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Economics of Potato Seed Production in four Districts of West Bengal

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Abstract: Presently, West Bengal ranks second in potato production across the country among different potato growing states. Each year there is a gradual increase in production of potato in the state but till date the major problem in potato cultivation is the non-availability of quality seed at the time of planting. Therefore, efforts had been made to produce potato seed tubers in the seed production programme and to estimate the economics of seed production to the different farmers in the districts namely Bardhaman, Nadia, Hooghly and Murshidabad of West Bengal were carried out. The seed multiplication system offered 23 percent higher return than general cultivation. Cost of planting material, human labour, and plant nutrient components are the major contributor to prime cost for multiplication. It is also important that the cost of planting material constitutes 43 per cent to its respective prime cost. The biotic stresses like diseases and pests were kept under check by adjustment of date of planting and application of pest control strategies and the performance of seed production was very outstanding

Key words: Potato, economics, seed production, prime cost.

INTRODUCTION

In West Bengal potato is the most popular crop next to cereals specifically rice. The crop is cultivated in rabi season (November to March) in the state. At present West Bengal ranks second both in terms of production and productivity. The average production

of the state is approximately 90-100 lakh tonnes from 3.5 to 4 lakh hectares of land annually. But the production does not remain constant in each year and this is mainly due to lack of quality seed tubers. In potato cultivation seed tuber is the single most important factor which accounts for nearly 40-50%

of the total cost of cultivation due to higher seed rate per unit area (Kushwa and Lal, 1988; Singh, 2003). Approximately 30-40% of the seed potato is procured from outside the state like Punjab, U.P etc. The quality of which is not always good enough resulting in rapid degeneration of tubers due to viral diseases. Not only that, cost of such seed tubers is also very high resulting in huge monetary loss. The rapid degeneration of tubers and also huge cost of seed material aggravates the situation because the farmers do not get the profitable price after harvest of their produce. Therefore, to save the farmers from such losses and to make the potato cultivation profitable an effort has been made to produce potato seed in the state so that the farmers in the state can produce the seed and avoid the dependence on other state for supply of quality seed. Not only that the potato seed production in West Bengal should be made to such an extent that the state can export the seed to other state instead of procuring from outside.

MATERIALS AND METHODS

Study Area

The present study has been carried out in Bardhaman, Nadia, Hooghly and Murshidabad districts of West Bengal. These four districts have selected purposively on the grounds of higher cropping intensity and their situation in lower Indo-gangetic basins of West Bengal.

Nature and Sources of Data

For the purpose of present study relevant data for four districts, namely Bardhaman, Nadia, Hooghly and Murshidabad of West Bengal have been collected from primary sources. Survey methods have been used for collection of data from individual farmers producing crops practicing seed and non-seed production. The data collection has been done with the help of pre-tested schedule and questionnaire through personal interview. Secondary information

has been collected from different sources, internet, government documents, published materials and relevant literature reports available in this field.

Sampling Design

Selection of blocks and villages

Based on the objectives of the study, the eight blocks from four district namely, Kalana and Katawa from Bardhaman; Chakadah and Haringhata from Nadia; Arambagh and Pandua from Hooghly and remaining two blocks, Khargram and Kandi from Murshidabad district has been selected in consultation with the government officials. Two villages based on the concentration of seed production from each block of respective district have been selected. In addition to that the local traders, those who are engaged in assembling the seed growers, namely, Polly Mongal Samity in Bardhaman, Gontra Samavaya Krishi Unnayan Samity in Nadia and Laxmi Agro Industries Ltd. and Kalimata Seed Farm of Hooghly has also been consulted.

Selection of sample farmers

Total 200 sample farmers are selected from these four districts of West Bengal following simple random sampling without replacement (SRSWOR) and presented in the Table 1. The distribution of samples is made on the basis of higher net cropped area of a particular district and accordingly samples have been distributed on the basis of simple percentage method.

It is being seen from the table that 66 sample farmers from Bardhaman district and consequently Nadia, Hooghly and Murshidabad having 44, 32 and 58 sample farmers respectively. Therefore, total 200 sample farmers constitute the total sample size of the present study. The data related to costs and returns in seed and non-seed cultivation of different crops are taken from sample farmers. The selected growers engaged in cultivation of so many crops but

Table 1
Selection and distribution of sample farmers

<i>Districts</i>	<i>Net cropped area (Ha)</i>	<i>No. of farmers (200)</i>	<i>Blocks</i>	<i>Villages</i>
Bardhaman	457797	66	Kalana, Katawa	Sargoria, Dhatrigram, Bandhmora, Bishnupur
Hooghly	219726	32	Arambagh, Pandua	Salepur, Ratanpur, Boichee, Boinchigram
Nadia	299941	44	Chakdah, Haringhata	Gontra, Ghetugachi, Jahirapara, Chandirampur
Murshidabad	404572	58	Khargram, Kandi	Jhilli, Kaspur, Purandarpur, Manoharpur

for seed purposes they confined only Paddy and potato in their fields. Except vegetables, for other crops they mainly used farm saved seeds or purchased seeds from the markets. The farmers generally retain some portion of general production from their selected parcel as seed purposes. For this reason the general cost of cultivation of some other prominent crops are included as an appendix table. Apart from the collection of data from the selected samples with prescribed schedule and questionnaire, interview and group discussion has been conducted among the scientist government officials, and the local traders with a view to assemble the qualitative information on seed production and distribution possibilities for different crops in the selected region. The first group consists of farmers with operational holding size up to 1 hectares, farmers fall into 1 to 2 hectare comprise the second farm size group, sample farmers having operational holding size 2 to 4 hectare and 4 to 10 hectare constitute third and fourth farm size groups. These farm size groups of farmers are designated as marginal, small, semi-medium and medium size of operational holding (Agricultural Census). This classification based on this standard is difficult for West Bengal due to absence of large farmers and predominance of marginal and small farmers with small average size of holdings.

Analytical tools used for study

In analyzing data different methods are employed keeping in view the stated objectives of the study.

Simple technique of tabular and percentage analyses are applied in case of annual crops and for input-output relations the following statistical tools are considered for the present investigation.

1. Multiple Linear Regressions.
2. Linear-Log (Damodar N. Gujarathi, 2004)
3. Cobb-Douglass (Heady and Dillon 1963)
4. The Multiple Linear Discriminant Function (Dillon and Goldstein, 1984)

Details of concepts have been explained in chapter VI.

Present worth of cost and return over time period

Estimation of present worth of cost and return incorporating the time as an element the economics for seed processing unit of Paddy are calculated with the help of following formula (Gittinger 1981):

$$Yw = \sum_{t=1}^p Dt Yt$$

Where

$$Dt = \frac{1}{\sum_{t=1}^{nt} (1+r)^{nt}}$$

r = discounting rate

l_t = lower discount rate of time period

nr = highest discount rate of time period

B/C ratio and Annual constant inflow and outflow of rice processing unit has been calculated by

$$\text{B/C ratio} = \frac{Ywr}{Ywc} = \frac{Ywr - Ywc}{\frac{1 - V^x}{r}}$$

Ywr = Present worth of discounted benefit or financial return over period of time

Ywc = Present worth of discounted cost or financial cost over period of time.

$$\left[\frac{1 - V^x}{r} \right]^a = \frac{1 - V^x}{r}$$

= Present worth of an annuity factor

$$V^x = \text{Discount factor} = \frac{1}{(1+r)^x}$$

= Present worth of an amount of 1 at the end of life.

$\left[\frac{1 - V^x}{r} \right]^a$ is the present worth of a sequence of n payments of 1 per year; each payment being made at the end of the respective year; and

n = years of life of rice processing unit.

Pricing per hours of run = Present worth of cost / present worth of annuity factor \times Total running hours.

RESULT AND DISCUSSION

Cost and Return Structure

The objective of this study is to estimate the socio economic status, the cost and return structure and the relative profitability of seed production and multiplication of potato crop comparing with its general cultivation. For the purpose of the study, selected households has been grouped into four categories like, marginal (below 1 ha.), small (1-2 ha.),

semi medium (2-4 ha.) and medium (4-10 ha.) farmers based on the agricultural census of our country. The West Bengal agriculture is mainly dominated by marginal and small farmers.

Costs and Input Intensity of Potato Seed Production

The objective of this section is to estimate the item wise cost of potato seed production. Attempt has also been made on the intensity of input application of potato seed production both in district and aggregate level in the high cropping intensity zones namely, Bardhaman, Hoogly, Nadia and Murshidabad of West Bengal.

Potato Tuber Multiplication and Production

West Bengal ranks second in potato production after Uttar Pradesh, the leader in potato production in the country. Both of these two states collectively contribute more than 50 per cent of the country's production of potato. Therefore, any minor deviation in the production of these two states largely affects the total production and supply, which ultimately enhanced higher market prices. Hooghly accords the highest production of potato aggregating to a total value of 3434.459 '000 MT in the year 2009-10 followed by Paschim Medinipore, Bardhaman, Bankura and Jalpaiguri. The per capita consumption has been recorded at 35 kg per annum in West Bengal (Food Processing Industries Survey, West Bengal). Despite the high volume of production in the state there are serious problem of quality planting materials. Only a few farmers in Bardhaman district engaged in multiplication of potato planting materials. This part deals with the relative advantages of tuber multiplications and general cultivation. Cost of Cultivation of potato seed multiplication over different cost concepts in the selected areas of West Bengal has been estimated in the Table 3 and it describes combined Cost A₁ as Rs. 60015, Cost B as Rs. 107837 and Cost C as Rs. 114853 with per quintal cost Rs. 448.50 for potato seed multiplication. The percentage share of imputed rental value of own

Table 2
Component wise prime cost of potato seed multiplication in selected areas of West Bengal during 2010-11 (In Percentage)

<i>Size Group</i>	<i>Seed</i>	<i>Manure</i>	<i>Fertilizer</i>	<i>Irrigation</i>	<i>Animal labour</i>	<i>Machine labour</i>	<i>Hired labour</i>	<i>Family Labour</i>	<i>PPCL</i>	<i>Misc*</i>	<i>Prime Cost (Rs/ha)</i>
Marginal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Small	40.41	1.76	11.75	3.57	1.01	4.27	11.84	20.86	2.15	2.35	100.00 (67242.74)
Semi Medium	42.59	1.04	12.45	3.83	1.05	3.51	22.04	9.12	1.72	2.66	100.00 (66108.15)
Medium	40.69	3.03	13.27	4.04	1.32	3.53	20.32	9.33	1.91	2.56	100.00 (67604.28)
Combined	41.40	2.12	12.79	3.91	1.18	3.60	20.09	10.48	1.86	2.58	100.00 (66976.55)

Figures within parenthesis indicate Absolute Cost.

*Miscellaneous including rate of interest on working capital and excluding land revenue and cesses.

Table 3
Cost of cultivation and Production of potato seed multiplication over different cost concepts in the selected areas of West Bengal during 2010-11. (Rs/ha)

<i>Potato seed Multiplication</i>						
<i>Size Group</i>	<i>Cost A₁ (Rs/ha)</i>	<i>Rental value of own land</i>	<i>Cost B (Rs/ha)</i>	<i>Family labour (Rs/ha)</i>	<i>Cost C (Rs/ha)</i>	<i>Cost of Production (Rs/q)</i>
Small	53268.67	46958.24 (46.85)	100226.91	14028.57 (12.28)	114255.48	437.96
Semi Medium	60135.43	47311.24 (44.03)	107446.67	6027.22 (5.31)	113473.89	431.72
Medium	61351.09	48406.99 (44.10)	109758.08	6307.69 (5.43)	116065.77	464.75
Combined	60014.97	47821.68 (44.35)	107836.65	7016.08 (6.11)	114852.73	448.50

Figures with in parenthesis indicate the percentage of total.

land (44.35), imputed value of family labours (6.11) in potato seed multiplication has found greater to its respective cost. Medium size group of farmers of potato seed multiplication possesses high costs in all respect. The yields for potato seed multiplication is 256.08 quintal per hectare in West Bengal during 2010-11 as revealed by Table 4. Utilization of seed is higher in case of potato seed multiplication (2145.88 kg per hectare). Fertilizer applied in potato

seed multiplication having greater share in the production process as against general tuber production. Hired human labour in potato seed multiplication and family labour in potato cultivation employed are more in the production process. In potato seed multiplication, Semi medium farm size group of potato cultivation among other size group of holding showing highest yield per hectare (262.84 qtl).

Table 4
Yield and Intensity of inputs of Potato seed multiplication in the selected areas of West Bengal during 2010-11

<i>Potato Seed Multiplication</i>								
<i>Size Group</i>	<i>Yield (q/ha)</i>	<i>Seed (Kg/ha)</i>	<i>Fertilizer (kg/ha)</i>	<i>N (kg/ha)</i>	<i>P (kg/ha)</i>	<i>K (kg/ha)</i>	<i>Family labour</i>	<i>Hired labour</i>
Marginal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Small	260.88	2115.38	560.88	187.69	272.97	100.22	154.95	87.91
Semi Medium	262.84	2161.74	579.65	192.49	282.66	104.50	66.67	161.34
Medium	249.74	2139.86	635.80	214.43	270.14	151.24	69.93	151.98
Combined	256.08	2145.88	605.74	202.95	275.37	127.41	77.66	148.87

Human Labour- Mandays/ha.

Gross Return from Potato Seed Production

Estimation of Gross return for Potato seed multiplication are presented in Table 5 where it reveals that the gross return in potato seed multiplication is Rs. 159405.59 per hectare. However, production cost per hectare has found to be Rs. 448.50 per quintal as revealed by Table 5.

Table 5
Estimation of Gross return for potato seed multiplication in the selected areas of West Bengal during 2010-11

<i>Potato Seed Multiplication</i>			
<i>Size Group</i>	<i>Production (q/ha)</i>	<i>Price (Rs/q)</i>	<i>Gross Return (Rs/ha)</i>
Marginal	0.00	0.00	0.00
Small	260.88	600	156527.47
Semi Medium	262.84	600	157704.14
Medium	249.74	646.11	161356.64
Combined	256.08	622.48	159405.59

Relative Profitability of Potato Seed Multiplication and General Cultivation

Relative Profitability for Potato seed multiplication and general tuber production reveals that returns on different costs like Cost A₁, Cost B and Cost C has found to be more in potato seed multiplication as

against potato cultivation. Marginal and small group of farmers in potato cultivation displayed more return cost ratio than other size group of farmers. But, in potato seed multiplication all size group of farmers representing moderately equal return cost ratio (Table 6).

CONCLUSION

From the foregoing discussion, one may safely conclude that there is an immense scope to convert the area of potato tuber production to seed multiplication in the selected pockets of West Bengal from the viewpoint of economic performances. Therefore, the technical aspects for up gradation and refinement of farmers existing practices from the part of agro-biological scientists are essential in setting of experiments for different agro ecological situations for tapping the scope into reality. Rapid extension and institutional impetus may also be helpful to protect the existing potato seed multipliers. The multiplication of potato tuber is also another thrust to the policy planner because the volume and cost of planting materials are high and the MNCs and other large companies are away from production and multiplications. In the selected area, farmers mainly collect the planting material of this orphan crop from outside the state. The possibilities have also been tapped and from the economic viewpoint. The seed multiplication system offered 23 percent

Table 6
Relative profitability over different cost concepts for potato seed multiplication and potato cultivation in selected areas of West Bengal during 2010-11.

<i>Potato Seed Multiplication</i>								
<i>Size Group</i>	<i>Return over Cost (Rs/ ha)</i>				<i>Return Cost Ratio</i>			
	<i>Cost A₁</i>	<i>Prime Cost</i>	<i>Cost B</i>	<i>Cost C</i>	<i>Cost A₁</i>	<i>Prime Cost</i>	<i>Cost B</i>	<i>Cost C</i>
Small	103258.80	89284.73	56300.56	42271.99	2.94	2.33	1.56	1.37
Semi Medium	97568.71	91595.99	50257.47	44230.25	2.62	2.39	1.47	1.39
Medium	100005.55	93752.36	51598.56	45290.87	2.63	2.39	1.47	1.39
Combined	99390.63	92429.04	51568.95	44552.87	2.66	2.38	1.48	1.39
<i>Potato Cultivation</i>								
Marginal	104984.92	93220.99	62352.81	50534.38	3.83	2.91	1.78	1.55
Small	97223.38	85502.37	55153.36	43377.85	3.26	2.56	1.65	1.45
Semi Medium	68675.78	61012.28	34442.43	26724.43	2.51	2.15	1.43	1.31
Medium	61394.15	56520.89	24759.72	19831.96	2.01	1.86	1.25	1.19
Combined	84575.58	75026.51	45629.88	36026.31	2.87	2.37	1.54	1.38

higher return than general cultivation. Cost of planting material, human labour, and plant nutrient components are the major contributor to prime cost for multiplication. It is also important that the cost of planting material constitutes 43 per cent to its respective prime cost. Lack of planting material and high cost involvement the general producer are not interested to multiply the potato planting material. Special attentions are important thrust for replication of planting material because in terms of potato production, West Bengal is the second largest state in the country.

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