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Economics of Rice Seed Production and Marketing – A Study in Terai Zone of West Bengal, India

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A B S T R A C T

The study analysed the economics rice seed cultivation in Cooch Behar and Jalpaiguri districts in Terai zone of West Bengal. The study has determined the costs, profitability, resource use efficiency, marketing and constraints of rice seed cultivation. The multistage sampling technique was used to select 90 rice seed growers. The study revealed that TVC of cultivation (₹ /acre) was found ₹ 22016.60 and ₹ 20758.31 respectively for seed and conventional production. The net return in seed production was ₹ 8622.55/acre with input-output ratio of 1:1.29. The overall contribution of different resources in variation of income found 53% (R^2 = 53.28). The factors viz. seed, chemical and irrigation revealed significant at 5% level. The calculated MVP and RUE were found positive for all resources viz. seed, organic fertilizer, Inorganic fertilizer, argo-chemical and irrigation except human labour. In respect of marketing, producer's share in consumer rupee found only 30 to 40 %. Garret's ranking showed that low price of output, shortage of labour, high price of input, weed infestation and availability of credit were the major problem in seed production. The study suggested that production potential of rice seed at the farmers level is to be enhanced with adequate infrastructure, guidance and training facility.

Introduction

Rice is an important staple food crop for about 50% of the population in Asia, where 90 percent of world's rice is grown and consumed (Debi Sita and Ponnarasi, 2009), providing about 35-59% of the total calorie intake of people and demand for rice would be 800 Million Tonnes by 2020 in South and Southeast Asia (Singh and Ram, 2012): India is the world's 2nd largest producers of rice, accounting 23.47% of world production with coverage of 32.16% world among ten top rice producing countries of the world viz. India, China, Bangladesh, Indonesia, Thailand, Vietnam, Mayanmer, Philiphines, Japan and Brajil (Agricultural statistics at a glance 2015). Based on four years average (2010-11

to 2013-14) India's share in rice production was 21.27% covering 32.07% of area with an average productivity of 2946.33 kg/ha whereas, China produced 34.12% of production by only covering 22.47% of area with an average productivity of 6723.67 kg/ha. In terms of productivity India was in last position among the said top ten rice producing countries (Agricultural statistics at glance 2015). On the other hand, the current population of India is 121.02 (2011 Census) crores. It is estimated that the population is likely to increase to 138.89 crores by the year 2025. To meet the requirement of growing population and changing life style, about 300 million tonnes of food grains including 130 million tonnes of rice will be required by 2025 (Anonymous, 2010) and this additional yield will have to be produced on less land with less usage of water, labour and chemicals (Zeng *et al.,* 2004). Improvement of rice grain is the only possible and potential strategy to attain increased produce because of the reduction in the rice cultivating area (Cassman, 1999). Under this context, India has to increase the rice productivity and that could be achieved through supply of good quality hybrid seed of suitable variety. Further, the usage of farm saved seed is to be reduced and farmers are to be encouraged to use quality seed to increase productivity levels as well association of yield with corresponding yield components should be considered in selection criteria of germ plasma on the basis of the variation (Habib *et al.,* 2005).

In West Bengal, rice is also the most important staple food. In India, West Bengal is the leading state both in terms of area and production of rice grown in area of 5.38 Mha with production of 14.68 Mt in 2013-14. But in terms of productivity, West Bengal ranked 4th position followed by Andra Pradesh, Telangana, and Tamil Nadu (Agricultural statistics at glance 2015). There is a shortage of certified seed or quality seed of desirable crop varieties in West Bengal. Therefore there is urgent need to establish quality seed sources at least for major crops of northern part of west Bengal (Roy, 2014). It is, therefore, inferred that, there is a possibility of increasing rice productivity in West Bengal and good quality seed is the most important input to fetch that. Further, the usage of farm saved seed is to be reduced and farmers are to be encouraged to use quality seed to increase productivity levels.

Seed is considered the basic input for enhancing agriculture production and productivity. Efficiency of all other agriculture input, such as fertilizers, pesticides and irrigation, etc. as well as the impact of agro-climate condition is largely determined by the quality of the seed. The estimated contribution of seed in the productivity is considered to be 20-25% and it can be further raised up to 45% with efficient management of other inputs (seednet.gov.in). The seed replacement ratio (SRR) was 2.85 per cent in India which is considered to be low (Government of India, 1989). The present level of SRR for field crops in India is just 5 – 7% (Roy, 2011). The reason for the low replacement of certified seeds could be its high price and non-availability of seed in time (Sidhu *et al.,* 1997). This has been associated with the failure of the formal seed sector to multiply sufficient quantities of the new varieties and make it available to the farming communities (Rubyogo *et al.,* 2010). Production of good quality seed will be of no value if it does not reach the farmer in time. Due to the high cost of purchased seed, the farmers used the self-retained seed which is usually inferior in quality. Moreover, the conventional farm produce retained for seed cannot be substituted for quality seed and it conventionally lacks genetic vigor and has poor germination rate (Singh *et al.,* 1990). Therefore, ensuring the availability of seed for enabling farmers to achieve higher agriculture

production is a strategic requirement. The system recognizes the generations of breeder, foundation and certified seeds and provides adequate safeguards for quality assurance in the seed multiplication chain to maintain the purity of variety as it flows from the breeder's backyard to the farmers and by bridging the existing yield gaps through improves the output per unit of input applied in agricultural production.

Under the above context the present investigation was carried out with a view to

To examine the cost of cultivation and relative income measures

To evaluate allocative efficiency of different resources

To explore existing marketing facilities available for seed producers and

Analysis of constraints of seed growers in the study area

Materials and Methods

Data

Cooch Behar and Jalpaiguri districts of Tearai zone were selected purposively for the present study. Two blocks *viz.* Cooch Behar-II and Sital Kuchi from Cooch Behar district and one block namely Maynaguri from Jalpaiguri district having maximum area under seed production were selected purposively. The list of villages was collected from Agriculture department of selected block and from three selected blocks nine villages were selected purposively again based on the maximum area under seed cultivation of the said crop. Out of nine villages, one from Cooch Behar block-II, six from Sitalkuchi block and two from Maynaguri block were selected for the study. From each village 10 number of rice seed growers were selected randomly. Thus a total number of 90 rice seed growers were taken as respondent for the study (Table 1).

The primary data was collected with the developed questionnaire/schedule from respondents through personal interview method. For the present study, data pertaining to one agriculture year 2017-18 were obtained.

Analytical tools

Descriptive statistical analyses such as mean, percentage etc. were carried out in order to present the conventional characteristics of sample rice seed growers and also to compute cost of cultivation. The farm management analysis and related farm income measures at $CostA_1$, $CostA_2$, $CostB_1$, $CostB_2$, $CostC_1$, $CostC_2$, and CostC3 were done. The efficiency measures were also carried out to examine the resource productivity in rice seed cultivation.

Production function

In order to study the relationship between the output and various inputs, Cobb-Douglas production functions in log-linear from was fitted to study the factors affecting productivity in production of seed. The resource-use efficiency of the inputs used by the rice seed growers was estimated using Cobb-Douglas production function, as given below

$$Y=aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}U_1$$

The Cobb-Douglas production function was linear zed by transforming it into the following double log or log linear form so that it could be solved by the least square method:

Log Y = Log a + b1 Log X1 + b2LogX2 + b3LogX3 + b4LogX4 + b5LogX5 + b6LogX6 + Ui

Where, Y= production (₹ /Acre).

X_1= Human labour (₹ /Acre),

X_2= Seeds (₹ /Acre),

X_3= Organic fertilizers (₹ /Acre),

X_4= Inorganic Fertilizer (₹ /Acre).

X_5= Agro-chemical (₹ /Acre).

X_6= Irrigation (₹ /Acre)

a = constant and

U_i = Error-term

Resource Use Efficiency (RUE)

The estimated coefficients of independent variables were used to compute the marginal value products (MVP) and the resources-use efficiency (RUE) was worked out using formula given by Rahman and Lawal (2003). MVP was estimated at their respective geometric mean level and MFC was taken as unit price of the factor.

RUE = MVP/MFC

Where

MVPi = $\beta_i \frac{\bar{y}}{\bar{x}_i} Py$

Here,

MVPi= Marginal value product of the ith input,

$\bar{y}$ = Geometric mean of value of output

$\bar{x}_i$ = Geometric mean of i^{th} input.

β_i = Estimated co-efficient (or) elasticity of the ith input, and
P_y = Price of output

Marketing margin

Marketing margin of the middleman was calculated as the difference between the total payment (marketing cost + purchase price) and receipts (sale price) of the middleman and calculated as:

Ami= Pri-(Ppi+Cmi)

Where

Ami= Absolute marketing margin of ith middleman.

Ppi= Total value per unit.

Cmi= Cost incurred on marketing per unit.

Marketing Efficiency (ME)

Marketing efficiency is the ratio of market output to marketing inputs. An increase in this ratio represents improved efficiency and decrease denotes reduced efficiency. Marketing efficiency was calculated by using Acharya's index of marketing efficiency.

This is stated as:

ME= $\frac{FP}{MC+MM}$

Where,

ME = Index of marketing efficiency

FP = Price received by the farmer

MC = Total marketing cost

MM = Marketing margins

Producer share in the consumer rupees

Ps= (P/C)*100
Ps= Producer share in the consumer rupees.

C= Price paid by ultimate consumer.

P= Price received by the producer.

Garrett's ranking technique

The Garrett's ranking technique was used to study the opinion of farmers regarding the constraints faced by them in cultivation and marketing of rice seed. The percent position of each rank is converted into scores by referring tables given by Garrett and Woolworth (1971). The constraint with the highest mean value was considered as the most important one and the others followed in that order. The percent position of each rank was found out by the following equation

$$\text{Present Position} = \frac{100\,(\text{Rij} - 0.5)}{Nij}$$

Where,

R_{ij} = Rank given for the i^{th} constraint by j^{th} individual.

N_{ij}=Number of constraints ranked by the j^{th} individual.

Results and Discussion

Socio-economic features

Economic feasibility of the cropping venture is judged by the standard cost and return, marginal value product and resource use efficiency concept. Again, input use and the corresponding efficiency depend to a large extent on the socio-techno-economic features of the farming folk. Many demographic and social attributes do help a farm family in participation and decision making process. Therefore, it necessitates having a brief sketch about the social and economic profile of the seed growers in the selected study areas of Cooch Behar and Jalpaiguri district. The age and family size play an important role in any kind of business, as an agriculture business in respect of the employment pattern, spatial mobility and quality of work done. The demographic and economic attributes of the seed growers delineated through table 2. The average age of the seed growers found 44.32 years with a average family size of 4.93. This indicates that young and middle aged farmers were more interested in seed cultivation. There were significant variations of caste composition. The overall percentage share of SC, ST, OBC and GEN was observed to be 39.29%, 28.57%, 25.00% and 07.14% respectively.

This result is also corroborating as Cooch Behar and Jalpaiguri district are mainly dominated by SC and ST population. It is revealed from the table 2 that nearly 50% of the seed growers have educational level from secondary onwards that led the seed grower to quickly and scientifically adopt with seed production technology. Farming is the primary occupation in the study area. The average annual income of the seed grower revealed ₹ 122357. It might be due to that the most of seed growers were in the category of small and marginal farmers.

The distribution of seed growers according to their farmer's status is presented in table 3. It is observed from the said table that 78.57% of seed grower had ownership on the land and only 7.14% of seed grower cultivated the land as tenant while owner cum tenant cultivator was 14.24%. This indicates that the farmers who have own land; they are more interested for seed production practices. The sample seed growers were also classified into four categories on the basis their main source of income viz. sole farming, farming plus business, farming plus wage labour and farming plus services or others accounting 46.42%, 17.85%, 28.57% and 7.14% respectively (Table 3). Although there was a wide variation of occupational status of

different category of seed growers and the main source incomes of the seed grower was sole farming and to some extent supplemented by wage earning. Therefore, they had to fetch their remunerative income from farming practices that led them to choose seed production practices which might be more profitable. Another important observation was that the farming folk were mostly marginal in nature and in the randomized selection of sample units (i.e., the seed growers) the matter is truly reflected. Average land holding (including homestead and pond area) of the sample seed growers was found 5.4 acre (Table 3) of which agricultural farm size 4.92 acre while the net cropped area was 4.28 acre of which 43.87% (2.05 acre) used for seed production purpose.

It is to be noted here that the varieties used rice seed production were MTU-1153, MTU-1075, SS-1, MTU-1121, MTU-1210, J.B-1, J.B-3 etc. The farming folk in the study area were rely mostly on government department and officials like agricultural university and office of the agricultural development officer for their desired information and technology of seed production. Of course, there were farmer's club who also formed a trusted media of supplementing information. The average experience of seed growers in seed cultivation observed 4.92 years which is very promising indicating their positive attitude towards seed production.

Cost and return analysis

The cost and return analysis was carried out on comparative approach between conventional rice production and rice seed production practices. The cost of cultivation of rice was worked out by using standard cost concepts. The information on various variable items of cost of cultivation of rice is presented in Table 4. It reveals that average total variable cost of cultivation was ₹22016.60 in seed production purpose which was slightly higher (6.06%) than total variable cost incurred for conventional production purpose. The reason behind it might be the use of organic fertilizers particularly FYM was higher (27.15%) in seed production than conventional production process. The cost of other items was found almost same. The amount of seed used for conventional production process was higher than seed production purpose, but the amount of cost for this input was almost same as the sample rice seed grower used lower quality seed in conventional production purpose and higher quality seed (foundation or certified seed) for seed production purpose. The major item of cost was human labour charges followed by machinery charges, expenditure for application organic fertilizers and inorganic fertilizers accounting 49.63% 18.57%, 12.13% and 4.77% respectively in seed production purpose and 50.38%, 19.59%, 10.12% and 4.86% respectively for conventional production purpose. It was noted that the share of own family labour with respect to total human labour charges revealed around 50% in both production purposes. The fixed cost of cultivation (per acre) of rice seed and conventional rice found same i.e. ₹ 5109.72.

The major items considered for accounting total fixed cost were rental value of own land, interest on fixed capital @8%, depreciation on major implements and land revenue. Thus, on an average, total cost of cultivation estimated as ₹ 27,148.82 in seed production ₹ 25,868.03 in conventional production process for one acre of land.

The average yield of rice fetched by sample farmers was 20.99 qtls/acre in seed production and 19.63 in conventional production purpose (Table 4) which indicates that although the farmers used higher quality seed in seed production purpose with scientific method and guidelines, the average productivity level in

both cases found almost same. The average gross return including return from by-product (straw) was calculated as ₹ 38303.30/acre in seed production purpose, revealed 13.74% higher than the gross return in conventional production purpose.

The variation in gross return is mainly due the difference in output price (7.74%) of rice grain between two production purposes. The costs and related income measures from the production of rice are presented in Table 5. The calculated per acre average Cost A_1, Cost B_1, Cost B_2, Cost C_1, CostC_2 and Cost C_3 were ₹ 16141.60, ₹ 16570.00, ₹ 21107.50, ₹ 22445.00, ₹ 26982.50 and ₹ 29680.75 respectively in seed production purpose whereas in conventional production process the above costs were ₹ 14883.31, ₹ 15311.71, ₹ 19849.21, ₹ 21186.71, ₹ 25724.21 and ₹ 28296.63 respectively.

Further, the calculated per acre Family Labour Income (FLI), Farm Business Income (FBI) and Net return found to be ₹17195.80, ₹16286.70 and ₹8622.55 respectively in seed production while above income were estimated as ₹13827.29, ₹12918.19 and ₹5379.87 respectively conventional rice production. The net income was calculated based on CostC_3 and in calculation of CostC_3, 10% of CostC_2 was considered as managerial cost and added with it. The overall technical efficiency input-output ratio (benefit cost ratio) based on CostC_3 and total cost were found 1.29:1 and 1.41:1 respectively in seed production and 1.19:1 and 1.30:1 under conventional production process. The results of input-output ratio (CostC_3) are also synonymous with the study of Mohandas and Thomas (1997). The cost of production based on CostC_3 was calculated as ₹1414.04 in seed production and ₹1441.50 in conventional production process.

Therefore, it can be concluded that due to relatively higher level of productivity of rice in seed production purpose than conventional production process, the cost of production revealed relatively lower although the total cost of cultivation found to be higher in seed production than conventional production process.

Efficiency measures of resources

The allocative efficiency of different resources was examined in terms of Marginal Value Product (MVP) and Resource Use Efficiency (RUE). It is to mention here that the allocative efficiency was only examined for seed production purpose.

For estimation of RUE, the Cobb-Drugless production function was fitted considering on dependent variable production and six independent variables viz.X_1-Human Labour X_2-Seed, X_3-Organic fertilizer, X_4-Inorganic fertilizer, X_5- Agro-Chemicals and X_6-Irrigation. The production function coefficients of rice seed production was analyzed and presented in Table 6. The Table 6 shows that the variables viz. seed, chemical and irrigation revealed significant at 5% level each. The elasticity of an individual input was less than unity in each input implying decreasing marginal productivity to each input.

Table.1 Sampling frame

Sampling stage	Numbers	Sampling technique	Sampling unit		
District ↓	2	purposive	Cooch Behar		Jalpaiguri
Block ↓	3	Purposive	Cooch Behar-ll	Sitalkuchi	Maynaguri
Village ↓	9	Purposive	1	6	2
Seed grower	90	Random	10	60	20

Table.2 Demographic and economic attributes of sample seed growers

Particular	Value
1. Average age	44.32 year
2. Family size	4.93
3. Caste composition	
GEN	7.14%
OBC	25%
SC	39.29%
ST	28.57%
4. Educational level	
Non educated	3.50%
Primary (I to IV)	10.71%
Upper primary (V – VIII)	35.71%
Secondary	28.57%
Higher secondary	7.14%
Above H.S.	14.28%
5. Average family income (annual)	₹ 122357.14
6. Average family expenditure (annual)	₹ 110118.64

Table.3 Distribution of seed grower based farming status

Particular	Value
1. Type of seed grower	
a. tenant	7.14%
b. owner	78.57%
c. owner cum tenant	14.24%
2. Occupation	
a. sole farming	46.42%
b. farming+petty business	17.85%
c. farming+ wage labour	28.57%
d. farming+ other	7.14%
3. Average land holding	5.4 acre
4. Av. Agricultural holding	4.92 acre
5. Av. net crop area	4.28 acre (100)
6. Av. seed crop area	2.05 acre (43.87%)

Table.4 Analysis of cost of cultivation of rice (size of farm: 1 acre)

Sl. No.	Costs item	Seed production			Conventional production		
		Amount /number	Rate (₹ /unit)	Total (₹ /acre)	Amount /number	Rate (₹ /unit)	Total (₹ /acre)
1	Seed	13.24 kg	50	662.00 (3.01)	16.51 kg	40	660.40 (3.18)
2	Family labour	25.00	235*	5875.00 (26.68)	25	235*	5875.00 (28.30)
3	Hired labour	21.50	235*	5052.50 (22.95)	19.50	235*	4582.50 (22.08)
4	Organic fertilizers	16.53 qtls	161.52	2669.93 (12.13)	13.00 qtls	161.52	2099.76 (10.12)
5	Inorganic Fertilizer (Urea,10:26:26 & MOP)	26.80 kg 31.27 kg 11.9 kg	7, 23 & 12	1049.61 (4.77)	26.00 kg 30.00 kg & 11.43 kg	7, 23 & 12	1009.16 (4.86)
6	Plant Protection (Agro Chemical)	837 ml	1.20	1004.40 (4.56)	737 ml	1.20	884.40 (4.26)
7	Irrigation	6.02 hrs	155	933.10 (4.24)	6.02 hrs	155	933.10 (4.50)
8	Machinery labour / charges	-	-	4089.30 (18.57)	-	-	4066.25 (19.59)
9	Interest on working capital. @8per annum	-	-	680.76 (3.09)	-	-	647.74 (3.12)
Total variable cost				**22016.60 (100)**			**20758.31 (100)**
1	Rental value of own land	-	-	4537.50	-	-	4537.50
2	Land revenue	-	-	143.82	-	-	143.82
3	Interest on fixed capital	-	-	428.40	-	-	428.40
Total fixed cost				**5109.72**			**5109.72**
Total Cost				**27148.82**			**25868.03**
Yield (Rice Gain)		20.99 qtl	1670	35053.30	19.63	1550	30426.50
By-product		6.50 khahan**	500	3250.00	6.50 khahan	500	3250.00
Gross return				**38303.30**			**33676.50**

*235 is the average wage rate of both male and female labour **1 Khahan = 16 pan = 1280 bundle

Table.5 Cost of cultivation and related income measures

Particular	Seed Production (₹ /Acre)	Conventional production (₹ /Acre)
Cost A_1	16141.60	14883.31
Cost A_2	16141.60	14883.31
Cost B_1	16570.00	15311.71
Cost B_2	21107.50	19849.21
Cost C_1	22445.00	21186.71
Cost C2	26982.50	25724.21
Cost C_3	29680.75	28296.63
Gross Return/Income	38303.30	33676.50
Farm Business Income	22161.70	18793.19
Family Labour Income	17195.80	13827.29
Farm Investment Income	16286.70	12918.19
Net Income (GI- Cost C_3)	8622.55	5379.87
Input Output Relationship (Technical coefficients)		
On the basis of Cost C_2	1.42	1.31
On the basis of Cost C_3	1.29	1.19
On the basis of TVC	1.74	1.62
On the basis of TC	1.41	1.30
Cost of production (Cost C_3/output)	1414.04	1441.50

Table.6 Regression coefficients of rice seed production

S. No.	Variables	Coefficients	t-Stat	Sig.
1	Log a	5.886375*	1.8850	0.0734
2	**X_1** (Human Labour)	-0.32408	-1.1792	0.2515
3	**X_2 (**seed**)**	0.579764**	2.2919	0.0323
4	**X_3 (**Organic fertilizer**)**	0.105854	1.3059	0.2057
5	**X_4 (**Inorganic Fertilizer**)**	0.037822	1.0333	0.3132
6	**X_5 (**Agro-Chemical**)**	0.158607**	2.5904	0.0171
7	**X_6 (**Irrigation**)**	0.235619**	2.3618	0.0279
8	**R^2**		0.5328	

a = constant, **- Significant at 5% level and *Significant at 10% level

Table.7 Allocative efficiency of recourses in rice seed production

Particular	Variables					
	X_1 (Human Labour)	X_2 (seed)	X_3 (Organic fertilizer)	X_4 (Inorganic Fertilizer)	X_5 (Agro-Chemical)	X_6 (Irrigation)
GM (₹)	10940.26	661.07	2625.73	871.27	1415.88	639.89
Byx	-0.32408	0.579764	0.105854	0.037822	0.158607	0.235619
Price(₹)/unit	235	50	161.52	18.20*	120	155
MVP (₹)	-228.72	1435.79	310.31	25.87	441.67	1875.24
RUE	-0.97	28.72	1.32	1.42	3.68	12.10

GM =Geometric mean , Byx = Coefficient of input *Aggregated mean price
MVP = Marginal Value Product, RUE=Resource use efficiency

Table.8 Net marketing margin at different stages of marketing channels

Channel	Marketing participants	Marketing Cost (₹ /kg)	Sale price (₹ /kg)	Purchase price (₹ /kg)	Net price (₹ /Kg)	Net marketing Margin (₹ /Kg)
I	Seed grower	0	16.70		16.70	0
	RSPG	12.50	36.5	16.70	24	7.30
	Wholesaler	3.7	45.7	36.5	42	5.5
	Retailer	1.5	50	45.7	48.5	2.8
II	Seed grower	0	16.70	-	16.70	-
	RSPG	12.50	41.70	16.70	29.20	12.50

Table.9 Producers share and marketing efficiency of marketing channels

Channel	Price received by the farmer (₹ /Kg)	Price paid by the Consumer (₹ /Kg)	Marketing Cost (₹ /Kg)	Marketing Margin (₹ /Kg)	Producer share in consumer rupee (%)	Marketing efficiency (%)
I	16.70	50.00	17.70	15.60	33.40	50.15
II	16.70	41.70	12.50	12.50	40.05	66.80

Table.10 Constraint analysis of rice seed production

N = 90

S/N	Constraints	Total score	Mean Score	Ranking
1	Unavailability of quality seed	5076	56.40	9
2	Weed problem	5518	61.31	4
3	Unavailability of quality fertilizers	4743	52.70	12
4	Technological problem	5170	57.44	8
5	Irrigation problems	5278	58.64	7
6	Disease and pest attack	5339	59.32	6
7	Shortage of labour	5945	66.06	2
8	Low price of output	6083	67.59	1
9	High price of input	5643	62.70	3
10	Small holding	5046	56.07	10
11	Availability of credit	5379	59.77	5
12	Storage facility	4854	53.34	11

The other variables viz. human labour, organic fertilizer and inorganic fertilizer were found insignificant which indicate that these variables were not optimally used by the sample seed growers in the study areas. The fitted function showed good fit to data since R^2 value is 0.5328 indicating the overall contribution of used variables i.e. different factors to variation of income was 53.28%.

In order to test of the allocative efficiency of resources in production of rice seed, the MVP and the RUE were examined and presented in table 7. A resource is considered to be used most efficiently if its marginal value product (MVP) is just sufficient to offset its cost i.e. the ratio is just unity under constrained supplies.

It is observed from table 7 that the MVP and RUE for all factors shown positive except human labour indicating the contribution human labour towards income was negative. Therefore, there is no further scope to increase output of rice seed through use of human labour unless there is change in the production technology. The MVP of all other inputs except human labour were found to be greater than zero indicating that further increase in its use would result in to an increase in rice seed production which should be coupled with change in production technology. The MVP was found highest for the input irrigation (₹ 1875.24) followed by seed (₹ 1435.79), Agro-chemical (₹ 441.67), organic fertilizer (₹ 310.31) and inorganic fertilizer (₹ 25.87). But RUE was examined 28.72 for seed and 12.10 for irrigation which inferring that by one unit extra use these above mentioned two inputs, the quantity of output would be added by 28.72 units and 12.10 units respectively.

Marketing

The major sources of quality seed (foundation seed as per information given by the sample farmer) were farmer's club, Agriculture University and KVK. The existed farmer's club in the study area registered them as "Registered Seed Producer Group (RSPG). As reported by the respondents More than 70% seed was supplied to the seed grower by Agriculture University and KVK jointly. In marketing of output of seed growers only two channels were identified for marketing of produce rice seed as follows.

Channel I: Seed grower → RSPG* → Wholesaler → Retailer → Consumer.

Chunnel II: Seed grower → RSPG* → Consumer

It is to be mentioning here that the seed producer sale their total amount of output to existed Registered Seed Producer's Group (RSGP) in the study areas who took the responsibility to perform the activities like cleaning, grading and all the procedures and formalities for certification of seed bought from the seed growers.

Marketing margin, marketing efficiency and producer's share in consumer rupee

The estimation of net marketing margin at different stages marketing channel of rice seed is depicted in table 8 and table 9. It is observed from the table 8 that net marketing margin for per kg of output was highest for RSGP (₹ 7.30) followed by wholesaler (₹ 5.50) and retailer (₹ 2.80) in marketing channel I.

Further, the marketing cost was revealed highest for RSGP (₹ 12.50/kg). The reason behind it might be that the RSGP did most of the post-harvest operations and formalities to get the certification. In channel II, RSGP was found to be the only middleman and fetched a net marketing margin of ₹ 12.50.

Marketing efficiency of the available channels for marketing of rice seed by the sample seed growers was calculated by the formula given by Acharya and present in table 9. It was examined that marketing efficiency as well as producer's share in consumer rupee of channel II found higher than channel I. The marketing efficiency of channel I of was observed around 50%. The main reasons might be the higher net marketing profit was taken away by the middlemen particularly by the RSGP.

Constraints analysis

Establishment of seed production venture at the farmer's level in disadvantaged villages is not an easy from resources; requite technology, institutional and financial point of view. Cooch Behar and Jalpaiguri are one of the disadvantage districts of West Bengal where number of small and marginal farmers constitute the core of the disadvantaged sections have no clear idea about development avenues and income generating self-employment opportunities due to low level of education, non-development of organizational capabilities and inadequacy of capital. A total twelve important problems viz. unavailability of quality seed, weed problem, unavailability of quality fertilizers, technological problem, irrigation problems, disease and pest attack, shortage of labour, low price of output, high price of input, small holding of seed growers, availability of credit and storage facility for output, were identified.

Garrett's ranking technique was used to rank the above said constraints faced by the sample seed growers. In rice seed production, among twelve constraints, the first six important constraints revealed low price of output followed by shortage of labour, high price of input, weed infestation, availability of credit and diseases and pest attack (table 10) hinder the adoption and expansion of seed cultivation at farmer's level. The higher net marketing profit taken by the middlemen in marketing channels might be the one of the important reasons of low price of output and the high humid condition and prevailing of mostly acidic soil might be reason of high weed infestation as well as diseases and pest attack. While the migration of unemployed youths for searching of employment in expectation of fetching higher income from the other region of the country might be the reason of shortage of labour. The availability of good quality seed or certified seed enabling farmers to

achieve higher agriculture production and the effectiveness of farmer based seed production in bulking depends on the economic profitability of seed production to the farmer. From the study of socio-economic features of sample seed growers it was observed that mostly younger and educated farmers were willing to adopt the venture of rice seed production to increase their family income and around 70% of the of them belong to SC and ST community. All the sample farmers were revealed small and marginal category net cropped area of 4.28 acre out of which 43.87% land used for seed production purpose. Out of four types of seed growers' viz. sole farming, farming plus petty business, farming plus wage labour and farming with services, 46.42% seed grower belonged to sole famer.

The average TVC of cultivation (₹ /acre) was found ₹ 22074.83 and ₹ 20953.37 respectively for seed and conventional rice production. Although the productivity of rice seed cultivation found only 6.93% higher than the productivity in conventional rice cultivation, but the net income (GI-CostC3) in seed production revealed 65.77% higher than conventional rice production. The evaluated input-output ratio (based on Cost C3) for seed production was 1:1.29. The overall contribution of different resources in variation of income found 53% (R^2= 53.28). The factors viz. seed, chemical and irrigation revealed significant at 5% level each. The elasticity's of an individual input was less than unity in each input implying decreasing rate of marginal productivity to each input. The calculated MVP and RUE were found positive for all resources viz. seed, organic fertilizer, Inorganic fertilizer, argo-chemical and irrigation except human labour revealing that further increase in its use would result in to increase in production which should be coupled with change in production technology. In respect of marketing, producer's share in consumer rupee observed to be less than 41% and marketing efficiency was also found around 50% to 60% as a big marketing profit were drawn away by middlemen particularly RSGP. The major problems faced by the seed growers in study area were low price of output, shortage of labour, high price of input, weed infestation, availability of credit and disease and pest attack

Thus the study critically judged the economic feasibility of the cropping venture of rice for seed production and arrived at a conclusion that for proper adoption and expansion of seed production at farmer's field level the venture has to be supported institutionally, technically or otherwise, wherever possible. To meet the demand of food grains particularly rice as well as the to increase surplus production to export, to increase the availability of proper quality seed, the production potential of seed at the farmers level is to be enhanced through different governmental agency and schemes with proper infrastructures facility particularly storage, monitoring and guidance, training facility, credit facility and effort to elimination of middlemen.

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