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STUDY ON THE COMPARATIVE USE OF TRADITIONAL, INTERMEDIATE AND MODERN TECHNOLOGIES IN RICE PRODUCTION

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ABSTRACT

This paper summarizes the cost of production of rice, using traditional, intermediate and modern technologies with a view to recommend the cheapest and most appropriate package of technological inputs for the farmers. The technological inputs used by small, medium and large farmers were designated as traditional, intermediate and modern respectively. For collection of information about the technological inputs in rice production, a survey work was conducted in 4 districts of Bangladesh. Additional information (market price, useful life, salvage value, interest on investment taxes, insurance, etc.) were collected from different organizations and institutions. The collected data were processed, summarized and analysed with a microcomputer. The study represents that the cost of production of rice by traditional, intermediate and modern technologies were 19712.07 Tk/ha, 18036.09 Tk/ha and 18903.40 Tk/ha respectively.

INTRODUCTION

Besides other factors, adoption of crop production technologies by the farmers depends upon their cost involvement. The cost items generally include fixed cost and variable cost. Introduction of package of technologies in rice production system is, therefore, inter related with their cost which acts as the dynamic force in technology transfer.

A. Technological Inputs in Rice Production

There prevails no systems for the use of technological inputs in rice production. The farmers are following the usual cycle of crop production in which gradual introduction of intermediate and modern technologies is taking place to increase rice yield. Since independence some scattered efforts have been made by the private and government sectors for introducing technological inputs such as high yielding varieties, tillage machinery, seed planters, weeders, irrigation machinery, fertilizers, pesticides, sprayers, harvesting and threshing machines in agriculture. Some of these technological inputs have been accepted by the farmers. The technology used by them for rice production were designated as

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traditional, intermediate and modern respectively (Appendix A, Table 1). The category of farmers is shown in Table 1.

Table 1. Category of Technology Users/Farmers

Category of farmers	Farm size, ha	Technology users, %
Small	0.40 — 0.99	50
Medium	1.00 — 3.03	30
Large	3.03 and above	20

Source : BBS, 1991.

B. Technological Operations for Rice Production

Techonological operations for rice production are interrelated and interdependent. Cropping systems (crop rotation and cropping pattern) dictate the technological operations needed and accordingly different field works are completed by using technological inputs. Hence, technological operations and cropping systems form the loop (Fig. 1) in which different field works take place to increase soil fertility and agro-technical suitability for rice cultivation (Salequa, 1991). It can be easily realized from Fig. 1 that any problem in the technological operations hampers the cropping systems. So, the farmers and agronomists should always be aware of the problems of technological operations in rice cultivation.

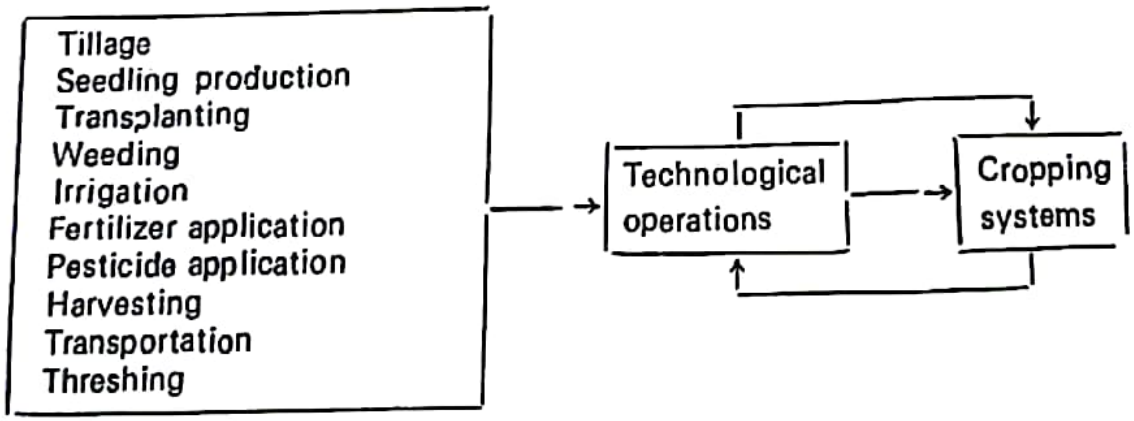

Fig. 1. Technological operations for rice production

C. Objectives of the Study

Many studies have been carried out on farm mechanization, farming systems, weed control, drying and storage of farm crops, milling of rice etc. But no work was done on the cost of package of technological inputs for their transfar to the farmers. Therefore, the authors of the present study have shown keen interest to conduct a study on the use of traditional, intermediate and modern technologies in rice production.

The main objectives of the study were :

i) Assessment of technological inputs and technological operations adopted by the farmers for rice production.

ii) Collection of information on market price, useful life, salvage value, interest on investment, taxes, insurance etc. for the technological inputs and estimation of their use.

iii) Recommendation on the cheapest and appropriate package of technological inputs for the farmers of Bangladesh in producing rice.

METHODOLOGY OF THE STUDY

The study was aimed at the determination of the production cost of rice, using different technological inputs. The area selected for the purpose of the study comprised of three villages in each Thana of Magura, Gopalganj, Bogra and Mymensingh districts. Data sheets were distributed among the leading (literate) farmers to collect information on technological inputs they use for rice production. Some data sheets were filled up by the investigators themselves because the small and some medium farmers were illiterate. The investigators were very much careful in collecting data on technologies. The unreliable data were rejected to make the study as authentic as possible.

To determine the production cost of rice, the market price and other information on the technological inputs were collected from different institutions and organizations. All collected data were processed, summarized and analysed by a microcomputer to achieve the required objectives.

RESULTS AND DISCUSSION

Cost involved in rice production by traditional, intermediate and modern technologies were 19712.07 Tk/ha, 18036.09 Tk/ha and 18903.40 Tk/ha respectively. Also cost incurred in each individual technological operation and comparative costs for rice production are shown in Appendix B (Table 1). Analysis of costs for technological operations showed that the total cost for traditional technology was higher by 1675.98 Tk/ha and 808.67 Tk/ha over intermediate and modern technologies respectively (Saleque *et al.*, 1992). Also the total cost for modern technology was higher than that of intermediate technology by 867.31 Tk/ha. It was found from the study that cost of intermediate technology was the lowest than that of traditional and modern technologies. Thus, intermediate technology might be recommended for the accomplishment of different operations in rice production. The market price and other information on different technological inputs are shown in Appendix C (Table 1-8).

CONCLUSION

The authors have been carried out this study to assess the relationship between the package of technological inputs and economic strength of the farmers. Results showed that cost involvement was such a dynamic force that divided the farmers into small, intermediate and large categories and accordingly the technological inputs were adopted. The study presents a picture of comparative cost for the selection of the cheapest package of technological inputs for rice production. Thus the authors hope that the study will be helpful to the farmers to make decision on the use of package of technological inputs in rice production with the least cost.

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APPENDIX A

Table 1. List of Traditional, Intermediate and Modern Technology Used by the Different Categories of farmers in Bangladesh.

Category of farmer	Technology used for							
	Tillage	Sowing/ transplanting	Weeding	Irrigation	Fertilizer and pesticide application.	Harvesting	Transportation/Carrying	Threshing
Small	Country plough, Yoke, Ladder, Bullocks, Rake, Spade, Mugur etc,	Hand	Nirani or Khurpi Sickle, Spade, Handhoe, etc.	Done, swing basket, Treadle pump, Pitcher, Balti etc.	Cowdung, Ash, compost, Lime, Chemical fertilizers like urea, TSP, MP & Zypsum, Pesticides, Hand sprayer, Duster,etc.	Sickle, Spade, Tengi (hand hoe), Da, Curved Knife (Haisa) etc.	Man, Bamboo-bar, Bot, etc.	Hand, Feet, Molon, etc.
Medium	Powertiller, Mouleboard plough, Disk plough, Harrow, Tine, Lister,Rotavator, Bullocks and bullock drawn implements, etc.	Hand, Seed drill, Rice transplanter (rarely)	Nirani or Khupri, Rice weeder, Jute weeder, Sickle, spade, Hand hoe etc.	Shallow tube well, LLP, pedal pump, Diaphragm pump, etc.	Cowdung, Compost Lime, Ash, Oil Cake, Bone meal, Chemical fertilizers and pesticides, Hand sprayer, Knapsack sprayer (rarely) Duster etc.	Sickle, spade, Da, Tengi, Curved Knife, etc.	Man, Bullock cart, Boat, Van, etc.	Pedal-thresher, Molon, Drum, etc.
Large	Tractor, Mouldboard plough, Disk plough, Disk harrow, Lister	Hand, Seed ill, Rice trans-	Nirani or Khurpi, Rice weeder, Jute weeder,	Deep tube well, Shallow tube well, LLP, Pedal/	Cowdung, Compost Lime, Ash, Oil Cake, Bone meal Chemical fertilizers and pesticides, Hand sprayer,	Sickle, spade, Da, Tengi, Durved Knife,	Man, Bullock cart, Tractor power Tiller with Trolley	Power thresher, pedal thresher, Molon,

Appendix A (Table 1). Continued

Large	Tine, Rotava- tor, Cultivator, Power tiller, Bullocks and bullock drawn implements etc.	planter (rarely)	Sickle, spade, Hand hoe, Wheel hoe etc.	Diaphragm pump, etc.	Knapsack Sprayer, Power sprayer, Han l spayer, Duster, etc.	etc.	(rarely) Boat. Van, etc.	Drum etc.

Notes :

1. Traditional technologies are those technologies which are used by the small farmers, the majority of which are indigenous with probable combination with seeds of HYV, chemical fertilizers and pesticides, treadle pump and irrigation water obtained from others on contract basis.

2. Intermediate technologies are those technologies which are used by the medium farmers including power tiller with related implements, rice weeder, shallow tube well, LLP, pedal pump, diaphragm pump, irrigation water obtained from others on contract basis, HYV, Chemical fertilizers and pesticides and some of the traditional technologies.

3. Modern technologies are those technologies used by the large farmers which include tractor with related implements, deep tube well, Knapsack sprayer, power thresher and some of the intermediate technologies.

It should be mentioned here that the classification of the farmers and the technologies used by them has been made on the basis of the information obtained from the statistical year Book of Bangladesh (1991) and t he survey work conducted by the investigators in 1991-92, respectively.

APPENDIX B

Table 1. Comparative Cost for Different Technologies

Technology	Operation	Operational Cost, Tk./ha	Total cost Tk./ha	Comparative Cost
1. Traditional	A. Tiliage	1123.82	19712.07	Total cost for traditional technology is higher than that of intermediate technology by Tk. 1675.98/ha & higher than that of modern technology by Tk. 808.67/ha.
	B. Seedling Production	305.00		
	C. Transplanting	1600.00		
	D. Weeding	3338.06		
	E. Irrigation	4829.00		
	F. Fertilizer Application	2838.00		
	G. Pesticide Application	2794.00		
	H. Harvesting	1671.55		
	I. Transportation/Carrying	—		
	J. Threshing	1212.64		
2. Intermediate	A. Tillage	1118.88	18036.09	Total cost of intermediate technology is less than that of traditional technology by Tk. 1675.98/ha and that of modern technology by Tk. 867.31/ha
	B. Seedling Production	305.00		
	C. Transplanting	1600.00		
	D. Weeding	2933.70		
	E. Irrigation	3499.70		
	F. Fertilizer Application	2838.00		
	G. Pesticide Application	2794.00		
	H. Harvesting	1671.55		
	I. Transportation/ Carrying	194.06		
	J. threshing	1081.20		
3. Modern	A. Tillage	1385.16	18903.40	Total cost of modern technology is less than that of traditional technology by
	B. Seedling Production	305.00		
	C. Transplanting	1600.00		

Appendix B (Table 1) Contd.

D. Weeding	2933.70	Tk. 808.67/ha and higher than that of intermediate technology by Tk. 867.31/ha
E. Irrigation	4191.27	
F. Fertilizer Application	2838.00	
G. Pesticide Application	2838.00	
H. Harvesting	1671.55	
I. Transportation/ Carring	194.06	
J. Threshing	941.58	

APPENDIX C

MARKET PRICE OF TECHNOLOGIES USED IN CONNECTION WITH RICE PRODUCTION

Table 1. Market price of technologies used for tillage operation

Sl. no.	Name of technology	Field capacity, ha/hr.	Useful life, yr.	Manufacturer/ distributor	Market price, Tk.
1.	Country plough	0.05	2-3	Local artisan	175.00- 225.00
2.	Yoke	—	4-7	Local carpenters	75.00- 125 00
3.	Bullocks (1 Pair)	—	5-8	—	10000.00-16000.00
4.	Ladder	0.50	2-3	Local artisan	80.00- 120.00
5.	Spade	0.05	3-4	Local black-smiths	75.00- 120.00
6.	Mallet (Mugur)	—	3-4	Local carpenters	8.00- 15.00
7.	Rake (Nangla)	0.035	8-10	Village artisan	200.00- 250.00
8.	Mould board plough (animal drawn)	0.05	4-5	BRRI	350.00
9.	Two shared plough (animal drawn)	0.03	4-5	BRRI	250.00
10.	Chinese power tiller (12 hp)	0.10-0.17	6-7	China	45000.00-52000.00
11.	Japanese power tiller (5, 10 & 12 hp)]	0.12-0.18	7-8	Japan	80000.00-125000.00

Appendix C (Table 1) Contd.

12.	Korean power tiller (11 hp)	0.09-0.16	6-8	South Korea	60000.00-70000.00
13.	BMTF power tiller (5 hp)	0.13-0.15	6-7	BMTF	60000.00-65000.00
14.	Tractor :				
	Model-Benye-254 (24 hp)	0.2-0.05	10-12	China/Samsons Ltd.	260000,00
	Model-DOORBAR-250 (24 hp)	0.2-0.05	9-10	China/BEFCO	240000.00
	DOORBAR-245 (16 HP)	0.18-0.04	8-9	,,	220000.00
	Massey Ferguson 365 (68 hp)	0.3-0.6	10-12	Japan/Progoti Industries	1150000.00

Table 2. Market price of technologies used for planting/transplanting

Sl. no.	Name of technology	Field capacity, ha/hr.	Manufacturer / distributor	Market price, Tk.
1.	Seed drill (4 row)	0.20	BRRI	2500.00
2.	Drum seeder	0.10	BRRI	1200.00
3.	Seed drill : single line	0.10	Comilla Cooperative Factory Ltd.	850.00
	Double line	1.12	,,	1050.00
4.	Rice transplanter (6 row)	0.03	BRRI	5000.00

Table 3. Market price of technologies used for weeding

Sl. no.	Name of technology	Field capacity, ha/hr	Manufacturer/ distributor	Market price, Tk.
1.	Nirani/Khurpi	0.003	Local artisan	8 00— 12.00
2.	Rice weeders	0.004	Comilla Cooperative Factory Ltd.	170.00—180.00
3.	Rice weeders	0.004	MAWTS and others	120.00—180.00
4.	Sickle	0.003	Local blacksmiths	8.00— 12.00

N B. Sickle is the only implement used for rice harvesting by all categories of farmers in Bangladesh, but it is also used as a weeding implement in certain districts.

Table 4. Market price of technologies used for irrigation

Sl. no.	Name of technology	Discharge capacity.	Manufacturer/ distributor	Market price, Tk.
1.	Done	60—80 gpm	Local carpenters	200—300/-
2.	Swing basket	40—60 gpm	Village artisan	8—15/-
3.	Pedal pump/Diaphragm pump	12—17 m^3/hr	BRRI, Comilla co-operative Factory Ltd. and others	3000/-and above
4.	Axial flow pump	3 m^3/min	BRRI	3000/-
5.	Hand pump	2—3 m^3/min	Differenr Engg. Workshops	500—700/-
6.	Tara pump	15 m^3/hr	MAWTS, Mecol group etc.	6000/- and above
7.	Treadle pump	8 m^3/hr	IDE and others	350—400/-
8.	Animal drawn pump	10 m^3/ha	BRRI	3000/-
9.	Centrifugal pump	1/2-5 cusec	Different Engg.	1020—7400/-
10.	$1\frac{1}{4}$"—$1\frac{1}{2}$" pvc pipe	—	MAWTS and others	8—15/rft
11.	Screen filter (2 m)	—	MAWTS and others	160—200/-
12.	Shallow tube well/LLP	1/2-2 cusec	China and Japan	20000—31000/-
13.	Deep tube well	2 cusec	BADC	175000/-

Table 5. Market price of commonly used chemical fertilizers

Sl. no.	Name of fertilizer	Market price, Tk./kg
1.	Urea	5.50-6.00
2.	TSP	7.00-7.50
3.	MP	5.00-5.55
4.	Zypsum	3.00-3.50

Table 6. Market price of technologies used for pesticide application

Sl. no.	Name of technology (Sprayer or pesticide)	Market price, Tk.
1.	Hand sprayer (Plastic container)	180.00- 270.00
2.	Knapsack sprayer	1300.00-2000.00
3.	Power sprayer	3000.00-5000.00
4.	Basudin 10 G	85.00/kg
5.	Dimecron 100 SCW	740.00/litre
6.	Nogos 100 EC	580.00/litre
7.	Sevion 10 G	100.00/kg
8.	DDVP 100 EC	500.00/litre
9.	Megaphos	550.00/iitre
10.	Diaton 10 G (Diazinon)	85.00/kg
11.	Sedial-5 G (Phenthoit)	70.00/kg
12.	Hilthion 57 EC (Malathion)	220.00/litre
13.	Furacarb-3 G (Carbofuran)	65.00/kg
14.	Fenitox-50 EC (Fenitrothion)	650.00/litre

Table 7. Market price of technologies used for threshing

Sl. no.	Name of technology	Capacity. quintal/hr	Useful life. yr	Market price, Tk.
1.	Pedal thresher	0.4-0.45	4-6	1800.00- 1900.00
2.	Power thresher	3.0-3.50	6-7	12000.00-13000.00
3.	Drum	0.3-0.35	6-7	300.00- 350.00

Commonly Used Pesticide with Price and Requirement/ha

Combination 1

Name of Pesticide	Requirement/ha	Price	Cost/ha
Basudin 10 G	10 kg	Tk. 85.00/kg	Tk. 850.00
Dimecron 100 SCW	1.2 lit	Tk. 740.00/lit.	Tk. 888.00
Nogos 100 EC	0.6 lit	Tk. 850.00/lit.	Tk. 348.00
			Tk. 2086.00

Combination 2

Name of Pesticide	Requirement/ha	Price	Cost/ha
Sevion 10 G	10 kg	Tk. 100.00/kg	Tk. 1000.00
Megaphos	3 lit	Tk. 550.00/lit	Tk. 1650.00
MAC DDVP 100 EC	1.2 lit	Tk. 500.00/lit	Tk. 600.00
			Tk. 3259.52

Source : Local dealers of pesticides.