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BUFPER STOCK SCHEMES TO SUPPORT PRODUCERS, INCOME IN BANGLADESH

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ABSTRACT

This study demonstrates government buffer stock schemes under alternative price and behavioural assumptions to identify the impact of these schemes on household net income from paddy marketing. Both net sellers and net buyers benefit from a buffer stock scheme with either a constant mean price or a modestly increasing price over the paddy season. Nonproducing consumers also benefit slightly from these policies. Government expenditure is higher if the policy price Is fixed at a higher level, and if an attempt is made to stabilise the prize completely over the season.

I. INTRODUCTION

Higher prices of foodgrains are an incentive to producers but reduce the• welfare of consumers. This conflict of interest is well recognised by the economic literature for the developing countries (Timmer 1986; Teklu and Johnson 1988). Policy makers, therefore, often prefer the more modest objective of reducing the dispersion of prices by a price stabilisation programme rather than increasing their average level (Mellor 1966).

The price for foodgrains at the lean months is very high. The difference of this price from the harvest price is sometimes much greater than the storage costs (Hays and McCoy 1978; Huq and Greeley 1989; Akter 1989). However, tiles farming households do not benefit from grain storage and therefore the high price at the end of the season is not an incentive for these households. Instead, these households are disadvantaged from the low price early in a crop season and high price later in the season. This is because most of these households sell early in the season and repurchase later, to a large extent,

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due to the imperfections fn the credit market. For instance; in Bangladesh net buying households sell more than 60 percent of their gross paddy sales in a season at the low price harvest month (Akter 1989).

The disadvantaged marketing of foodgrains is one of the sources of low income of agricultural households where foodgrains are major agricultural crops as in Bangladesh. Since production is affected by the low income of households via low level of input use, the government policy should aim at increasing net income from foodgrain marketing.

The objective of this study is to demonstrate government buffer stock schemes under alternative price and behavioural assumptions to identify the impact of these schemes on household net income from paddy marketing.

II. THE THEORY OF STABILISATION POLICY

Since farming households are disadvantaged from the low price early in the season and the high price later, this problem would reduce by a seasonal stabilisation programme which raises the price early in the season and lower the price later in the season, The literature on the theory of stabilisation mostly concerns annual fluctuations of prices or income but the theory is applicable to the problem of seasonal price variation with some modification. Waugh (1944), Of (1961) and Masseli (1969, 1970) use graphical analysis to measure the welfare effects of commodity price stabilisation. Waugh considers the case of instability on the supply side. Measuring the benefits and losses of price stabilisation by consumer surplus waugh arrived at the lusion that consumers lose from price stabilisation.

Oi considers the case of instability on the demand side. Measuring the benefits of price stabilisation by producer surplus he arrived at the conclusion that producers lose from a stabilisation scheme.

Waugh's concern was consumers and supply instability and therefore its effect on producer surplus was ignored. By contrast 01's concern was producers and demand instability and so the effect of this instability on consume-r surplus was ignored.

By taking into account producer surplus in the supply instability and

consumer surplus in the demand instability Massell concluded that there are net benefits from price stabilisation.

This framework is based on a number of assumptions like costless storage, linearity of demand and supply schedules and the demand and supply as functions of actual prices which implies that both producers and consumers' decisions are based on complete information. The critics have queried these assumptions (Newbery and Stiglitz 1981).

In addition, the possibility of simultaneous instability of both supply and demand has not been taken into account. In our case, both demand and supply are the sources of seasonal price variation because some households at the beginning of the season become buyers at the end of the season.

Moreover, the instability of supply and demand is taken as exogeneous, since annual fluctuations in supply or demand are assumed to be caused by some uncontrollabe factors. In other words, the supply (demand) function in the second period does not depend on the supply (demand) function of the first period. In our case, the supply and demand curves in one period are determined by the changes in demand and supply in the preceding period. This means that the position of the supply and demand curves before and after the stabilisation is not the same. It is not possible to show these changes by simple diagrams. A mathematical model is therefore developed in the next section to measure the impact of seasonal price stabilisation.

III. THE MODEL

In rural markets the monthly foodgrain supply comes from farming households and traders. Foodgrains are demanded in these markets by traders, non-producing rural consumers and farming households. Log-linear functional form is assumed for both supply and demand functions for all these groups. This functional form has simple algebraic properties and well-understandable economic implications and also it allows for non-linearity. Algebraically, aggregate market supply (Q^S) and demand (Q^D) are given as :

$$Q^S_t = \sum Q^S_S + \sum Q^S_B + \sum Q^S_{TR} \qquad (1)$$

$$Q^D_t = \sum Q^D_S + Q^D_B + Q^D_{TR} + Q^D_C \qquad (2)$$

where, Q^S and Q^D refer to aggregate market supply and demand respectively. The subscripts S and B distinguish producing households as net sellers and net buyers. The subscripts TR and C refer to traders and rural non-producing consumers respectively. The subscript t refers to a month.

The market clearing equation in each period is given as :

$$Q^S_t = Q^D_t \qquad (3)$$

Household supply and demand functions are given by :

$$Q^S_S = A_{tS} \, P^{\alpha}_{tS} \qquad (4)$$

$$Q^S_B = A_{tB} \, P^{\alpha}_{tB} \qquad (5)$$

$$Q^D_S = B_{tS} \, P^{\beta}_{tS} \qquad (6)$$

$$Q^D_B = B_{tB} \, P^{\beta}_{tB} \qquad (7)$$

where, A and B are multiplicative supply and demand shifters respectively, P is the market price, α is the elasticity of supply and β is the elasticity of demand. Elasticities may be variable between months. Changes in stocks and prices each month affect the household income level and therefore their behaviour also changes each month.

Due to the urgent cash requirements at harvest for repayment of loans and to pay harvest labour, most households sell at harvest. Since from harvest onwards households are added to the demand side from the supply side the household supply function shifts gradually to the left and the demand function shifts to the right. Hence, supply and demand shifters A and B vary between months. These variable shifters are given by :

$$A_{tS} = f(ST_{tS}, K_{tS}) \qquad (8)$$

$$A_{tB} = f(ST_{tB}, K_{tB}) \qquad (9)$$

$$B_{tS} = f(ST_{tS}, Y^O_{tS}) \qquad (10)$$

$$B_{tB} = f(ST_{tB}, Y^O_{tB}) \qquad (11)$$

where, ST is the per capita initial stock, K is the amount of credit to be repaid plus payment to casual labour and Y^0 is the liquid income from other sources than food production.

Once credit is taken under the condition that it must be repaid at harvest it is exogenous. The payment to casual labour at harvest is exogenous because production decisions are already taken. So Kt, the cash requirements to repay loans and to pay harvest labourers is exogenous for both net sellers and net buyers. Beginning stocks at time t are given by :

$$STt = STt\text{-}1 - (Q^S t-1 + Ct\text{-}1 + Q^O t-1) + Q^D t-1 \qquad 12$$

where, C is the consumption of foodgrains and Q^0 is the net other uses of foodgrains (net payments in kind).

The supply and demand functions of traders and the demand function of non-producing consumers are given by :

$$Q^S_{TR} = A_{tTR} P_t^{\alpha TR} \qquad (13)$$

$$Q^D_{TR} = B_{tTR} P_t^{\beta TR} \qquad (14)$$

$$Q^D_{C} = B_{tc} P_t \qquad (15)$$

Clearly if the supply shifter (At) in equations (4) and (5) were constant, rational households would sell more at higher prices in the highest price month. However these shifters are endogenous as shown in equations (8) and (9). This is turn makes more early sellers into buyers at the end of the season and thereby causes the demand curve to shift via equations 10 and 11. Moreover, if households have no income other than foodgrains, in the absence of borrowing facilities they cannot buy foodgrains at harvest.

If households are ensured a higher price at harvest because excess supply is purchased by a government buffer stock scheme, their income from selling grains will be higher even if their major share of sales occur at harvest. On the other hand, if the grains purchased are supplied back into the market so that prices do not rise above the fixed price level at the end of the season,

the expenditure on purchasing grains will be reduced. However the government programme is not costless.

Suppose the government operates a programme by fixing a constant price P for the whole-season, under which the government is willing to buy the excess supply when Pt <P and is willing to sell the excess demand when Pt> P. If the sum of excess demand exceeds the sum of excess supplies, the government will be able to buy less than it needs to sell to keep the price at P. Hence there is a possibility of increasing price above P unless the government imports foodgrains. In operating these buying and selling operations, the annual expenditure incurred by the government is given by :

$$E = \sum PQ^G_t + \sum CST^G_t \qquad (16)$$

where, E is the net cost of the government for the programme,

$Q^G_t (= Q^S_t - Q^D_t)$ is the net quantity purchased by the government, the exogenous storage cost per unit of government stocks per month is denoted by c and ST^G_t is the stock by the government at the end of the month t.

To keep the price constant at P in each month the government must ensure the supply and demand to be equal for this price. If $(Q^S_t - Q^D_t) > 0$ the price will be less than P, then it means that the government needs to buy the excess supply and for that the government incurs costs. On the other hand, if $(Q^S_t - Q^D_t) < 0$ then the gnvernment sells and receive revenue.

The government stock at the end of time t is given by :

$$ST^G_t = Q^G_t + Q^G_{t-1} + Q^G_{t-2} + \ldots\ldots = Q^G_t - ST^G_{t-1} \qquad (17)$$

If the government sets a constant target price, then it will have to pay the entire cost of its stockpile and price will be completely stabilised, Instead of buying and selling at a constant price the government may set different buying and selling prices, can be called the support price (Ps) and the release price (P_R). This will stabilise prices partially and the government expenditure will be less than that of the complete price stabilisation. To operate this policy, the government needs to buy and sell the excess supply and demand such that the priee does not fall below Ps or rise above P_R. This means that,

If $Pt < Ps$ then $Qg_t < o$ and (18)
If $Pt > P_r$ then $Qg_t < O$, where Qg_t is the net quantity purchased by the government at the month t.

The annual government expenditure in this scheme is given by :

$$E = \sum (P_S - P_R) Q^G_t + \sum cST^G \quad (19)$$

From equations (16) and (19), it is clear that if $P = P_S$ and $P_R > P$ then the partial stabilisation scheme will cost the government less than the complete stabilisation.

IV. DATA, VARIABLES AND PARAMETERS

The model described in previous sections is solved for the agregate monthly data of 400 households from 16 rural villages of similar cropping pattern. These are surplus villages in all rice seasons. Of these villages 12 are from northern districts Bogra, Rangpur and Dinajpur, 2 villages are from Mymensingh district and the remaining 2 are from Faridpur and Jessore districts. Of the 400 households 265 households are net sellers and 135 are net buyers. The data for these households are taken from a nation-wide survey carried out in October-November, 1982 to September-October, 1983 (Islam *et al.* 1987).

The supply of net sellers and net buyers is their monthly aggregate gross sales. The demand for paddy of net sellers and net buyers is their aggregate monthly gross purchases. These supply and demand are measured in kg. Monthly price is obtained by taking the weighted average of average monthly selling and buying prices of households.

Data are not available for consumers' demand, traders supply and demand, household cash requirements at harvest and other income. The information presented in table 1 is used for imputing the value of consumerdemand.

It is assumed that all non-farm household are rural consumers except in harvest months. At harvest, active members of labour households are assumed to eat with farm-households.

We also assume 150 non-farm households consisting of 94 labour households based on the proportionate distribution of rural households in

Table 1. Background Information about Rural Households.

	Value	Year	Source
Farm household (% of rural household)	73	1983-84	BBS (1986a)
Non-farm rural household (%)*	27	1983-84	BBS (1986a)
% of non-farms as labour household**	63	1983-84	BBS (1986a)
Household size (persons/household)	5.7	1981	BBS (1984)
Rice intake per capital per day (kg)+	0.404	1981-82	BBS (1986b)
Active population per household++	1.7	1983-84	BBS (1986c)

* BBS (1986a) defined rural areas to be all areas except Municipalities of the country. So urban areas other than municipalities are included in rural areas. Households with less than 0.05 acres of cultivated land were treated as non-farm households and with a minimum of 0.05 acres of cultivated land were considered as farm households.

** These are agricultural labour households.

\+ Cleaned rice equivalent to 0.606 Kg. paddy.

++ Members who are above 10 years of age.

table 1 since 400 farm households are selected for this analysis. We know the peak harvest months in each paddy season and therefore consumers' demand is calculated as follows :

$Q_C^D = 150 \times 5.7 \times 0.6 \times 30$ kg. per month in a non-harvest month,

$Q_C^D = 130 \times 5.7 \times 0.6 \times 30$ kg. per month in a harvest month,

where non-farm rural households who are rural consumers are assumed to be 150 for non-harvest months and 130 for the harvest month. Household size and paddy consumption per person per day are assumed to be 5.7 persons and 0.6 kg. respectively (Akter, 1989).

Consumers' demand, Q_C^D, is then adjusted in response to price changes, using prce elasticities of demand of -0.2, -0.5 or -0.8. These elasticities are assumed based on the evidence from other studies where the elasticity of demand ranges mostly from -0.29 to -0.83 (Mahmud 1979; Ahmed 1984; Pitt 1983).

Once Q_C^D is calculated, traders' supply and demand are generated by equations (1) to (3).

The effect of other income is ignored, since neither data nor a proxy was available for this. The effect of cash needs at harvest on shifting household supply is taken into account by the use of dummy variables for the harvest month in each crop season.

The assumed elasticities are shown in table 2.

Table 2. Scenarios of Elasticity Assumptions.

Scenarios	Supply		Demand		
	α_S	α_B	β_S	β_B	β_C
A	*	*	—0.02	—0.20	—0.50
B	*	*	—0.55	—0.70	—0.50
C	*	*	—0.80	—0 80	—0.50
D	0.30	0.30	—0.55	—0.70	—0.50
E	2.00	2.00	—0.55	—0.70	—0.50
F	*	*	—0.55	—0 70	—0.20
G	*	*	—0 55	—0.70	—0.80

α_S = Elasticity of supply (gross sales) for net sellers.
α_B = Elasticity of supply for net buyers.
β_S = Elasticity of demand (gross purchases) for net sellers.
β_B = Elasticity of demand for net buyers.
β_C = Elasticity of demand for other consumers.
* In this case elasticity of supply is considered to be variable between months. These variable elasticities are

α_S = .70, .15, .45, .50, .58, .62, .50, .10, 40, .15, .60, .68 and α_B = .56, .05, .25, .30, .36, .52, .40, -.15, .30, .10, .56, .64, respectively from Oct-Nov, 1982 to Sept-Oct, 1983.

For net sellers' and net buyers' supply elasticities (α S and αB) in scenarios A, B, C, F and G in table 2 were estimated by using household supply models and household level data for each month (Akter, 1989). The

pattern of these elasticities shows that household supply is highly inelastic during the harvest month and the value of the elasticity increases from harvest onwards. This pattern seems plausible. During the harvest month, house holds cannot reduce their sales much with the decrease in price due to urgent cash need. On the other hand, a small increase in harvest price may not induce them to sell more, since a higher price is certain at the end of the season. The urgency of cash reduces from harvest onwards. Therefore the elasticity increases gradually.

In scenario D the supply is highly inelastic and E the supply is highly elastic.

Demand elasticities in scenarios B, D, E, F and G are assumed based on cross-section elasticities estimated by Akter (1989) with the same data. No other evidence is available. In scenario C it is relatively high.

Demand elasticities for consumers are assumed to be —0.2, —0.5 and —0.8 based on the evidence of other studies as mentioned earlier in this section.

The parameters in shifter equations 8-11 were estimated by log-linear specification on 12 month observations, where the supply shifter was a function of initial stocks and dummy variables for harvest months and the demand shifter was a function of initial stocks. The estimated equations are then used in simulation.

V. IMPACT OF BUFFER STOCK SCHEMES

Producers' revenue, expenditure and income, consumers' surplus and government expenditure are simulated under the policy that the government operates a buffer stock scheme to ensure either a constant price throughout the season or a moderately increasing price from harvest onwards. The policy price is assumed constant either at the mean, low or high level. The mean price is the weighted average of the monthly average of household selling and buying prices of paddy. The 7 per cent difference of the mean price in lower and upper directions is assumed to calculate the low and high prices. The mean price is Taka 3.88 per kg., low price is Taka 3.60 per kg. and high price is Taka 4.15 per kg. (at 1982/3 prices). Traders are assumed to become superfluous when the policy is in operation.

The constant price policy do not provide any incentive to households to store grains for future supply. The programme may therefore be costlier via the maintenance of early stocks, since under the policy households may tend to sell the highest share of their marketable surplus at harvest. A policy which allows prices to increase at a constant rate from harvest will lower the seasonal fluctuations and the programme cost. The rate of increase in price is assumed to be moderate such that the traders are still become superfluous under the policy. For this policy the floor harvest price in each season is assumed to be Take 3.80 per kgi. The prices in other months in the season are obtained by allowing for 15 per cent annual increase (1.25 per cent per month) from the harvest price.

Changes in producers' revenue from selling paddy, expenditure on buying paddy and net income are shown in table 3, where revenue is the quantity sold multiplied by price, expenditure is the quantity purchased multiplied by price and net income is the difference between the revenue and expenditure. These chenges in percentage term are shown in table 4.

All changes are compared with the results of the base simulation. Since net buyers purchase more than they sell, their net income is higher when the policy price is low and constant. By contrast, net sellers' net income is higher when the policy price is high. However both of these groups benefit from the policy of constant mean price or increasing price.

The size ot revenue and expenditure changes varies between Elasticity scenarios but the net effect in terms of changes in net income is almost invariant in most of the cases.

Large changes in expenditure due to differences in the supply elasticity under scenarios D and E are notable. Scenario D is the case of inelastic supply and scenario D is the case of elastic supply. For instance, under the policy of the low price, the inelastic sales function results in a 10 per cent reduction in net sellers' expenditure whilst the elastic sales function results in a 29 percent reduction in the expenditure (Table 4). This happens via endogenous stocks, When the supply is inelastic, household supply and therefore demand remain the same as prices move. So the variations in revenue and expenditure in this case are mostly the pure price effect. On the other hand with highly elastic supply household sales change with the

Table 3. Annual Changes (Taka per household, 1982 / 3) in Household Revenue, Expenditure and Net Income (Compared with the base) from Paddy Marketing*.

Scen-arios**	Changas in	Low Price		Mean Price		High Price		Incr. Price	
		S	B	S	B	S	B	S	B
A	Revenue	-415	-44	+72	+67	+547	+178	+64	+63
	Expenditure	-117	-430	-30	-111	+53	+185	-26	-69
	Net income	-298	+386	+102	+178	+494	-7	+90	+132
B	Revenue	-400	-37	+79	+59	+540	+148	+78	+57
	Expenditure	-102	-407	-30	-119	+42	+156	-18	-84
	Net income	-298	+370	+109	+178	+498	−8	+96	+141
C	Revenue	-389	-30	+79	+59	+532	+148	+79	+67
	Expenditure	-90	-408	-26	-119	+34	+148	−20	−85
	Net income	-298	+378	+105	+178	+498	+0	+99	+152
D	Revenue	-381	-30	+87	+67	+536	+163	+43	+52
	Expenditure	-79	-415	-19	-111	+42	+170	−45	−60
	Net income	-302	+385	+106	+178	+494	−7	+88	+112
E	Revenue	-532	-74	+53	+81	+645	+237	+63	+58
	Expenditure	-230	-467	-53	-104	+151	+237	−26	-74
	Net income	-302	+393	+106	+185	+494	+0	+89	+132

Note :

At the top of the table S stands for net sellers and B stands for net buyers.

* Net income from paddy marketing is defined as the total revenue from selling paddy minus total expenditure on buying paddy.

** Defined in table 2.

Incr. Price refer to increasing price.

movements in price affecting their stocks. This leads to a change in their demand.

The overall changes in income of households due to these changes in revenues and expenditures and also consumers' surplus expressed as a percentage of the base are given in table 5.

Table 4. Changes in Household Revenue and Expenditure (%).

Scenarios*	Change (%) in	Low Price		Mean Price		High Price		Incr. Price	
		S	B	S	B	S	B	S	B
A	Revenue	-6.6	-3.1	1.1	4.6	8.7	11.7	0.9	3.1
	Expenditure	-15.1	-9.6	-3.9	-2.5	6.8	4.1	-3.4	-1.2
	Net income	-5.4	12.8	1.9	5.9	9 0	-0.5	1.5	3.2
B	Revenue	-6.4	-2.5	1.3	4.1	8.6	10.2	1.1	2.5
	Expenditure	-13.4	-9.1	-4.0	-2.6	5.5	3.5	-2.0	-1.3
	Net income	-5.4	12.3	2.0	5.9	9.1	-0.3	1.6	3.3
C	Revenue	-6.2	-1.9	1.5	3.9	8.5	9.6	1.3	4.3
	Expenditure	-12.1	-9.0	-3.5	-2.6	4.5	3.3	-0.5	-0.8
	Net income	-5.4	12.6	2.0	5.9	9.1	0.0	1.5	3.5
D	Revenue	-6.1	-2.0	1.4	4.6	8.5	11.2	0.5	3.6
	Expenditure	-10.0	-9.2	-2.4	-2.5	5.2	3.8	-5.7	-1.3
	Net income	-5 5	12.7	1.9	5 9	9.0	-0.2	1.4	3.4
E	Revenue	-8.5	-5.1	0.8	5.6	10.1	15.8	0.8	3.7
	Expenditure	-28 6	-10.4	-6.6	-2.3	18.8	5.3	-3 3	-1.3
	Net Income	-5.5	-13.0	1.9	6.1	9.0	0.0	1.4	3 5

* Defined in table 2.

Consumers are assumed to be fixed income groups and therefore they purchase their food requirements each month. So, they lose from the high price policy and gain from the low price policy, because the high policy price is higher and the low policy price is lower than the current price in most of the months. By the mean and increasing price policies they are slightly gainers. The effect of the changes in the elasticity of demand on consumers, surplus is higher than the effect of the changes in the elasticity of supply and demand on producers' net income. This is because unlike producers', consumers' changes occur only from the buying side.

(a) Government net Stock Changes and Expenditure

In addition to households the government is the only other stock holder under the policies since traders become superfluous. Thrders' net annual

Table 5. Percentage Changes in Household Income and Consumer Surplus (compared with the base).

Scenarios	Low Price	Mean Price	High Price	Incr. Price
	Net Sellers' Net Income (% change)			
A	—5.43	1.86	9.00	1.50
B	—5.43	2.00	9.08	1.51
C	—5.43	2.00	9.08	1.52
D	—5.50	1.92	9.00	1.44
E	—5.50	1.92	9.00	1.45
	Net Buyers' Net Incom (% Change)			
A	12.75	5.88	—0.49	3.20
B	12.28	5.90	—0.25	3.40
C	12.59	5.93	—0.00	3.70
D	12.71	5.87	—0.24	3.10
E	12.96	6.11	0.00	3.30
	Consumers' Surplus (% Change)			
B	3.96	0.38	—2.83	0.15
F	6.41	0.57	—4.90	0.20
G	1.70	0.19	—1.13	0.10

stock changes in the current situation and government net annual stock changes under the policies are reported in table 6. These changes in net stocks include the supplies to urban areas.

The higher the offer price the greater the changes in net annual stocks collected from rural markets to supply to urban areas. The changes in traders net annual stocks before the policy are almost equal to the changes in government net annual stocks under the modestly increasing price policy.

Government net stocks are higher when the policy price is higher. This addition to the government stocks from the increase in household sales or the decrease in household purchases. The increase in sales was in some cases

Table 6. Traders' Net Annual Stock Changes in the No Policy Situation and Government Net Annual Stock Changes Under the Policies from Rural Markets.

	Traders' Net Stocks	Government Net Stock Changes			
		Low Price	Mean Price	High price	Incr. Price
Scenarios		Net Annual Stock Changes (Tonnes)			
A	105	96	103	122	104
B	104	86	102	132	105
C	106	88	104	133	106
D	105	87	102	131	105
E	105	88	103	132	104
F	103	89	104	125	103
G	105	80	101	135	105

more than the decrease in purchases. This difference comes from endogenous household stocks.

In calculating the government expenditure in table 7, a few assumptions are made. Under constant prices throughout the season the government net expenditure is the storage cost for net stocks each month which embodies storage losses, handling and maintenance of stocks and interest charges per month. A 15 per cent annual interest rate (equivalent to 1.25 per cent of net stocks per month) is assumed to calculate interest charges. Taka 0.15 per month per kg. is assumed to be the storage cost of paddy 2. It is also assumed that the urban demand is met each month from the stocks and therefore is deducted from net stocks each month when estimating interest charges and storage costs3.

Except for the high price policy, there were shortages of government stocks to meet both rural and urban demand. This excess demand was assumed to be met by imports. However the import cost is not added to the government net expenditure 4.

Government expenditure is higher when the policy price is fixed at a higher level. For instance under scenario F government net expenditure

Table 7. Government Expenditure under Buffer Stock Schemes.

(000' Taka in 1982/3 prices)

Scenarios	Low Price		Mean Price		High Price		Incr. Price	
	Int. Charge	Storage Cost	Int Charge	Storage Cost	Int. Charge	Storage Cost	Int Charge	Storage Cost
A	13	40	17	41	21	60	14	37
B	11	36	17	41	25	61	14	37
C	12	37	18	42	25	61	15	38
D	11	36	17	41	24	60	15	39
E	12	37	17	41	25	61	16	40
F	13	40	18	42	22	61	14	37
G	10	32	16	40	26	62	16	39

including interest charges is 20 per cent higher from low price to mean price fixed by the policy. The net expenditure increases by another 28 per cent from mean to high price fixed by the policy.

The effect of changes on the government expenditure, although not very high, is interesting. Compare scenarios A, D and E. When elasticities are low at harvest and increase gradually from harvest onwards (as in A), the government expenditure is lower than the other two scenarios, where elasticities are constant throughout the season. This is because if the elasticity is low at harvest, although the policy price is higher than the prevailing market price at harvest household sales do not increase at this time as much as under scenario E (where the elasticity is high and constant in all months). This means that the government buys less at harvest under scenario A than under scenario E. Although the government buys more in other months under scenario A, its net expenditure is less due to lower early stocks. The net expenditure will be even lower if the price elasticity of sales for households at harvest is negative.

It is to be noted that import costs were not added when estimating these costs, If the import costs were added the net government expenditure on the low price policy would be much higher and the net expenditure on the mean and increasing price policies would be slightly higher. The shortages of net government stocks to meet rural and urban demand are much higher under the low price policy than under other policies. The overall gain/loss situation is shown in table 8.

Table 8. Overall Situation of Gains/Losses from Buffer Stock Schemes and Traders' Profit under No Policy Situation.

(000' Taka in 1982/3 prices)

Scenarios	Net Government Expenditure				Households' Gain/Loss*			
	Low Price	Mean Price	High Price	Incr. Price	Low Price	Mean Price	High Price	Incr. Price
A	53	58	81	40	—27	51	130	42
B	47	58	86	40	—29	53	131	44
C	49	60	86	42	—28	52	132	46
D	47	58	84	43	—28	52	132	38
E	49	58	86	44	—27	53	132	42
F	53	60	83	40	—29	53	131	41
G	42	56	88	43	—29	53	131	43
	Consumers' Gain/Loss				Traders' Net Profit**			
A	32	7	—40	5	13			
B	32	7	—40	5	12			
C	32	7	—40	5	14			
D	32	7	—40	5	13			
E	32	7	—40	5	13			
F	42	8	—49	7	11			
G	20	5	—25	4	13			

*Aggregate net income of 400 households in 000' Taka.

**Traders' net profit no policy situation after deducting 15% interest rates per annum (1.25% per month) storage costs as assumed for the government.

Household gain plus rural consumer gain exceed government net expenditure under the mean and increasing price policies.

(b) Impact of the Scheme on Monthly Selling and Buying

The monthly pattern of changes in revenues from and expenditures on paddy marketing is identified in tables 9 and 10.

Households as sellers benefit from the mean price policy during the harvest month and the following month after harvest. Nov-Dec is the Aman

Table 9. Monthly Pattern of Changes in Revenue and Expenditure of Households under the Mean Price Policy (compared with the base).

(in 1982/3 prices)

Months	Scenario A		Scenario D		Scenario E	
	S	B	S	B	S	B
	Revenue (changes in Taka per household)					
Oct-Nov	-12.83	-0.95	-9.27	-0.33	-15.28	-1.04
Nov-Dec	103.71	58.16	103.69	57.32	105.66	63.45
Dec-Jan	24.52	4.36	24 46	3.90	25.21	7.93
Jan-Feb	-4 69	-0.70	-4.57	-0.53	-5.20	-1.24
Feb-March	-18.91	-1.10	-18 94	-1.41	-26.63	-3.31
March-April	-36 63	-2.98	-28.43	-2.40	-54 55	-4.87
April-May	-18.27	-1.33	-17.59	-0.79	-28.42	-2.68
May June	13 85	1.76	13 71	1.30	18 19	3.95
June-July	4 94	0.36	4.95	0.27	7.04	0.84
July-Aug	26.35	10.76	27.54	9 77	39.40	18.45
Aug-Sep	7.69	1.48	6.71	0.70	9.80	1.99
Sep-Oct	-17.50	-2.00	-14.98	-0.75	-22.45	-2.47
	Expenditure (changes in Taka per household)					
Oct-Nov	-6.80	-21.36	-3.23	-21.05	-9.26	-21.21
Nov-Dec	0 54	3.32	0.49	2.48	2.46	8.61
Dec-Jan	0.22	1 70	0 16	1.24	0.71	3.29
Jan-Feb	-0.34	-1.20	-0.54	-1.03	-0.85	-1.75
Feb-March	-3.08	-18.46	-3.13	-18 37	-10.88	-20,66
March-April	-16.94	-59.47	-11.71	-57.87	-34 87	-61.36
April-May	-6 00	-28.97	-5.32	-28.43	-16.16	-30.33
May-June	0.62	10.31	1.48	9 86	5.95	12.51
June-July	0.13	4.51	1 05	4.41	3.23	5.99
July-Aug	3.49	7.19	4.68	6.19	16.55	15.72
Aug-Sep	2.48	2 94	1.51	2 16	3 58	5.44
Sep-Oct	-8 48	-20 74	-4.60	-19 48	-13.42	-21.21

Table 10. Monthly Pattern of Changes in Revenue and Expenditure of Households under the Increasing Price Policy (Compared with the base).

(in 1982/3 prices)

Months	Scenario A		Scenario D		Scenario E	
	S	B	S	B	S	B
	Revenue (changes in Taka per household)					
Oct-Nov	—0 10	—0.10	—3 60	0.00	1 40	—0.10
Nov-Dec	74.50	42 65	75.90	43 04	77 40	46.00
Dec-Jan	16.90	4.90	15 02	2.60	16 80	4 40
Jan-Feb	2.00	3.20	1.00	1 20	0.70	1 00
Feb-March	—10.20	0.90	—13 90	—0.60	—14.40	—1.40
March-April	—23.20	—1.00	—23.40	—0 95	—37.90	—2 60
April-May	—4.60	—0.30	—7 90	—0.15	—5 80	—0 80
May-June	2.10	1.35	0 30	0.65	3 60	0.35
June-July	1 30	1.15	—1.75	0 30	2.80	0 25
July-Aug	16 40	7.00	14 20	6.40	25.40	11 00
Aug-Sep	3.50	2 80	0.10	0.40	5.60	1 70
Sep-Oct	—13.50	—0.75	—13 25	—0.65	—11,80	—2.40
	Expenditure (changes in Taka per household)					
Oct-Nov	—0.70	—8.10	—4.10	—0.10	0.90	—1.70
Nov-Dec	0.30	2.40	—0.10	1.90	1.70	2.45
Dec-Jan	0.05	1.10	—0.40	0.90	0.50	0.20
Jan-Feb	—0.50	—0.40	—1.80	—0.35	—0.30	—2.20
Feb-March	—2.50	—11.30	—5.30	—11.20	—6 80	—14 40
March-April	—12.50	—40 70	—14 60	—39 60	—22.50	—44.30
April-May	—2.10	—5.80	—5 40	—5 70	—3.35	—8.30
May-June	—0.40	2.10	—2 70	2 00	1.15	0.55
June-July	—0.71	2.20	—3.25	2.15	1.30	0 50
July-Aug	1.50	5.30	—0.70	4.70	10.55	6.30
Aug-Sep	0 50	2.82	—2.90	2.40	2.60	3.00
Sep-Oct	—8.60	—18.20	—8.30	—17.50	—11.80	—19.80

harvest month, May-June is the Boro harvest month and July-August is the Aus harvest month. In other months households lose from the policy. The pattern is opposite in case of buying as expected.

The pattern of gains and losses in revenues from the mean price policy is similar for both net sellers and net buyers. However the size in Taka per household is different between these two groups. Net sellers gain much more than net buyers from selling paddy at the harvest time, but lose much more than net buyers at the end of the season. The highest gain of net sellers in the month of Nov-Dec is about double the highest gain of net buyers in this month. However, net sellers' highest loss in the month of March-April is about 12 times greater than the highest loss of net buyers in this month of March-April.

Net buyers gain more than net sellers from buying at the end of the season. For instance at the end of the Aman season (March-April), net buyers gain is three and a half times greater than the gain of net sellers.

Under the mean price policy, households earn more revenue up to one month after harvest. By contrast, under the increasing price policy households earn revenue up to 2 months after harvest in the Aman season (table 9). This occurs as consequences of both offered incentive to store grains and that the offered price in the month of Dec-Jan is slightly higher than the average price.

From the pattern of monthly distribution of revenue under different scenarios it is clear that when the price elasticity of supply is low at harvest, households sell less at this time and sell more later.

IV. CONCLUSIONS

In this paper, government buffer stock schemes under alternative prices were evaluated for a rice surplus rurul region in Bangladesh. In 1982/3 households did not participate in the grain procurement programme of the government. A simulation was carried out where it was assumed that the government was always interested to buy and sell such quantities as necessary to keep the price stable.

Households both as net sellers and net buyers benefit from a buffer stock scheme with either a constant mean price or a modestly increasing price over

the season. Consumers also benefit slightly from this policy. A high price policy results in gains to net sellers but does not benefit net buyers. Consumers lose from a high price policy but gain from a low price policy.

Government expenditure is higher when the policy price is fixed at a higher level. The study suggests that a mean price policy or a moderately increasing price policy is desirable for all groups : net sellers, net buyers and consumers. However the subsidy will be higher if an attempt is made to make the price completely flat over the season, since the net cost in this programme is higher than the policy of moderately increasing prices.

Since an important reason for an excess supply and therefore low price at harvest is the need for cash to repay loan, the reduction of the imperfection in the credit market may stabilise price. This possibility is not investigated in this study.

Finally the conclusions are based on a survey data for a particular year and the assumptions about the supply and demand behaviour. However the year was a representative of average year and efforts were made to use plausible assumptions.

NOTES :

1. The harvest price is assumed as follows. The weighted average prices per kg. were Taka 3.91, Taka 3.81 and Taka 3.90 in the Aman, Boro and Aus seasons respectively. Assuming this price in the middle of the season and 15% annual increase, the harvest prices are Taka 3.79, Taka 3.80 and Taka 3.82 in the Aman, Boro and Aus seasons respectively. Taka 3.80 per Kg. is assumed to be the harvest price in all three seasons.
2. Ahmed and Barnard (1989) used a storage cost of Taka 5400 per ton of rice per year in 1986/7 prices. This is approximately equivalent to Taka 0.15 per kg. of paddy per month in 1982/3 prices (assuming 12% inflation rate).
3. Urban demand is estimated based on the assumption that 15 percent of total population live in urban areas and their demand is 0.36 kg. of rice per capita per day, equivalent to 0.54 kg. of paddy (BBS 1986b).

4. For each group of 550 rural households (400 farm+150 non-farm households) about 97 urban households are assumed. The annual food requirements for these 97 households are about 108 tonnes (assuming household sixe to be 5.9 persons and food requirements per person is about 0.54 kg. per day).

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