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EMPIRICAL ESTIMATION OF MARKETED SURPLUS OF RICE IN BANGLADESH: A CRITICAL REVIEW*

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ABSTRACT

Understanding marketed surplus and marketing behaviour of producers helps design technology, policy and institutions to facilitate the process of commercialization of agriculture. In this paper, empirical studies on marketed surplus of rice have been reviewed with a focus on the concepts and methods used, their strengths and weaknesses, and some recommendations have been made to improve estimation methodology in future studies.

I. BACKGROUND

The flow of food grains and prices in the market will depend on marketed surplus of producers and their marketing patterns as well as the stocking and marketing behaviour of traders. Marketed surplus of food grain among smallholder producers is of interest to researchers and policy makers because market participation is essential for farmers for raising farm income and welfare. Also adequate regular supply of food grain in the market is essential to keep food prices at affordable levels for consumers. As the economy develops, number and proportion of population engaged in agriculture usually decline though the size of the overall population increase. Consequently, food grain producers need to produce not only enough for themselves but also for an expanding non-producing consumer in both rural and urban areas so that dependence on import or aid can be avoided or at least minimized. On the other hand, if surplus above national food need is produced, then there will be scope for export of food grain to raise both producers' and national income. Understanding marketed surplus and marketing behaviour of producers helps design technology, policy and institutions to facilitate the process of commercialization of agriculture.

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Literature on food grain marketing in Bangladesh is very thin compared to those on food grain production. Few studies that were conducted on food grain marketing addressed questions of the extent of marketed surplus, extent of competition and efficiency in the market, the degree of market integration and informational inefficiency, and the role of pre-harvest credit on marketing behaviour of producers. These studies were conducted at different points in time and used varieties of concepts and estimations procedures, so the results from different studies are not easily comparable. Some of the studies have been published and widely circulated, while a number of others have remained unpublished, hence beyond the reach of ordinary researchers. In view of the above, this paper presents a review of the available evidence on marketed and marketable surplus of rice with a focus on the concepts and methods used, and the trend and pattern of marketing, and identifies methodological gaps, if any, that might be overcome in further research.

The paper is organized as follows. First, standard definitions of marketed and marketable surplus used in the marketing texts and literature are presented. Then applications of these concepts in various studies in Bangladesh are critically reviewed. Summary of findings and recommendations on methodology are presented at the end.

II. DEFINING MARKETED AND MARKETABLE SURPLUS

In the past, smallholder subsistence oriented producers in Bangladesh as elsewhere in the developing countries used to produce food grain primarily for home consumption and for selling any surplus to earn cash income.' Smallholders' preference for home produced food emanated from their efforts to avoid market risks, especially risks of possible high price in the off season when they needed to buy food. However, production and market participation increased over time with introduction of improved technologies which contributed to increase income and welfare of producers as well as consumers. In theory, a fully market oriented farmer may produce anything that is profitable, and buy food grain from the market.

In some of the early studies on food grain marketing in South Asia as elsewhere in the developing countries, three concepts of marketed surplus are generally found - gross marketed surplus, net marketed surplus and marketable surplus (see for example Narain,1961; Krishna,1962; Krishnan,1965; Raquibuzzaman,1966; Sharma and Gupta,1970; Farruk,1970; Bhargava and Rustogi, 1972; Rahman, 1980; Harriss, 1982; Hussein and Rajbanshi, 1985).

Gross marketed surplus has been generally defined as sales as a share of current gross output. But sometimes, rather than gross output, net output after deduction for `seed, feed and waste' has been used as the base. The logic behind this deduction is that in smallholder production systems, most producers have to depend on own seed as seed market is not well developed, and there is some on-farm wastage due to storage, processing and other reasons, and some

[1]Wharton Jr (1963) distinguished three different meanings of subsistence. Subsistence production - production only for home consumption; subsistence consumption - level of consumption equivalent to minimum biophysical needs; subsistence income - a level of income that allows subsistence level of living. Thus a farmer may participate in the market yet enjoy only subsistence level income or consumption.

grains, especially low quality ones, may be fed to livestock, which are an essential component of smallholder mixed farming systems. So a portion of the gross output is usually not available for sale, hence marketed surplus is estimated as a ratio of output net of these requirements.

Net marketed surplus is usually calculated as sales minus purchases as a share of gross or net output. Marketing studies have shown that smallholder producers may sell because they have a surplus over family needs for consumption but some producers also sell as well as buy for a variety of reasons; e.g. sell after harvest to meet immediate cash needs and buy back later; some may buy because they do not produce enough for own consumption; yet others may sell some variety that they do not like or prefer and buy back those they do.[2] Such transactions may occur between producers or between producers and various market agents but a portion of the sold output are bought back by the producers. Thus net marketed surplus measures the size and share of net output available for non-producing consumers, and where applicable for export, after inter-farm sales are netted out.

Marketable surplus is measured to assess whether a producer has the real capacity to sell above own consumption needs, irrespective of whether the producer actually sells or not. If gross or net marketed surplus of a farmer is positive, marketable surplus may or may not be positive. Sales under condition of negative marketable surplus may have welfare implications if the sales are of a distress nature and arise due to compelling cash needs that can't be generated otherwise. From a livelihood perspective, for smallholders' marketable surplus is a useful concept as it allows to see under what conditions they sell and if that improves their welfare. It is particularly useful so long as own produced food grain is preferred to secure food and protect food security under conditions of price uncertainty or volatility. However, in fully market oriented production systems, the importance of marketable surplus as a concept becomes less relevant because it is assumed that the producer produces only those commodities that have a market and are profitable, irrespective of whether it is food grain or something else.

So, generally production, consumption, sales and purchases have been considered as elements in defining marketed or marketable surplus. In the smallholder production system in Bangladesh as elsewhere in the developing countries, in addition to sales, transactions and transfers may take place among producers due to rent, in kind wage payment, gift, loan, etc. Moreover, due to seasonality of harvest and more continuous consumption needs, significant inventory changes between two seasons or years may occur- output of a season or a year is not fully disposed of within the season or year. Thus the volume of food grain available on a farm over time depends on the volume of incomings due to new harvest, purchases or receipts for other reasons and outgoings due to consumption, sales and payments or giving away for other reasons. In fully commercial production systems or systems in which non-sale

[2] Some studies in Ethiopia showed that some smallholders sold a larger share of their marketed output immediately after harvest to avoid high rate of post harvest storage losses due to lack of proper and good quality on-farm storage facilities, and bought back later as required (Gebre-Meskel et al., 1998; Bekele. 2003; Gabriel and Hundie, 2005). Whether this reason prompt early sale among Bangladeshi farmers. and if so to what extent, is not known.

transactions and transfers and inventory changes is zero or negligible, sales as a percentage of net output is a good measure of marketed surplus or commercial off take rate. However, where non-sale transactions and transfers and inventory changes involve a significant proportion of output, accurate estimation of marketed surplus will require proper treatment of non-sale inter-farm transactions and transfers.

However, the concepts gross marketed surplus, net marketed surplus and marketable surplus how been defined and measured somewhat differently by different empirical researchers, especially the non-sale, non-purchase transactions and transfers have been treated variously - some left them out of consideration for measuring marketed or marketable surplus ratios while others included them one way or another, partly or fully.

Studies conducted in Bangladesh are reviewed below in light of the above definitions highlighting major strengths and weaknesses and their implications. These will be summarized at the end of the paper.

III. EVIDENCE ON MARKETED AND MARKETABLE SURPLUS AND MARKETING TREND OF RICE IN BANGLADESH

One of the earliest studies on rice marketing in the then East Pakistan reported that aggregate marketed surplus of rice[3] in 1964-65 was 10% of net production. Net production was derived by deducting 11% of gross production as seed, feed and waste (Raquibuzzaman, 1966). Ahmed (1979) mentioned that in the mid 1960s, 61% of gross rice output was consumed on farm, 9% accounted for seed, feed or waste and 17% was used for non-market disposal including rent payment, which implies that the remaining 13% was marketed. Ahmed (1981) quoted results of several rounds of Master Surveys of Agriculture which also reported marketed surplus of 10-14% of gross output of rice. At that time, the public sector handled only 4-5 percent of total net supply of rice, which represented 40-50 of total rice entering the marketing channels, the remainder was supplied by the private sector (Farruk, 1970).

Bangladesh Planning Commission reported marketed surplus of 19% of net output in 197374. Several other estimates reported marketed surplus for several years during the 1970s and the 1980s (Table 1). It appears that in about 10 years from 1976/77 to 1986/87, marketed surplus increased from 34% to about 42% of net output.

Quasem (1979) estimated marketable surplus of Aman paddy in 1977 based on a sample of 276 farms selected from three villages each in Haluaghat upazila in Mymensingh district and Birganj upazila in Dinajpur district. Two key assumptions in the estimation of marketable surplus was family consumption requirement of rice at the rate of 411 gm/capita/day against FAO recommendation of 397 gms and actual 1973-74 consumption of 354 gms based on Rabbani and Hossain (1978) and seed requirement for aman was 3% of production and wastage was 1% of production. Both the upazilas were surplus paddy growing areas and suppliers of paddy to government procurement programme. Aman accounted for about 70% and Aus 30% of paddy production in the sample areas and at that time virtually no boro was

[3] It seems that in the literature on Bangladesh under review in this paper, the terms rice and paddy have sometimes been used interchangeably.

grown in those areas. Average farm size was 4.78 acres in Haluaghat and 3.25 acres in Birganj - much higher than the national average farm size of around 1.5 acres. Overall, marketable surplus was 57% in Haluaghat and 26% in Birganj with considerable variation among size classes (Table 2). On average, all size groups in both the upazilas except small farms in Birganj had positive marketable surplus. Forty four percent of marketable surplus in Haluaghat was sold during December and January - immediately after the harvest when government procurement programme was active; in Birganj, it was 76%, and in both the upazilas a higher share was sold in December. Proportion of marketable surplus sold in December-January declined as farm size increased.

Table 1. Marketed surplus of rice in Bangladesh, selected years

Year(s)	% rice area under HYV		Rice production (MMT)	Marketed surplus (000MT)	% marketed surplus
	Aman	Total			
1976/77-78/79	6	13	10.8	4250	34
1979/80-81/82	16	21	12.5	4824	36
1982/83-84/85	18	26	13.4	5573	39
1986/87	21	30	14.4	6468	42

Source: Dey (1988).

The study did not estimate actual total marketed surplus but estimated share of total Aman production sold during December and January, to understand market participation in the government procurement programme. It was found that 40% of Aman production in Haluaghat and 30% in Birganj were sold during these two months, and a larger share was sold during the month of December, as in the case of marketable surplus. However, proportion of Aman output sold during the two months increased as farm size increased, which was opposite the pattern found in case of proportion of marketable surplus sold. The reason for this difference in pattern was not explained.

A major study conducted by the Bangladesh Rice Research Institute (BRRI) estimated supply and utilization of paddy (as well as wheat) for the period November 1982-October 1983 based on a stratified random sample of 2000 farms from six zones defined for the study based on agroecological environment and surplus/deficit production situation (Islam *et al*. 1987). The size distribution of the sample was not shown but the average rice crop per sample farm was 4.74 acres (taking all three rice crops together), which indicates that the sample might be slightly biased towards larger farms. Separate production and disposal data for each of the three rice crops as well as for the three crops together were shown in the study report. Over all supply and utilization figures per farm for all three rice crops are shown in column 2 of Table 3. Although the range of data presented are one of the most comprehensive farm level data on rice production and disposal including quantities sold and purchased, surprisingly nowhere in the report one finds any reference or measure of marketed or marketable surplus ratios.

Table 2. Estimated marketable surplus of Aman paddy and marketing pattern by size of farm in Haluaghat and Birganj upazilas, 1977

Upazila	Small	Medium	Large	All farms
Marketable surplus				
Haluaghat area	19.4	49.0	68.8	57.2
Birganj area	-20.4	22.1	48.7	26.2
% marketable surplus sold in Haluaghat				
December	65.7	32.3	22.9	26.9
January	11.6	10.1	19.3	17.2
Total in two months	77.2	42.9	42.2	44.0
% marketable surplus sold in Birganj				
December	-40.4	56.2	31.1	49.1
January	-16.1	23.1	19.8	26.6
Total in two months	-56.6	79.3	50.9	75.7
% Aman production sold in Haluaghat				
December	19.7	23.5	26.4	24.6
January	3.5	7.2	22.3	15.7
Total in two months	23.2	30.7	48.7	40.4
% Aman production sold in Birganj				
December	12.5	18.6	22.5	19.3
January	5.0	6.7	14.3	10.4
Total in two months	17.5	26.3	36.8	29.7

Source: Quasem (1979).

However, the detailed production, transaction and disposal data provided by Islam *et al.* 1987 indicate that there were conceptual or methodological problems in using conventional definitions of marketed and marketable surplus in the given context. In order to illustrate these complexities, marketed surplus ratios were estimated in two ways using data from Table 3 and presented in columns 3 and 4 of the table. The implications of these are discussed below.

First, for the sample average farm, production accounted for 83% of total supply of rice during the year, the remaining 17% was incoming due to purchases and receipts from others[4]. Looked differently, supply was 121% of production and it was the supply rather than the production alone that in theory provided the basis for utilization including sales.

Second, gross marketed surplus ratio could be estimated as percentage of production or percentage of available output (production + receipts) or total supply (assuming purchased paddy could also be sold along with own output). In column 3 it is shown that gross marketed surplus would be 25.1% if calculated as a percentage of total production and net marketed

[4] Perhaps as rent of share cropped land, wage payment, loan repayment or gift but no such details were explicitly mentioned in the original report

surplus i.e., sales minus purchase as a share of production would be only 6.3%. But if the base was availability or supply rather than production, gross and net marketed surplus would be lower. In reality supply or availability would be better alternatives than production as a base to calculate marketed surplus because in theory sales took place out of the total available or total supply, not just from gross or net production.

Table 3. Overall supply and utilization of paddy per farm, 1982-83 crop season (maunds)

	Total 3 seasons (maunds)	% of gross output*	% of supply*
Supply			
Production	87.9	100.0	82.8
Purchase- Paddy	8.3	9.4	7.8
-Rice in paddy equivalent (PE)	8.2	9.3	7.8
Received from others -Paddy	1.6	1.8	1.5
-Rice (PE)	0.1	0.1	0.1
Total supply	**106.1**	120.7	100.0
Utilization			
Sales -Paddy	20.7		
-Rice (PE)	1.0		
-Seeds	0.4		
Total sales (marketed surplus)	**22.1**	25.1	20.8
(Net sales = Sales – Purchase)	**(5.6)**	(6.3)	(5.3)
Given to others -Paddy	1.9		
-Rice (PE)	0.1		
-Wage in paddy	3.3		
Total given out	**5.3**	6.0	5.0
Loss in storage	**1.0**	1.1	0.9
Total outgoing	**28.4**	32.2	26.7
Consumed - Paddy	58.4		
-Rice (PE)	13.1		
-Used as seed	3.8		
Total consumed	**75.3**	85.7	71.0
Total utilized	**103.7**	118.0	97.7
Balance (closing stock)	2.4	2.7	2.3
Total disposal	**106.1**	120.7	100.0
Stored	81.6	92.8	76.9

* Figures in these columns were not shown in the original report or table. They have been derived by the author of this paper to discuss their implications (see below).
Source: Islam *et al.* (1987).

Third, sales bring cash but non-sale outgoings also have opportunity cost-cash that could be derived if the amount disbursed in kind was sold. Therefore, a question is whether only sales or sales plus other outgoings should be considered for estimating marketed surplus ratios. Similarly, whether in estimating net marketed surplus ratio, only purchases or purchase plus all other incomings should be deducted from total availability is also a question.

Fourth, non-sale outgoing was about 5.0% of total utilization while non-purchase incoming was only 1.6% of total supply. Therefore non-sale transactions did not cancel out each other, as some of these transactions possibly took place with non-producing households such as landless, which might not have been adequately included in the sample[5] Such imbalances also make accurate estimation of marketed surplus from sample data, especially when the sample may not truly represent population characteristics, problematic.

Fifth, seed (own use plus sales) and wastage in storage accounted for only 4.8% of total production but 4.0% of total supply or disposal. This was quite low compared to the 9-I1% rate generally assumed and used in estimating net output for consumption and marketing. This raises the question if all or most farmers use own seeds and if there is really a justification for deducting 9-11% of gross output as seed, feed and waste to calculate net output (more on this in another study reviewed below). Moreover, some seeds were sold and some were purchased, so seed appeared to be a tradable commodity. Hence, bundling seeds with feed and waste and using a fixed rate of deduction to estimate net output also appeared questionable.

Sixth, closing stock accounted for 2.7% of production or 2.3% of supply but no opening stock was recorded, which probably was due to non-collection of opening stock data. Moreover, 93% of production or 77% of supply was stored by the sample households for a few days to several months during the year. This was operating stock for consumption and other disposal as they occurred over time. So the quantities available for consumption, sale or other forms of disposal did not remain static rather it changed over time due to incomings and outgoings including sales and purchases. Sales and purchase patterns by month for the sample as a whole are summarized in Table 4. It appears that some proportion of farms sold paddy throughout the year though the highest proportion of farms sold during May-July, when born was the main harvested crop. Similarly some proportion of farms purchased paddy throughout the year and lowest proportion purchased in June-August. Over 50% of the sample households did not buy or sell paddy during the survey year; they were perhaps autarkic. Nonparticipation was lowest at 38% in June and highest at 62% in February, and the modal value was about 55%.

Distribution of yearly sales and purchase volumes showed that they were more or less evenly distributed over the year, which means that surplus producers sold intermittently throughout the year and deficit producers bought intermittently throughout the year.

[5]Such imbalance can occur for the individual household or a sample if it is not representative of the population. In reality, for a representative sample or in the aggregate the volume given out and received under non-sale transactions would be equal., as the volume sold and purchased would be also equal.

Table 4. Paddy buying and selling pattern among the sample farms, 1982-83 crop season

Month	% farms selling	% yearly total sales	% farms buying	% yearly total buys	% farms not buying or selling
November 82	19	7.2	21	7.7	60
December	25	11.0	22	7.6	53
January 83	24	9.6	15	8.3	53
February	28	6.8	10	9.5	62
March	27	7.0	12	8.6	61
April	20	9.3	20	8.2	60
May	36	7.6	26	9.0	38
June	43	9.2	9	9.9	55
July	34	9.4	11	6.7	55
August	30	7.0	15	7.7	55
September	23	8.1	23	8.7	54
October	20	7.8	24	8.0	56

Source: Islam *et al.* (1987).

These problems underlie methodological complexities in the context of smallholder production system in which production is not the only source of supply, and consumption and sales are not the only forms of disposal. These data point to the need for systematic recording of opening and closing stocks along with increasing farm stock due to harvest and other receipts and depleting farm stock due to consumption, sales and other transactions and transfers in order to get accurate measurement of marketed surplus.

The same data set was used by Akter (1989) who estimated marketable and marketed surplus of paddy on the basis of 1976 households out of the original 2000 samples due to data limitations in some cases. She defined marketable surplus as the quantity available for marketing which was equal to household net output (gross output less rent paid and seed, feed and wastage) minus consumption, and marketed surplus as the net quantity marketed which was equal to gross sales minus gross purchases. She showed estimated quantities of marketable and marketed surplus per adult unit for the sample households (Table 5) instead of per household shown by Islam et al. She also did not calculate the marketed and marketable surplus ratios for which no explanation was also given.

Gross marketed surplus (sales) as share of production would be 22.8% and net marketed surplus (sales minus purchase) as share of production would be 5.3%. As a share of available supply (production plus receipts), gross and net marketed surplus would be respectively 22.4% and 5.2%. If marketable surplus was calculated as a share of production, it would be 16.8% and as a share of available supply it would be 16.5%. Thus gross marketed surplus was higher than marketable surplus and this was compensated by purchase. Marketable surplus amount was almost equal to the amount purchased. One last caveat in the data is that a figure for `net change of stock' was shown in the table to close the utilization account, but the figure actually was closing stock as the residual, without a corresponding opening stock.

Table 5. Marketable and marketed surplus of paddy per adult unit in 1982-83 crop season

, **Characteristics**	Mean (kg/adult unit)
` **Production** (excluding net rent paid)	513
Receipts in kind	9
Gross purchases	90
~ Consumption	400
~ Payments in kind to labour	16
~ Other in kind payments	12
~ Gross sales	117
Seed used	21
Seed sold	1
Storage loss	5
Net change in stock	40
Marketable surplus	86
Marketed surplus (net)	27

Source: Akter (1989).

Quasem (1987) reported estimated marketed surplus based on a sample of 496 farms surveyed in 16 villages in different parts of the country in 1982. He defined gross marketed surplus as sales as a ratio of total production, which included own production plus rent received for sharecropped or mortgaged land. No adjustment was made for `seed, feed, wastage'. Goss marketed surplus was 28% for the year and 24, 18 and 43% respectively for aus, aman and boro paddy production. By farm size, gross marketed surplus was 26, 30 and 26% for small, medium and large farms respectively. Net marketed surplus was defined as gross marketed surplus minus buy back and it was 11% overall and -9, 21 and 22% respectively for small, medium and large farms.

Overall 39% of total sales occurred at `harvest time' - 50% for small, 41% for medium and 22% for large farms. Share of yearly sales in each quarter of the year was as follows: first quarter 23%, second quarter 32%, third quarter 25% and fourth quarter 20%.

The main concern about the results of this study is that gross marketed surplus ratios were almost similar for the three farm size groups- in fact the highest ratio was for medium farms, and net marketed surplus ratios of medium and large farms were about the same. This would be normally unexpected as the author has shown in the paper that the size distribution of the sample was not too far from the national level size distribution, so much higher marketed surplus for larger farms would be normally expected. This raises the question on whether outputs were adequately and properly measured and whether exclusion of non-sale and nonpurchase transfers and transactions including non-adjustment of any amount due to `seed, feed, wastage' rendered the estimated output and marketed surplus ratios - both gross and net-

inaccurate.[6] To the extent these transfers and transactions affect different size groups differently; their exclusion might have distorted the estimated marketed surplus ratios differently.

Record on quarterly sales on its own was not very meaningful without reference to the particular rice crop sold in a given quarter. It was more likely that sales of a particular rice crop spilled into the production-marketing period of another rice crop, so in a quarter more than one type of rice was sold. The data on `harvest time' sales also could not be interpreted easily because the meaning of `harvest time' was not clearly defined. Since harvest time itself might be spread over several weeks and with threshing, the spread might be even longer, a clear definition of harvest time would make the data more meaningful.

Murshed and Rahman (1988) estimated marketed surplus for 1986/87 crop season based on a sample of 222 randomly selected farms in eight districts. Eighty small, 70 medium and 72 large farms were selected. Since the distribution of the sample was not proportionate to the population, only size specific results were presented without presenting an overall average as that would be unrepresentative or biased.

Marketed surplus was defined as "gross quantity of produce actually sold by the farmers", and production included output from own and mortgaged in land and half of the output from rented in and rented out land. No adjustment was made for `seed, feed, wastage'. Estimated marketed surpluses by size of farm are shown in Table 6. Marketed surplus as a share of production turned out to be 26, 28 and 36% for small, medium and large farms respectively. Net marketed surplus was not defined or calculated but with respect to small farms it has been stated that " ... the balance was negative, viz, marketed surplus and family consumption together exceeded production. This indicates the prevalence of distress sale among farmers belonging to the small size group".

Table 6. Annual average production, consumption and marketed surplus of paddy per farm according to farm type (metric tons)

Farm type	Production	Consumption	Marketed surplus
Small	2.43	2.14	0.64
Medium	4.60	3.06	1.29
Large	11.03	4.51	3.93

Source: Murshed and Rahman (1988).

The main caveat in the methodology and the results presented was that if marketed surplus was equal to quantity actually sold, as defined, then consumption was a residual after sales since production was shown in the table as equal to consumption plus marketed surplus. But consumption in that case was actual consumption as no other transfers or transactions were recognized or recorded, not even purchases as a source of consumption, or disposal due to seed, feed and wastage, and no assumptions were made regarding such transfers and transactions. This was unrealistic in the Bangladesh context as several other studies recorded

[6] This was evident in the disposal pattern of the sample reported by Islam et al. (1987) discussed earlier

incomings and outgoings in various forms including sales and purchases. The authors stated that sales plus consumption exceeded production for small farmers, which was an indirect recognition that such farmers indeed had incomings in some form to balance the equation or fill the deficit. Even though in theory, in the aggregate, such inter-farm transfers might cancel out, for a given sample, especially if it did not resemble actual population distribution, as in the present case, non-consideration of non-sale and non-purchase transfers and transactions would distort the estimates for marketed surplus to some extent.

Chowdhury (1992) presented marketed surplus ratios for 1989-90 crop year based on a survey by IFPRI on a sample of farms from 11 progressive districts and 9 non-progressive districts classified on the basis of technology used and surplus/deficit status in rice production. He estimated marketed surplus as sales as a percentage of net output and presented ratios separately for aman and boro seasons and for the two seasons combined according to farm size and type of sample district (Table 7 and 8). However, there are problems in his data, results as well as interpretation of results.

Table 7. **Production and marketing regimes per farm for Aman season in 1989/90 by farm size and type of district**

District type and Farm type	N of sample	Own land (acres)	Operated land in aman season (acres)	% under HYV	Net output (mds)	% net output marketed
Progressive						
Small	94	1.3	1.7	39	46	42
Medium	162	3.7	3.1	41	94	46
Large	186	9.9	5.3	37	196	57
All	442	5.8	3.7	39	127	53
Non progressive						
Small	71	1.4	1.6	47	36	39
Medium	94	3.7	2.9	47	73	40
Large	72	8.9	4.7	35	143	49
All	237	4.6	3.0	45	83	42
Overall	**679**	**5.4**	**3.5**	**41**	**112**	**49***

* On pages *64-65*, Chowdhury reported that the overall marketed surplus ratio for the crop year *1989-90* was *49%*. This was perhaps reported by mistake because aman season ratio was *49%* and boro season ratio was *82%* (see table *6* below), so overall marketed surplus could not be *49%*. Source: Chowdhury *(1992)* Table *A1.1, p. 106*.

First, overall marketed surplus in the aman season was 49% and the ratio increased along with farm size but the differences between progressive and non-progressive districts were not very large. Overall marketed surplus ratio in the boro season was 82%, which appeared really very high. Like the aman season, the ratio increased with farm size. However, in table 8, the closing stock of aman season has been shown along with boro season data but neither opening nor closing stock has been shown for the aman season in Table 7 even though elsewhere in his

report, he mentioned that ' the ratio of the carry in to the aman harvest stands at 6%'[7] (Chowdhry, 1992, p. 67). He also mentioned that carry out for the year was 4 kg per person compared to 1.5 kg a year ago (p. 67). Because of such large volume of inventories by season or year, it can be reasonably assumed that sales in a season occurred not just from current net output but also from carry over stocks from the previous season. Yet gross seasonal marketed surplus has been estimated as sales as a percentage of only current net output of the relevant crop season. Since inventory change and other transactions and transfers may not always cancel each other in small samples, especially if the sample is not representative of the national size distribution, as in the present case, exclusion of inventory changes and other transactions have rendered estimated marketed surplus in this study inaccurate. [8]

Table 8. Production and marketing regimes per farm for Boro season in 1989/90 by farm size and type of district

Farm type	Closing stock of aman season, mds	Operated land in boro season (acres)	% under HYV	Net output (mds)	% net output marketed
Progressive districts					
Small	16	1.3	81	47	60
Medium	41	2.1	91	95	80
Large	85	4.0	98	198	92
All	49	2.7	85	128	86
Non-progressive districts					
Small	11	1.3	55	46	53
Medium	26	2.4	69	80	75
Large	63	4.1	53	154	84
All	na	2.6	na	92	76
Overall	**42**	**2.7**	**77**	**116**	**82**

Source: Chowdhury (1992).

Second, it appears as though inadvertently Chowdhury recognized the relevance of inventory changes in measuring marketed surplus while discussing measurement of private stocks later in the document, and presented two new measures of marketed surplus: gross marketed surplus as a percentage of output (not net output) and gross marketed surplus as a percentage of availability where "availability is equal to carry in from past production plus net size of the harvest at the onset of the current market season" (p.219).`' The estimates are presented in Table 9. The new estimates showed that when marketed surplus was estimated as a percentage of available supply rather than net output, the ratio came down from 49 to 32% in the aman

[7] It was not clear if it was 6% of aman harvest or any other base.
[8] This was evident in the disposal pattern of the sample reported by Islam et al (1987) discussed earlier.
[9] There was still confusion about the appropriate base to be considered as he used gross output in one case and net output and availability in another without explaining the rationale behind the alternatives.

season and from 82 to 48% in the boro season. However, the author did not explain the logic behind the two separate procedures and estimates and did not clarify which estimate was more appropriate.

Table 9. Marketed surplus of rice taking into account private stocks, 1989-90

	Aman season	Boro/aus season	All seasons
~ Opening stock, 000 mt	660	2660	-
Rice production, 000 mt	8274	7667	15941
' Gross marketed surplus, 000 mt	2853	4935	7788
GMS as % of output	34	64	49
GMS as % of availability	32	48	47
Closing stock, 000 mt	2660	1140	-

- no data provided and no explanation provided
Source: Chowdhury (1992, p. 219).

Third, the sample distribution by size shows that sample selection was biased towards medium and larger holdings, and it did not resemble the national size distribution as few landless and smallholders were sampled. The conceptual confusion and accounting problems in the estimation procedures for the marketed surplus ratios, along with sample bias, might have resulted in the relatively high marketed surplus ratios, especially in the first set of estimates. The second set that was based on availability rather than net output was conceptually more accurate and the numbers also appeared more realistic, if not fully accurate.

Chowdhury argued that his estimates were more robust and accurate than Murshed and Rahman because of the larger sample size from a larger number of districts covered by the IFPRI survey and because of the buoyant rice production situation in 1989-90 (p.65-66). However, there were methodological pitfall of his estimates as discussed above which definitely rendered those advantages partly ineffective in generating accurate estimates for marketed surplus irrespective of whether Murshed and Rahman's estimates were accurate or not.

Alam and Afruz (2002) estimated marketed and marketable surpluses for aus, aman and boro seasons for the period March 2001 to April 2002 based on a random sample of 180 households from Chandina upazila in Comilla district and Ishawrganj upazila in Mymensingh district. They defined marketable surplus as total production minus total family requirements (family consumption, farm seeds, kind payment to labour, gifts for social and religious purposes, and storage losses) as percentage of total production and net marketed surplus as gross sales minus buy back as percentage of total production. Some key results of the study are summarized in Table 10. However, narrative in the paper and close examination of the results show that the estimated ratios were questionable due to some conceptual problems and the estimation procedures applied.

Table 10. Estimated marketable and marketed surplus of Aus, Aman and Boro paddy in Chandina and Ishwarganj upazilas, 2001-2002

	Aus	Aman	Boro
Disposal of total production	%	%	%
Consumption	44.1	31.6	28.8
Debt payment in kind	2.8	3.3	2.1
Wage payment in kind	4.2	15.8	3.5
Donation and jakat	1.8	3.4	2.7
Seed use	4.0	4.7	8.9
Storage loss	1.8	1.3	1.0
Marketable surplus	**41.2**	**50.0**	**60.5**
Total	100.0	100.0	100.0
Marketed surplus	**38.3**	**48.3**	**57.5**
Of total sales :			
Pre-harvest sales	26.4	35.3	27.9
Harvest time sales	43.4	52.9	62.1
Sales at other times during the year	30.2	11.8	10.0

Source: Alam and Afruz (2002).

First, the estimated marketable surpluses for all three rice crops were higher than marketed surplus, which implied that the sample producers did not sell as much as they could. This was an unexpected result, albeit an inconsistent result, unless the unsold paddy was actually consumed in addition to the volume already shown as consumed. A closer look however indicates that there was a confusion or an inconsistency about the procedure for estimation of marketed surplus. In the text, it has been defined as gross sales minus buy back as a percentage of total production (not net production) but in table 5 of the paper, it has been calculated as marketable surplus minus buy back as percentage of total production. Again volume of total sales shown in Table 7 of the paper did not match the volume of marketed surplus shown in Table 5. Therefore neither the estimated marketable surplus nor the marketed surplus could be considered as accurate.

Second, total sales were shown for three periods - pre-harvest time, harvest time and other times during the year. Normally rice would not be sold before harvest except in a few cases where poor producers might have borrowed on condition of paying back in kind in terms of harvested paddy, which could be considered as pre-harvest sale, but such transactions were supposedly included in the category called `debt payments'. Moreover, the volume of such transactions could not be as much as 26-35% of total sales as reported in this study. The most plausible explanation of pre-harvest sale was that for each crop season, there was carry over stock from the previous rice crop, which was sold before harvest of the next crop, e.g. some portion of aus was sold just before the next aman harvest, so it was end of season sale of the aus crop and not the pre-harvest sale of the aman crop. The authors probably failed to record properly the sales of different rice crops according to time of sale, hence this confusion.

However, the fact that they have shown pre-harvest sale, even if with improper connotation, they have inadvertently shown that every crop season had opening and closing stocks, which spilled into the next crop season for disposal along with the current season production one way or another, whether through consumption or through sale. As mentioned earlier, this information once again highlighted the need for inclusion of inventory changes in the equation for estimation of marketed surplus in an accurate way.[10]

Bayes and Hossain (2007) studied changes in resources and livelihoods of a panel of nearly 2000 households in 62 villages in 57 districts for 1988, 2000 and 2004. As a part of that study, they reported that marketed surplus of paddy defined as sales as percent of net output increased from about 38% of output in 1987/88 to 43% in 1999/2000 and 41% in 2003/04. Of the total sales, respectively 31, 31 and 42% was sold within the, first month of harvest in 1987/88, 1999/00 and 2003/04. Separate figures for different rice crops were not shown so it was unclear if the ratios were the same for all three rice crops.

More detailed results have been shown for 2003/04 (Table 11). Overall 52% of farms sold some paddy during the year and 48% did not buy or sell. Islam et al (1987) found that in 1982-83 season, non-participation was lowest at 38% in June and highest at 62% in February, and the modal value was about 55%. So non-participation has decreased only slightly in 2003/04.

When surplus/deficit status of a household was considered taking into account family consumption needs, the sample as a whole had a net surplus of only 4% of their aggregate production for the market outside the sample. As farm size or economic status increased, the extent or proportion of surplus output after meeting consumption needs increased, proportion of farms who sold output increased and the share of net output sold also increased. On the other hand, farm size or economic status had an inverse relationship with the proportion of sold output that was sold within the first month after harvest, which the authors termed as `distress sales'. Only about 2% of the sample farms operated over 2 ha of land and they produced 16.5% of net output, they had 77% of their output as surplus, which they sold. On the other hand, 31% of the sample farms had farm size up to 0.4 ha and they produced only 18% of net output but they had 42% deficit to meet their consumption needs yet 36% of this group sold paddy amounting to 15% of the group net output and two third of their sales was done within the first month after harvest.

Similar pattern was observed when farms were classified by economic status (Table 11). Only 15% of the farmers were rich and they produced 38% of net output and had 47% of their output as surplus. Seventy six percent of this group sold paddy amounting to 61% of the group net output. Overall, this group supplied 92% of the volume of surplus paddy entering

[10] Wright (2009) in analyzing role of international grain reserves in addressing volatility in grain markets emphasized that in any period regardless of economic setting (monopoly, competition, oligopoly) two accounting relations hold: available supply for the period is the sum of the harvest and stocks carried in from the previous period, and consumption during the period is the difference between available supply and the stocks carried forward to the next period. Therefore, estimation of marketed surplus without taking into account inventory changes, whether at individual household or at national or international level, is bound to be erroneous.

the market. On the other hand, poor households had a deficit of 61 % of their needs yet 38% of the group sold paddy amounting to 24% of group net output and 61% of the sales volume occurred within the first month of harvest.

Table 11. Market participation and marketed surplus of paddy in 2003/04

Farm characteristics	% farms	% net output	% output surplus/ deficit (-)	% farms sold	% of output sold	% of sale within the first month
Farm size (hectare)						
Landless	38.6	0.2	-95	-	-	-
Up to 0.40	31.0	18.2	-42	36	15	65
0.41-1.00	20.7	36.3	32	67	28	59
1.01-2.00	8.0	28.9	50	89	56	40
Over 2.00	1.9	16.5	77	94	78	27
Economic status+						
Ultra poor	9.3	0.8	-90	-	-	-
Poor	28.7	10.2	-61	38	24	61*
Small/vulnerable	47.3	51.2	0.6	58	33	49
Rich	14.7	37.8	47	76	61	34*
All farms	100.0	100.0	4	52	41	42

- not available

+ Definitions of these terms or groups are not available in the text.

* In the text, the authors wrote "...probably, somewhat unexpectedly, rich households sold two third of the sold amount within the first month of harvest. Small/vulnerable households sold 49% and poor households sold 34%" p.263. But it can't be true if the upper part of the column is correct, which shows an inverse relationship between % sale within first moth and farm size. Most likely this is a typing error; in reality the ratio for the poor is 61 % and for the rich 34%.

Source: Bayes ad Hossain (2007), p. 279 and 283.

Since information on opening and closing inventories and transfers and transactions other than sales and consumption were not shown, and apparently no adjustments were made for seed, feed and wastage, accuracy of the marketed surplus ratios mentioned above remain suspect for reasons discussed earlier.

IV. SUMMARY AND RECOMMENDATIONS

Generally, three concepts of marketed surplus ratios have been used in empirical studies - gross marketed surplus, net marketed surplus and marketable surplus. Gross marketed surplus has been generally defined as sales as a share of current gross output. But sometimes, rather than gross output, net output after deduction for `seed, feed and waste' has been used as the base. Net marketed surplus has been generally defined as net sales (sales minus purchases) as a share of gross or net output. Marketable surplus has been generally defined as potential ability to sell after meeting own consumption needs or consumption needs plus other obligations such as wage payment in kind, irrespective of whether there was any actual sale or not. As such marketable surplus could be negative or positive. In empirical studies, several

deviations from these general definitions were observed - some more serious than others with important implications for the estimated marketed surplus ratios and stocks. From the literature, what is evident is that gross marketed surplus ratio for paddy increased from about 10% in the late 1960s to about 25% in the 1970s, to over 40% in the more recent years (Table 12). However, the accuracy of the reported ratios are questionable and they can't be always compared straight way because of conceptual problems and deficiencies and inconsistency in the definitions and measurement procedures applied. Net marketed surplus and marketable surplus have been estimated in fewer studies and figures are less clear because of the varieties of definitions used.

Table 12. Estimated gross marketed surplus (%) of rice for selected years, 1964- 2004

Reference year	Sources of data	Boro rice	Aus rice	Aman rice	All rice
1964/65	Raquibuzzaman, 1966				10
Mid 1960s	Ahmed, 1979				10-14
1973/74	Planning Commission				19
1976/77-78/79	In Dey, 1988*				34
1977	Quasem 1979			30-40	
1979/80- 81/82	In Dey, 1988*				36
1982	In Dey, 1988*	43	24	18	28
1982/83-84/85	In Dey, 1988*				39
1982/83	Islam et al , 1987				25
1982/83	Akter, 1989				23
1986/87	In Dey, 1988*				42
1986/87	Murshed & Rahman,1988				26-36
1989/90	Chowdhury, 1992	64 or 82?	64	34	49
2001/02	Alam and Afruz, 2002	58	38	48	na
2003/04	Bayes & Hossain, 2007				41

* For original data sources for these, see Dey (1988)

Note: There are some differences in the definition of gross marketed surplus used in the studies quoted in the table, so the ratios are not always directly comparable but they provide adequate of order of magnitude to get a rough approximation

The main problems in measurement are inherent in the general definitions mentioned above whereby production, consumption, sales and purchases have been considered as elements in defining marketed or marketable surplus. In the smallholder production system in Bangladesh as elsewhere in the developing countries, in addition to sales, transactions and transfers may take place among producers due to rent, in kind wage payment, gift, loan etc. Moreover, due to seasonality of harvest and more continuous consumption needs, significant inventory changes between two seasons or years may occur- output of a season or a year is not fully disposed of within the season or year. Thus the volume of food grain available on a farm over time depends on the volume of incomings due to new harvest, purchases or receipts for other reasons and outgoings due to consumption, sales and payments or giving away for other reasons. In fully commercial production systems or systems in which non-sale transactions

and transfers and inventory changes is zero or negligible, sales as a percentage of net output is a good measure of marketed surplus or commercial off take rate. However, where non-sale transactions and transfers and inventory changes involve a significant proportion of output, accurate estimation of marketed surplus at the individual household level will require proper treatment of non-sale inter-farm transactions and transfers although such transfers are supposed to cancel out at the aggregate level.

Some of the major issues that need careful consideration for proper estimation of marketed surplus and related parameters under the prevailing systems of production and disposal of paddy in Bangladesh are the following:

Net output - BBS and DAE currently deduct 12% for `seed, feed, waste' from gross output. Farm survey based marketing studies have used various rates under different implicit or explicit assumptions. Question is whether there is a justification for bundling these three items together and whether deduction rate of 12% is justified. Empirical studies showed that in recent times, wastage and feed accounted for about 5-6% of gross output. The remaining 67% does not appear to be required for seeds, especially for transplanted HYV aman and boro. For example, at recommend seed rates, local and HYV aman respectively requires 5-6% and 1-2% of output as seeds for next year planting. Thus potentially larger quantities are left onfarm as allowance for SFW than is required thereby underestimating the available supply for sale and consumption. Moreover seeds have become a tradable commodity as many farmers no longer depend on own seeds rather buy from the market supplied by other farmers and seed companies, and some amount is also imported. Therefore, seeds should be treated as a tradable commodity and shown separately as actual consumption (used for planting) like grain consumption and/or as sale where appropriate. Allowance rate for wastage and feed or other uses should be crop specific rather than uniform and empirical studies should be conducted - rapid appraisal included - to establish the actual rates of seed use, wastage, and other uses, so that a more robust empirically based allowance for these items can be made.

Gross marketed surplus -The general practice is to treat only sold amount as equivalent to marketed amount. The question is whether other in-kind outgoings except own consumption could also be treated as marketed. In reality anything that leaves the farm over own consumption - whether in the form of sale or in-kind payment - could be treated as sales, as in-kind outgoings could be sold and the payments could be made in cash (the opportunity cost principle). RRAs may be conducted to determine actual or estimated marketed volume. For example, Bayes and Hossain (2007) have shown that about 14% of households, usually large and medium land owners, supply 92% of marketed surplus of rice. So a focused RRA on such farms may provide robust information on a large part of the disposal pattern including sales.

Net marketed surplus - The general practice is to deduct purchases from sold amounts to get net marketed amount. The question here is whether sales and purchases are adequate ingredients to get net marketed amount when non-sale and non-purchase transfers and transactions account for a significant portion of output, and they do not cancel each other for the individual farm even if they do in the aggregate. The answer is that from an accounting point of view, for the individual farm, net marketed amount should be derived by taking into account all incomings and outgoings rather than only purchases and sales.

Grow marketed surplus ratio - The general practice is to calculate gross marketed amount as a percentage of gross or net output. The question here is whether gross or net output is the appropriate denominator. In reality sales (plus other outgoings) occur not just from own production - gross or net- but from available supply, i.e. own production plus incomings. Therefore, the appropriate denominator for estimation of gross marketed surplus ratio is available supply rather than just output.[11]

Net marketed surplus ratio - The general practice is to calculate net marketed amount as a percentage of gross or net output. In line with the gross marketed surplus ratio, here also the appropriate denominator should be available supply rather than just output.

Marketable surplus - The paramount assumption behind this concept is that achievement of food grain self-sufficiency from own production is a desirable goal. From a livelihood and food security perspective, for small and marginal farmers who may make distress sale, marketable surplus may indicate the welfare implications of their sales. However, as a general rule, the relevance of this concept declines along with increased commercialization of agriculture. When even smallest farms buy and sell paddy along with other daily necessities and the production and marketing decisions are guided by market and profit motive as well as concern about food security and livelihood, marketable surplus and its ratio may be derived as an accounting output but problems of identifying appropriate numerator and denominator, as discussed above with respect to marketed surplus ratio, still remain. Moreover, without a full accounting of the farm's other activities and income, few policy implications can be derived from marketable surplus as a parameter.

There are a number of large data sets that have been generated in recent years for various rice policy research purposes, e.g., the study on diesel subsidy in 2008 by BIDS, the study on market integration in 2007/08 by Rice Foundation, and the Household Income and Expenditure Survey 2005 by the BBS. They contain detailed information for conducting marketed surplus, marketing pattern and stock analyses. These data have not been fully exploited. Each data set was designed for different purposes hence each has some pros and cons for assessing marketed surplus and related parameters. However, their differences also provide interesting opportunities to compare results. Sometimes valuable research output may be derived from existing data before new large surveys are planned and executed. So these may be fruitfully used for additional analyses, especially by graduate students.

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[11] In smallholder livestock systems, inventory of livestock on a farm may change over time during a season or year due to sale as well as various non-sale transactions and transfers. For such systems, gross marketed surplus has been measured as sales as a percentage of average inventory during the year, and net marketed surplus is measured as sales net of purchase as a percentage of the average inventory during the year. See, for example, Barrett et al (2004), Bouman et al (2005), Negassa and Jabbar (2008).

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