
Marketable and Marketed Surplus of Rice and Wheat in India: Distribution and Determinants

Vijay Paul Sharma*

ABSTRACT

Over the last few decades, Indian agriculture has witnessed significant changes and become market-oriented due to changing policies, dietary diversification, urbanization, population growth, technological changes, infrastructure and expanding exports opportunities. Farm households, who allocated a significant portion of their resources to foodgrains production largely for self-consumption, produce increasingly for the market. The present study was undertaken to assess the marketed and marketable surplus of rice and wheat, major cereals, in leading producing states and examine important factors, which determine the level of marketed surplus on various categories of farm households. These trends clearly indicate that the government has almost a monopsony in rice and wheat procurement and restricted the participation of private sector. The results of marketed surplus show that about 78 per cent of total rice production was sold in the market and varied from about 63 per cent on marginal farms to about 81 per cent on medium and larger farms.

Keywords: Marketed and marketable surplus, Rice, Wheat, Monopsony, India.

JEL: Q11, Q12, Q13, Q18

I

INTRODUCTION

Over the last few decades, Indian agriculture has witnessed significant changes and become market-oriented due to changing policies, dietary diversification, urbanization, population growth, technological changes, infrastructure and expanding exports opportunities. Farm households, who allocated a significant portion of their resources to foodgrains production largely for self-consumption, produce increasingly for the market (Sharma, 2011 and Sharma and Wardhan, 2014). The marketed surplus ratio of rice has increased from about 60 per cent in mid-nineties to about 80 per cent in recent years while in case of wheat it has increased from about 55 per cent to nearly 75 per cent during the same period (Government of India, 2015a). Production of foodgrains in the country has increased significantly during the last decade and reached a record level of 265 million tonnes in 2013-14 (Government of India, 2015b), compared to 195.4 million tonnes in triennium ending (TE) 2004-05 (about

*Chairman, Commission for Agricultural Costs and Prices (CACP), Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi-110001.

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70 million tonnes additional production), while it witnessed a marginal increase from about 185 million tonnes to 195.4 million tonnes between TE 1994-95 and TE 2004-05 (Government of India, 2015a). The per capita availability of foodgrains, which marginally declined from 170.8 kg per year in TE 1994 to 169.7 kg per year in TE 2004 increased to 175.4 kg per year in TE 2013 (Government of India, 2015a). The average stocks of cereals held by central and state agencies (as on first day of January) were higher (35.6 million tonnes) during 2004-14 compared with 1994-2004 period (32.2 million tonnes). In spite of the increase in total production, per capita availability of foodgrains and higher food stocks, prices of foodgrains (average year-on-year rates of change in the wholesale price index) were higher (>14 per cent) during the 2005-14 than in the 1994-2004 (about 7 per cent). A marginal surplus or marginal deficit in the availability of foodgrains in a country like India has a significant effect on the price level. The marketed surplus is, therefore, as important as total production in influencing market prices. It is, therefore, important to have reliable estimates of marketed surplus and identify important determinants of marketed surplus to design appropriate production, procurement, storage, distribution and pricing policies. The present study was undertaken to assess the marketed and marketable surplus of rice and wheat, major cereals, in leading producing states and examine important factors, which determine the level of marketed surplus on various categories of farm households. Section II of the paper discusses the sampling methods used to select study areas, and households as well as the conceptual framework of the study. Section III analyses rice and wheat production and procurement trends and pattern. Section IV presents results of the estimation of marketable and marketed surplus and determinants of marketed surplus. The summary of findings and conclusions of the study are discussed in Section V.

II

METHODOLOGY

Study Area

The primary focus of the present study is on estimation of marketed and marketable surplus of rice and wheat, and response of marketed surplus to price and other exogenous variables. The study is based on household data collected from rice and wheat farmers in selected major producing states. First of all, States having a significant share in total production and acreage were chosen. These were, West Bengal (14.2 per cent),¹ Uttar Pradesh (13.6 per cent), Punjab (10.5 per cent), and Haryana (3.7 per cent) for rice, and Uttar Pradesh (31.8 per cent), Punjab (18.1 per cent), Madhya Pradesh (13.2 per cent), Haryana (12.5 per cent) and Rajasthan (9.6 per cent) for wheat. Multi-stage sampling technique was followed to select the farmers from the selected states.

In the first stage, appropriate number of districts were chosen from each state (depending upon the total number of districts in the state) keeping in view the representative nature of the district based on share in total production and importance of the crop in the district. In all, nine districts for rice and 15 districts for wheat were selected for the study (Annexure). In the next stage, appropriate numbers of blocks/talukas from each selected district were chosen based on the crop acreage and production. In the third stage, villages were randomly selected from each taluka/block. Finally, from each selected village, an appropriate number of farmers keeping in view the representative nature of different farm categories (≤ 1 ha; 1-2 ha; 2-4 ha, and > 4 ha) were selected randomly. A total sample size of 918 rice and 1193 wheat growers was selected for the present study. In some states, selected farmers were growing both rice and wheat but were considered separate sample units in the study. The data were collected during 2011-12. Table 1 presents the distribution of different categories of sample households selected from each state for the selected crop.

TABLE 1. DISTRIBUTION OF CROP-WISE AND FARM SIZE-WISE SAMPLE SIZE IN SELECTED STATES

States (1)	≤ 1 ha (2)	1-2 ha (3)	2-4 ha (4)	> 4 ha (5)	Total (6)
		Rice			
Haryana	58	79	34	29	200
Punjab	36	60	96	108	300
Uttar Pradesh	61	21	11	7	100
West Bengal	124	97	65	32	318
Total	279	257	206	176	918
		Wheat			
Rajasthan	21	100	70	102	293
Madhya Pradesh	42	16	21	21	100
Uttar Pradesh	126	41	22	11	200
Haryana	86	110	59	45	300
Punjab	36	60	96	108	300
Total	311	327	268	287	1193

Source: Field survey.

Conceptual Framework and Theoretical Model for the Study

Several economists including Dharam Narain (1961), Krishnan (1965), Krishna (1962, 1965), Bardhan (1964), Parthasarathy and Rao (1964), Dandekar (1965), Bhalerao and Lal (1965), Rao (1965), Majumdar (1965), Behrman (1966, 1968), Bardhan and Bardhan (1969), and Bardhan (1970) have written extensively on the marketed surplus during the 1950s and 1960s. The major focus of these studies was to estimate marketed surplus and its relationship with farm size holdings. The studies were based on secondary and micro-field data. However, Dharm Narain's study (1961) on the estimation of marketed surplus across different size classes of farmers for the period 1950-51 may be considered as a pioneering work in this area.

While many studies do not make a distinction between marketable and marketed surplus and the terms have been used interchangeably, but some studies make a clear distinction between these two terms. Hati (1976) defined marketable surplus as marketed surplus net of repurchases and analysed the relationship between marketable surplus of paddy and farm size for Hooghly district in West Bengal. Nadkarni (1980) in a study on marketable surplus and market dependence in a millet region of Maharashtra defined three concepts of 'market surplus'. 'Gross marketed surplus' as actually marketed quantities; the same net of repurchases was termed 'net marketed surplus'. 'Marketable surplus' represented the difference between net available output (output net of seeds plus receipts net of payments in kind) and total consumption of foodgrains (including consumption from the market). However, there are few studies (Chattopadhyay and Sen, 1988; Kumar, 1999) in the recent past which have comprehensively analysed marketable and marketed surplus issues in India.

Before examining the issue of marketed surplus and its determinants, it is important to make a theoretical distinction between the concept of 'marketed surplus' and 'marketable surplus'. The concept of marketed surplus has been used in different ways, and it is necessary to define precisely the term. In some of the earlier studies on foodgrains marketing in the developing countries, three concepts of marketed surplus have been used; gross marketed surplus, net marketed surplus and marketable surplus. For the purpose of this study, the marketable surplus has been estimated by subtracting total retention from total production. The retention consists of quantity kept for self-consumption, seed purpose, feed, and payments in kind to labourers, gifts, and others (Figure 1). Gross marketed surplus is calculated by estimating the

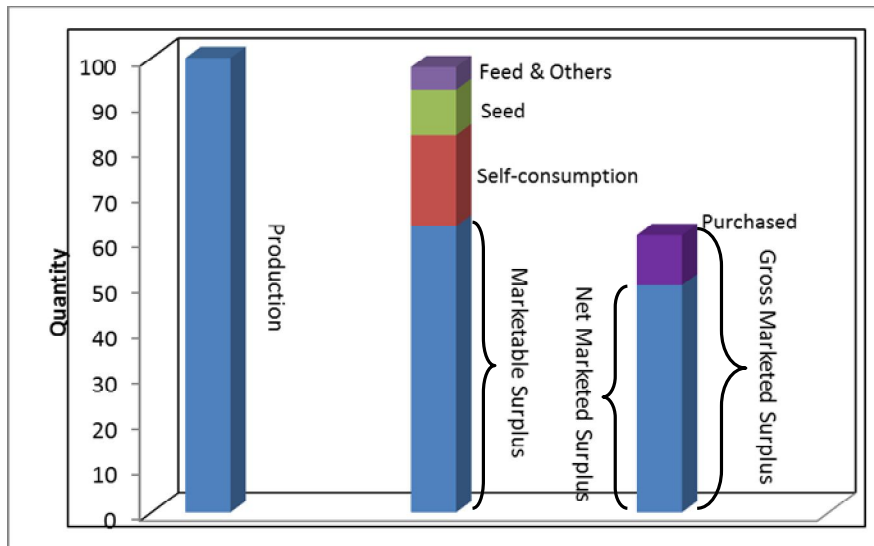


Figure 1. Concepts of Marketable and Marketed Surplus Used in the Study

total quantity of produce sold in the market without considering whether there is any buy back by those sellers later on. Net marketed surplus, on the other hand, excludes the amount of produce which is bought back. There could be five different types of farmers, (i) exclusive sellers who only sell and do not buy-back, (ii) exclusive buyers who buy and do not sell at all, (iii) net seller households whose sales are higher than purchases, (i.e. they are involved in both sales and purchases), (iv) net buyer farmers whose purchases are greater than their sales, and (v) non-participant farmers who neither sell nor buy. The net marketed surplus will be available from category (i) and (iii) farms.

The entire amount of marketable surplus, which is available for sales, may not be actually sold in the market. Therefore, marketed surplus may be more, less or equal to the marketable surplus, depending upon the socio-economic conditions of the farmers, type of the crop, access to market, etc. Since marketed surplus represents actual sales by farmers, the difference between marketable and marketed surplus can reveal several patterns of sale, purchase and stockholding by various categories of farmers. If marketable surplus is higher than marketed surplus, it indicates that stocks are held by farmers who have better retention capacity in anticipation of fetching higher prices in future period or sometimes during emergencies (Acharya and Agarwal, 2004). On the other hand, if marketed surplus and marketable surplus are equal, it indicates that farmers are not in a position to hold back their stocks as they need cash for the next crop or other purposes. The marketed surplus is higher than marketable surplus when the farmer retains a smaller quantity of the crop than actual requirements for family, farm and other needs. It holds true especially for small and marginal farmers, who sell after harvest to meet immediate cash needs and buy back later either from the market generally at higher prices or from public distribution system at subsidised prices.

Determinants of Marketed Surplus

In this section, a theoretical model of marketed surplus response function has been discussed. Many studies have observed that marketed surplus of a crop depends on various price and non-price factors. Empirical studies of marketed surplus have found that farmers respond positively to price changes, and this is consistent with economic theory. In addition to price, a number of other socio-economic, institutional, technological and infrastructural factors influence marketed surplus. Among these are, farm size, the quantity of production, family size, wealth/income, risks, access to markets, market information, etc.

A number of studies have reported that in most cases there exists a strong linear, and in some cases a non-linear relationship between the quantity sold and variables like farm size, quantity produced, family size, output prices and socio-economic and institutional variables for different categories of farmers. The linear relation may be written as:

$$MS = \alpha + \beta_i X_i$$

where, MS denotes the marketed surplus, and X_i ($i = 1, 2, \dots, n$) represents the independent variables influencing marketed surplus. The dependent variable, marketed surplus (MS), is defined as sales as a share of total output per household. The independent variables include farm size (ha), family size (numbers), awareness about minimum support price (MSP), access to regulated market, distance to market (km), per household production of the crop (in quintals), sources of off-farm income, access to institutional credit, roads, markets and market information and price received for the produce. We hypothesise that with the increase in farm size and production, higher income, better output price and access to various institutional and technological factors, marketed surplus should increase. Family size, distance from market, and lack of access to infrastructure, on the other hand, are expected to have a negative effect on the marketed surplus. We used multiple linear regression analysis to examine the impact of various factors on marketed surplus of the selected crops. The model is estimated first for each of the four major farm size categories and then for all farms combined.

III

PRODUCTION AND PROCUREMENT TRENDS

Before discussing the results of marketed surplus and its determinants, it is important to examine the major trends in production and procurement of the selected crops. We analysed the changes in area, production and yield over the last four decades and procurement during the last decade.

Rice

Rice is the most important crop in the country occupying about 43.4 million ha of the total cultivated area and having a total production of about 105.7 million tonnes (TE 2013-14). Rice had the highest contribution (14.5 per cent) to the total value of output from agriculture in TE 2012-13 and also emerged as India's top agricultural export commodity with about 15.2 per cent of the total agricultural export value in TE 2013-14 (Government of India, 2015a). Rice production in the country increased at an annual compound growth rate of 2.35 per cent during the period 1971-2012, of which yield accounted for nearly 84 per cent and area, 16 per cent of the production growth rate (Table 2). Rice production has continued to increase during the last four decades; however, rice production (4.2 per cent) and yield (3.58 per cent) recorded the highest growth rate during the 1980s and the lowest (1.86 per cent in production and 1.07 per cent in yield) during the 1990s. The growth rate of rice production and yield has improved during the last decade.

TABLE 2. TRENDS IN COMPOUND ANNUAL GROWTH RATES IN AREA, PRODUCTION AND YIELD OF SELECTED CROPS IN INDIA: 1971-72 TO 2012-13

(1)	<i>(per cent)</i>				
	1970s (2)	1980s (3)	1990s (4)	2000s (5)	All Period (6)
	Rice				
Area	0.92***	0.6	0.78***	0.08	0.36***
Production	2.58*	4.20***	1.86***	2.10***	2.35***
Yield	1.65	3.58***	1.07**	2.03***	1.96***
	Wheat				
Area	2.34***	0.36	1.40***	1.53***	0.99***
Production	4.91***	3.39***	3.11***	3.13***	3.25***
Yield	2.51***	3.02***	1.69***	1.58***	2.24***

Source: Authors' computation using Government of India (2015a) data.

***, ** and *: Significant at 1, 5 and 10 per cent level.

Rice yields, which were low (about 1.39 t/ha) during the early-1980s, witnessed a steady increase during the last three decades and reached a level of 2.4 t/ha in the recent period (TE 2013-14). However, rice yield in the country is lower compared to other major rice-producing countries such as China (6.74 t/ha), Indonesia (5.14 t/ha), and Vietnam (5.63 t/ha) as well as the world average (4.39 t/ha). At the state level, Punjab has the highest yield (3.9 t/ha), followed by Tamil Nadu (3.2 t/ha), Haryana (3.2 t/ha) and Andhra Pradesh (3.1 t/ha). Rice yields are relatively lower in eastern states such as Assam, Jharkhand, Chhattisgarh and Odisha.

Due to effective government procurement policy, rice procurement increased significantly during the last decade. Rice procurement increased from about 21 million tonnes in 2000-01 to 35 million tonnes in 2011-12 with a slight decline to 34 million tonnes in 2012-13 and 31.3 million tonnes in 2013-14. Procurement as a percentage of production has also increased during these years from about 24 per cent in 2000-01 to about 33.7 per cent in 2011-12, declined in the next three years and reached 29.9 per cent in 2013-14. It is estimated that government procures about 40 per cent of marketed surplus at the national level. This varies from less than 5 per cent in Karnataka and Assam to about 93 per cent in Chhattisgarh, Punjab (76 per cent), Andhra Pradesh (68 per cent) and Odisha (66 per cent). Large scale procurement by government drives out the private sector from the market and thus restricts competition.

Procurement of rice, which was highly concentrated in few states like Punjab (35.7 per cent), Andhra Pradesh (32.9 per cent) and Haryana (6.8 per cent) up to mid-1990s, has become more diversified after introduction of decentralized procurement policy (DCP) in 1997-98. Punjab is still the largest contributor (24.1 per cent) to total procurement in the country, and Andhra Pradesh ranks number two (22.9 per cent), but both states have lost their shares in the post-DCP period. On the other hand, DCP states like Chhattisgarh, Odisha, West Bengal, and Bihar have increased their share in rice procurement. The share DCP states, namely, Andhra Pradesh, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Odisha, Tamil Nadu, Uttarakhand, West Bengal, and Bihar, has increased significantly and crossed 50 per cent share in TE

2013-14. In Chhattisgarh, rice procurement has increased from 13.6 lakh tonnes in TE 2002-03 to 42.2 lakh tonnes in TE 2012-13. Similarly, in Odisha it has increased from 10.2 lakh tonnes to 29.8 lakh tonnes, in Bihar from less than one lakh tonnes to 12.7 lakh tonnes and in West Bengal from 2 lakh tonnes to 17.1 lakh tonnes during the same period. It is evident from procurement trends that rice procurement has become more diversified in terms of coverage of states in the post-DCP period.

Wheat

Wheat is an important staple crop and occupies about 15 per cent of the total cultivated area. Wheat acreage in the country increased from 19.1 million ha in TE 1973-74 to over 30 million ha in TE 2013-14 and production increased from 24.3 million tonnes to 94.7 million tonnes. During the same period, wheat productivity increased by about 2.5 times from 1274 kg/ha to 3146 kg/ha. Wheat production increased at an annual compound growth rate of 3.25 per cent during 1971-72 and 2012-13, and this was due to a modest area expansion (0.99 per cent) but a significant yield increase (2.24 per cent). Growth in wheat production was the highest (4.91 per cent) during the seventies, which decelerated to 3.39 per cent per year during 1980s, 3.11 per cent during the 1990s but improved marginally (3.13 per cent) during the last decade (Table 2). Yield growth rates were particularly rapid during the 1970s and 1980s. Growth in wheat yield, 2.51 per cent per year in the 1970s and 3.02 per cent per year in the 1980s, slowed down to 1.69 per cent in the 1990s and 1.58 per cent in the first decade of the 2000s. During the last two decades, acreage expansion and yield improvement contributed almost equally to growth in wheat output while yield was the primary source of growth in output during the 1980s.

Government plays an important role in wheat procurement. Wheat procurement that reached a peak of about 21 million tonnes in 2001-02 witnessed a steady decline and touched the lowest level of 9.23 million tonnes in 2006-07. India imported about 5.4 million tonnes of wheat in 2006-07 and about 1.9 million tonnes in 2007-08, which concerned the policy makers, and concerted efforts were made to increase wheat production and procurement. This led to a significant increase in wheat production as well as procurement. Wheat procurement increased from 9.2 million tonnes in 2006-07 to 37.9 million tonnes in 2012-13 while procurement as a percentage of total production increased from about 12 per cent to 40.6 per cent. In the late-1990s, wheat procurement was mainly concentrated in Punjab (58.9 per cent), Haryana (24.8 per cent) and Uttar Pradesh (10 per cent). Top three states accounted for more than 90 per cent of total procurement, making them almost a monopoly vis-à-vis other states. However, during the last decade, the share of traditional states like Punjab, Haryana and Uttar Pradesh has declined while the share of Madhya Pradesh and Rajasthan has increased. The share of Madhya Pradesh has increased from less than 2 per cent to over 24 per cent during the last decade, and it has happened primarily due to the state policy of additional bonus over the MSP and effective public procurement. The procurement trends show that wheat procurement

has diversified in terms of coverage of states but at an additional cost. The share of government procurement has been rising over the years in all wheat producing states. Madhya Pradesh has recorded the highest increase of over 30 per cent, from six per cent in TE2001-02 to 37.5 per cent in TE2011-12. These results indicate that the government has almost a monopsony in wheat procurement and restricted the participation of private sector.

IV

MARKETED SURPLUS AND DETERMINANTS OF MARKETED SURPLUS

Demographic and Socio-Economic Characteristics of Surveyed Farmers

Table 3 presents some demographic and socio-economic characteristics of the surveyed farmers. The average age of head of the household was 49.2 years in the case of rice growers and 47.7 years in the case of wheat cultivators. The average year

TABLE 3. DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS OF SAMPLE HOUSEHOLDS IN THE STUDY AREA

Characteristics (1)	Rice (2)	Wheat (3)
Age	49.2	47.7
Education (Avg. years of schooling)	7.3	7.4
Gender (per cent)		
Male	99.7	99.3
Female	0.3	0.7
Family Size	6.7	11.4
Main occupation (per cent)		
Crop farming	97.9	97.0
Dairy	0.1	0.1
Service	1.4	2.6
Others	0.6	0.3
Social groups (per cent)		
Scheduled cast	7.3	6.9
Scheduled tribe	0.4	0.8
Other backward classes	16.0	38.0
General and others	76.3	54.4
Total operational holding size (ha)	1.80	6.28
Irrigated	1.75	6.22
Unirrigated	0.05	0.06
Awareness about MSP (per cent)	90.5	72.7
Awareness about futures trading (per cent)	1.3	1.6
Access to credit (per cent)	66.9	54.2
Distance to market (km)	5.3	9.8
Main sources of information (per cent)		
Traders	36.4	30.2
Print media	15.3	24.2
Electronic media	12.2	14.1
APMC mandis	8.9	18.9
Access to market		
Regulated	61.1	51.4
Unregulated	38.9	48.7

Source: Author's computations from survey data.

of schooling was little over seven years. Almost all sample households were male-headed, and over 97 per cent of the households had crop farming as main occupation. The average family size varied from about seven members in case of rice farmers to over 11 in case of wheat producers. About three-fourth of rice farmers and over half of wheat belonged to General category. The average operational holding size was significantly higher (6.28 ha) in case of wheat producers than rice farmers (1.80 ha). More than 90 per cent of rice farmers were aware of MSP while in case of wheat 72.7 per cent of surveyed farmers knew about the MSP. Awareness about futures markets was extremely low. More than two-third of rice farmers and 54.2 per cent wheat farmers received credit from formal financial institutions to finance their farm operations. The average distance to market varied from 5.3 km in the case of rice producers to 9.8 km on wheat farmers. Traders were the primary source of information to farmers, and other important sources of information included print and electronic media and APMC mandis. More than 61 per cent of rice farmers and 51.4 per cent wheat farmers had access to regulated markets. These results clearly indicate that rice producers have slightly better access to markets, credit, public procurement and other infrastructure.

Rice

Rice production, sales and retention pattern on the sample households are presented in Table 4. The table shows that production and sales per farm are directly related to farm size. However, the same relationship does not hold true for total retention. The average retention for home consumption was the lowest (13.7 quintals) on marginal farms (≤ 1 ha), followed by farms having area more than 4 ha (20.5 quintals). The possible reason for relatively lower retention for self-consumption on large farms could be that all large farmers in the sample were from Punjab and Haryana, where rice is not a staple food, and therefore farmers do not keep large quantities for self-consumption. The average total farm retention (self-consumption, seed, and other purposes) was 14.5 per cent but varied from 7.4 per cent on large farms to 35.3 per cent on marginal farms. In the case of states, average farm retention was less than one per cent in Punjab and the highest (37.4 per cent) in West Bengal because rice is an essential part of the daily diet in the state particularly in rural areas, accounting for about one-fourth of the total food expenditure. More than 90 per cent of the total retention was for self-consumption. The average quantity of net payments in kind was higher in West Bengal, where large farms lease-in land for cultivation, which increases the payments in kind for wage payments and land rent to the lessor farmers. It is interesting to note that farmers in West Bengal purchased rice for self-consumption from the market. Since farmers need cash for next crop and other requirements, they (particularly small and marginal farmers) are forced to sell part of the produce after harvest and buy at a later date at a higher price. However, in

some cases, farmers sell their produce in the market at MSP and buy back later from the public distribution system at much lower price.

TABLE 4. RICE PRODUCTION, SALES AND RETENTION PATTERN ON SAMPLE HOUSEHOLDS

Farm size/ State (1)	Production (2)	Sales (3)	Self-consumption		Seed (6)	Feed (7)	Others* (8)	Total retention (4+6+7+8) (9)
			Retention (4)	Purchased (5)				
			<i>(quintal)</i>					
≤ 1 ha	41.6	26.2	13.7	1.4	0.2	0.5	0.4	14.7
1-2 ha	87.8	65.0	21.9	1.6	0.4	0.6	0.3	23.2
2-4 ha	151.0	122.2	27.4	1.6	0.5	0.4	0.4	28.7
> 4 ha	307.4	246.8	20.5	1.1	1.2	0.3	0.6	22.7
All farms	152.9	119.3	20.6	1.4	0.6	0.5	0.4	22.1
States								
Haryana	74.0	48.6	0.7	0.3	1.4	0.0	0.0	2.1
Punjab	233.3	231.9	0.6	0.0	0.2	0.2	0.5	1.5
Uttar Pradesh	70.8	53.7	12.4	0.0	0.5	1.4	2.3	16.3
West Bengal	152.7	108.7	55.3	3.9	0.5	0.7	5.7	57.1

Source: Field survey, 2011-12. * Others include payments in kind.

Table 5 presents average marketable and marketed surplus statistics for different farm size groups and States. A positive marketable surplus indicates that the household is a net seller of rice, and a negative marketable surplus indicates that the household is a net buyer. Hence, as the table shows, the average household is a net seller of rice in the study area. The survey findings show that more than 85 per cent of the total output produced in the selected states is offered as marketable surplus. The share of small (1-2 ha) and marginal farmers (≤1 ha) fall much below the average while the proportion of large farms (>4 ha) is higher than the average. It is also evident that marketable surplus increased in direct proportion to the size of holding. In the case of marginal farmers, more than one-third of total production is kept for self-consumption.

TABLE 5. AVERAGE MARKETABLE SURPLUS AND GROSS AND NET MARKETED SURPLUS OF RICE ON DIFFERENT CATEGORIES OF HOUSEHOLDS

Farm size/ State (1)	Marketable surplus		Gross marketed surplus		Net marketed surplus	
	Quantity (quintal) (2)	Per cent of total production (3)	Quantity (quintal) (4)	Per cent of total production (5)	Quantity (quintal) (6)	Per cent of total production (7)
	<i>(quintal)</i>					
≤ 1 ha	26.9	64.7	26.2	63.0	24.8	59.6
1-2 ha	64.6	73.6	65.0	74.0	63.4	72.2
2-4 ha	122.3	81.0	122.2	80.9	120.6	79.9
> 4 ha	284.7	91.8	246.8	81.3	245.7	80.9
All farms	130.8	85.5	119.3	78.0	117.9	77.1
States						
Haryana	67.4	95.5	67.4	95.5	67.1	95.1
Punjab	231.8	99.4	231.9	99.4	231.9	99.4
U.P.	54.5	77.0	53.7	75.8	53.7	75.8
West Bengal	95.6	62.6	61.8	40.5	57.9	37.9

Source: Field survey, 2011-12.

The entire amount of marketable surplus, which is available for sales, may not be sold in the market. Therefore, there may be a considerable gap between marketable and marketed surplus due to various reasons. The results presented in Table 5 show that marketable surplus was the highest on large farms (91.8 per cent) and the lowest on marginal farms (64.7 per cent). In case of states, Punjab had the highest marketable surplus (99.4 per cent), followed by Haryana (95.5 per cent) and the lowest (62.6 per cent) in case of West Bengal. The gross marketed surplus (sales as a proportion of production) among the three groups of farms is marginally lower than marketable surplus with large farms having the highest rate of surplus (81.3 per cent of total output), followed by farmers having 2-4 ha farm size (80.9 per cent) and marginal farms (63 per cent). It indicates that stocks are held large farmers to be sold in the market when crop prices rise in future. The net marketed surplus is, however, lower than gross marketed surplus on all farm sizes but higher on marginal and small farms. The possible reason for this gap is that small and marginal farms sell their produce just after the harvest to meet credit requirements of the next crop and then buy back at a later date.

A comparison of the share of respective groups in the total marketed surplus shows that the marginal farmers contribute the minimum quantity (5 per cent), whereas large farms (>4 ha) offer the highest share of marketed surplus accounting for about 59.3 per cent of total marketed surplus. The share of small and marginal farmers in total output was about 20.4 while their share in the marketed surplus was only 16.9, which indicate that small farmers retain relatively large quantity for self-consumption and other purposes (Table 6). It is interesting to note that share of small and marginal farmers in total production and the marketed surplus was higher than their share in total area under rice. The first three categories of farmers together constitute around 37 per cent of the area but contribute 45.6 per cent of total output and 40.7 per cent of marketed surplus in the study area. The data also shows that proportion of farmers having marketed surplus among all groups of farms is quite high (96.8 per cent on small farms (1-2 ha) to 100 per cent on farms with >4 ha land). As Table 6 shows, Punjab and Haryana farmers are highly commercialised, producing a very high proportion (>97 per cent) of rice output for the market. West Bengal farmers, on the other hand, retain about one-third of their output for self-consumption. However, farmers' market participation was quite high in all states and varied from 94.7 per cent in West Bengal to 100 per cent in Punjab and Haryana.

The distribution of farmers presented in Table 7 show that about half of the sample farmers in West Bengal sold less than 60 per cent of the total output in the market while in Punjab (99.3 per cent) and Haryana (97.5 per cent), majority of the farmers sold more than 90 per cent of the produce in the market. In Uttar Pradesh, about 41 per cent of the farmers sold 70-80 per cent of produce in the market. These results clearly show that the level of market participation is very high in Punjab and Haryana compared with West Bengal and Uttar Pradesh.

TABLE 6. MARKET PARTICIPATION BY RICE PRODUCERS BY SIZE OF FARM

Farm size (1)	Share of output (2)	Share of marketed surplus (3)	Share of area operated (4)	(per cent)
				Proportion of farmers who sold (5)
≤ 1 ha	6.6	5.0	4.3	98.2
1-2 ha	13.8	11.9	10.7	96.8
2-4 ha	25.2	23.8	22.0	97.5
> 4 ha	54.4	59.3	63.0	99.6
All farms	100.0	100.0	100.0	98.0
States				
Haryana	10.5	12.0	39.5	100.0
Punjab	49.9	57.8	38.5	100.0
Uttar Pradesh	5.1	4.9	4.5	99.5
West Bengal	34.5	25.3	17.5	94.7
All	100.0	100.0	100.0	98.0

Source: Field survey, 2011-12.

TABLE 7. DISTRIBUTION OF GROSS MARKETED SURPLUS IN SELECTED STATES

Quantity sold (1)	Punjab (2)	Haryana (3)	Uttar Pradesh (4)	West Bengal (5)	All (6)
<60 per cent	0.0	0.5	4.0	48.7	17.4
60-70 per cent	0.0	0.0	26.0	6.3	5.2
70-80 per cent	0.3	0.5	41.0	11.0	8.4
80-90 per cent	0.4	1.5	18.0	11.9	6.5
90-100 per cent	99.3	97.5	11.0	22.1	62.5

Source: Field survey, 2011-12.

Access to Market

Smallholder farmers face various marketing constraints that can either increase marketing costs or market risks associated with market access and market information. High marketing costs are mainly due to inadequate transportation facilities, lack of reliable and timely market information, lack of competitive markets, etc. It is evident from Table 8 that about one-third of the total marketed surplus was procured by government agencies, followed by private traders (30.2 per cent) and processors (27.5 per cent). Large farmers sold about 71.4 per cent of marketed surplus to government agencies while small farmers sold about 30.2 per cent to government agencies. The price paid by private traders and processors was lower than the price paid by public agencies. However, large farmers received relatively higher price from private traders compared with other farm sizes, showing their better bargaining power compared with small and marginal farmers, who received lower prices than large farmers.

However, there are significant inter-state variations in market access. For example, due to effective government procurement in Punjab and Haryana, more than 96 per cent of the total marketed surplus of sample farmers was purchased by the government agencies. In contrast, in West Bengal more than two-third of the total

TABLE 8. SALE PATTERN BY TYPE OF BUYER AND PRICE RECEIVED (RS./QUINTAL) IN SELECTED HOUSEHOLDS

Farm size/State (1)	Government agencies		Private trader		Processor/Miller		Others	
	Share (per cent) (2)	Price (Rs./qtl) (3)	Share (per cent) (4)	Price (Rs./qtl) (5)	Share (per cent) (6)	Price (Rs./qtl) (7)	Share (per cent) (8)	Price (Rs./qtl) (9)
≤ 1 ha	39.1	1011	35.7	808	25.2	1080	0.0	0
1-2 ha	30.2	1085	32.0	827	37.8	1047	0.0	0
2-4 ha	25.3	1095	24.9	829	32.0	976	17.8	900
> 4 ha	36.9	1098	26.7	878	27.2	1000	9.2	902
All farms	33.2	1077	30.2	842	27.5	1032	14.4	873
State								
Haryana	96.8	-	-	-	3.2	-	-	-
Punjab	99.2	1110	0.1	1090	0.7	1063	-	-
Uttar Pradesh	61.7	-	38.3	-	-	-	-	-
West Bengal	0.7	1080	68.4	824	30.2	1023	0.7	873

Source: Field survey, 2011-12.

output marketed was sold to village-level traders, and less than 1 per cent of the marketed surplus was procured by government agencies. The rice millers purchased about 30 per cent of the output produced by the farmers but it must be mentioned here that the share of sale to rice miller does not reflect the actual picture over time in case of West Bengal. The rice mills purchased less than 5 per cent of the surplus directly from the farmers and mainly larger farms. It was only during the year 2011-12 that the mills were forced to purchase specified quantities directly from the farmers at MSP under the new government regulations, which led to higher prices paid by rice millers compared with village-traders (Sarkar *et al.*, 2013). It is also worth noting that the prices received by farmers in Punjab were higher than West Bengal under all channels. Even in Punjab, the price paid by traders and processors was below the price paid by government agencies.

Determinants of Marketed Surplus of Rice

A multiple linear regression model was used to analyse the factors affecting marketed surplus. The analysis focuses on the role of household characteristics and various institutional, economic and infrastructure variables like access to market and market information, output price, access to roads, awareness about price support programme, credit availability, etc. on marketed surplus. The dependent variable is marketed surplus as a percentage of total output per household.

The estimated regression parameters of the marketed surplus model are shown in Table 9. All the variables except family size have positive sign, and most are statistically significant, indicating that they have a positive impact on marketed surplus. The relationship between farm size and marketed surplus is positive and statistically significant, suggesting that with an increase in farm size, marketed surplus ratio also increases. The existence of an inverse relationship between family size and marketed surplus shows that higher the household family size, the lower was

the marketed surplus of rice. The results also show a significant effect of price of crop on marketed surplus. The higher the price of rice, the larger was the marketed surplus. The elasticity of marketed surplus of rice to its price is about 0.08, implying that a 1 per cent higher price is likely to induce a 0.08 per cent larger marketed surplus. Household's awareness of minimum support price (MSP) has a positive and significant impact on marketed surplus, and so do access to regulated markets. This is highly plausible, as given better access to regulated markets and procurement agencies; farmers will sell more quantity. The access to institutional credit has a significant positive influence on marketed surplus of rice. In sum, our analysis confirms the significant positive effect of price, farm size, procurement price, access to market and institutional credit on marketed surplus of rice. Family size matters and has a negative but statistically non-significant impact on marketed surplus.

TABLE 9. FACTORS INFLUENCING MARKETED SURPLUS OF RICE

Factor (1)	Coefficient (2)	Standard error (3)	't' value (4)	Relative Rank (5)
Constant	-14.4340***	3.3275	-4.3378	-
Farm size	0.5659***	0.1243	4.5520	4
Family size	-0.0470	0.1718	-0.2738	6
Price received	0.0838***	0.0028	30.4431	1
Awareness about MSP	3.5945*	2.0615	1.7436	5
Access to regulated market	6.4390***	1.3174	4.8875	3
Access to credit	7.1754***	1.3096	5.4789	2
R ²	0.58***			

*** and *: Statistically significant at 1 and 10 per cent level, respectively.

The relative importance of factors influencing marketed surplus as measured by standardised regression coefficients indicated that the price received by the farmers was the most important factor, followed by access to credit and regulated markets, farm size and awareness of MSP. The family size turned out to be the least important variable in influencing marketed surplus of rice. One of the main reasons could be low preference of consumers for rice particularly in Punjab and Haryana, thereby less retention for self-consumption.

Wheat

The average production of wheat per household was the highest (163.3 quintal) on larger farms, followed by medium (76.1 quintal), small (36.2 quintal) and the lowest (21.6 quintal) on marginal holdings (Table 10). Almost a similar trend was observed in the case of sales and retention. At the household level, average farm retention (self-consumption, seed, and other purposes) was 15.3 per cent of the total production but varied from 12.7 per cent on larger farms to 33.3 per cent on marginal farms. About 60 per cent of the total retention was for self-consumption, followed by for seed (21.4 per cent) and feed purpose (12.9 per cent). The retention for self-consumption was the highest (81.9 per cent) on marginal farms and the lowest (51.4 per cent) on larger

farms. It is interesting to note that farmers bought wheat from the market for self-consumption, and the share was higher in case of marginal (14.5 per cent of total consumption) and small (7 per cent) farmers. Since small and marginal farmers have low holding capacity, need cash for next crop and other requirements and have poor access to institutional credit, they are forced to sell immediately after harvest and buy at a later date at a higher price. However, there is also a counter argument that farmers sell their produce at MSP and buy from the PDS, where it is available at a much lower price.

TABLE 10. AVERAGE WHEAT PRODUCTION, SALES AND RETENTION PATTERN ON SAMPLE HOUSEHOLDS

Farm size (1)	Production (2)	Self-consumption		Seed (5)	Feed (6)	Others (7)	Total Retention (3+5+6+7) (8)
		Retention (3)	Purchased (4)				
≤ 1 ha	21.6	5.9	1.0	0.6	0.6	0.1	7.2
1-2 ha	36.2	6.6	0.5	0.9	1.0	0.3	8.8
2-4 ha	76.1	8.6	0.3	1.9	1.7	0.5	12.8
> 4 ha	163.3	10.7	0.1	5.8	2.9	1.4	20.8
All farms	91.4	8.5	0.4	3.0	1.8	0.8	14.0
States							
Haryana	97.4	7.3	0.0	2.2	4.7	1.3	16.7
Punjab	203.0	12.7	0.0	3.1	3.3	1.1	20.2
Uttar Pradesh	44.6	8.7	0.0	1.1	1.1	0.1	11.0
Madhya Pradesh	210.6	15.8	4.5	18.2	6.1	12.1	52.3
Rajasthan	47.5	14.9	2.8	1.1	1.7	0.7	18.4

Source: Field survey, 2011-12.

Madhya Pradesh had the highest output per farm (210.6 quintal), followed by Punjab (203 quintal) and the lowest (44.6 quintal) in case of Uttar Pradesh. On an average, about 39 per cent of the total output was retained for domestic use in Rajasthan, while in Punjab only 10 per cent of the produce was retained for domestic use. The share of total production for self-consumption was the highest (81 per cent) in Rajasthan and the lowest (30.2 per cent) in Madhya Pradesh. Wheat growers in Madhya Pradesh kept more than one-third of the total produce for seed purpose because seed replacement rate is lower in the state compared with other states. In case of Punjab and Haryana, a higher share of produce was kept for feed purpose as these states are leading milk producing states.

Table 11 presents the average marketable and marketed surplus of wheat on sample households. The results show that average marketable surplus was 83 per cent of the total output in the selected states. The share of marketable surplus on marginal farms (64.8 per cent) and small farms (72.2 per cent) is much below than the average while the proportion of larger farmers (85.4 per cent) is higher than the average. It is also evident that marketable surplus increased in direct proportion to the size of land holding. In the case of marginal farmers, a greater share of production is kept for self-consumption. The data also shows that there is a small gap between marketable and

marketed surplus on different size of land-holdings. The gross marketed surplus (sales as a proportion of production) on marginal farms is lower (61.2 per cent) than marketable surplus (64.8 per cent). The marketed surplus was the highest on larger farms and the lowest on marginal farms. The net marketed surplus as shown in the Table is, however, lower than the gross marketed surplus on marginal and small farms. On the other hand, the gross and net marketed surplus ratios are the same on medium and larger farms. The gap between gross and net marketed surplus on small and marginal farms is due to the fact that small and marginal farmers sell their produce after the harvest to meet their financial requirements for the next crop and other social obligations and buy from the market and/or PDS in future.

TABLE 11. AVERAGE MARKETABLE SURPLUS AND GROSS AND NET MARKETED SURPLUS OF WHEAT ON DIFFERENT CATEGORIES OF HOUSEHOLDS

(1)	Marketable surplus		Gross marketed surplus		Net marketed surplus	
	Quantity (quintal) (2)	Per cent of total production (3)	Quantity (quintal) (4)	Per cent of total production (5)	Quantity (quintal) (6)	Per cent of total production (7)
≤ 1 ha	15.9	64.8	15.0	61.2	13.8	56.3
1-2 ha	33.0	72.2	31.7	69.4	30.6	66.9
2-4 ha	76.2	79.9	74.0	77.7	73.5	77.1
> 4 ha	211.6	85.4	206.3	83.3	206.1	83.3
All farms	100.9	83.0	98.1	80.7	97.4	80.1
State						
Haryana	81.1	82.9	81.1	82.9	81.1	82.9
Punjab	182.8	90.1	182.8	90.1	182.8	90.1
Uttar Pradesh	26.6	68.6	25.2	65.1	25.2	65.1
Madhya Pradesh	158.3	75.2	173.9	82.6	169.4	80.4
Rajasthan	29.6	61.6	26.1	54.3	23.2	48.4

Source: Field survey, 2011-12.

It is interesting to note that marketable and marketed surplus ratios are same in the case of Punjab and Haryana while, in Uttar Pradesh and Rajasthan, marketed surplus is lower than the marketable surplus. This indicates that the farmers may be holding stocks due to low prices just after harvest because of the weak procurement system in the states and sell in the market, either when crop price rises in future or during emergencies. In case of Madhya Pradesh, gross marketed surplus (82.6 per cent) is higher than marketable surplus (75.2 per cent). In Madhya Pradesh and Rajasthan, net marketed surplus is lower than gross marketed surplus thereby indicating that farmers sell their produce just after harvest due to high prices (state government bonus over and above MSP) and buy from the public distribution system at lower prices. The gross marketed surplus was the highest (90.1 per cent) in Punjab, followed by Haryana (82.9 per cent), Madhya Pradesh (82.6 per cent) and the lowest (54.3 per cent) in Rajasthan. A similar trend was also observed in the case of net marketed surplus.

The share of various farm size groups in total output, marketed surplus, and area operated as well as farmers' participation in wheat marketing is given in Table 12.

The results show that about two-third of the total output of sample households was contributed by medium and large farms while marginal farmers contributed about 5 per cent. A comparison of the shares of respective farm size groups in the total marketed surplus shows that marginal farmers contribute the lowest quantity (4.1 per cent), whereas larger farms offered the highest share of marketed surplus accounting for about 69 per cent of the total marketed surplus. The share of small, marginal and medium farmers in total output as well as marketed surplus was higher than their share in total area under the crop. More than 96 per cent of sample households participated in the marketing of wheat and there was no significant difference among various farm categories. These results show that all farmers including small and marginal farmers have access to markets and the main reason for market access is effective government procurement system of wheat in all the selected states.

TABLE 12. MARKET PARTICIPATION BY WHEAT PRODUCERS BY SIZE OF FARM

Farm size (1)	Share of output (2)	Share of marketed surplus (3)	Share of area operated (4)	(per cent)
				Proportion of farmers who sold (5)
≤ 1 ha	5.0	4.1	2.7	96.4
1-2 ha	9.7	8.5	8.2	95.4
2-4 ha	19.0	18.4	17.3	96.3
> 4 ha	66.4	69.0	71.7	96.5
All farms	100.0	100.0	100.0	96.2
States				
Haryana	21.6	21.4	36.6	100.0
Uttar Pradesh	7.7	7.2	4.9	100.0
Punjab	45.0	48.4	23.6	99.7
Rajasthan	15.5	14.7	11.7	100.0
Madhya Pradesh	10.3	8.2	23.2	84.6
All	100.0	100.0	100.0	96.2

Source: Field survey, 2011-12.

Among various states, Punjab had the highest share in wheat output as well as in marketed surplus, followed by Haryana. The proportion of farmers selling wheat was lower in Madhya Pradesh compared with other states, where it was almost 100 per cent. The distribution of farmers presented in Table 13 shows that about 90 per cent of Punjab wheat producers and 70 per cent of producers in Haryana sold more than 70 per cent of the total output. On the other hand, less than 40 per cent of farmers in Rajasthan sold more than 70 per cent of their produce. Nearly 48 per cent of the farmers in Rajasthan sold less than 60 per cent of the total wheat produced and retained more than half of production, while this share was very low in Punjab (3 per cent), Haryana (13.7 per cent) and Madhya Pradesh (14 per cent). These findings show that the level of market participation was very high in Punjab, Haryana and Uttar Pradesh compared with Rajasthan.

TABLE 13. DISTRIBUTION OF GROSS MARKETED SURPLUS IN SELECTED STATES

Quantity sold (1)	Punjab (2)	Haryana (3)	Uttar Pradesh (4)	Rajasthan (5)	Madhya Pradesh (6)	All (7)
<60 per cent	3.0	13.7	19.0	47.9	14.0	20.3
60-70 per cent	7.3	16.3	17.5	15.1	25.0	14.7
70-80 per cent	14.7	32.0	37.5	21.2	46.0	27.1
80-90 per cent	39.3	30.3	23.0	12.3	15.0	25.7
90-100 per cent	35.7	7.7	3.0	3.4	0.0	12.2

Source: Field survey, 2011-12.

Marketing Pattern by Type Buyer

Farmers' access to different markets varies widely across states and farm categories, as shown by the results from the survey data in Table 14. More than 63 per cent of total marketed surplus was procured by government agencies, followed by private traders (20.4 per cent) and less than 5 per cent by millers/processors (Table 15). Larger farmers sold higher share of marketed surplus to government agencies while small farmers sold about 25.3 per cent to government agencies. The price paid by private traders and processors was lower than the price paid by public agencies. However, larger farmers received higher price from private traders compared to small and marginal farmers, thereby indicating that large farmers have better bargaining power compared with small and marginal farmers.

TABLE 14. SALE PATTERN BY TYPE OF BUYER ON SELECTED HOUSEHOLDS

Farm size (1)	Government agencies		Private trader		Processor/Miller		Others	
	Share (per cent) (2)	Price (Rs./qtl) (3)	Share (per cent) (4)	Price (Rs./qtl) (5)	Share (per cent) (6)	Price (Rs./qtl) (7)	Share (per cent) (8)	Price (Rs./qtl) (9)
≤ 1 ha	25.3	1262	17.4	1204	20.0	1285	37.4	1285
1-2 ha	71.6	1307	28.4	1225	-	-	-	-
2-4 ha	78.7	1299	21.3	1227	-	-	-	-
> 4 ha	74.2	1320	16.6	1294	-	-	9.2	1031
All farms	63.2	1298	20.4	1243	4.8	1285	11.6	892

Source: Field survey, 2011-12.

Determinants of Marketed Surplus

The estimated regression parameters of the marketed surplus model are shown in Table 15. As expected, variables like farm size, price, awareness about MSP, access to regulated market and institutional credit have positive sign while family size has a negative sign. All variables included in the model are statistically significant, indicating that they significantly influence marketed surplus. The relationship between farm size and marketed surplus is positive and statistically significant, suggesting that with an increase in farm size, marketed surplus ratio also increases.

TABLE 15. FACTORS INFLUENCING MARKETED SURPLUS OF WHEAT

Factor (1)	Coefficient (2)	Standard error (3)	't' value (4)	Rank (5)
Constant	-7.9928***	2.3813	-3.3564	-
Farm size	1.5113***	0.1422	10.6277	3
Family size	-0.8261***	0.1253	-6.5945	6
Price received	0.0524***	0.0018	28.8059	1
Awareness about MSP	12.5935***	1.1619	10.8386	2
Access to regulated market	7.5619***	0.9734	7.7689	4
Access to credit	6.5789***	1.0144	6.4856	5
R ²	0.60			

***: Statistically significant at 1 per cent level.

The existence of an inverse relationship between family size and marketed surplus shows that, bigger the family size, the lower was the marketed surplus and therefore, higher retention for self-consumption and other purposes. Farmers retained a significant portion of produce for self-consumption as wheat is the main staple food in these states. The results show that wheat price has a positive and significant impact on marketed surplus. The higher the price of wheat, the larger was the marketed surplus. Awareness of minimum support price (MSP) and access to regulated markets had positive and significant impact on marketed surplus. Improved access to regulated markets, procurement agencies and a higher price will encourage farmers to sell more quantities in the market. Access to institutional credit was also an important determinant and had positive impact on marketed surplus of wheat. The above results clearly indicate a positive effect of price, farm size, market access, access to institutional credit and a significant negative impact of family size on marketed surplus of wheat.

The relative importance of factors influencing marketed surplus as measured by standardised regression coefficients indicated that the price received by farmers was the most important factor, followed by awareness of MSP, farm size, access to regulated market and institutional credit. Family size was the least important variable in influencing marketed surplus of wheat.

However, juxtaposing these results with earlier studies on the marketed surplus of foodgrains by Bardhan and others during the 1960s and 1970s, gives interesting insights. They found a negative impact of grain prices on marketed surplus, indicating that farmers may not necessarily market more grains when grain price goes up. However, in this study we found that marketed surplus has positive response to output prices and total output on all farm categories. The positive nature of the percentage of marketed surplus to output prices and total output is a clear indication of the fact that these crops are treated as a cash crop even by the small and marginal farm holdings. What is also important to note is that small and marginal farmers, who were net purchasers of foodgrains, have become net sellers of grains and volume of marketed surplus has also gone up.

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SUMMARY OF FINDINGS AND CONCLUSIONS

In this paper, we estimate marketable and marketed surplus of rice and wheat and analyse factors affecting marketed surplus based on data collected from about 918 rice producers and 1193 wheat growers in main producing states. The results indicate that procurement of rice, which was highly concentrated in few states, has become more diversified after introduction of decentralized procurement policy (DCP) in 1997-98. The share of decentralized procurement states (DCP) has increased significantly and crossed 50 per cent share in TE 2013-14. In case of wheat, Punjab, Haryana and Uttar Pradesh, which accounted for more than 90 per cent of total procurement, have lost their share in total procurement while Madhya Pradesh and Rajasthan increased their share in total procurement. Wheat procurement has become little more diversified in terms of coverage of states but at an additional cost, particularly in Madhya Pradesh and Rajasthan. These trends clearly indicate that the government has almost a monopsony in rice and wheat procurement and restricted the participation of private sector.

The results of marketed surplus show that about 78 per cent of total rice production was sold in the market and varied from about 63 per cent on marginal farms to about 81 per cent on medium and larger farms. It was found that marketed surplus was lower than marketable surplus in case of large farms (>4 ha), indicating that these farmers retain some of surplus produce hoping that they will get higher prices in future. Net marketed surplus was marginally lower than gross marketed surplus in case of all farm sizes but difference was higher in case of marginal and small farms, indicating that these farmers retain smaller quantity of output than actual requirement. The possible reasons could be that they need cash immediately for next crop season or other social obligations while in some cases farmers sell output at MSP and buy from PDS at much lower price. In case of wheat, average marketed and marketable surplus were 80.7 per cent and 83 per cent, respectively. The net marketed surplus was lower than gross marketed surplus on small and marginal farmers, indicating forced sale. The proportion of farmers who sold produce, a measure of market participation, was very high, with 98 per cent of rice growers and over 96 per cent of wheat growers selling their output.

The results of regression analysis suggest that marketed surplus depends on the price of the crop. Besides this, the factors that influence farmer's decision to increase marketed surplus include awareness of MSP, farm size, access to regulated markets, institutional credit and family size. Among these variables, family size had a negative impact on marketed surplus, indicating that if family size is big, the quantity of food crops to be consumed by the family members will be relatively higher and marketed surplus will be relatively lower. Understanding marketed surplus behaviour of producer can help in designing appropriate policies, technology choices and

institutions to facilitate the development of agriculture. The findings of this paper point to some important policy implications. One, access to markets and price information has significant impact on marketed surplus, therefore, provision of better access to timely information about prices and a competitive market structure by liberalizing agricultural markets are important for increasing marketed surplus. Two, easy access to institutional credit and proper storage at farm household level would reduce forced distress sale.

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NOTES

1. Figures in parentheses show share of the State in total production of a crop during triennium ending 2013-14.

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ANNEXURE 1. LIST OF SELECTED DISTRICTS

(1)	Selected state (2)	Selected districts (3)
Rice	Haryana	Karnal
	Punjab	Gurdaspur, Sangrur and Ferozpur
	Uttar Pradesh	Shahjahanpur and Barabanki
	West Bengal	Burdwan, Birbhum and Murshidabad
Wheat	Rajasthan	Alwar, Chittorgarh, Churu, Hanumangarh and Udaipur
	Madhya Pradesh	Hosangabad
	Uttar Pradesh	Shahjahanpur, Barabanki, Agra and Budaun
	Haryana	Karnal and Bhiwani
	Punjab	Gurdaspur, Sangrur and Ferozpur