

DETERMINATION OF PROCUREMENT PRICE
OF RICE IN BANGLADESH

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EXECUTIVE SUMMARY

1. It is important to understand and uphold the principal purpose of the procurement program. This objective is to prevent any crash in foodgrain prices during harvest season and provide a stability to farm prices that will reduce price risk to farmers. Other objectives should not be mixed-up with this primary purpose, so that the effectiveness of the program is not diluted.

2. The appropriate level of procurement price is critical for (a) providing incentives to producers, (b) allowing maximum scope for operation of private traders, and (c) preventing excessive destabilizing impact on either the budget or the financial market. Three criteria are relevant in determination of procurement price. These are: (a) market price, (b) world price and (c) cost of production. Among these criteria, market price is the most relevant for short run price stabilization and the other two criteria indicate the direction of medium or long run changes required. On the basis of these criteria, the level of procurement price in the 1991-92 rice crop seasons may not exceed Tk.230 per maund of paddy. Because the current level is already Tk. 240, administrative considerations may dictate the continuation of the present procurement price. But this is not in the domain of this report.

3. Under the emerging food situation in Bangladesh, it is considered logically consistent to increase wheat price relative to rice in domestic market. A reflection of this market price change may be shown by raising the ratio of wheat to rice price from about 0.6 to about 0.7 in the procurement program.

4. Effectiveness of the procurement program is a necessary condition for achieving program objectives. If procurement program can not be made effective in supporting prices, there remains little basis for undertaking such program. Ineffective effort in

(ii)

procurement is simply wastage of resources. For making the program effective in price support, procedural changes are necessary. For a greater degree of transparency and impact on market prices, the proposal of purchasing foodgrains through open tenders in selected central locations deserves serious consideration.

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I. INTRODUCTION

1. Procurement price of rice/paddy is the price at which the government purchases such grains domestically from farmers/traders/millers. The level at which this price is fixed and the extent to which this is made effective have wide ranging potential implications including incentives for producers and welfare of consumers, budgetary costs, behavior of market prices and supply, and the pace and pattern of agricultural growth. Therefore, determination of procurement price deserves careful examination and serious consideration both at the level of analysis and decision making.

2. The purpose of this report is to present the analysis of principal arguments that are involved in the determination of procurement price. To be more specific, the following aspects involved the determination of procurement price are examined in this paper:

- a. Why public procurement - what objectives are supposed to be achieved by public procurement ?
- b. What criteria are relevant for guiding the determination of the level of procurement price that is consistent with the objectives ?
- c. What steps are involved in application of these criteria in arriving at the estimate of procurement price for the 1991/92 rice crops ?

- d. How the procedures of implementation of the procurement operation make differences in the effectiveness of the policy ?

3. After presentation of analysis on the above four dimensions of public procurement policy, the report is concluded with a few critical observations that sharply define the context of this report in order to avoid any confusion that may arise because of induction of extraneous political factors in future debates.

II. WHY PUBLIC PROCUREMENT ?

4. Why public efforts in procurement of foodgrain and what objectives are supposed to be achieved through such efforts ? A clear understanding of this question is necessary in order to be able to appreciate the logic underlying the determination of procurement price.

5. The answer to the above question, usually offered in a spontaneous fashion, is that the producers of rice are to be provided an incentive price for production. This is obvious. However, what is not so obvious is the degree of incentive. How much incentive is appropriate and what constitute the criteria of appropriateness ? This question will be examined in the next section. The nature of incentives and other objectives of procurement warrant a further elaboration here.

6. Incentive through procurement price is based on the presumption that market price of rice will be higher due to procurement than the market price without procurement. Therefore, the farmers get benefit of price incentives. However, if the procurement operation, for any reason, is not effective in influencing the market price, the purported benefit will not

realize. Therefore effectiveness of procurement is a necessary condition for incentives. Another form of incentives is the reduction of price risk. Generally, farmers make their production decisions (i.e. how much area to be allocated to what crops and how much purchased inputs are to be used, etc.) on the basis of their expectation of price levels that would prevail after harvest. Although farmers with marketable surplus are more likely to make these decisions quite seriously, even deficit farmers who sell after harvest and purchase later, are likely to weigh the post-harvest price situation. It is sometimes believed that small farmers, because of their poor holding power, take the assessment of expected price rather seriously. On the other hand, if the procurement program is not effective, farmers' confidence on government procurement is eroded and the reduction of risk does not take place.

7. It has been pointed out that the procurement program has another objective -- the objective of maintaining adequate stock of foodgrains in the public godowns. This has been one of the reasons for an extra-effort (through increase in procurement price) in the past for procurement even when there was no need for procurement to support prices. Very often procurement in poor harvest years, for the purpose of replenishing stock destabilizes the price levels. Therefore, it is important that the government does not mix-up the stock policy with the price stabilization measures, particularly in times when these two policies will produce conflicting effects. If the optimum stock policies are pursued in a disciplined manner, then the occasion to replenish public stock by siphoning grains from the market will not arise.

8. If the public procurement is not effective in providing incentives as discussed above, there may not be any need for such programs under the public sector. In that event, the question whether open-market sale operation should also be judged as unnecessary is quite relevant. These are elements of a broader

question about the effectiveness and costs of the public foodgrain distribution system that is not examined in this report.

III. GUIDING CRITERIA FOR PROCUREMENT PRICE

The following considerations are particularly relevant in the choice of criteria for determination of the level of procurement price:

- a. A higher level of incentives through a higher procurement price than a lower one will cost more public resources (in the form of subsidy) unless the sale price of the procured grains can be increased *pari passu* with the procurement price. This is the direct cost of incentives through price support.
- b. The indirect cost of providing incentives to farmers could, however, be potentially more significant than the direct cost. A higher price for rice will attract resources, including land, from other crops to rice. Therefore, this reallocation of resources from other crops to rice may imply no net social gain, or even a loss to the overall economy. This is a serious social cost.
- c. Sustaining domestic price of foodgrain at levels that deviate from world price invariably implies a substantial indirect cost. World market represents a window of opportunity for considering the alternatives either of import substitution or export expansion depending on whether the country is a deficit or a surplus producer. Therefore, deviation from world price causes distortion in domestic prices that cannot be sustained for any prolonged period without a heavy burden on the public resources.

- d. Domestic market price is of course the most immediate concern and therefore relevant to the determination of procurement price. Because most farmers and consumers trade in competitive foodgrain markets, incentives through public intervention is generally provided through the influence of public operations on market prices. If this domestic price is considerably out of line from world price or cost of production, adjustment is necessary but often possible only over a period of time rather than immediately by one stroke. Government's concern for incentives to producers is often matched by an equal or even a larger concern for consumers. The reflection of these two concerns is the open market public sale for bringing down prices in peak price season and public procurement for boosting prices in harvest season. Therefore, public procurement in conjunction with public distribution of foodgrains is basically a mechanism of price stabilization in foodgrain market. In this task of price stabilization, the procurement price and open market sale price play critical roles and are required to be linked for two reasons. First, if the gap between procurement price and open market sale price is reduced too much, it involves reduced public revenue and hence larger subsidy cost. Second, and more significant than the first, is the effect of public action on private trade. If the price band (difference between procurement and OMS price) is made narrower and the policy is made effective, then the scope of private trade diminishes because private trade operates on the margin between harvest and peak season prices. In such a situation government operation may simply replace private trade without much of an impact on market prices. Procurement and OMS prices can not be set in isolation of market conditions and market prices. A procurement price much higher than market price introduces considerable

scope of rent seeking and corruption. Similar is the case when OMS price is much lower than the peak season market price. Therefore, some sort of assessment of the likely market conditions and price levels are required for the advance determination of procurement price.

The foregoing discussion clearly indicates the need for at least three criteria for determination of procurement price:

(a) Cost of production as a check on the rate of return to land and farm entrepreneurship, (b) World price as a check for not allowing domestic prices to be distorted far from prices necessary in availing opportunities provided by world market, and (c) market prices for ensuring feasible and efficient operation of public system in stabilizing domestic prices in the short run. Whenever there are multiple criteria for deciding on a single parameter (i.e. the procurement price), there is a potential scope of conflict. Different criteria may indicate different levels of procurement price. How to reconcile conflicts, if any, among these criteria? We shall examine this question of reconciliation of conflict when we show how much or whether there is in fact any conflict in the criteria and the estimates derived therefrom.

(a) Cost of Production Criterion

Cost of production is defined as the cost of producing a unit of rice (or any output). It should not be confused with the concept of cost of production per unit of land (i.e. per acre cost). The former is the relevant concept for the purpose of pricing. The per unit cost of output can easily be derived from per acre cost by dividing the per acre cost by the per acre yield of rice.

Most professional economists object to the use of cost of production as a criterion for determining the level of product price. The objections are as follows:

- (a) Cost of production criterion is oriented toward safeguarding the gains of private producers. It does not protect the gains or losses from the social point of view. For example, cost of production of rice could be so high that it would be socially profitable to import rice and use resources thus saved for other productions. Cost of production criterion does not allow this possibility.
- (b) cost of specialized resources (e.g. land rent) is demand-determined and therefore is affected by product price. Accommodation of this cost in fixing the price involves circularity. Every time the product price is raised, the cost of these resources will also rise and, subsequently, the administered price will have to be raised.
- (c) Inclusion of rent in cost of production does not reflect society's opportunity cost of land. Similar is the case with family labor that will not be offered to market in absence of the production of the commodity in question.
- (d) Since differences in costs among farmers and regions is very high, the choice of farmer groups and regions whose cost is to be covered by the procurement price will be arbitrary. An arbitrary choice of a cost estimate may generate enormous problems of interregional or intergroup income distribution.
- (e) Cost of production argument will imply lowering procurement price with progress of technological diffusion, because, by definition, technological progress

means a proportionately higher rate of increase in yield than the increase in per acre cost of production.

In spite of so many objections to the use of cost of production, its dominance in the debate on public pricing is remarkable. It is so because it serves as a lay-man's logic and perception of fairness in pricing. An ordinary man tends to compare the price with the cost in order to evaluate a fair rate of return. Therefore, this criterion is popular in political debate on pricing. The level of procurement price and the procedure involved in arriving at this level by using cost of production is shown in Appendix A.

(b) The World Price Criterion

The world price criterion is basically designed to maintain a price level that would prevail in absence of any government control. However, world price fluctuates very widely and few developing country can afford to absorb such wide fluctuations in their domestic prices. This is believed to be one of the main reasons for the government to design some sorts of intervention in the external foodgrain trade. Given this fact, the application of world price criterion implies an attempt to keep domestic price in line with the trend of world prices and not actual prices of any particular year.

Application of the principle of world price requires a prejudgment about the status of the country in respect of whether it is an importer or exporter of the commodity, that is rice in the present case.

Bangladesh is currently self-sufficient in rice; the country neither imports nor exports rice. Of course, occasionally a surplus situation in domestic rice production has had a depressing impact on domestic rice market. But the country has not attained

a exporter status in rice. This situation has been emerging recently inspite of the fact that the country has been a net importer of foodgrain, mostly in the form of wheat. An analysis of rice production and domestic demand for rice indicates that the recent experience of marginal surplus of rice, along with increasing demand for imported wheat, may exacerbate in the future. The world price on the basis of an importer is much higher than the world price on the basis of an exporter. The balance of the consideration relating to Bangladesh's status in rice, we have used the average of import and export parity prices in arriving at the border price of rice that is used as a basis for the procurement price. The details of the estimates and the procedure followed are presented in Appendix B.

(c) Domestic Market Price Criterion

This criterion is important for operational purposes as well as for the stability of government budget. A level of procurement price way out of line with market price generally breeds inefficiency and destabilizes budget. Moreover, when price stabilization is one of the primary objectives of the PFDS, pricing practices cannot be devoid of considerations of market prices. The procedure followed in application of this criterion involves an assessment of the likely market price situation in the coming season or year. Then the procurement price is determined as a mechanism of price support (i.e. as a floor price) that is consistent with price band necessary for protecting the scope of private traders in the market. The details of this procedure and the estimate of procurement price for 1991/92 rice crops are presented in Appendix C.

IV. ESTIMATES OF PROCUREMENT PRICE

The estimates of procurement price of rice for the 1991/92 rice crops on the basis of the three criteria discussed

earlier are shown in the Table 1. It is clear that the cost of production criterion indicates the price of rice ranging from Tk 292 to Tk 310. The world price criterion indicates a level of

TABLE 1

Estimated levels of Procurement Price for 1991/92 Rice Crops

Criteria	Estimated Procurement Price of Rice (Tk/maund)	Estimated Procurement Price of Paddy (Tk/maund)
1 Cost of Production ^a		
Aman HYV	292	194
Boro HYV	310	206
2 World Price	308	205
3 Market Price	346	230

Source: See Appendix A, B, and C for detailed procedure

Note: (a) Cost per maund on Cost C basis plus a "normal" profit margin. Cost of land has been included in this estimate, too. Cost C basis is outlined in Appendix-A.

Tk 308, and the Market price criterion indicates a price of Tk 346. How to choose from this wide range?

The appropriate procedure will be to take the market price as the leading guide. It is so because procurement price is primarily an instrument for short-run objective of market price stabilization. The world price criterion is a check for long run distortion in prices and therefore provides a guide for the direction to which this short run estimate will have to be consciously adjusted at the margin. The cost of production criterion confirms that even at the proposed procurement price there is sufficient incentive in the production of rice.

The difference in the estimates of procurement price following world price and domestic market price criteria is rather small-- Tk 308 and Tk 346 per maund of rice. Both these estimates are below the current procurement price of rice.

Therefore, we suggest that the procurement price for 1991/92 rice crops may not exceed Tk 346 per maund of rice, or Tk 230 per maund of paddy.

Implications of High Procurement Price Relative to Market Price

There are three important implications for setting a procurement price way above the market price in harvest season:

1. A wide gap between procurement price and market price may encourage rent seeking tendencies. This may take many forms. Beside the usual way of selective purchase and sharing in the price gap, there are other potential ramifications. For example, if procurement price is higher than the price in the rural rationing scheme, the same grains lifted as rural rations, may in turn be sold to government agents under the procurement program. It

is possible to make money simply by adjusting book accounts without even any physical exchange under the two programs.

2. If procurement price is substantially higher than market price, a large quantity of grains will be offered to government. If government has adequate finance to take as much grain as offered, private trade will be discouraged to remain in stock holding business. This implies the substitution of private trade by public. Moreover, large scale financing for procurement destabilizes financial market or public budget.
3. On the other hand, if government does not have financial as well as physical resources to buy whatever quantity is offered, as is often the case, the program becomes ineffective. Thus, we hear the allegation that the Food Department is not interested in price support.

Setting a procurement price closer to market price is therefore a critical requirement.

Wheat Procurement Price

Wheat procurement price is currently set at about 60 percent of rice procurement price. In the past this ratio was about 0.7. In view of the prevailing situation, there is a ground to set wheat prices at about 70 percent of rice. The emerging food situation in the country is likely to be dominated by an increasing domestic production of rice but an increasing deficit in wheat. This situation warrants an increase in wheat price relative to rice in domestic market.

V. IMPLEMENTATION PROCEDURES AND PROGRAM EFFECTIVENESS

Pricing Policy does not end with the setting of a procurement price. It embraces making such a policy effective, too. An effective procurement program is one that stabilizes producers' price at an adequate level. For this to happen, the Government has to stand ready to buy any quantity of grain of acceptable quality at the price declared. The government also ought not to procure in years when the market itself supports price adequately. There are two major elements in the implementation: (1) the choice of the form, the location and the scale of grain procurement; (2) the mode, the liquidity and the transaction costs of the payment system in procurement. The modalities involve (a) the number and location of purchasing centers; (b) the payment system from the viewpoint of farmers' transaction costs; (c) the choice of grain (rice or paddy) that is being procured; (d) the setting of the milling ratio when rice mills are paid to buy paddy, mill it and sell clean rice to the government; and (e) the public-sector role in providing financing support to contract rice mills. The positive incentives may be yielded through raising the procurement price. Again, the character of implementation can yield incentives over and above administered price.

An effective procurement policy entails buying mostly from farmers. Or, if trade channels perform well, this requires that differences between primary market prices and procurement prices do not remain excessive. In Bangladesh, the procurement program does not meet this bill. There is much evidence to support this. First, a preponderant share of the grain procured is from traders (World Bank, 1979; Osmani and Quasem, 1985). In years with good crops large price differences have persisted even in major primary paddy markets in surplus areas where procurement had reached record levels. Data for 1989/90 aman season show convincingly that while the price differences between primary market and wholesale prices (in paddy) are mostly due to transportation and normal profits, the

differences between the latter and the procurement price were sufficiently large to suggest the presence of serious imperfections of the procurement system.

Aman procurement during 1989/90 was at a record level. Even so, IFPRI Farm Survey data have shown that in seven important surplus districts in North Bengal, only 2% of a sample of medium and large farmers sold on average merely 1.3% of their marketings to the government. This was the case even though they were fetching about Tk 15 - 18 per maund less for every sale in the market. Why were these better-off and numerate farmers not succeeding in selling at the administered price? Preliminary results suggest that farmer's transactions costs per unit in selling paddy to the government are high due to rent-seeking. IFPRI's ongoing market survey report would more fully investigate this and other related questions.

A major implementational change has recently occurred regarding procurement of rice. Up until 1988/89, the greater bulk of rice procurement was in paddy form. The chief class of transactors of this regime were the numerous paddy merchants in rice-surplus districts. The typical size of enterprise of this class is under one-tenth the size of rice millers in the country. Because the possibility of upward movement in market price put a time limit on the window of opportunity for profitable transactions, there was quite a vigorous competition among these numerous paddy traders to buy. The effect, howsoever small, was to farmer's advantage.

In 1989/90, the "Mill-gate Contract" was renovated as a way for the government to procure rice from rice millers. Essentially, the contract is for a package of three services: paddy purchase, millage, and transportation. If market paddy price falls short of procurement price, the difference will be pocketed by the miller. If the milling ratio obtained by miller is higher than statutorily

stipulated, the de facto procurement price of paddy received by the miller rises.

From 1989/90 aman season, the relative shares of rice procurement by source has had a quantum change. Mill-gate contract now accounts for about eighty percent of the paddy procured in Rajshahi division. Overall, mill-gate contract share in rice procurement was about 55% in 1989/90.

This is how the system works. A Food inspector, a low-paid employee, certifies drying and milling capacities whereupon the District Food Controller issues a contract for the delivery per fortnight of a stated quantity of milled rice. The contractor has to deposit, as a form of security money, 60% of the value of the paddy implied in the contract. Normally, the contractor buys defence saving certificates as the security. This instrument yields income to him at 21% per year equivalent. Food Department issues a Weight Quality and Stock Certificate (WQSC), whereupon a commercial bank pays the miller full-value of paddy equivalent of rice to be delivered at the procurement price. It is easy enough for the miller to put up paddy stocks that in fact belong to processors without own milling facilities and have been brought to mill premises for processing only. Consequently, the miller will frequently go to the market to buy paddy after the bank has paid. This amounts to a free paddy advance to the contractor. The miller is required to pay for paddy at the administered price. Mostly, however, the miller pays the going market prices, which may be lower.

Further, the Food Department pays a higher milling charge within the "millgate contract" to automatic rice mills (Tk.10.50 per maund of paddy) than to "major" rice mills/husking mills

(Tk.9.25 per maund).¹ As against one's expectations, marginal costs in reality are probably higher for more automated facilities, due to inappropriate choice of plants, for example. They should therefore be handicapped while placing orders, due to their higher cost. In reality, however, a considerable portion of the procurement does take place from automatic rice mills.

There is another differentiation in favor of automated facilities. The statutory milling ratio (the rice-to-paddy ratio) during aman procurement season is 0.643 (25.7 seers of rice per maund of paddy) for automatic/"major" rice mills but 0.652 (26.1 seers) for husking mills in greater Rangpur/Dinajpur districts. In greater Bogra and Rajshahi districts, the ratios are 0.633 and 0.643 for automatic and other processors. Husking mills can save the government Tk. 3.2 per maund of paddy milled on account of greater rice recovery. Of course, it is easier and quicker to check quality/moisture and issue the payment certificate for a large amount than a small. But that misses the point of the matter. In quantity targeting public operations, one tries to maximize quantity procured at given fiscal cost. The time cost in checking quality is a fixed cost, and does not enter into optimization.

The choice of the Form of Procurement

The public need to support producer prices is probably greater during the boro season than during the aman season. This is because of (a) larger marketable surplus (b) the higher atmospheric moisture (c) and greater transportation uncertainties during the wet season. However, the choice of the form of grain can be crucial. Fluctuations in atmospheric moisture are common during

¹. Automatic mills are wholly mechanized, they ought to have greater levels of technical efficiency than the husking mills, where manual methods are more pervasive. Marginal milling costs ought to be lower for automatic rice mills. The statutory milling costs, on technical efficiency grounds, should be lower for them.

the peak of the monsoon -- a spell of 2-3 months. These fluctuations can lead to greater quality deterioration in milled rice than in paddy. The capacity of the government to stabilize consumer prices during post-boro-harvest lean months through OMS operations may critically depend upon the quality of its rice stock. But it can choose between buying milled rice, and buying paddy and milling later when moisture fluctuations are smaller. The current system is heavily weighted favoring purchase of milled rice.

The Choice of the Milling Ratio

The milling ratios currently in use are based on sample results that are 8-9 years old. the secularly growing share of modern variety strains in paddy in both aman and boro seasons has raised the share of coarse grain. By and large, coarse varieties predominate market offerings. And the milling ratio of coarse grains is supposed to be higher. A reexamination of the milling ratios for various category of rice mills has probably now become overdue.

VI. CONCLUDING OBSERVATIONS

Three concluding observations are considered to warrant particular underlining in this report:

1. The objectives of public procurement has to be re-emphasized and clearly understood by those who are responsible to implement the program. This objective is price support against a crash in harvest season prices. Other objectives such as income distribution or replenishment of stock etc. should not be mixed up with the main objective of price support. Other policy instruments are available for the other objectives.

2. If procurement program cannot be carried out effectively to support price incentives, then the program should not be undertaken at all. Because an ineffective program wastes resources without achieving the objectives. For making the procurement program effective, it is critical to: (a) set procurement price close to expected market price, (b) make necessary arrangements of procurement in advance with locational specificity, and (c) make the procedure of procurement more transparent and widely known among traders than is the case at present.

3. Most farmers sell rice in market and the procurement program makes its contribution to incentives through its impact on market prices. The procedure of implementation is critically important in producing impact on market prices. This procedure should be transparent and effective enough to create expectation among traders that fall in prices would be prevented. Current procedure involves almost a bilateral negotiation between an officer and a trader. To make the procedure more transparent and publicized, some form of bulk purchase through open tenders may be seriously examined. This procedure will involve purchasing through a large number of selected central locations all over the country. The impact of such an approach on market prices is likely to be much sharper and dramatic for a given quantity of procurement than the impact under the current procedure. Procurement price under this proposed procedure will serve as an upper limit for quoting price by traders.

Appendix - A**ISSUES ON COST OF PRODUCTION ESTIMATION, 1991/92**

This appendix outlines the method used in full-valuation of inputs in rice cultivation in Bangladesh. All production stages (from ploughing through threshing) are included. First, a few words about various cost concepts are in order.

The cost concepts

At least, four cost classifications seem plausible. Cost A₁ embraces all paid-out cost or expenses incurred in cash and kind on material inputs, hired human labor, bullocks and machine labor. In particular, this shall include payments for hired human labor and bullock power services, hired machinery charges, imputations for owned bullock and machine power, value of seeds, fertilizers, pesticides (owned or purchased); manures (owned and purchased); irrigation charges; interest on working capital (excluding crop loan); interest paid on crop loans; and depreciation on farm implements and machinery, etc. Cost A₂ equals cost A₁ + imputed value of family labor using market wage rates. Cost B equals cost A₂ + rent paid for leased-in land + interest on owned fixed capital excluding land. Cost C includes cost B + rental value of own land.

The admissibility of rent as a cost

The real choice is between cost B and cost C. In economic theory, accommodation of the cost of specialized resource, e.g. land, as a valid item for inclusion in administered price is unsatisfactory. This is because such costs depend on the product price. When the latter increases, costs of such resources increase, too, thus warranting fresh administered price increases. Inclusion of rent is similarly criticized. Hence it is questionable that rentals on owned land ought to be included in

costs. Finally, it has been argued that use of land for cultivation does not involve any cost to its owner in Bangladesh. The argument here is that the unit price of single-cropped, unirrigated in Bangladesh land rose by 17% annually during 1973-1987, as against a 12% per-year inflation rate during the period and a 13% interest rate on commercial bank deposits (Hossain et al 1990, p.33). Even when left fallow, investment in land pays more than other uses of money.

Public pricing discourses in this region, however, almost uniformly include rent on own land as a cost (Sarma, 1988)². In Bangladesh, too, rent is included. We include land rent after adapting estimates taken from Mahabub Hossain et al's recent study (Hossain, et al. 1990).

All in all, our method corresponds to full valuation roughly on Cost C Basis, plus a 50% margin to account for profit, risk margin, and all other own-account inputs. Sample estimate for 1989/90 of full-valuation cost per maund is revised to reflect 1991/92 prospective input prices on a rough basis. All data relate to cost of aman paddy.

A few observations bearing on the character of government's production-cost data may be in order. Government data include a large provision for land rental. Calculations for 1989/90 Boro

² The most usual definition of rent equates it with what the factor earns over and above the minimum level necessary for it to be retained in present use. The minimum may be depressed far lower than the cost of subsistence. Land is not an end in itself. At the minimum, it is meant to generate the means for subsistence. When the sum of returns to farm-supplied input and farm operator surplus falls below the minimum subsistence of laborers on farm-which can sometime be the case-the admission of a rent on owned land in cultivation to plug the difference does not seem to totally negate efficiency consideration.

cost put land rent at 21.4% of average cost estimate. This would seem to be on the high side to some people. Second, interest on cash investment is charged to all paid-out expenses, including irrigation. However, this would overstate costs for those farms who pay for water in kind, after the produce is harvested. Thirdly, while government data on costs probably are sample estimates and are roughly comparable to IFPRI estimates and BIDS estimates (after adjustment for inflation), their yield figures are Bangladesh-wide averages, which are lower than sample averages. Bangladesh-wide estimates of costs per acre are bound to be lower than their (and anybody else's) sample estimates. The numerator and denominator both have to be consistently measured.

It is pertinent that the major results (for aman season) as between the Mahabub Hossain et al. study for 1987-88 and IFPRI Farm Survey for 1989-90 are sufficiently similar, after adjustment for inflation is made. Yield rates, labor use per land unit, cost per unit output and the share of HYV in aman area are fairly similar between these two studies. Hossain et al. study was jointly done by BIDS/IRRI, using surveys of 1245 households from 62 randomly selected villages. IFPRI survey sample had 620 households from 34 villages from throughout Bangladesh.

APPENDIX TABLE A-1

ESTIMATED COSTS OF PRODUCTION OF AMAN PADDY UNDER TRADITIONAL
AND MODERN VARIETIES, 1988, 1990

Varieties	Cost per md (TK) ^a	
	1987/88 ^b	1989/90 ^c
(1)	(2)	(3)
Local T. Aman Paddy	86	97
Modern variety aman Paddy	99	112
All aman Paddy sample average	90	102

Notes: (a) Figures do not include cost of land, and profit margin.

(b) Full valuation at market prices, but no provision made for putative interest on farmer investment on "working capital".

(c) Full valuation at market prices, including accrued or imputed interests due to "working capital", which is equated with cost of purchased input plus imputed value of own-account inputs (e.g. seeds) that are highly liquid. The estimate of total cost per maund of aman paddy (of Tk.194/md.) noted in the main text uses this and other relevant information. The assumption regarding profit margin etc. is the same as in Table A-2.

Source: Col. (2) from Mahabub Hossain et al (1990).
Col. (3) use data from IFPRI Farm Stock Survey.

APPENDIX TABLE A-2

COST OF PRODUCTION OF BORO PADDY IN 1989/90, 1991/92 (in Tk)

(a)	1989/90	1991/92
(b) Purchased input cost per acre 1989/90 ^a	4,679	5,846
(c) Interest payments on working capital, 1989/90	108	135
(d) Cost, 1989/90, per acre	4,787	5,981
(e) Yield rate/acre (md.)	55.8	55.8
(f) Cost per maund	85.8	107.2
(g) Land rent per md ^b	13.0	15.0
(h) Cost per maund {(f) + (g)}	98.8	122.2
(i) Cost per maund, rent incl. profit and risk margin {(H) x 1.5} ^c	148.4	183.0
(j) Cost of family labor and other own-account inputs per maund	21.0	23.0
(k) Total cost per maund	169.2	206.0

Note: (a) Purchased input cost per acre during 1987/88 was Tk 4,198 according to Hossain et al. study. Allowing for inflation between 1987/88 and 1989/90, the two estimates are close. Between 1989/90 and 1991/92, cost of purchased inputs is estimated to increase by 25%. So is the interest payable on working capital.

(b) For most economists, inclusion of rent as a cost would appear to have little or no "economic" justification. It is arguable, however, that pricing on efficiency terms can not totally brush aside the following point relating to the need for labor to reproduce itself. When the sum of the cost of farm-supplied inputs and farm operator surplus is lower than the cost of subsistence of "laborers" on the farm, the accommodation of rent as a "return" to owned land in cultivation to bridge the difference would seem to be consistent with efficiency.

(c) A 50% margin for profit, risk premium etc. is applied to average cost of purchased input plus rent. This procedure assumes that the gross margin in the farmer's mind will be related to his market purchases. Were the profit margin to be applied to full average costs including family labor, this would amount to allowing family labor to earn market wage as well as profit - a highly questionable assumption in labor surplus Bangladesh.

Source: Computed from Table A-3.

Table A-3 presents comparative estimates of cost of boro paddy per maund from three sources, namely Mahabub Hossain et al (1990), IFPRI (1991) and Government of Bangladesh.

The major similarities between Hossain et al study and IFPRI survey are worth pointing out. First, the labor use per acre are very close, thus resulting in closely similar labor costs. (The other cost components in Hossain et al. study are not separable.) Overall, cost per acre excluding cost of land, are quite close, namely Tk 5729/acre and Tk 5919/acre. Note that, according to IFDC's fertilizer market survey, retail fertilizer price in 1989/90 had fallen upon 1987/88. Also, diesel price was lowered in 1989/90. Finally, yield rates are very close. Because both Hossain's and IFPRI samples involved stratified random sampling techniques, similar results induce some strong confidence in IFPRI's own positions, regarding cost estimates.

On fertilizer and irrigation cost, the IFPRI and Government estimates for 1989/90 are very similar indeed. However, all other government estimates are higher. This is sometimes due to questionable methodology. For instance, interest is charged on all of cash investment in government costs. However, as argued already, this will overstate unit costs. The reason why government estimate of average cost is higher than either Hossain et al estimate or IFPRI estimates mostly does not, however, have to do with the differences in these line items. This has to do with a lower yield rate in government calculations. In addition, accommodation of a large land rent leads to government estimate of average cost being high.

All in all, the large differences in average cost estimates are in spite of close similarities in per-acre costs. The key issue is the yield rate in use. The government uses a lower yield rate. In sample surveys, it is common for respondents to fudge

over true yield performance of their farms. It requires well-trained and motivated investigators to get at true yield rates.

The government cost data, on the other hand, are based on reliable variety - specific input-output coefficients collected through adequate sample surveys. These data are similar to IFPRI cost estimates. The coefficients, when coupled with input price estimates for a particular season or year, generate the estimate of cost per acre. When the input price estimates are right-as, for example, in the case of fertilizer and irrigation in 1989/90 - costs per acre estimates will be about right. The yield data may be less reliable even when they are based on crop-cut experiments.

APPENDIX TABLE A-3

Comparative Cost Structure per BIDS/IRRI Survey, IFPRI Farm Survey, and Govt. Estimates, 1987/88, 1989/90

Item	1987/88 (BIDS/IRRI estimate)	1989/90 (IFPRI estimate)	1989/90 Ministry Estimates	1990/91 ^c (Ministry estimate)
(1)	(2)	(3)	(4)	(5)
Human labor	2734 (82.2)	2830 (81.8)	3148 (89.9)	3463
Bullock power ^a		417	561	589
Seed/seedling		310	554	606
Manure		83	155	155
Fertilizer		726	751	826
Pesticide		145	213	213
Interest on working capital		108	213	234
Cost per acre ^b	5729	5919	6981	7680 (10%)
Yield rate	55.4	55.8	43.9	42.0
Total Cost per maund (excluding rent)	103.4	106.07	159.0	183 (15%)
Rental on land per maund	13.0	13.00	42.9	42.9

- Note:
- (a) Parentheses against human labor are estimated labor coefficients (in mandays) per acre.
 - (b) Disaggregation was not possible with Mahabub Hossain et al data. However, the close similarity between Mahabub Hossain and IFPRI survey-returned costs is remarkable, knowing that as between 1987/88 and 1989/90, fertilizer prices in nominal term, fell by 7%.
 - (c) Figures in parentheses in this column are percentage increase over the last year.

Comparative Aman and Boro Average Costs

Both BIDS/IRRI and IFPRI studies shows that in both 1987/88 and 1989/90 average cost was lower for modern variety paddy overall than for traditional varieties. On given land supply, adoption of modern varieties is often the avenue to increase output. The cost conditions of the modern variety adopters therefore provide the point of reference. It is more appropriate to peg the procurement price at one level. It turns out that average cost (excluding land cost) for HYV boro is somewhat higher than for HYV aman. Hence the higher of the HYV average cost estimate is here adopted as the basis. HYV boro has been and will remain for some times, the major engine of growth of rice output in Bangladesh. Hence, two separate estimates for rice procurement price are presented in the fact: one for HYV aman, the other for HYV boro. Only average cost is used.

As for the profit, 50% margin is applied to the sum of the cost of purchased inputs plus rent. Ninety percent of the latter is accounted for by purchased inputs. The rationale is that "profit" should perhaps be related to cost of resources purchased in the market.

APPENDIX - B**DETERMINATION OF PROCUREMENT PRICE ON THE BASIS
OF WORLD PRICE OF RICE**

The procedure of deriving the world price equivalent of domestic procurement price are as follows:

1. Decide on the particular grade of grains in the world market that is comparable with the most dominant grade in the domestic market for which the procurement program is relevant. In the case of domestic market, the coarse variety is generally the grade that represents procurement by the government and consumed by vast majority of our people. Finding an equivalent grade in the world market is however a complicated task. The grades in the Thai market are shown in appendix table B-1. It will be seen from this table that there are about 8 major grades but each major grade is again subdivided into about 7 to 8 sub-grades depending on the grain composition (i.e. extent as well as dimensions of broken grain). Specificity of grades is very rigid in the world market but not so in the domestic market. Bangladesh consumers are known to prefer domestic rice, even of relatively low quality, to imported rice. On the other hand, if we want to sell our rice to other countries, they generally prefer low quality Thai rice to Bangladesh rice. Thus, consumers' taste in Bangladesh differs from the taste of foreign consumers. This consideration makes the task of selecting comparable grade quite difficult. For the purpose of the present exercise, we take the Thai 15 percent broken white rice as the relevant grade for assessing price on import

parity basis. This grade is usually the one that compares with our domestic grades and consumers' taste.

The question has been raised as to why Thai rice market price is taken as a basis of calculation rather than Indian or Pakistan exported rice. Thailand sells, in relatively large quantities and throughout the year a number of homogeneously graded rice varieties. A few of these are comparable to Bangladeshi staples, at widely quoted prices. Thailand thus quite closely approximates an international market of rice grades of interest to pricing policy in Bangladesh. In contrast, the varieties exported by India and Pakistan are very specialized high quality grades traded in smaller quantities. No Bangladeshi rice nor Thai rice presently compares with these varieties.

For the purpose of examining the price on the basis of export parity, we take the grade known as A1-special in the Thai market. This price is modestly higher than the price Vietnam is getting for export in the world market. For example, the actual price of A-1 special in Thai market was about \$180 per metric ton while Vietnam was selling at about \$165 per m.ton in 1989/90. It is understood that the World Bank recently brought some rice-trade consultants in Bangladesh to examine the price that the Bangladesh coarse rice could fetch in the world market. This consultancy provided the opinion that Bangladesh rice would probably receive about \$160 per m. ton in the world market.

2. It is well-known that world price is more volatile than domestic price. For this reason, the trend of world price rather than the actual price is considered relevant for the purpose of keeping domestic price in line with

the world price. For the present exercise, a three-year moving average is used as the world price guide.

3. Official exchange rate (i.e. Tk 36.00 per dollar) is used in converting dollar into Taka price.
4. The import parity (MP) price at producer level is calculated as follows:

$$MP = BPH(1-b_2)$$

and

$$BPH = (CIFP. xe)(1+b_1)$$

where

BPH = border price at wholesale level

CIFP = FOB price plus shipping and insurance cost

b_1 = rate of marketing cost, including profit for business, from port to wholesale (assumed 15%)

b_2 = rate of marketing cost between wholesale and farm level (assumed 10%)

Plugging the relevant values in the above formula we get the following estimate:

$$\begin{aligned} BPH &= [(297+20) \times 36](1.15) \\ &= 13,124 \end{aligned}$$

Thus,

$$\begin{aligned} MP &= 13,124(1-0.10) \\ &= \text{Tk } 11,812 \text{ per m.ton} \end{aligned}$$

In terms of Tk per maund, the import parity price at producer level is Tk 441 (i.e. $11,812/26.8$).

Now, this estimate is in terms of annual average. For deriving the floor price, providing a price band of 15 percent (i.e. 7.5 percent above the average and 7.5 percent below it), the

average price is multiplied by the fraction 0.925 (i.e. $1-0.075$) and get the floor price or procurement price of Tk 408.

5. The export parity (EP) price at producer level is calculated as follows:

$$EP = WP \cdot xe - MC$$

where

$$WP = \text{FOB world price in dollar/m.ton}$$

$$MC = \text{Marketing cost from farm to export point} \\ \text{(assumed 22\% of WP in Tk)}$$

thus,

$$EP = 215 \times 36 - MC$$

$$= 7,740 - 1,703$$

$$= \text{Tk } 6,037 \text{ per m.ton}$$

$$\text{or, Tk } 225 \text{ per maund of rice.}$$

As was the case with import parity price, the estimate of export parity price is in annual average price. For deriving the floor price, this annual average is multiplied by a factor of 0.925. This estimate is equal to Tk 208 per maund.

6. The average of Import and Export parity floor price is:
 $(408+208)/2 = 308$

Thus, the world price criterion leads us to the estimate of procurement price of rice for the 1991/92 rice crops at Tk 308 per maund. This compares with the current level of procurement price of rice at Tk 358. In terms of paddy, using the current rice/paddy price ratio, the estimated procurement price is about Tk 205 per maund. This compares with the current procurement price of Tk 240 per maund of paddy.

7. In conclusion, a few observations are in order. First, the annual average world price conceals the fact that there is a considerable variation in world prices across seasons. Generally, prices in the months of November through February are about 8-10 percent lower than the average. Therefore, timing of import order can be quite important. Second, there is a 10 to 15 percent difference between the posted price (used in this calculation) and the actual price. Third, purchase in cash implies a lower price than the purchase on credit through government to government contract. Finally, the complex grading system in the world market warrants a caution and checking in order to ensure that the grade on which the price was negotiated and paid, is the grade of rice that is actually delivered at home port. It is observed that, for the same recorded grade that Bangladesh government had purchased rice in the past, the price was considerably higher than the posted price published in the World Grain Situation and Outlook. One of the reasons could be that the Bangladesh government generally bought rice from the world market in the months when prices were higher than the average.

APPENDIX TABLE B-2Rice Prices in the Thai Market

(price in \$ per m.ton)

Year	15% broken white rice		A-1 special white rice	
	Posted Price	Actual Price	Posted Price	Actual Price
1982	270.00	-	193.00	-
1983	259.00	-	191.00	-
1984	243.00	-	208.00	-
1985	210.00	-	169.00	-
1986	199.00	181.00	123.00	104.00
1987	216.00	203.00	160.00	149.00
1988	282.00	266.00	230.00	219.00
1989	310.00	282.00	235.00	215.00
1990	298.00	259.00	181.00	166.00

Source: USDA, foreign Agricultural service G&F Division, 1991

APPENDIX - C

**PREDICTING 1991/92 RICE PRICE USING AN AGGREGATE
RICE SECTOR MODEL, BANGLADESH**

The objective of this Appendix is to present the formulation and estimation of a four-equation model that permits predictions of rice wholesale price in 1991/92.³

The model structural form is as follows:

$$PR_t = f_1(Y_{t_1}, MSR_t, SW_t, OSR_t)$$

$$MSR_t = QR_t - QRP_t + MRD_t$$

$$QRP_t = f_2(QR_t, PR_t, ADPR_t, OSR_t)$$

$$MRD_t = f_3(PR_t, RPR_t, Z_t)$$

where

- PR_t - price of rice in real terms (nominal price deflated by manufactured goods price index)
- MSR_t - market supply of rice per capita
- QRP_t - public rice procurement from domestic production per capita

³Ahmed and Bernard (1989) were the first expositors of this model. Shahabuddin modified it somewhat, before using it for recommending a procurement price for 1989/90 (Shahabuddin, 1990). The present model bears on Shahabuddin's work, with one important addition, with respect to treatment of private of private stock changes. Given the availability of annual data needed, it is not immediately obvious how this aggregate model could be made a great deal better. Ahmed and Bernard (1989) showed earlier that a more fully specified model with 1960-1984 data yielded poor results. Hence, such an effort is not repeated here.

MRD_t	-	monetized rice offtake from public rationing system per capita
Y_t	-	per capita real income (Disposable income deflated by national income deflator)
SW_t	-	production of wheat per capita
QR_t	-	production of rice per capita
ADP_t	-	Rice procurement price in real term
RPR_t	-	Rice ration price in real terms
OS_{Rt}	-	Opening Govt. stock of rice per capita
Z_t	-	Availability rice public stock per capita during year, which equals opening stock plus import plus public procurement.

It is possible to solve the above system of equations for the four unknowns, namely PR, MSR, QRP and MRD. Because the number of endogenous variables on the right hand side (RHS) of any relation is less than that of exogenous variables excluded from it, the parameters permit identification. The model was estimated using two-stage least squares (TSLS) and data for 1975/76 through 1989/90.

The model treats OS_{Rt} , Z_t and rice imports exogenous, the first two explicitly. (For a justification, see Ahmed and Bernard, 1989). The inclusion of beginning-of-period public stocks is motivated by the assumption that they negatively impact on private storers' price expectations in future. More specifically, by future we mean the period during July through October --typically a lean period. Decreases in price expectations in future are assumed to increase supply from storage, which likely lowers market price. Hence, price equation is posited to have a negative coefficient on the public-stock argument. The model is therefore not totally without any treatment of changes in private stocks. This is a desirable feature. By all accounts, the relative share

of privately-traded paddy/rice in total in rice market absorption is probably growing through the period under reference.⁴

Estimated equations are presented below, with t-statistics being put within parentheses. The estimate of the price equation is plausible. Derived income elasticity is 0.36. This is consistent with other estimates. The derived price elasticity (-0.07) is lower than other estimates. In our opinion, our specification is less culpable on account of omitted-variable criticism: price elasticity would have been higher if opening public stock were not in the equation. That gains in public stocks dampen market price is plausible. Increases in wheat production, too, depress rice prices although the effect is not statistically significant.

The Procurement Equation

Like its precursors, this model establishes the strong effect of both market and administered prices on rice procurement. Increases in market price lower public procurement, and increases in procurement price increase the quantity procured. Elasticity is significantly higher for market price. This difference in the two price elasticities suggests the existence of transactions costs in the public procurement program unrelated to "normal" handling margins of private trade. The significant positive impact of production on the quantity procured is reestablished.

The Ration Equation

⁴ Dr. Akhter Ahmed estimated, using an indirect method, gross marketed surplus for 1986/87 at 42% of net production (Ahmed, 1990). For 1989/90 aman season, result from farm stock survey currently directed by Nuimuddin Chowdhury at IFPRI, Dhaka suggest the ratio at 43%. For entire 1989/90, the ratio will be higher.

Both market and administered ration prices have correct signs. The latter is significant, too. Relative prices are again shown to have become influential in determining public ration offtake in recent years. Availability of government stock has the correct sign albeit on a weak coefficient.

Predictive Power of the Model

In historical simulations, the model performed well in tracking rice price, ration offtake and market rice supply variables. Theil inequality index computed for PR, MSR, QRP and MRD are 3.70%, 5.3%, 24% and 8%, respectively. Adequate predictive performance as concerns PR, MSR and MRD is promising. As with other models, prediction of rice procurement is relatively less accurate.

Determination of Rice Procurement Price

The steps involved here is (a) make a prediction of market rice price in 1991/92 using this model and after generating a set of forecasts on the exogenous variables; (b) compare predicted price with trend price; (c) choose the annual target price (ATP) at the lower (higher) value of the target price band if the predicted price is lower (higher) than the trend price (the target price band used in this exercise is one allowing 8% variation in annual price due to production fluctuations); (d) fix target wholesale "floor" and "ceiling" prices consistent with an established pattern of seasonality; (e) arrive at procurement price by netting farm-to-wholesale-level marketing margins from the target ceiling price.

Following Ahmed-Bernard (1989), seasonal-price band of 16 percentage points is used in this exercise. Predicted price in 1991/92 is lower than the normal price. The ensuing calculations for determining rice's procurement price are shown in Table C-3 in Appendix C. The resulting estimate of rice procurement price is Tk 346 per maund. This is higher than the procurement price of Tk 338 during the 1990/91 aman season. (This was subsequently raised to Tk 358 per maund before 1991 boro season).

APPENDIX TABLE C-1

Estimated equations for price prediction Model

<u>Equations and variables</u>	Estimated coefficients	t-value	R ²	D.W.
<u>Price Equations</u>				
Constant	-28.559	-0.64	.83	2.34
Income (Y_{t-1})	0.090	4.94***		
Market supply (MSR_t) of rice	-0.016	-0.05		
Wheat production (QW_t)	-0.555	-1.89*		
Opening stock of (OSR) rice	-1.081	-2.49**		
<u>Procurement Equation</u>				
Constant	-22.627	-1.83*	.75	1.21
Production of rice (QR_t)	0.220	2.76**		
Market price of rice (PR_t)	-0.615	-2.84**		
Procurement price ($ADPR_t$)	0.489	1.48		
Opening stock of (OSR) rice	-0.134	-0.51		
<u>Ration Equation</u>				
Constant	10.764	2.49**	.70	1.42
Market price of rice (PR_t)	0.009	0.06		
Ration price (RPR_t)	-0.254	-2.60**		
Availability at (ZR_t) Govt. stock	0.111	0.71		

Note: ***, **, and * denote that the coefficient is statistically significant at 1%, 5% and 10% level respectively.

APPENDIX TABLE C-2

Reduced - form Coefficients of Rice Price
Determination Model, Bangladesh, 1976 - 1990

C	Y(-1)	QW	OSR	QR	ADPR	RPR	ZR
PR -28.8069	0.0893	-0.0552	-1.0727	-0.0124	0.0078	0.0041	-0.0018
QRP -4.8907	-0.0550	0.3388	0.5258	0.2282	0.4846	-0.0025	0.0011
MRDT 10.4937	0.0008	-0.0052	-0.0101	-0.0001	0.0001	-0.2549	0.1111
MSR 15.3844	0.0558	-0.3439	-0.5359	0.7717	-0.4845	-0.2524	0.1100

Note: For definitions of variables, see text of the paper

APPENDIX TABLE C-3Calculation of Rice Procurement Price, 1991 Aman Crop

(a)	Predicted Nominal Price, 1991/92	434
(b)	Trend price, 1991/92 ^a	437
(c)	Annual target price [(b) x 0.96]	419
(d)	Target floor price, wholesale, [(c) x 0.92] ^b	386
(e)	Target ceiling price, wholesale, [(c) x 1.08] ^b	452
(f)	Farm-to-wholesale-level marketing margin as % of wholesale price in rice ^c	10.2
(g)	Rice Procurement price, 1991/92	346
(h)	Paddy procurement price, 1991/92 [(g) x 0.665]	230

- Notes:
- (a) A semi-logarithmic quadratic trend is used on real price series "is used."
 - (b) A 16% band for seasonal price variation is used
 - (c) This uses result from IFPRI survey of rice market in Bangladesh.