasonal cycles:** Seasonal cycles are present in rice cultivation. Price tends to be lower as harvesting progresses and produce starts coming into the market. At the time of sowing and before harvesting price tends to rise in view of tight supply situation.
- **Demand:** Import demands as well as domestic demand. Breakthrough in the technology may increase the productivity and would lead to more supply. This may bring some softness in the price.
- **Marketing Margin:** According to Shrestha, 2010, marketing margin was found the major factor causing rice price spread. It was found Rs.4.32 from farm to wholesale and Rs.5.90 from farm to retail.

3.11 Rice and Food Security

One fifth of the world's population—more than a billion people—depend on rice cultivation for their livelihoods. Asia, where about 90% of rice is grown, has more than 200 million rice farms, most of which are smaller than 1 hectare. Rice-based farming is the main economic activity for hundreds of millions of rural poor in this region. In Africa, rice is the fastest growing staple. This increase in the demand for rice is also true for Latin America and Caribbean countries. In most of the developing world, rice is equated with food security and closely connected to political security. Changes in rice availability, and hence price, have caused social unrest in several countries. To keep rice prices stable and affordable at around $US300 a ton, IRRI estimates that an additional 8-10 million tons of rice needs to be produced every year. The challenge, above anything else, is to produce this additional rice with less land, less water, and less labor, in more efficient, environmentally-friendly production systems that are more resilient to climate change, among other factors.

3.12 Rice and Poverty

Rice is the most important food crop of the developing world and the staple food of more than half of the world's population, many of whom are also extremely vulnerable to high rice prices. Worldwide, more than 3.5 billion people depend on rice for more than 20% of their daily calories. In 2009, nearly one billion people were living in poverty, including 640 million in Asia where rice is the staple food. Rice is so closely linked with poverty that in 2008, when rice prices tripled, the World Bank estimated that an additional 100 million people were pushed into poverty. Rice consumption can be very high, exceeding 100kg per capita annually in many Asian countries. For about 520 million people in Asia, most of them poor or very poor, rice provides more than 50% of the caloric supply. In Africa, urban dwellers

who only rarely ate rice few decades ago, now consume it daily. Per capita consumption has doubled since 1970 to 27kg. In South America, average per capita consumption of rice is 45kg. In the Caribbean it has already risen to over 70kg. Asia, where about 90% of rice is grown, has more than 200 million rice farms, most of which are smaller than 1 hectare. Rice-based farming systems are also the main economic activity for hundreds of millions of rural poor, many of whom do not own their own land. For the extreme poor (less than $1.25/ day), rice accounts for nearly half of their food expenditures and a fifth of total household expenditures, on an average. This group alone annually spends the equivalent of $62 billion (Purchasing Power Parity - PPP) for rice. In Africa, rice is the fastest growing food staple. The gap between demand and supply in sub-Saharan Africa, where rice is grown and eaten in 38 countries, reached 10 million tons of milled rice in 2008, costing the region an estimated $3.6 billion for imports. Rice is also one of the most important and fastest growing staple foods in Latin America, especially among urban consumers and particularly the poor. Like Africa, the region is a net importer of rice, with a projected annual deficit of 4 million tons by 2015. But, the biggest common ground is that we all share the same goals and ideals: to contribute to a more food-secure, less poor, and more environmentally friendly world. The input to the Rice mill is paddy whereas the output is parboiled rice and raw /white rice depending upon whether the pretreatment is given to paddy or not. The objective of milling is to get whole grain rice and preserve most of the rice kernels in their original shape. Rice mills in India generally produce 2 types of rice, Parboiled Rice and White (Raw) Rice. In order to improve nutritional and cooking qualities of rice, pre-treatment is given to paddy. The rice obtained from milling pretreated paddy is known as parboiled rice, whereas the rice obtained from milling untreated paddy is known as raw rice or white rice. Parboiling is one of the latest well-developed pre-milling conditioning treatments given to paddy to improve its nutritional & cooking quality. In parboiling the paddy is soaked in water and subsequently steamed and dried, before milling. This helps in minimizing the breakage of rice and reducing the loss of nutrients during milling.

3.13 Steps to Improve Production of Rice

The following strategies may be adopted to increase the productivity of rice in various states:

- Emphasis may be given on a cropping system approach rather than a single crop development approach.
- Propagation of location specific crop production technologies in different agro-climatic zones.
- Replacement of low potential/pest susceptible old varieties by new high yielding varieties with promising yield potential.
- To encourage cultivation of hybrid rice through demonstrations and making seed available to the farmers.

- Motivating the farmers to provide life saving irrigation to the crop wherever possible during long dry spells.
- Improving soil fertility.
- Emphasis on balanced use of plant nutrients along with the popularization of integrated plant management system.
- Use of bio-fertilizer.
- Popularization of line sowing in upland rice areas through suitable seeding devices establishment of desired level of plant population, easy in weed control and the application of other management techniques.
- Encouraging the use of machines as well as bullock drawn and hand operated implements.
- Effective control of pests and diseases by emphasizing the need based application of pesticides.

More emphasis on the adoption of non-monetary inputs like timely sowing, maintaining optimum plant population, timely irrigation, efficient use of fertilizers, plant protection measures and timely harvesting of crop etc.

Considering the fact that sizable amounts of food grains spill over from the Indian side of the border into Nepalese markets (largely through informal channels), it would be important to understand how this impacts the prices received by farmers in Nepal. With food grain cultivators in India receiving various input subsidies, it is possible that the grain entering into Nepal from India might be sold at a lower price than domestically produced grain. In the absence of farm-level price data, as well as reliable estimates of the informal food -grain trade along the border, it becomes difficult to probe this aspect in greater detail. However, a comparison of the national average retail price for coarse rice in Nepal and the Minimum support price (MSP) of paddy (common) in India does show that the two prices follow a similar trend in their rise, indicating the existence of a relationship between the prevailing prices in India and the corresponding prices in Nepal (Pullabhotla et al., 2011).

Chapter IV

Summary, Conclusion and Recommendation

4.1 Summary

Average yield of the paddy was found 3.88 t/ha which is slightly higher than the national average yield (3.3 t/ha). Among 21 varieties of rice found in the survey, Jira masino and local have the lowest productivity (2.38 and 2.78 t/ha); and hybrid and OR have highest productivity (6.62 and 5.33 t/ha). Besides this, basmati rice has productivity of 3.88 t/ha and area under this variety is limited due to the requirement of some specific cultivation practices and high soil fertility. Average rice recovery percentage of brown rice was found to be 73.15% which is lower than that in other developed and Asian countries with 80% (IRRI, 2010). White Rice Recovery percentage was found 66.2% (66.08% weighted average) excluding broken rice. The rice recovery percent differs from variety to variety. Krantibold variety has highest milling percentage (71.00%) and Bindeswori has the lowest milling percentage of 63.50%. Bran and husk were found to be 5.90% and 24.60%, respectively. Average farm gate and retail price of paddy are Rs 20.39 and Rs 22.90 per Kg, respectively. Basmati rice fetches the highest price (farm gate Rs 42.25 and retail 49 per Kg). It is due to its aroma and taste preference of the consumers. The average price of the milled white rice is found to be Rs 35.77 and 43.50 per Kg for coarse and medium varieties, respectively. Broken rice, bran and husk have the mill gate price of Rs 20.52, 18.22 and 1.95 per Kg respectively. The highest price spread is found in Basmati followed by Taichung. Prices of coarse and medium coarse paddy rice were found Rs 20.39 and 22.90 per Kg respectively. On the basis of taste preference and aroma, the farmers are cultivating local rice varieties and such varieties also fetch higher gross revenue even the yield is low. Retail price of coarse and medium coarse white rice was found Rs 35.77 and 43.50 per Kg respectively. Broken rice, bran and husk have Rs 20.52, 18.22 and 1.95 per Kg respectively. Average transaction per mill was found 158.8 tons of paddies per year with the standard deviation of 399.0 tons.

4.2 Conclusion

The sample includes larger proportion of the better off farmers than the national average. This is mainly due to the nature of survey that concentrated on farmers and mill holders having more education in order to extract reliable information on rice production, milling percentage and price spread. Increasing interest of farmers on cash crops like tea, coffee,

cardamom, offseason vegetables, fruits and ginger resulted into less interest of farmers towards rice cultivation in general. The small size of holding with small scale production limits the farmers from accessing the wholesale markets for paddy for fetching better price. This leads to increased spread of the price.

Among different varieties, local has low productivity but generates higher gross revenue than the improved due to higher market price. This can be the reason that the seed replacement rate is lower in rice than in the cash crops. The productivity of paddy crop depends on climatic and non climatic factors. Although the basmati rice has higher productivity, it has some limitations on production like some basmati varieties are location specific eg. Jorayali Basmati is grown in a ward of Laxminagar VDC of Doti district. Such confinement can be attributed to local culture, climatic conditions, high soil fertility and reliable irrigation with better quality water. So, only few farmers are cultivating basmati rice in the location specific areas. Some varieties of rice such as Local fetch higher gross revenues even with lower yield due to the higher price in the market. On the basis of taste, preference and aroma, the farmers are cultivating local rice varieties and are also fetching higher price compared to other varieties. The results lead to a conclusion that we have to conserve the local rice varieties.

Hulling gives brown rice with higher recovery percent whereas Shelling gives white rice with lower recovery percent. The brown rice is more nutritious than the white rice. The traditional technologies for rice milling such as foot pounding (*dhiki*) and hand pounding (*okhal*) produces better quality rice. These traditional technologies are however, labour intensive and getting rarer in recent years.

The lower recovery percent of the brown rice in Nepal as compared to other countries may be due to variety selection, low level of irrigation, unsuitable post harvest handling, inadequate drying, unsuitable storage, unscientific mechanical milling, lack of skilled manpower for milling, and lack of advanced type of mills. Similarly, the major factors causing low white rice recovery percentage can be inadequate skills of the mill operators, unsuitable mills, frequent power cuts, inadequate drying and threshing facilities for the paddy and the varieties used.

A factor affecting the price spread on rice is the storage problem. The farmers are unable to store the rice for lean season due to limited storage facilities, and related problem of storage pests. Some farmers are indebted during festival seasons and have to sell their produce at the time of the harvest to repay loans. Most of the traders and private mill holders purchase paddy at the time of harvest, store in their own storage and supply milled rice at the time of shortage to earn more from the paddy and milled rice. The stored rice is liked by the consumers in the name of old rice due to its better cooking quality.

The profit margin gained by traders and middlemen after value addition by deducting marketing cost is found 25% compared to rough rice marketing. This percentage of profit is higher

than normal. If we can increase marketing efficiency of the farmers and minimize the profit margin of the traders down to 10% which is reasonable in case of non perishable commodity, the remaining 15% can go either to the consumers or the producers. If the producers get higher price, they will get encouraged for producing more rice the next year by using high yielding varieties and modern technology. This will ultimately benefit the consumers as well. If the consumers get some share of the surplus thus generated, the consumers' surplus, the welfare measure, will increase and also the poor can purchase more quantity of rice increasing their wellbeing. This will ultimately benefit the people in the country and improves the food availability and accessibility helping in the food security.

The wholesale price significantly influences the marketing margin in the farm to rice wholesale market. Farmers are selling their product regardless of their household demand in order to meet other basic needs and to repay the credit taken at the time of cultivation. This clearly signifies that though government in policy level does not perceive rice as cash a crop, it is deriving significant amount of instant cash to meet the basic household needs (Joshi et al., 2011).

4.3 Recommendations

Due to small size of landholding, 42% farmers have to search alternatives to meet their annual food requirement (Appendix 13). Alternative policies should be focused especially on the farm to wholesale marketing services such as transportation, handling, packaging, and milling to reduce the marketing margin. The market information to the farmer can help in reducing the marketing margin of rice. The establishment of relevant and regular market information to farmers could be useful to reduce the marketing margin. Different forms of media like radio, telephone, television and publications can help disseminate the market information regularly. This could possibly help the farmers to sell their products at better prices which can eventually help decrease the marketing margin.

Farmers training programs need to include modules on proper time and techniques of rice harvesting, testing moisture content at the time of harvesting, proper threshing, adequate drying, and selection of seeds for varietals purity, and selecting the seeds with bold and uniform grain size. The mill operators need information on advanced type of mills, benefits of skillful operation to get more rice recovery percentage from milling. The moisture content has a marked influence on all aspects post harvest handling of paddy and the quality of rice and it is essential that paddy be milled at the proper moisture content to obtain the highest head rice yield.

The involvement of traders such as middlemen and assemblers who exercised more market power to determine the price of paddy can be reduced by encouraging the formation of farmers' cooperatives and establishment of relevant and regular market information to farmers could be useful to reduce the marketing margin. Market information harmonizes rice supply and demand and stabilizing its price for the benefit of both consumers and producers. Formation of farmers' cooperative, reduction of hurdles in the transportation, improvement of the market information system, and improvement of the role of farmer in price determination help to reduce the marketing margin.

If the farmer's have storage facilities, they can store the excess paddy to sell at the time of shortage and can get more prices. Government should facilitate and provide the subsidy for storage facilities and the provision of interest subsidy and loan repayment system through warehousing. This could help to farmers to supply their products at the time of low production with higher prices compared to harvesting time. Stocks play a key role in equilibrating markets and smoothing price variations. A clear distinction between providing a buffer against shocks to the rice market and embarking on a hoarding strategy must be clearly defined in order to reduce impacts from external price shocks.

Minimum support price on rice before the sowing season can encourage the farmers to increase production and discourage the traders to set lower price than the costs of production. So, the farmers can prepare a good plan for good harvest. If the farmer has secured market, they can produce more. If the market price of paddy goes down than the minimum support price fixed by government, then government need to be ready to purchase the paddy at minimum support price through different agencies like Nepal Food Cooperation or other. Government interventions is applied properly with the minimum risks of moral hazards, it can help to minimize the marketing margin and benefits both the producers and consumers with reasonable price.

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6. Appendices

Appendix 1: Various forms of Rice

***1. Rough Rice*:** Also called paddy rice. Rice kernels are still enclosed in an inedible, protective hull which must be removed.

***2. Brown Rice*:** Rice which has only the hull removed. The bran layers and rice germ remain, giving the rice a brown color.

***3. Parboiled Rice*:** Rice that has been steam pressurized to gelatinize the starch within the rice kernel, resulting in a firmer, more separate grain that is more stable and less susceptible to overcooking than regular-milled white rice.

***4. Regular-Milled White Rice*:** Sometimes called milled rice, polished white rice, or polished rice. Hulls, bran layers, and germ have all been removed.

***5. Precooked Rice*:** Regular-milled white rice, parboiled milled white rice, and brown rice can be precooked and dehydrated before packaging. Precooked rice includes quick cooking rice, instant rice, and boil-in-the-bag rice.

Appendix 2: World Rice Production (million tons)

S.No	Country	2007/2008	2008/2009
1	China	193,354,175	166,417,000 (32.7%)
2	India	148,260,000	132,013,000 (26.0%)
3	Indonesia	60,251,072	52,078,832 (10.2%)
4	Bangladesh	46,905,000	38,060,000 (7.5%)
5	Vietnam	38,725,100	34,518,600 (6.8%)
6	Thailand	31,650,632	27,000,000 (5.3%)
7	Myanmar	30,500,000	24,640,000 (4.8%)
8	Philippines	16,815,548	14,031,000 (2.8%)
9	Brazil	12061465	10,198,900 (2.0%)
10	Japan	11,028,750	9,740,000 (1.9%)
11	Pakistan	10,428,000	
12	USA	9,241,173	
13	Egypt	7,253,373	
14	Republic of Korea	6,919,250	
15	Combodia	7,175,473	
16	Nepal	4,299,264	

Source: International Rice Research Institute, 2010

Appendix 3: People facts in Nepal in 2012

S.No.	Particulars	Nepal
1	Population (Number)	26,494,504
2	Population growth rate (%)	1.35
3	Gross Domestic Product per capita/Purchasing Power Parity	515767 Million
4	Percentage of people living below the poverty line	24.7
5	Life expectancy at birth (years)	64.1

Source: Statistical Information on Nepalese Agriculture, MoAD, 2011/12

Appendix 4: Rice statistics (2012)

S. No.	Particulars	In Nepal
1	Total crop area (‘000 ha)	3091
2	Total rice area (‘000 ha)	1531.49 (50%)
3	Average rice yield (tons per ha)	3.3
4	Total rice production ('000 tons)	5072.25
5	Rice import (milled rice, '000 tons)	Husked 2.4, milled 171.5 & broken 9.8
6	Annual rice consumption per person (kilograms)	125

Source : Statistical Information on Nepalese Agriculture, MoAD, 2011/12

Appendix 5: Production and Area of Rice from 2007/08-2011/12

S.No.	Particulars	2007/08	2008/09	2009/10	2010/11	2011/12
1	Area (Ha)	1549262	1555940	1481289	1496476	1531493
2	Production (Mt)	4299246	4523693	4023823	4460278	5072248
3	Productivity (ton/ha)	2.77	2.90	2.71	2.98	3.31

Source : Statistical Information on Nepalese Agriculture, MoAD, 2011/12

Appendix 6: Rice Nutrition Chart

Rice (1/4 Cup Raw)	Calories (kcal)	Carbohydrates (g)	Fat (g)	Fiber (g)	Protein (g)
White Rice (Unenriched)	169	36.98	0.31	0.60	3.30
Parboiled (Unenriched)	172	37.80	0.26	0.79	3.14
Brown Rice	171	35.72	1.35	1.62	3.64

Appendix 7: Average age of the Farmers

S.No.	Particulars	Value (Years)	Remarks
1	Average Age	46.16	
2	Standard Deviation	12.04	

Appendix 8: Average age of the Mill holders

S.No.	Particulars	Value (Years)
1	Average Age	46.43
2	Standard Deviation	10.17

Appendix 9: Literacy rate of the farmers

S.No.	Items	Literate	Illiterate	Upto SLC	Above SLC
1	Number of farmers	25	6	7	12
2	Percentage	50	12	14	24

Appendix 10: Literacy rate of the mill holders

S.No	Items	Illiterate	Literate	Upto SLC	Above SLC
1	Number of Mill holders	2	22	4	12
2	Percentage	5	55	10	30

Appendix 11: Family size of the farmer

S.No	Particulars	Value	Remarks
1	Average Family Size	7.42	
2	Standard Deviation	2.93	

Appendix 12: Rice cultivation area of the farmers

S.No	Items	Total land (ha)	Rice cultivated land (ha)	Percentage
1	Average	1.59	0.96	60.59
2	Standard Deviation	1.40	0.89	

Appendix 13: Food sufficiency from their own production

S.No	Items	Upto 3 months	3-6 months	6-9 months	Above 9 months
1	Household	3 (6)	8 (16)	10 (20)	29(58)

Data inside parenthesis indicates percentage

Appendix 14: Common Varieties used by farmers

S.No	Varieties	Area cultivated per variety (m^2)	Percentage	Remarks
1	CH 45	167.86	1.75	
2	Taichung	365.76	3.81	
3	Hybrid BCC 801	440.82	4.59	
4	Khumal 4	333.02	1.85	
5	Makwanpur 1	177.8	1.85	
6	Radha 4	419.58	4.37	
7	Kranti Bold	133.2	1.39	
8	Sawa	66.6	0.69	
9	Sawa Sugandha	66.6	0.69	
10	Local	765.8	7.97	IV
11	Sona Mansuli	2048.94	21.32	I
12	Jira Masino	250.6	2.61	
13	Ram Dhan	666	6.93	
14	BG44/42	33.3	0.35	
15	Chandina	133.2	1.39	
16	OR	732.6	7.62	V
17	Sabitri	832.5	8.66	III
18	Sarju 52	1724.3	17.94	II
19	Megdhut	53.28	0.55	
20	Hardinath 1	33.3	0.35	
21	Basmati-Local/Jorayali	166.5	1.73	

Appendix 15: Type of Mills included in the interview

S.No	Particular	Huller	Sheller	Dhikki	Total	
1	Mill No.	8	31	3	40+2	2 mills have both huller n Sheller
2	Percentage	17.5	75	7.5		

Appendix 16: Rice Area by region and country, Asia, 1946-80

Region & country	Average production (thousand mt, paddy) 1946–55	1956–65	1966–75	1976–80	Average annual growth rate 1946–55 to 1976–80 (percent)
East Asia	82,269	107,135	137,946	164,149	2.54
China	63,643[a]	82,993	110,164	134,400	2.76
Japan	12,157[b]	15,368	16,090	14,793	0.72
South Korea	3,514[b]	4,426	5,560	7,135	2.61
North Korea	1,173[b]	1,712	2,981	4,462	4.98
Taiwan	1,782	2,636	3,151	3,359[c]	2.33
Southeast Asia	31,223	41,711	57,445	72,545	3.11
Burma	4,995[d]	7,037	8,054	9,579	2.40
Indonesia	10,180[b]	12,159	18,738	25,695	3.42
Laos	506[b]	559	844	899	2.11
Malaysia	743[b]	971	1,679	1,862	3.40
Philippines	2,768	3,747	5,060	7,221	3.55
Thailand	6,546	8,177	13,182	16,400	3.40
Vietnam	5,485[b]	9,061	9,888	10,889	2.52
South Asia	50,667	67,298	84,274	101,321	2.55
Bangladesh	11,140[c]	13,735	16,700	19,230	2.01
India	35,955	49,164	60,773	73,475	2.63
Nepal	1,752[b]	1,937	2,268	2,306	1.00
Pakistan	1,258[b]	1,625	3,212	4,589	4.82
Sri Lanka	562[b]	837	1,321	1,721	4.15
Total Asia	164,159	216,144	279,665	338,015	2.66

Source: Appendix tables.
[a] 1949–55 av.
[b] 1950–55 av.
[c] 1976–79 av.
[d] 1946–51 av.
[e] 1947–55 av.

Appendix 17: Economic Indicators in the Asian Rice Economies

Country	GNP/capita (1980) 1980 $US	Growth 1960–80 (percent/yr)	Percent of GDP from agriculture 1980	Percent of labor force in agriculture 1978	Per capita milled rice consumption 1975–79 (kg/yr)	Population/ sq km of arable land
Japan	9,890	7.1	4	12	90	2,064
Malaysia	1,620	4.3	24	49	138	369
South Korea	1,520	7.0	16	41	148	1,615
Philippines	690	2.8	23	47	93	551
Thailand	670	4.7	25	76	181	255
Indonesia	430	4.0	26	60	127	833
Pakistan	300	2.8	31	54	27	371
China	290	n.a.	31	61	94	655
Sri Lanka	270	2.4	28	53	100	1,402
India	240	1.4	37	65	73	390
Burma	170	1.2	46	53	171	328
Nepal	140	0.2	57	93	105	570
Bangladesh	130	0.0	54	84	157	850

Sources: GDP from agriculture: World Bank, *World Development Report 1982.* Labor force and population/sq km: A. Palacpac, *World Rice Statistics* (1982). Rice consumption: U.S. Department of Agriculture, Foreign Agricultural Service, *Foreign Agriculture Circular: Grains,* FG-5-80. Population: Appendix tables.

Appendix 18: Average Net Rice Exports, 1951-80 (thousand mt, milled)

Region & country	1951–60	1961–70	1971–80
East Asia			
China	–	946	1,529
Japan	–	–166	285
South Korea	–	–295	–475
North Korea	–	59	249
Taiwan	120	103	104
Southeast Asia			
Burma	1,551	898	480
Kampuchea	536	230	–145
Indonesia	–600	–567	–1,319
Laos	–	–61	–79
Malaysia	–	–384	–268
Philippines	–63	–161	–109
Thailand	1,258	1,420	1,817
Vietnam		–420	–518
South Asia			
Bangladesh	–201	–325	–297
India	–348	–488	99
Nepal	–	234	146
Pakistan	–	145	760
Sri Lanka	–	–485	–334
Total of above	–	683	1,925

Note: Negative signs indicate imports.