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INPUT-OUTPUT COEFFICIENTS FOR ESTIMATING RICE PRODUCTION COSTS AND RETURNS IN BANGLADESH

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1. Introduction

An understanding of the incentive structure for sustaining growth in rice production is required for relevant policy formulation. In this regard, the structure of costs associated with rice production practices, and farmers' profitability of adopting improved methods are usually considered as important indicators of farmers' welfare, and the pace of transformation to improved cultivation practices.

The purpose of this study is to provide a set of input-output coefficients for rice production in Bangladesh. Farmers' financial profitability of growing a rice crop can be calculated from these input-output coefficients, and the corresponding market prices of inputs and output. The assumed fixed relationship between inputs and the resulting output is a numerical approximation of the underlying production function. Since the production function estimates at the national level are rarely available, the fixed input-output coefficients are commonly used to estimate production cost in evaluating the structure of incentives. However, it is important to understand that there is no unique set of input-output coefficients. The full array of country's farmers have widely different costs of production. The conceptual and empirical problems with cost of production calculations based on such fixed input-output coefficients are discussed in Section 4 of this report.

2. Profile of Rice Crops

There are three rice growing seasons in Bangladesh: aus, aman, and boro. Before discussing the input-output relationships in rice production, a brief description of each of

the three rice crops may facilitate a better understanding of the production relations. Figure 1 illustrates the trends in rice production in the three rice seasons.

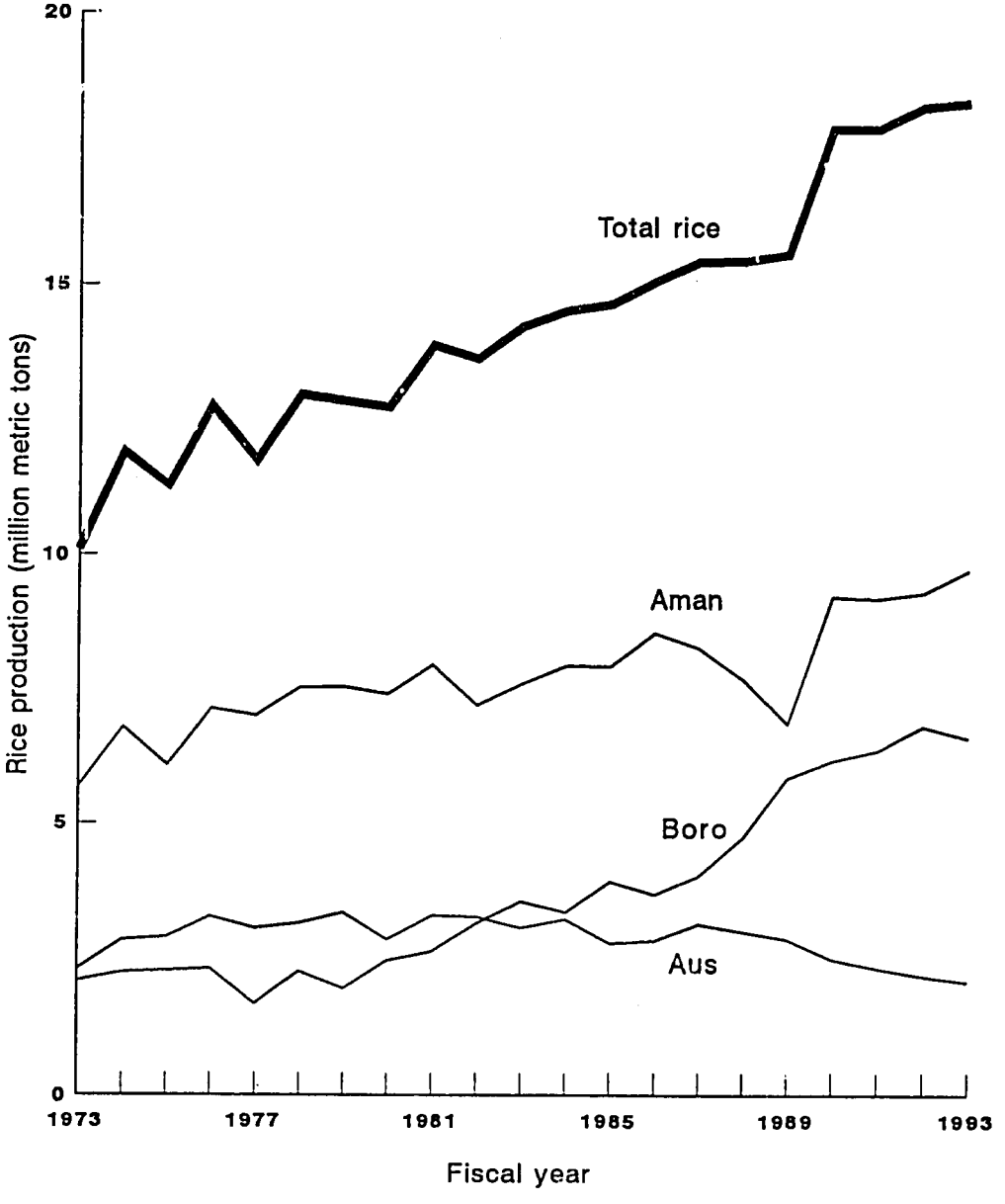
Aman Rice. Aman is the most important rice crop in Bangladesh, accounting for 57 percent of total rice area and 53 percent of total rice production in fiscal year 1992/93 (FY93). Historically, the production of aman rice has been erratic, mainly due to weather variations.

There are two types of aman--broadcast aman (b. aman), accounting for about 16 percent of total aman area, and transplanted aman (t. aman). B. aman, also known as deepwater aman, is sown in March-April and is harvested in November, while t. aman is transplanted during July-August and harvested in November-December. B. aman is a local variety of rice. In recent years b. aman rice area has gradually trended downward due to the substitution of irrigated high-yielding variety (HYV) boro area.

Boro Rice. Boro rice is the most important irrigated dry season (winter) crop in Bangladesh. In FY93, boro rice accounted for 26 percent of total rice area and 36 percent of total rice production in the country. Until FY82, boro rice was the least important rice among the three in terms of production. But with the expansion of irrigation, boro has surpassed aus rice. Access to surface or groundwater irrigation is the single most important determinant of boro rice cultivation. In the low floodplain land boro is grown with surface water irrigation lifted by mechanical pumps or traditional devices. Mechanical tubewells are used to irrigate boro crop in higher land, using groundwater.

Boro crop is relatively free from weather hazards. Because the crop does not depend on rainfall and because it is photoperiod insensitive, both planing and harvesting periods have wider ranges than the other two rice crops. The vegetative period of boro rice is longer than aus and t. aman crops because cold weather during the vegetative stage slows down the growth rate. Boro rice seedlings are transplanted between December and the end of February. The crop is harvested between April and June.

Figure 1—Trends in rice production in the three rice seasons



Source: Bangladesh Bureau of Statistics.

Aus Rice. In FY93, aus rice accounted for 17 percent of total area and 11 percent of total production of rice. Potential area expansion of aus is constrained both by jute, a cash crop that directly competes for land, and the lower-risk irrigated boro rice, which precedes aus in the agricultural year but is harvested too late to permit aus cultivation on the same land. Farmers' decisions to plant the aus crop is also influenced by the high risks of both flooding and drought during its growing season. Aus rice is planted during March-April and harvested in July-August.

3. Source of Data

In Bangladesh, numerous studies are available on costs of production that provide input-output coefficients in rice production. The findings of these studies vary widely due to differences in years of data collection, regions covered in the samples, sample sizes, and to some extent, methods adopted in data collection, analysis and reporting. IFPRI made an attempt to collect and review these studies. The findings of these studies are provided in Appendix Tables 2.1 to 2.7 and 3.

The Agro-Economic Research (AER) unit of the Ministry of Agriculture is the pioneer in conducting studies on costs and returns of rice, wheat and jute crops since 1979/80. Time series data on costs and returns are available only from AER. However, as Zohir points out, coverage under AER is limited in terms of regional representation. Regional break-down is not available in the AER data set. Skepticism also prevails regarding the quality of data generated (Zohir 1992).

The World Bank (1992) study provides secondary data on input-output coefficients, much of which are drawn from the data generated from the Farming System Research (FSR) in six locations of Bangladesh. The FSR provides regional data from the locations of FSR stations, classified by land elevation (Appendix Table 3). However, the FSR data are available only upto 1985/86 period. It is likely that rice yields in the FSR sites are higher than the average, and thus may not represent the regions.

There are a number of small sample studies by Bangladesh Rice Research Institute (BRRI) and Bangladesh Agricultural Research Institute (BARI) on rice cultivation practices. Findings of some of these studies are incorporated in the appendix tables.

The International Fertilizer Development Center (IFDC) administered nation-wide costs and returns studies during the early eighties. Recently, IFDC carried out a set of crop studies during 1989-92 under their Farm-level Fertilizer Use Survey (FLFUS). The sample of IFDC-FLFUS studies is scientifically designed, consisting of 56 locations and 2,719 farms.

The Bangladesh Bureau of Statistics (BBS) undertook a large-scale nation-wide sample survey on the use of inputs in major crops during 1989/90. However, labor inputs, the single most important cost component, are reported in hours, therefore comparisons with other studies are quite difficult. The findings of these studies also seem questionable, in spite of a great deal of efforts put in data collection.

IFPRI's Bangladesh Food Policy Project conducted four studies on crop cultivation practices and farmers' profitability in crop production during 1990-93. Two of these are collaborative studies--one with Bangladesh Institute of Development Studies (BIDS) under the Agricultural Diversification project, and the other with International Maize and Wheat Research Center (CIMMYT) under the wheat project. The other two IFPRI studies are 1990/91 Farm Survey, and 1992/93 T. Aman Rapid Rural Appraisal (RRA). Region-level data are available from these studies.

4. Why do production costs vary?

This report attempts to provide a set of "standard" input-output coefficients that can be used to estimate costs of rice production. It is important to understand, however, that there are serious conceptual and empirical problems with such cost of production calculations. The conceptual problem is that the input-output relationships are not static.

A farmer's decision to produce a desired amount of rice output is influenced by expected rice price, all input prices, prices of various other crops, and the availability of technology. The production function analysis suggests that as total crop production increases, marginal productivity of inputs used in production diminishes. That is, within a given set of technology, more inputs are required to produce an additional unit of output. As a result, production cost rises at the margin. However, crop output can increase substantially if modern technologies (such as bio-chemical technology and irrigation) are available to the farmer. Within such a technological environment, the farmer's production cost per unit of output will decline because of increased yields. Thus, even an individual farmer does not have a unique set of input-output coefficients. Moreover, the production functions (hence, crop yields) may vary significantly by agroclimatic zones even with the same level of technology. Clearly, therefore, the full array of country's farmers are bound to have widely different costs of production.

The empirical problems arise mainly from methodological issues. Ideally, farmers' accounting records would be a reliable source of data from which both physical and financial input and output coefficients for individual crops could be derived. However, such an ideal situation requires literate farmers trained in record-keeping methods, a sound system of monitoring such records, and the capacity to collect and process information on a regular basis. This ideal situation simply does not exist in Bangladesh. Instead, cost of production studies rely on farm survey method of data collection, which requires answers to questions having various lengths of recall periods. IFPRI survey experience suggests that, it is particulary difficult to obtain reliable measurements of crop yields, use of family labor, irrigation, draft power, and farm-yard manure. Furthermore, the review of cost of production studies reveals that sampling procedures and data collection methods varied considerably among different studies.

Inclusion of land rent and family labor cost in cost of production calculations involves both conceptual and empirical problems. Land rent should reflect the true opportunity cost of the land for production of any particular crop. The opportunity cost of land is the net value of production foregone when the land is engaged in its next best alternative use. Clearly, the opportunity cost of land will vary between crop seasons, and

between agroclimatic zones within the same season. Empirically it is very difficult, if not impossible, to calculate the true opportunity cost of land for production of any particular crop.

Most farmers in Bangladesh rely heavily on family labor for crop cultivation. If family members cannot find jobs, or if family labor will not be offered to the market when the crop in question is not produced, then the opportunity cost of family labor may be near zero. But when labor must be hired to supplement family labor, the use of market wage rate to value family labor may be appropriate. However, the valuation of family labor using these criteria is very difficult, because these calculations will vary at different stages of crop cultivation (such as, at land preparation, planting, weeding, and harvesting time).

Due to the problems cited above, cost of production calculations from the aggregate and static set of input-output coefficients have little or no justification. The nature of the serious conceptual and empirical problems with such cost of production calculations based on input-output coefficients are reflected in the wide variation in these coefficients across various studies (see the appendix tables). In this context, the remarks by Timmer, Falcon and Pearson (1983) may be appropriately quoted:

> The supply curve for a farm crop is directly related to its marginal cost curve, that is, the additional cost of producing additional units of output. The point at which a rational farmer chooses to be on the cost curve (or the supply function) depends not only on the price of inputs but also on the absolute and relative prices of the various crop outputs. Even for a single crop on a given farm, *the* cost of production is a fiction; there is only a schedule of costs and outputs. These schedules vary by farm and by agroclimatic zone. Both conceptually and empirically, therefore, the search for a single cost of production is fruitless, despite the tendency of government procurement agencies and price control boards to justify their prices on just such a basis. Various estimates over a wide range can all be correct even if the numbers are generated from reliable farm surveys. There cannot be one right answer even with perfect measurements.

5. Standardized Input-Output Coefficients

In Bangladesh and elsewhere, there is a general tendency among the concerned people to compare the harvest price with the production cost to evaluate farmers' profitability. In spite of objections (see Ahmed, Chowdhury and Ahmed 1993; Haggblade and Rahman 1993), the use of cost of production remains popular as a basis for determining rice procurement price in Bangladesh. While the actual costs of rice (or any crop) production can only be calculated after the crop is harvested, policymakers often seek these estimates well before the harvest time to formulate the procurement price. This study makes an effort to arrive at a set of "standard" input-output coefficients which can be used to estimate rice production costs before the harvest time.

The relevant cost considerations are those of providing incentive to farmers to induce high-yielding variety (HYV) rice production. In Bangladesh, the growth in rice production comes almost exclusively from two sources: (a) expansion of irrigated HYV boro area, and (b) a switch from local variety aman area to HYVs. Therefore, the standardized input-output coefficients are calculated only for aman and boro HYVs for the present exercise. As Ahmed, Chowdhury and Ahmed (1993) contend:

> It is the cost of production at the margin and not the average cost that is relevant in using production cost as a guide, if such guidance is at all necessary. The margin of change in rice production in Bangladesh is the area where HYVs are being introduced, replacing local varieties. In the case of aus, it is the conversion of aus area into boro HYVs, under the influence of irrigation-HYV technology, that represents the margin of change. Therefore, the production costs of aman and boro HYVs appear to be the relevant rice costs for this exercise.

Because the Northwest region produces the largest marketed surplus of rice, the government procures over 90% of all procurement from this surplus zone (Haggblade and Rahman 1993). Therefore, for cost of production estimates, the relevant input-output coefficients are those of the farmers from the Northwest, if government rice procurement prices are to be determined on the basis of such production costs.

Table 1 provides input-output coefficients of aman and boro HYVs for the Northwest region (greater Dinajpur, Rangpur, Bogra and Rajshahi districts), as well as for entire Bangladesh. From a large number of studies and data sets, a few recent ones with consistent methodology have been selected, excluding the extreme outliers, to calculate these average input-output coefficients (Appendix Tables 1.1 to 1.4).

Physical quantities of certain inputs are difficult to record (also meaningless for some inputs) in any study, therefore only costs of these inputs are available. These input costs are: seedling raising, irrigation, pesticides, and mechanical power. Costs of these inputs are expected to be related to crop revenue, since the levels of input use affect crop yields. Therefore, average shares of these input costs in total revenue per acre (i.e. yield times paddy price) are calculated from the selected studies, and are reported in Table 1 in percentage terms. In many places, charges for irrigation and mechanical power use are paid after harvest as crop share. If the price of diesel fuel, for example, increases, the crop share also tends to increase. Therefore, the method of estimating costs of these inputs as revenue shares seems quite prudent.

6. Estimating Production Costs

Paddy production costs and returns can be estimated before the harvest time by using the input-output coefficients from Table 1, and current or predicted prices of inputs and output. Tables 2 to 5 demonstrate the results of application of input-output coefficients in estimating the 1993/94 HYVs of aman and boro paddy production costs and returns. Costs are estimated by adopting the following procedure:

- Average fertilizer prices and labor wages for the Northwest region and Bangladesh are obtained from monthly IFDC reports. August 1993 prices and wages are used for HYV aman, and December 1993 for HYV boro. Price of seed, bullock hire rate, and price of manure are obtained from IFPRI field information. These average prices and wages are multiplied by respective input coefficients to calculate

Table 1—Standardized input-output coefficients

Items	Northwest Region		Bangladesh	
	HYV Aman	HYV Boro	HYV Aman	HYV Boro
	(.....per acre.....)			
OUTPUTS				
Paddy (maund)	41.0	53.3	35.2	47.7
Straw (maund)	31.0	34.1	26.0	35.8
INPUTS				
Seed (kg)	29.1	27.8	26.0	22.7
Seed raising cost* (%)	3.2	2.0	3.7	3.1
Fertilizers (kg)				
Urea	67.0	84.9	52.8	81.7
TSP	42.2	49.8	33.7	43.8
MP	21.8	24.6	13.1	16.7
Other	10.2	13.6	17.1	16.8
Labor (man-days)	60.5	70.8	60.8	75.4
Family	23.5	24.3	28.4	28.1
Hired	37.0	46.5	32.4	47.3
Animal power (pair-days)	13.0	16.5	14.8	14.7
Family-owned	12.1	10.9	12.9	10.7
Hired	0.9	5.5	1.9	4.0
Manure (maund)	33.8	38.2	26.0	24.8
Irrigation cost* (%)	1.3	14.0	1.0	15.5
Pesticide cost* (%)	2.2	3.2	1.5	2.7
Tractor/power* (%)	0.1	0.2	1.4	0.7

* Percent of total revenue.

Conversions: 1 Hectare = 2.4711 Acre, 1 Maund=37.3242 Kg.

Source: See appendix Table 1.1, 1.2, 1.3, and 1.4.

per acre costs of these inputs. Dividing the cost per acre by paddy yield gives cost per maund of paddy.

- Seedling raising, irrigation, pesticides, and mechanical power costs are estimated as follows. December 1993 average prices of aman paddy in the Northwest and in Bangladesh are calculated from monthly IFDC report.[1] Harvest price of 1994boro paddy was assumed to be Taka 210 per maund. These prices are multiplied by respective paddy yields to obtain the expected revenue per acre for 1993/94 aman and boro HYVs. Then, revenue shares from Table 1 are used to derive the seedling raising, irrigation, pesticides, and mechanical power costs.

- In calculating the interest cost (opportunity cost of capital) as a component of cost of production, a charge of 4% for four months on total cash costs, reflecting a 12% annual rate, is adopted as the interest cost. Cash costs consist of seed, fertilizers, hired labor and animal power, irrigation, pesticides, and mechanical power costs.

- Average land rent is calculated from IFPRI field information. In collecting information on land rent, it is important to keep in mind that the renting-out price determines the opportunity cost of land, not the renting-in price. Also, as the supply of land is fixed, land rent is determined by demand and therefore is affected by product price. If the harvest price of the crop in question is expected to be higher than the previous year's price, land rental is likely to be higher as well for cultivation of that crop.

Tables 2 to 5 provide paddy production costs per unit of land (acre) and per unit of output (maund). Cost of producing a maund of rice is the relevant concept for the purpose of pricing, rather than cost of production per acre. Cost per maund can be viewed in terms of break-even point, indicating the price that farmers must receive for their crop in order to cover their costs.

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[1] In order to estimate expected revenue before harvest, predicted harvest price should be used.

Table 2—Cost of 1993/94 HYV aman cultivation: Estimates for the Northwest region

	Unit	Quantity	Price	Value		Percentage Distribution of Total Cost		
				Per Acre	Per Manud	Cash	+ Imputed Family Inputs	+ Land Rent
		(per acre)	(.....taka.....)			(.....percent.....)		
OUTPUTS								
Paddy	Maund	41.00	193.71	7,942	193.71			
Straw	Maund	30.97						
INPUTS								
Seed	Kg	29.13	6.79	198	4.82	6.93	4.10	2.86
Seed raising cost*	%	3.19		254	6.19		5.26	3.66
Fertilizers								
Urea	Kg	66.99	4.74	318	7.75	11.13	6.59	4.59
TSP	Kg	42.24	7.88	333	8.12	11.66	6.90	4.81
MP	Kg	21.80	6.85	149	3.65	5.23	3.10	2.16
Other	Kg	10.19	3.53	36	0.88	1.26	0.75	0.52
Labor	Man-days	60.53		2,451	59.80			
Family	Man-days	23.52	40.50	953	23.24		19.75	13.76
Hired	Man-days	37.01	40.50	1,499	36.56	52.50	31.08	21.65
Animal power	Pair-days	12.95		564	13.75			
Family-owned	Pair-days	12.09	43.55	527	12.84		10.92	7.61
Hired	Pair-days	0.86	43.55	37	0.91	1.30	0.77	0.54
Manure	Maund	33.82	3.57	121	2.95		2.50	1.74
Irrigation cost*	%	1.27		101	2.45	3.52	2.09	1.45
Pesticide cost*	%	2.23		177	4.31	6.20	3.67	2.56
Tractor/power*	%	0.10		8	0.19	0.27	0.16	0.11
Interest cost	Taka			114	2.79		2.37	1.65
Land rent	Taka		2,100	2,100	51.22			30.34
TOTAL COST								
Cash cost only				2,855	70	100		
+ Imputed Family Inputs				4,823	118		100	
+ Land Rent				6,923	169			100

*Percent of total revenue.

Conversions: 1 Hectare = 2.4711 Acre, 1 Maund=37.3242 Kg.

Table 3—Cost of 1993/94 HYV aman cultivation: Estimates for Bangladesh

	Unit	Quantity	Price	Value		Percentage Distribution of Total Cost		
				Per Acre	Per Manud	Cash	+ Imputed Family Inputs	+ Land Rent
		(per acre)	(..... taka.....)			(.....percent.....)		
OUTPUTS								
Paddy	Maund	35.17	200.43	7,049	200.43			
Straw	Maund	26.01						
INPUTS								
Seed	Kg	25.98	6.79	176	5.01	6.36	3.40	2.42
Seed raising cost*	%	3.69		260	7.40		5.02	3.57
Fertilizers								
Urea	Kg	52.76	4.72	249	7.08	8.97	4.80	3.42
TSP	Kg	33.65	8.06	271	7.71	9.78	5.24	3.73
MP	Kg	13.08	7.06	92	2.62	3.33	1.78	1.27
Other	Kg	17.07	3.29	56	1.60	2.03	1.09	0.77
Labor	Man-days	60.80		2,950	83.89			
Family	Man-days	28.44	48.53	1,380	39.24		26.64	18.96
Hired	Man-days	32.36	48.53	1,570	44.64	56.61	30.31	21.57
Animal power	Pair-days	14.84		646	18.38			
Family-owned	Pair-days	12.92	43.55	563	16.00		10.86	7.73
Hired	Pair-days	1.92	43.55	84	2.38	3.02	1.62	1.15
Manure	Maund	26.03	3.57	93	2.64		1.79	1.28
Irrigation cost*	%	0.97		69	1.95	2.48	1.33	0.94
Pesticide cost*	%	1.54		108	3.08	3.90	2.09	1.49
Tractor/power*	%	1.39		98	2.78	3.53	1.89	1.34
Interest cost	Taka			111	3.15		2.14	1.52
Land rent	Taka		2,100	2,100	59.71			28.84
TOTAL COST								
Cash cost only				2,774	79	100		
+ Imputed Family Inputs				5,181	147		100	
+ Land Rent				7,281	207			100

*Percent of total revenue.

Conversions: 1 Hectare = 2.4711 Acre, 1 Maund=37.3242 Kg.

Source: Estimated from input-output coefficients in Table 1; and prices from IFDC monthly reports, and IFPRI field data.

Table 4—Cost of 1993/94 HYV boro cultivation: Estimates for the Northwest region

	Unit	Quantity	Price	Value		Percentage Distribution of Total Cost		
				Per Acre	Per Maund	Cash	+ Imputed Family Inputs	+ Land Rent
		(per acre)	(.....taka.....)			(.....percent.....)		
OUTPUTS								
Paddy	Maund	53.33	210	11,199	210			
Straw	Maund	34.10						
INPUTS								
Seed	Kg	27.84	6.79	189	3.54	3.59	2.61	2.03
Seed raising cost*	%	2.00		224	4.20		3.10	2.40
Fertilizers								
Urea	Kg	84.86	4.92	418	7.83	7.93	5.77	4.47
TSP	Kg	49.83	8.24	411	7.70	7.80	5.68	4.40
MP	Kg	24.56	8.48	208	3.91	3.96	2.88	2.23
Other	Kg	13.64	5.93	81	1.52	1.54	1.12	0.87
Labor	Man-days	70.78		2,684	50.33			
Family	Man-days	24.27	37.92	920	17.26		12.72	9.86
Hired	Man-days	46.51	37.92	1,764	33.07	33.49	24.39	18.90
Animal power	Pair-days	16.46		717	13.44			
Family-owned	Pair-days	10.92	43.55	476	8.92		6.58	5.10
Hired	Pair-days	5.54	43.55	241	4.52	4.58	3.34	2.59
Manure	Maund	38.21	3.57	136	2.56		1.89	1.46
Irrigation cost*	%	14.04		1,572	29.48	29.86	21.74	16.85
Pesticide cost*	%	3.24		363	6.80	6.89	5.02	3.89
Tractor/power*	%	0.17		19	0.36	0.36	0.26	0.20
Interest cost	Taka			211	3.95		2.91	2.26
Land rent	Taka		2,100	2,100	39.38			22.50
TOTAL COST								
Cash cost only				5,266	99	100		
+ Imputed Family Inputs				7,232	136		100	
+ Land Rent				9,332	175			100

*Percent of total revenue.

Conversions: 1 Hectare = 2.4711 Acre, 1 Maund=37.3242 Kg.

Source: Estimated from input-output coefficients in Table 1; and prices from IFDC monthly reports, and IFPRI field data.

Table 5—Cost of 1993/94 HYV boro cultivation: Estimates for Bangladesh

	Unit	Quantity	Price	Value		Percentage Distribution of Total Cost		
				Per Acre	Per Manud	Cash	+ Imputed Family Inputs	+Land Rent
		(per acre)	(.....Taka.....)			(.....percent.....)		
OUTPUTS								
Paddy	Maund	47.66	210	10,008	210.00			
Straw	Maund	35.77						
INPUTS								
Seed	Kg	2.66	6.79	154	3.23	3.03	2.11	1.64
Seed raising cost*	%	3.11		311	6.52		4.26	3.31
Fertilizers								
Urea	Kg	81.67	4.7	384	8.05	7.55	5.26	4.08
TSP	Kg	43.83	8.06	353	7.41	6.95	4.84	3.76
MP	Kg	16.74	8.16	137	2.87	2.69	1.87	1.45
Other	Kg	16.79	3.38	57	1.19	1.12	0.78	0.60
Labor	Man-days	75.39		3,091	64.86			
Family	Man-days	28.08	41.00	1,151	24.16		15.76	12.24
Hired	Man-days	47.31	41.00	1,940	40.70	38.16	26.56	20.63
Animal power	Pair-days	14.69		640	13.43			
Family-owned	Pair-days	10.71	43.55	466	9.79		6.39	4.96
Hired	Pair-days	3.98	43.55	174	3.64	3.41	2.38	1.85
Manure	Maund	24.82	3.57	89	1.86		1.21	0.94
Irrigation cost*	%	15.47		1,548	32.49		21.20	16.46
Pesticide cost*	%	2.71		271	5.69	30.46	3.71	2.88
Tractor/power*	%	0.66		66	1.38	5.33	0.90	0.70
Interest cost	Taka			203	4.27	1.29	2.78	2.16
Land rent	Taka		2,100	2,100	44.07			22.33
TOTAL COST								
Cash cost only				5,083	107	100		
+ Imputed Family Inputs				7,303	153		100	
+ Land Rent				9,403	197			100

*Percent of total revenue.

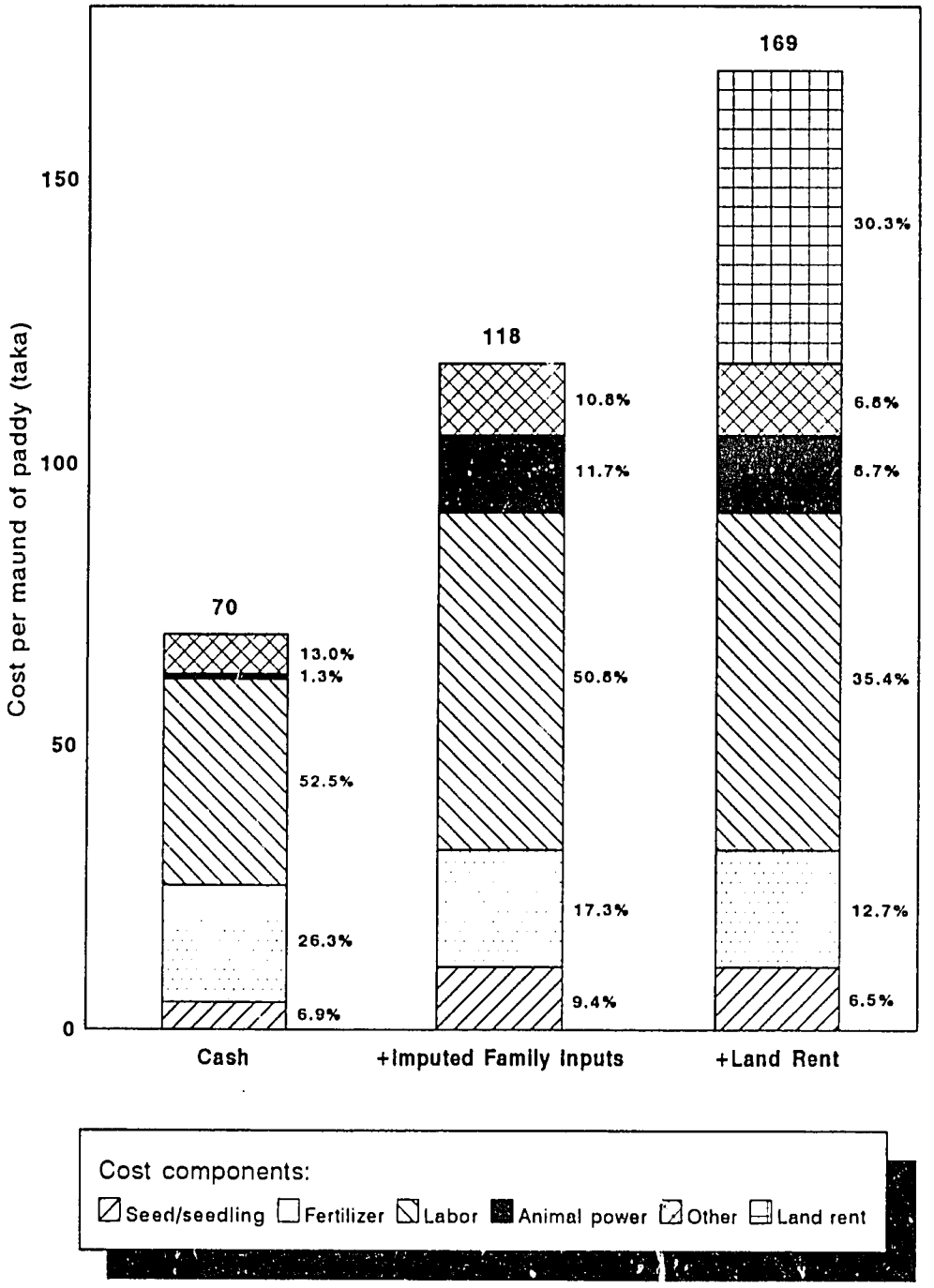
Conversions: 1 Hectare = 2.4711 Acre, 1 Maund=37.3242 Kg.

Source: Estimated from input-output coefficients in Table 1; and prices from IFDC monthly reports, and IFPRI field data.

Three types of cost calculations are provided in the tables: (a) cash costs; (b) cash costs plus costs of family labor, family-owned bullocks and manure (imputed at market prices); and (c) cash costs plus full valuation of family inputs plus land rent. Figures 2 and 3 illustrate the cost components in (a), (b), and (c) cost classifications.

The cost classifications have considerable implications for price policy. Opportunity costs of family labor and other family supplied inputs (including land) are likely to be lower than their market prices. Thus, "full-cost" valueing of family supplied inputs at prevailing market prices overestimates their actual costs. "Cash-cost" calculations of what farmers actually pay out of pocket probably guide their crop production decisions more than "full-cost" valuation of family labor and other family inputs.

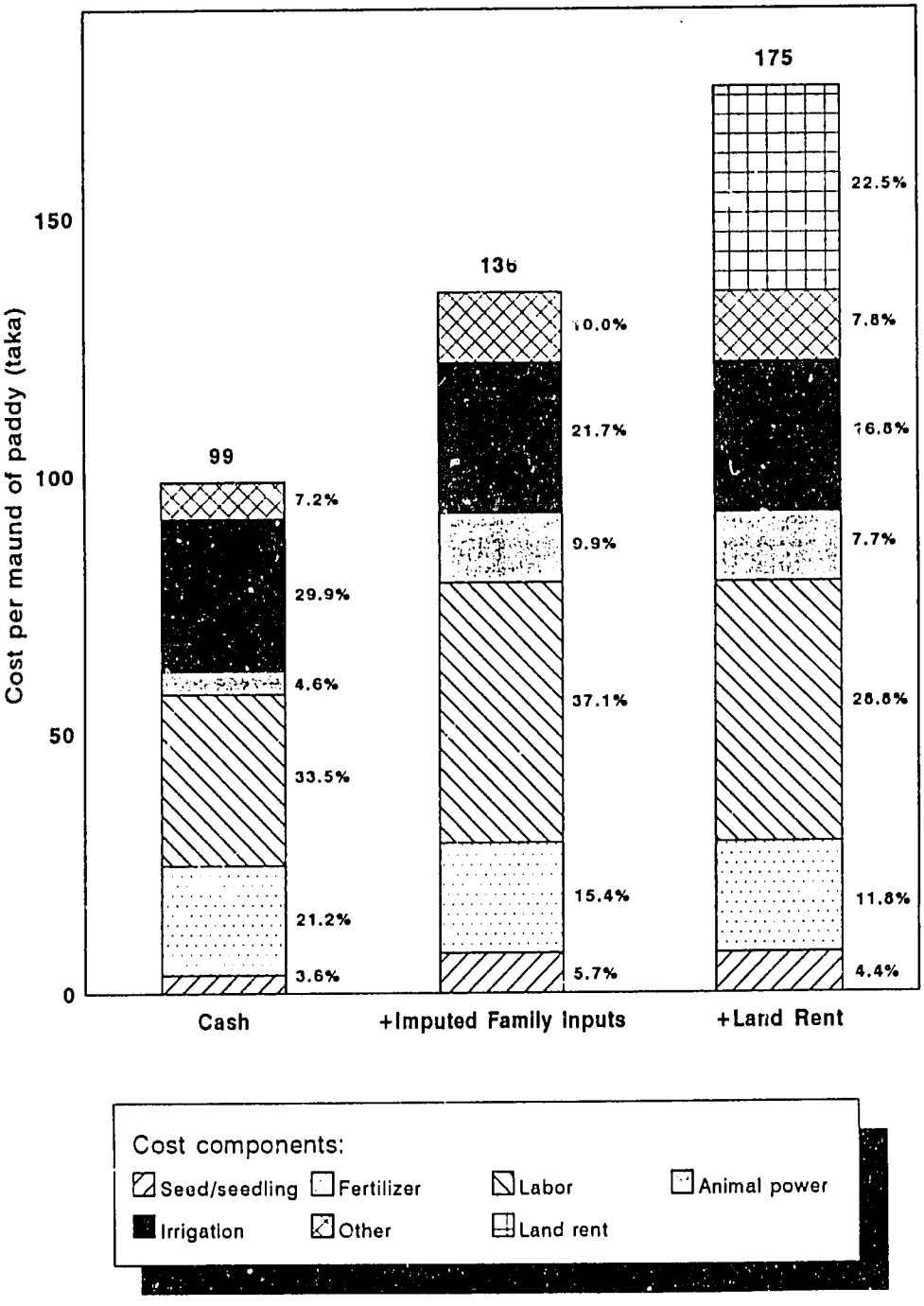
Figure 2—Cost components of 1993/94 HYV aman production in the Northwest region
(paddy production cost per maund)



Note: Other costs include manure, irrigation, pesticides, tractor/power and interest costs.

Source: Computed from Table 2

Figure 3—Cost components of 1993/94 HYV boro production in the Northwest region
(paddy production cost per maund)



Note: Other costs include manure, pesticides, tractor/power and interest costs.

Source: Computed from Table 4.

Appendix Tables

Table 1.1—Selected studies used in estimating the standardized input-output coefficients: HYV t. aman, Northwest region

	IFPRI, Farm Survey 1989-90	IFPRI, Rapid Rural Appraisal 1992	IFPRI-BIDS, Agricultural Diversification Project 1990-91	Mean of All Studies
	(.....per acre.....)			
OUTPUTS				
Paddy (maund)	40.56	41.10	41.33	41.00
Straw (maund)			30.97	30.97
INPUTS				
Seed (kg)	26.73		31.52	29.13
Seed raising cost* (%)	2..77	3.16	3.66	3.19
Fertilizers (kg)				
Urea	62.54	70.80	67.63	66.99
TSP	38.96	43.48	44.27	42.24
MP	19.12	21.55	24.73	21.80
Other	4.60	6.69	19.27	10.19
Labor (man-days)	65.53	63.94	52.12	60.53
Family	19.62	29.68	21.26	23.52
Hired	45.91	34.26	30.86	37.01
Animal power (pair-days)	13.10	18.46	12.79	12.95
Family-owned	12.64		11.54	12.09
Hired	0.46		1.25	0.86
Manure (maund)	40.14	50.04	11.29	33.82
Irrigation cost* (%)	0.20	2.33		1.27
Pesticide cost* (%)			2.23	2.23
Tractor/power* (%)	0.02	0.17		0.10

* Percent of total revenue.

Note: The Northwest region includes the greater Rajshahi, Dinajpur, Rangpur and Bogra districts..

Table 1.2—Selected studies used in estimating the standardized input-output coefficients: HYV boro, Northwest region

	IFPRI, Farm Survey 1989-90	IFPRI, Wheat Survey 1992-93	IFPRI-BIDS, Agricultural Diversification Project 1990-91	Mean of All Studies
	(.....per acre.....)			
OUTPUTS				
Paddy (maund)	50.19	57.80	52.00	53.33
Straw (maund)			34.10	34.10
INPUTS				
Seed (kg)	25.72	30.50	27.31	27.84
Seed raising cost* (%)	2.03	1.55	2.42	2.00
Fertilizers (kg)				
Urea	78.97	95.03	80.58	84.86
TSP	49.62	43.23	56.63	49.83
MP	22.47	20.84	30.36	24.56
Other	13.20	12.71	15.02	13.64
Labor (man-days)	68.66	70.20	73.47	70.78
Family	14.59	30.53	27.69	24.27
Hired	54.07	39.67	45.78	46.51
Animal power (pair-days)	12.29	21.18	15.91	16.46
Family-owned	11.57	9.81	11.38	10.92
Hired	0.72	11.37	4.53	5.54
Manure (maund)	38.48	61.32	14.83	38.21
Irrigation cost* (%)	10.02	18.75	13.36	14.04
Pesticide cost* (%)			3.24	3.24
Tractor/power* (%)	0.02	0.14		0.17

* Percent of total revenue.

Note: The Northwest region includes the greater Rajshahi, Dinajpur, Rangpur and Bogra districts..

Table 1.3—Selected studies used in estimating the standardized input-output coefficients: HYV t. aman, Bangladesh

	IFPRI, Farm Survey 1989-90	IFPRI, Rapid Rural Appraisal 1992-93	IFPRI-BIDS, Agricultural Diversification Project 1990-91	IFDC, 1992 1990	IFDC, 1993 1991-92	BRRI,1992 1990	Mean of All Studies
	(..... per acr ....)						
OUTPUTS							
Paddy (maund)	39.64	37.94	37.94	30.73	36.02	28.75	35.17
Straw (maund)			26.01				26.01
INPUTS							
Seed (kg)	26.93		26.71		24.29		25.98
Seed raising cost* (%)	2.74	3.40	3.38	4.25	4.69		3.69
Fertilizers (kg)							
Urea	62.80	71.39	50.59	57.28	50.20	24.29	52.76
TSP	40.01	49.20	39.26	37.78	19.43	16.19	33.65
MP	15.64	15.79	16.59	17.89	4.45	8.10	13.08
Other	5.92	6.38	31.57	34.19	7.29		17.07
Labor (man-days)	65.06	63.89	76.49	61.26	58.30	39.81	60.80
Family	18.15	31.92	29.95	30.18	29.55	30.90	28.44
Hired	46.91	31.97	46.54	31.08	28.74	8.91	32.36
Animal power (pair-days)	12.20	16.34	15.78	16.41	14.98	14.98	14.84
Family-owned	11.71		12.14	14.47	13.36		12.92
Hired	0.49		3.64	1.94	1.62		1.92
Manure (maund)	33.66	33.50			10.93		26.03
Irrigation cost* (%)	0.14	1.78	1.28	0.69			0.97
Pesticide cost* (%)	0.69	2.72	2.63	1.31	0.31		1.54
Tractor/power* (%)	0.38	3.25	0.68	0.00	1.24		1.39

* Percent of total revenue.

Table 1.4—Selected studies used in estimating the standardized input-output coefficients: HYV boro, Bangladesh

	IFPRI, Farm Survey 1989-90	IFPRI, Wheat Survey 1992-93	IFDC, 1991 1989-90	IFDC, 1993 1990-91	IFPRI-BIDS, Agricultural Diversification Project 1990-91	Mean of All Studies
	(per acre)					
OUTPUTS						
Paddy (maund)	49.27	50.88	45.79	45.54	46.80	47.66
Straw (maund)					35.77	35.77
INPUTS						
Seed (kg)	25.78	32.52		5.22	27.11	22.66
Seed raising cost* (%)	2.16	2.67	3.44	4.54	2.72	3.11
Fertilizers (kg)						
Urea	81.23	90.77	78.29	90.89	67.18	81.67
TSP	47.27	43.61	38.59	39.09	50.59	43.83
MP	19.52	16.45	12.34	11.13	24.28	16.74
Other	9.84	15.34	6.46	5.79	46.54	16.79
Labor (man-days)	70.75	74.76	73.99	75.52	80.53	75.39
Family	16.57	28.21		37.19	30.35	28.08
Hired	54.18	46.55		38.32	50.18	47.31
Animal power (pair-days)	11.60	17.96	16.99	14.25	14.97	14.69
Family-owned	11.08	7.68		12.75	11.33	10.71
Hired	0.52	10.28		1.50	3.64	3.98
Manure (maund)	31.80	27.49		15.18		24.82
Irrigation cost* (%)	10.77	22.01	13.50	16.62	14.44	15.47
Pesticide cost* (%)		2.67	0.92	4.54	2.71	2.71
Tractor/power* (%)	0.29	0.57	0.51	1.01	0.90	0.66

* Percent of total revenue.

Table 2.1–Input–output coefficients: Local Aus

Survey Year:	1980	1980	1980	1981	1981	1981	1982	1982	1982
Survey Area:	Dinajpur	Bogra	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh
Report:	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984
Cultivation Method:					Broadcast	Random Transplanted		Broadcast	Random Transplanted
OUTPUTS					(per acre)				
Paddy (maund)	11.44	15.80	16.89	13.00	13.37	14.50	12.71	12.91	14.50
Straw (maund)									
INPUTS									
Seed (kg)									
Seed raising cost (taka)									
Fertilizer (kg)	0.05	1.25	0.51	19.78	15.67	42.92	14.55	12.32	11.57
Urea				13.44	11.57	27.24	9.33	8.58	8.58
TSP				5.22	2.99	13.44	4.48	2.99	2.61
MP				0.37	0.37	1.49	0.37	0.37	0.37
Others				0.75	0.75	0.75	0.37	0.37	0.00
Labor (man–days)	44.87	33.03	60.28	42.57	39.75	65.02	41.04	39.22	51.03
Family									
Hired									
Animal power (pair–days)				17.25	17.50	21.75	16.88	17.63	14.50
Family–owned									
Hired									
Manure (maund)	60.10	24.82	40.50	113.70	123.40	109.80	119.60	135.70	97.00
Irrigation cost (taka)									
Pesticides cost (taka)									
Tractor/power (taka)									

Table 2.1 continued

Survey Year:	1990	1991/92	1986	1989	1990	1991	1992		
Survey Area:	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh		
Report:	IFDC, 1991c	IFDC, 1993b	AER	AER	AER	AER	AER		
			(Data from Agro-Economic Research Unit (AER), Ministry of Agriculture)					All Studies	
Cultivation Method:			Broadcast	Broadcast	Broadcast	Broadcast	Broadcast	Mean	Coefficient of Variation
OUTPUTS					(per acre)				(percent)
Paddy (maund)	14.36	15.18	16.00	13.00	15.00	14.40	16.30	14.34	10.18
Straw (maund)									
INPUTS									
Seed (kg)		32.46	29.11	28.55	27.99	30.79	35.18	30.68	8.16
Seed raising cost (taka)									
Fertilizer (kg)	24.63	21.89	31.73	38.26	33.59	33.03	39.19	21.31	64.52
Urea	19.92	18.29	21.46	23.33	25.19	22.02	25.19	18.01	36.57
TSP	4.32	3.12	8.40	11.20	6.53	8.96	11.20	6.57	53.96
MP	0.32	0.49	1.87	3.73	1.87	1.96	2.80	1.26	85.71
Others	0.07					0.09		0.39	76.43
Labor (man-days)	48.30	48.73	61.3	64.6	60.3	57.6	54.0	50.72	19.21
Family		31.00	31.4	32.7	32.4	31.0	27.10	30.94	5.94
Hired		17.73	29.9	31.9	27.9	26.6	26.90	26.81	16.59
Animal power (pair-days)		17.64	22.3	18.2	18.7	17.8	18.50	18.22	10.91
Family-owned		16.51	21.3	15.5	17.9	16.2	16.70	17.36	10.96
Hired		1.13	1.0	2.6	0.8	1.6	1.80	1.50	41.17
Manure (maund)	38.85	20.60	24.0	45.0	40.0	17.3	17.0	64.21	66.26
Irrigation cost (taka)	1.00							1.00	
Pesticides cost (taka)	3.00	2.83	9.00	5.00	5.00	29.00	14.00	9.69	89.60
Tractor/power (taka)	13.00	10.93						11.96	8.66

Table 2.2—Input—output coefficients: HYV Aus

Survey Year:	1980	1980	1980	1981	1981	1981	1981	1982
Survey Area:	Dinajpur	Bogra	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh
Report:	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984
Cultivation Method:					Broadcast	Random Transplanted	Line Transplanted	
OUTPUTS				(per acre)				
Paddy (maund)	12.92	25.20	31.56	25.25	22.45	30.54	27.61	26.32
Straw (maund)								
INPUTS								
Seed (kg)								
Seed raising cost (taka)								
Fertilizer (kg)	0.48	2.00	2.22	89.94	41.05	117.93	131.37	80.98
Urea				47.77	26.12	62.70	60.09	42.92
TSP				29.86	8.96	38.81	43.29	26.87
MP				9.33	2.61	16.05	5.22	8.58
Others				2.99	3.36	0.37	22.77	2.61
Labor (man—days)	47.66	41.67	86.21	81.32	43.26	104.55	87.27	71.67
Family								
Hired								
Animal power (pair—days)				18.63	16.75	24 88	13 50	16.50
Family—owned								
Hired								
Manure (maund)	75.01	32.06	37.72	107.50	160.80	128.20	134.70	1
Irrigation cost (taka)								
Pesticides cost (taka)								
Tractor/power (taka)								

Table 2.2 continued

Survey Year:	1982	1982	1982	1990	1991/92	1986	1989	1990
Survey Area:	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh
Report:	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1991c	IFDC, 1993b	AER	AER	AER
						(Data from Agro-Economic Research Unit (AER), Ministry of Agriculture)		
Cultivation Method:	Broadcast	Random Transplanted	Line Transplanted					
OUTPUTS					(per acre)			
Paddy (maund)	19.29	40.48	31.57	32.69	31.44	21.50	33.80	33.80
Straw (maund)								
INPUTS								
Seed (kg)					24.28			
Seed raising cost (taka)						382.00	471.00	415.00
Fertilizer (kg)	39.93	110.47	113.08	88.72	87.98	90.00	90.00	102.00
Urea	25.75	51.87	59.71	54.43	54.80	54.0	47.0	63.0
TSP	10.45	31.35	37.32	27.79	25.01	32.0	32.0	32.0
MP	2.24	12.69	15.67	5.58	5.79	4.0	11.0	7.0
Others	1.49	14.55	0.37	0.92	2.39			
Labor (man-days)	45.44	50.58	104.30	63.93	64.95	78.0	72.7	74.3
Family					35.13	48.6	31.4	48.9
Hired					29.83	29.4	41.4	25.4
Animal power (pair-days)	18.75	10.63	20.13	18.23	17.08	25.0	16.4	19.1
Family-owned					15.78	24.8	16.4	16.8
Hired					1.30	0.2		2.3
Manure (maund)	157.90	109.40	90.31	57.34	18.43	26.0	58.0	31.0
Irrigation cost (taka)				48.00	60.30	73.00	26.00	23.00
Pesticides cost (taka)				54.00	34.80	73.00	26.00	23.00
Tractor/power (taka)				64.00	121.00			

Table 2.2 continued

Survey Year:	1991	1992		
Survey Area:	Bangladesh	Bangladesh		
Report:	AER	AER		
			All Studies	
Cultivation Method:			Mean	Coefficient of Variation
OUTPUTS		(per acre)		(percent)
Paddy (maund)	31.50	33.00	28.38	22.25
Straw (maund)				
INPUTS				
Seed (kg)			24.28	
Seed raising cost (taka)	437.00	500.00	441.00	9.38
Fertilizer (kg)	99.50	111.50	77.73	52.42
Urea	51.0	62.4	50.90	22.42
TSP	32.8	35.2	29.58	30.47
MP	15.0	13.3	8.94	51.54
Others	0.7	0.6	4.43	150.38
Labor (man-days)	77.7	78.1	70.76	26.49
Family	43.5	45.5	42.17	15.77
Hired	34.2	32.6	32.14	15.42
Animal power (pair-days)	16.2	18.8	18.04	19.62
Family-owned	14.4	18.6	17.80	18.93
Hired	1.8	0.2	1.15	74.55
Manure (maund)	18.0	26.0	77.24	62.71
Irrigation cost (taka)	61.00	247.00	76.90	93.01
Pesticides cost (taka)	61.00	171.00	63.26	74.66
Tractor/power (taka)			92.50	30.81

Table 2.3—Input—output coefficients: Local Aman

Survey Year:	1979	1979	1979	1980	1980	1980	1980/81	1981
Survey Area:	Bogra	Bangladesh	Dinajpur	Dinajpur	Bogra	Bangladesh	Rajshahi	Bangladesh
Report:	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1982	BRRI, 1982	IFDC, 1984
Cultivation Method:								
OUTPUTS				(per acre)				
Paddy (maund)	20.54	16.61	18.10	21.79	25.67	22.02	24.61	16.93
Straw (maund)								
INPUTS								
Seed (kg)								
Seed raising cost (taka)								
Fertilizer (kg)	1.44	0.83	0.14	0.03	1.01	0.45	23.47	20.15
Urea							10.12	12.69
TSP							6.88	4.85
MP							6.48	1.12
Others								1.49
Labor (man—days)	26.48	45.58	31.61	34.46	36.04	53.77	52.00	54.10
Family							25.86	
Hired							26.14	
Animal power (pair—days)							11.53	15.25
Family—owned							9.63	
Hired							1.90	
Manure (maund)	8.33	7.60	3.14	4.10	27.89	7.68	86.74	57.10
Irrigation cost (taka)								
Pesticides cost (taka)								
Tractor/power (taka)								

Table 2.3 continued

Survey Year:	1981	1981	1981	1981/82	1990	1990	1990	1990
Survey Area:	Bangladesh	Bangladesh	Bangladesh	Dhaka	Bogra	Dinajpur	Rajshahi	Bangladesh
Report:	IFDC, 1984	IFDC, 1984	IFDC, 1984	BRRI, 1983	IFDC, 1992	IFDC, 1992	IFDC, 1992	IFDC, 1992
Cultivation Method:	Broadcast	Random Transplanted	Line Transplanted					
OUTPUTS				(per acre)				
Paddy (maund)	15.13	17.32	18.67	20.17	25.75	28.41	29.36	23.23
Straw (maund)								
INPUTS								
Seed (kg)								
Seed raising cost (taka)								
Fertilizer (kg)	10.08	26.12	15.30	121.00	104.14	65.70	40.28	30.30
Urea	7.46	16.05	9.70	64.35	58.66	49.50	25.45	22.87
TSP	1.49	6.34	4.48	44.11	30.52	10.79	9.96	6.08
MP	0.37	1.49	1.12	12.55	14.96	5.30	2.03	1.01
Others	0.75	2.24	0.00			0.11	2.84	0.34
Labor (man-days)	38.30	61.71	55.01	36.69				49.43
Family				21.83				27.02
Hired				14.86				22.41
Animal power (pair-days)	15.75	0.00	0.00	13.42				18.99
Family-owned				13.42				17.79
Hired								1.20
Manure (maund)	33.30	65.60	37.30	45.32	83.59		44.74	22.34
Irrigation cost (taka)								4.00
Pesticides cost (taka)								
Tractor/power (taka)								19.00

Table 2.3 continued

Survey Year:	1991/92	1988	1989	1990	1991	1992		
Survey Area:	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh		
Report:	IFDC, 1993c	AER	AER	AER	AER	AER		
		(Data Agro-Economic Research Unit (AER), Ministry of Agriculture)						
Cultivation Method:							All Studies	
							Mean	Coefficient of Variation
OUTPUTS				(per acre)				(percent)
Paddy (maund)	24.94	22.60	20.70	26.70	23.20	24.12	22.12	17.38
Straw (maund)								
INPUTS								
Seed (kg)	23.47						23.47	0.00
Seed raising cost (taka)		413.00	415.00	483.00	482.00	459.00	450.40	6.87
Fertilizer (kg)	30.35	58.41	52.63	51.32	42.74	48.80	33.85	95.64
Urea	21.45	35.18	31.82	33.31	24.73	28.18	28.22	58.48
TSP	6.88	18.76	16.33	14.00	14.09	15.21	13.17	80.03
MP	1.21	4.48	4.48	4.01	3.92	4.48	4.31	92.87
Others	0.81					0.93	1.06	86.20
Labor (man-days)	47.75	59.9	60.9	65.1	64.2	62.3	49.23	23.99
Family	26.31	29.9	27.8	28.9	32.2	31.6	27.94	10.77
Hired	21.45	30.0	33.1	36.2	32.0	30.7	27.43	23.29
Animal power (pair-days)	14.97	17.8	17.9	19.0	18.3	18.2	13.93	45.37
Family-owned	14.16	16.7	17.2	16.4	17.2	16.1	15.41	15.93
Hired	0.81	1.1	0.7	2.5	1.1	2.1	1.43	43.89
Manure (maund)	0.00	22.0	27.0	17.0	15.0	19.4	30.25	82.28
Irrigation cost (taka)	0.40	27.00		7.00			9.60	107.41
Pesticides cost (taka)	2.02	33.00	23.00	18.00	32.00	32.00	23.34	47.15
Tractor/power (taka)	64.75						41.88	54.63

Table 2.4—Input—output coefficients: HYV Aman

Survey Year:	1979	1979	1979	1980	1980	1980	1980/81	1981
Survey Area:	Dinajpur	Sogra	Bangladesh	Dinajpur	Bogra	Bangladesh	Rajshahi	Bangladesh
Report:	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1982	IFDC, 1982	BRRI, 1982	IFDC, 1984
Cultivation Method								
OUTPUTS				(per acre)				
Paddy (maund)	17.09	34.16	21.30	22.77	37.30	31.56	29.17	27.60
Straw (maund)								
INPUTS								
Seed (kg)								
Seed raising cost (taka)								
Fertilizer (kg)	0.21	2.51	1.78	0.18	1.94	1.70	60.30	72.77
Urea							24.28	38.81
TSP							20.23	23.14
MP							15.78	8.96
Others								1.87
Labor (man-days)	31.15	28.05	54.73	36.74	36.37	73.30	64.10	71.00
Family							38.24	
Hired							25.86	
Animal power (pair-days)							10.97	15.75
Family-owned							7.69	
Hired							3.28	
Manure (maund)	0.43	6.46	6.17	7.76	30.23	6.40	54.21	62.80
Irrigation cost (taka)								
Pesticides cost (taka)								
Tractor/power (taka)								

Table 2.4 continued

Survey Year:	1981	1981/82	1986	1988	1989/90	1989/90	1990	1990
Survey Area:	Bangladesh	Dhaka	Bangladesh	Bangladesh	Bangladesh	Northwest	Bangladesh	Bangladesh
Report:	IFDC, 1984	BRRI, 1983	BARI, 1986	BRRI, 1991	IFPRI, Farm Survey	IFPRI, Farm Survey	IFDC, 1992	BRRI, 1992
Cultivation Method	Line Transplanted							
OUTPUTS				(per acre)				
Paddy (maund)	24.07	37.19	35.96	32.36	39.64	40.56	30.73	28.75
Straw (maund)								
INPUTS								
Seed (kg)			17.81		26.93	26.73		
Seed raising cost (taka)					244.29	242.49		
Fertilizer (kg)	63.82	140.02	55.87	13.36	124.37	125.22	147.14	48.58
Urea	33.21	67.18	34.01	12.15	62.80	62.54	57.28	24.29
TSP	23.14	47.35	17.81	1.21	40.01	38.96	37.78	16.19
MP	6.72	21.85	4.05		15.64	19.12	17.89	8.10
Others	0.75	3.64			5.92	4.60	34.19	
Labor (man-days)	64.68	44.56	56.28	55.47	65.06	65.53	61.26	39.81
Family		21.58			18.15	19.62	30.18	30.90
Hired		22.99			46.91	45.91	31.08	8.91
Animal power (pair-days)	15.50	15.10	12.55		12.20	13.10	16.41	14.98
Family-owned		15.10			11.71	12.64	14.47	
Hired					0.49	0.46	1.94	
Manure (maund)	60.50	68.31	5.36		33.66	40.14	25.05	
Irrigation cost (taka)					12.70	17.31	29.00	
Pesticides cost (taka)					61.91	0.91	47.98	
Tractor/power (taka)					33.86	1.98	38.98	

Table 2.4 continued

Survey Year:	1990	1990	1990	1990/91	1990/91	1991/92	1992
Survey Area:	Bogra	Dinajpur	Rajshahi	Bangladesh	Northwest	Bangladesh	Northwest
Report:	IFDC, 1992	IFDC, 1992	IFDC, 1992	IFPRI–BIDS, Agricultural Diversification Project	IFPRI–BIDS, Agricultural Diversification Project	IFDC, 1993c	IFPRI, Rapid Rural Appraisal
Cultivation Method							
OUTPUTS				(per acre)			
Paddy (maund)	48.96	38.96	38.46	37.94	41.33	35.78	41.10
Straw (maund)				26.01	30.97		
INPUTS							
Seed				26.71	31.52	24.28	
Seed raising cost (taka)				285.41	325.69		225.57
Fertilizer (kg)	98.52	48.68	101.94	138.00	155.90	77 70	142.52
Urea	59.29	38.26	61.25	50.59	67.63	50 18	70.80
TSP	28.67	6.64	26.32	39.26	44.27	19.43	43.48
MP	10.56	3.60	8.16	16.59	24.73	4.45	21.55
Others		0.18	6.21	31.57	19.27	3.64	6.69
Labor (man–days)				76.49	52.12	58.28	63.94
Family				29.95	21.26	29.54	29.68
Hired				46.54	30.86	28.73	34.26
Animal power (pair–days)				15.78	12.79	14.97	18.46
Family–owned				12.14	11.54	13.35	
Hired				3.64	1.25	1.62	
Manure (maund)	83.59		48.49		11.29	10.84	50.04
Irrigation cost (taka)				108.46			166.90
Pesticides cost (taka)				222.58	198.44	25.91	49.69
Tractor/power (taka)				57.87		101.62	12.25

Table 2.4 continued

Survey Year:	1992	1988	1989	1990	1991	1992		
Survey Area:	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh		
Report:	IFPRI, Rapid Rural Appraisal	AER	AER	AER	AER	AER		
	(Data from Agro-Economic Research Unit (AER), Ministry of Agriculture)						All Studies	
Cultivation Method							Mean	Coefficient of Variation
OUTPUTS				(per acre)				(percent)
Paddy (maund)	37.94	36.50	35.20	39.90	37.20	38.90	34.43	19.90
Straw (maund)							28.49	8.70
INPUTS								
Seed (kg)							25.66	16.04
Seed raising cost (taka)	250.40	447.00	494.00	539.00	522.00	469.00	367.71	32.70
Fertilizer (kg)	142.76	110.80	107.30	121.50	118.70	108.50	80.43	65.47
Urea	71.39	63.3	54.3	63.8	62.5	57.2	51.61	31.74
TSP	49.20	36.0	41.2	45.3	42.1	38.3	31.57	41.60
MP	15.79	11.5	11.8	12.4	14.1	13.0	13.02	44.62
Others	6.38					2.4	9.09	117.41
Labor (man-days)	63.89	72.0	71.0	75.0	75.0	74.4	58.85	24.28
Family	31.92	35.1	30.3	31.7	35.7	36.8	29.42	20.31
Hired	31.97	36.9	40.7	43.5	39.3	37.6	34.50	28.19
Animal power (pair-days)	16.34	19.4	18.3	19.1	18.7	18.9	15.75	16.02
Family-owned		18.6	17.2	17.3	17.4	17.4	14.35	21.36
Hired		1.6	1.1	1.8	1.3	1.5	1.67	54.90
Manure (maund)	33.50	25.0	28.0	24.0	29.0	28.3	31.18	70.95
Irrigation cost (taka)	130.97	53.00	26.00	65.00			67.70	77.11
Pesticides cost (taka)	200.56	122.00	130.00	83.00	136.00	120.00	107.61	62.83
Tractor/power (taka)	239.65						69.46	109.04

Table 2.5—Input—output coefficients: Boro

Survey Year:	1980/81	1981/82	1988—89	1988—89	1988—89	1988—89	1990/91	1990/91
Survey Area:	Bangladesh	Bangladesh	Rajshahi	Bogra	Dinajpur	Bangladesh	Rajshshi	Bogra
Report:	IFDC, 1984	IFDC, 1984	IFDC, 1991a	IFDC, 1991a	IFDC, 1991a	IFDC, 1991a	IFDC, 1993a	IFDC, 1993a
Cultivation Method:								
OUTPUTS				(per acre)				
Peddy (maund)	32.82	35.40	27.08	56.23	24.62	45.58	37.94	41.16
Straw (maund)								
INPUTS								
Seed (kg)								
Seed raising cost (taka)								
Fertilizer (kg)	69.04	92.55	170.50	123.82	90.36	141.64	212.30	153.80
Urea	40.31	52.62	99.95	81.13	49.77	82.50	121.80	85.90
TSP	25.00	30.23	58.17	24.47	28.26	42.80	63.00	41.40
MP	3.73	8.21	12.38	14.44	11.06	14.79	27.30	15.70
Others		1.49		3.78	1.27	1.55	0.20	10.80
Labor (man—days)	81.83	86.62						
Family								
Hired								
Animal power (pair—days)	17.63	20.13						
Family—owned								
Hired								
Manure (maund)	126.10	147.70		48.76	34.29	6322.96	104.49	80.38
Irrigation cost (taka)							47110.00	116418.00
Pesticides cost (taka)								
Tractor/power (taka)								

Table 2.5 continued

Survey Year:	1990/91	1990/91		
Survey Area:	Dinajpur	Bangladesh		
Report:	IFDC, 1993a	IFDC, 1993a		
			All Studies	
Cultivation Method:			Mean	Coefficient of Variation
OUTPUTS		(per acre)		(percent)
Paddy (maund)	46.11	43.49	39.04	23.15
Straw (maund)				
INPUTS				
Seed (kg)				
Seed raising cost (taka)				
Fertilizer (kg)	219.30	127.60	140.09	34.09
Urea	122.70	78.00	81.47	33.01
TSP	45.30	33.40	39.20	32.60
MP	25.10	9.50	14.22	48.40
Others	26.20	6.70	6.50	125.31
Labor (man-days)			84.23	2.84
Family				
Hired				
Animal power (pair-days)			18.88	6.62
Family-owned				
Hired				
Manure (maund)	91.09	69.66	780.60	251.06
Irrigation cost (taka)	14337.00	2197288.10	593788.28	156.03
Pesticides cost (taka)				
Tractor/power (taka)				

Table 2.6—Input—output coefficients: Local Boro

Survey Year:	1979/80	1980/81	1980/81	1981/82	1981/82	1981/82	1981/82	1989/90	1989/90
Survey Area:	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Rajshahi	Dinajpur
Report:	IFDC, 1982	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1991b	IFDC, 1991b
Cultivation Method:			Random Transplanted	Broadcast	Random Transplanted	Line Transplanted			
OUTPUTS					(per acre)				
Paddy (maund)	19.41	22.57	22.51	24.78	19.30	59.43	21.91	50.27	43.74
Straw (maund)									
INPUTS									
Seed (kg)									
Seed raising cost (taka)									
Fertilizer (kg)	0.17	4.85	2.99	45.90	4.85	139.20	16.42	116.81	98.40
Urea		3.36	2.24	29.48	2.61	84.72	10.08	68.51	56.37
TSP		1.12	0.37	4.11	1.12	36.95	3.36	38.85	29.55
MP		0.37	0.37	4.11	0.75	13.06	1.49	9.45	12.48
Others				8.21	0.37	4.48	1.49		
Labor (man—days)	84.90	81.43	81.77	44.72	84.05	94.91	79.47		
Family									
Hired									
Animal power (pair—days)		16.50	16.50	12.38	16.38	21.63	16.13		
Family—owned									
Hired									
Manure (maund)	1.76	30.00	30.00	16.30	25.00	54.20	28.70		66.18
Irrigation cost (taka)								2231.00	23782.00
Pesticides cost (taka)									
Tractor/power (taka)									

Table 2.6 continued

Survey Year:	1989/90	1989/90	1990/91	1990/91	1990/91	1990/91	1990/91		
Survey Area:	Bogra	Bangladesh	Bangladesh	Rajshshi	Bogra	Dinajpur	Bangladesh		
Report:	IFDC, 1991b	IFDC, 1991b	IFDC, 1993a	IFDC, 1993a	IFDC, 1993a	IFDC, 1993a	IFDC, 1993a		
								All Studies	
Cultivation Method:				Irrigated	Irrigated	Irrigated	Irrigated	Mean	Coefficient of Variation
OUTPUTS					(per acre)				(percent)
Paddy (maund)	43.82	32.69	33.61	40.91	39.47	34.67	30.32	33.71	34.12
Straw (maund)									
INPUTS									
Seed (kg)			25.05					25.05	
Seed raising cost (taka)									
Fertilizer (kg)	113.88	81.62	12.63	23.90	150.00	61.60	73.30	59.16	85.75
Urea	73.00	50.20	9.02	16.90	89.60	33.70	50.10	38.66	77.64
TSP	29.20	22.98	2.63	3.50	37.10	27.90	16.90	17.04	86.53
MP	11.68	8.22	0.85	3.50	14.00		5.70	6.15	81.64
Others		0.22	0.12		9.30		0.60	3.10	114.00
Labor (man-days)			49.01					75.03	22.48
Family			22.62					22.62	
Hired			26.39					26.39	
Animal power (pair-days)			12.38					15.98	18.09
Family-owned			12.26					12.26	
Hired			0.12					0.12	
Manure (maund)	31.08	60.28	0.11		58.94	40.19	48.23	35.07	57.19
Irrigation cost (taka)	238.00	51536.75	82.15	867.00	3706.30	840.00	28304.20	12398.60	138.64
Pesticides cost (taka)			14.57					14.57	
Tractor/power (taka)			1.21					1.21	

Table 2.7—Input—output coefficients: HYB Boro

Survey Year:	1979/80	1979/80	1980/81	1980/81	1980/81	1981	1981/82	1981/82
Survey Area:	Bogra	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh	Bangladesh
Report:	IFDC, 1982	IFDC, 1982	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984	IFDC, 1984
Cultivation Method:				Random Transplanted	Line Transplanted	Random Transplanted		Random Transplanted
OUTPUTS				(per acre)				
Paddy (maund)	38.44	35.96	39.73	38.61	41.37	30.07	41.52	40.31
Straw (maund)								
INPUTS								
Seed (kg)								
Seed raising cost (taka)								
Fertilizer (kg)	3.44	2.94	122.78	104.50	123.16	78.75	127.26	135.47
Urea			76.13	55.23	78.75	42.54	71.28	77.63
TSP			40.68	39.93	42.17	23.14	42.92	47.02
MP			5.97	9.33	2.24	10.08	11.57	10.08
Others						2.99	1.49	0.75
Labor (man—days)	48.22	80.49	82.10	97.47	64.50	75.75	89.87	93.75
Family								
Hired								
Animal power (pair—days)			18.38	20.63	15.63	15.88	22.00	19.00
Family—owned								
Hired								
Manure (maund)	51.75	26.16	128.10	133.20	131.40	62.10	149.60	149.20
Irrigation cost (taka)								
Pesticides cost (taka)								
Tractor/power (taka)								

Table 2.7 continued

Survey Year:	1981/82	1989/90	1989/90	1989/90	1989/90	1989/90	1989/90	1990/91
Survey Area:	Bangladesh	Rajshahi	Dinajpur	Bogra	Bangladesh	Northwest	Bangladesh	Bangladesh
Report:	IFDC, 1984	IFDC, 1991b	IFDC, 1991b	IFDC, 1991b	IFPRI, Farm Survey	IFPRI, Farm Survey	IFDC, 1991b	IFDC, 1993a
Cultivation Method:	Line Transplanted							
OUTPUTS				(per acre)				
Paddy (maund)	42.44	45.48	47.45	57.82	49.27	50.19	45.79	45.54
Straw (maund)								
INPUTS								
Seed (kg)					25.78	25.72		27.28
Seed raising cost (taka)					233.90	233.37		322.29
Fertilizer (kg)	122.41	233.02	106.57	131.46	157.86	164.26	135.68	146.50
Urea	67.92	131.86	60.77	84.81	81.23	78.97	78.29	90.89
TSP	40.31	71.21	31.23	32.69	47.27	49.62	38.59	39.09
MP	12.32	29.81	14.57	10.59	19.52	22.47	12.34	11.13
Others	1.87	0.14		3.37	9.84	13.20	6.46	5.79
Labor (man-days)	88.53				70.75	68.66	73.99	75.52
Family					16.57	14.59		37.19
Hired					54.18	54.07		38.32
Animal power (pair-days)	24.25				11.60	12.29	16.99	14.25
Family-owned					11.08	11.57		12.75
Hired					0.52	0.72		1.50
Manure (maund)	54.40		68.32	46.24	31.80	38.48		15.18
Irrigation cost (taka)		44402.50	113254.00	61756.03	1167.18	1090.44	1279.48	1592.47
Pesticides cost (taka)					151.94	175.34	86.96	93.89
Tractor/power (taka)					31.20	21.23	47.98	97.13

Table 2.7 continued

Survey Year:	1990/91	1990/91	1992/93	1992/93	1987	1988	1989
Survey Area:	Bangladesh	Northwest	Bangladesh	Northwest	Bangladesh	Bangladesh	Bangladesh
Report:	IFPRI–BIDS, Agricultural Diverdification Project	IFPRI–BIDS, Agricultural Diverdification Project	IFPRI, Wheat Survey	IFPRI, Wheat Survey	AER	AER	AER
					(Data from Agro–Econnomic Research Unit (AER), Miinistry of Agriculture)		
Cultivation Method:							
OUTPUTS			(per acre)				
Paddy (maund)	46.80	52.00	50.88	57.80	48.40	49.80	49.10
Straw (maund)	35.77	34.10					
INPUTS							
Seed (kg)	27.11	27.31	32.52	30.50			
Seed raising cost (taka)	279.90	267.32	249.96	203.35	483.0	569.0	536.0
Fertilizer (kg)	188.59	182.59	166.17	171.81	155.80	146.20	153.30
Urea	67.18	80.58	90.77	95.03	86.9	79.8	95.4
TSP	50.59	56.63	43.61	43.23	51.0	49.7	45.2
MP	24.28	30.36	16.45	20.84	16.1	16.7	12.7
Others	46.54	15.02	15.34	12.71	1.8		
Labor (man–days)	80.53	73.47	74.76	70.20	89.8	88.4	82.2
Family	30.35	27.69	28.21	30.53	41.8	43.7	36.4
Hired	50.18	45.78	46.55	39.67	48.0	44.7	45.8
Animal power (pair–days)	14.97	15.91	17.96	21.18	18.8	18.7	18.6
Family–owned	11.33	11.38	7.68	9.81	17.0	16.2	15.1
Hired	3.64	4.53	10.28	11.37	1.8	2.4	3.5
Manure (maund)		14.83	27.49	61.32	25.0	23.0	13.0
Irrigation cost (taka)	1488.47	1461.49	2058.79	1909.92	1293.00	1382.00	1418.00
Pesticides cost (taka)	279.24	230.51	31.63	231.85	217.00	150.00	64.00
Tractor/power (taka)	93.08		53.55	14.22			

Table 2.7 continued

Survey Year:	1990	1991		
Survey Area:	Bangladesh	Bangladesh		
Report:	AER	AER		
			All Studies	
Cultivation Method:			Mean	Coefficient of Variation
OUTPUTS		(per acre)		(percent)
Paddy (maund)	48.50	46.00	45.57	13.84
Straw (maund)			34.94	2.40
INPUTS				
Seed (kg)			28.03	8.38
Seed raising cost (taka)	558.0	612.0	379.01	39.81
Fertilizer (kg)	158.08	177.62	135.86	36.65
Urea	84.8	94.2	80.48	20.85
TSP	53.1	53.5	44.89	21.08
MP	20.2	19.3	15.60	44.03
Others		10.7	9.25	118.12
Labor (man-days)	84.2	82.2	78.88	13.62
Family	34.8	35.1	31.40	27.11
Hired	49.4	47.1	46.98	9.82
Animal power (pair-days)	17.7	17.8	17.62	17.22
Family-owned	14.9	15.1	12.82	21.12
Hired	2.8	2.7	3.81	87.60
Manure (maund)	27.4	26.7	59.30	77.04
Irrigation cost (taka)	1452.00	1590.00	14912.24	205.89
Pesticides cost (taka)	223.00	161.00	161.26	44.64
Tractor/power (taka)			51.20	59.72

Table 3—Input—output coefficient of rice crops: variation by regions and flooding depth

	B.Aman(local)	T.Aman(local)					T.Aman(MV)	
	LB (SE)F3	LT (NW)F0	LT (NW)F1	LT (NE)F1	LT (NE)F0	LT (SW)F1	MV T (NE)F1	MV T (NW)F2
OUTPUTS				(per acre)				
Paddy (maund)	22.05	13.01	27.11	25.59	20.28	18.33	28.84	28.41
Straw (maund)	45.45	26.03	54.22	4.99	40.56	26.78	28.84	28.41
INPUTS								
Seed (kg)	32.38	28.33	28.33	25.50	20.23	23.07	12.14	20.23
Seed raising cost (taka)								
Fertilizer (kg)								
Urea	60.00	24.00	24.00	0.00	0.00	22.00	79.00	77.00
TSP	53.00	59.00	59.00	0.00	0.00	0.00	30.00	33.00
MP	23.00	28.00	28.00	0.00	0.00	0.00	0.00	14.00
Others								
Labor (man—days)	51.40	36.42	57.06	57.06	57.06	57.06	66.77	30.35
Family	41.28	20.64	32.38	32.38	32.38	32.38	53.42	24.28
Hired	10.12	15.78	24.69	24.69	24.69	24.69	13.35	6.07
Animal power (pair—days)	8.90	12.95	11.74	10.93	10.93	10.93	18.21	5.26
Family—owned								
Hired								
Manure (maund)	32.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation cost (taka)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides cost (taka)								
Tractor/power (taka)								
Land rent (taka)	1640.23	1416.43	1416.43	1537.84	1537.84	1456.90	1821.13	1699.72

Table 3 continued

	T.Aman(MV) continued				Aus(MV)	B.Aus		
	MV T (SW)F1	MV T (SW)F2	Ir MV T (NW)F1/F2	ir MV T (NW)F1	Rf MV	Rf B	Rf B	Rf B
OUTPUTS				(per acre)				
Paddy (maund)	33.40	34.48	42.40	45.11	36.87	17.13	18.00	14.10
Straw (maund)	33.40	38.71	42.40	45.11	36.87	17.13	25.48	14.10
INPUTS								
Seed (kg)	25.09	26.71	23.88	24.28	10.12	51.40	57.47	36.42
Seed raising cost (taka)								
Fertilizer (kg)								
Urea	132.00	150.00	112.00	81.00	158.00	71.00	99.00	0 00
TSP	106.00	110.00	75.00	24.00	65.00	0.00	31.00	0.00
MP	34.00	56.00	26.00	10.00	4.00	0.00	16.00	0.00
Others								
Labor (man–days)	44.92	48.16	42.49	57.06	76.89	38.45	39.26	59.09
Family	36.02	38.45	33.99	45.73	20.23	29.95	17.40	21.45
Hired	8.90	9.71	8.50	11.33	56.66	8.50	21.85	37.64
Animal power (pair–days)	8.09	7.28	9.31	10.12	13.76	8.09	8.50	8.09
Family–owned								
Hired								
Manure (maund)	0.00	43.38	0.00	0.00	0.00	51.22	24.40	0.00
Irrigation cost (taka)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides cost (taka)								
Tractor/power (taka)								
Land rent (taka)	1740.19	1740.19	1699.72	1699.72	566.57	1295.02	1295.02	1375.96

Table 3 continued

	B.Aus continued			Boro(MV)		
	Rf B	Rf B	Rf B	Ir MV	Ir MV	Ir L
OUTPUTS			(per acre)			
Paddy (maund)	18.43	14.75	18.43	43.92	47.39	43.23
Straw (maund)	18.43	14.75	18.43	43.92	47.39	35.98
INPUTS						
Seed (kg)	36.83	40.47	50.59	25.09	12.14	65.16
Seed raising cost (taka)						
Fertilizer (kg)						
Urea	0.00	38.00	70.00	176.00	141.00	190.00
TSP	0.00	7.00	0.00	81.00	73.00	85.00
MP	0.00	0.00	0.00	26.00	12.00	23.00
Others						
Labor (man-days)	34.80	38.45	45.73	71.63	71.63	76.89
Family	12.55	29.95	24.28	19.02	19.02	20.23
Hired	22.26	8.50	21.45	52.61	52.61	56.66
Animal power (pair-days)	8.09	8.09	8.09	13.76	13.76	13.76
Family-owned						
Hired						
Manure (maund)	0.00	0.00	44.46	37.22	0.00	10.54
Irrigation cost (taka)	0.00	0.00	0.00	1586.81	1696.07	1183.33
Pesticides cost (taka)						
Tractor/power (taka)						
Land rent (taka)	1254.55	1335.49	1295.02	1942.53	1821.13	1834.88

Source: World Bank, 1992.

Note: L=local variety MV=modern variety Rf=rainfed Ir=irrigated T=transplanted B=broadcast
SE=south-east SW=south-west NE=north-east NW=north-west
Flood depth type (cm.): F0=0-30 F1=30-90 F2=90-180 F3=180-270 F4>270.

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