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Economic feasibility analysis of potato cultivation in West Midnapur district of West Bengal

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ABSTRACT

Increasing economic importance of potato cultivation in West Bengal was prominently reflected not only in estimated positive exponential growth rate values of area, production and productivity of the crop, but in higher magnitudes of these parameters over all India average for period 1980-81 to 2005-06. As regard to cost of cultivation, the crop required an initial investment amounting Rs. 68461.30/ ha and yielded a total return and net return of Rs. 87409.31 and Rs. 14178.27/ ha respectively with return-cost ratio of 1.19 measured by using farm management cost concept. Based on prime cost concept, these values were worked out to be Rs. 47812.61, Rs. 87409.31 and Rs.39222.77 with return-cost ratio of 1.81 in the same order. Cost of labour, fertilizer, seed and land preparation were major contributors to total cost arranged in ascending order of their percentage contribution. Potato cultivation was found to be both capital and labour intensive and inter-farm cost variation revealed that total cost, total return and net return were directly proportional to farm-size in both counts.

Key words : Exponential growth rate, farm management cost concept, prime cost concept, return –cost ratio.

Potato, one of the most important commercial vegetable crop, commonly known as 'poor man's food', has now created hue and cry among rank and file in West Bengal, in particular and India, in general because of its soaring market prices in current year. The reason may be mostly attributed to demand-supply gap arising out of large scale infestation of late blight resulting production to ever low level in past few years. Potato as a staple food crop grows extensively all over the world and leading potato growing countries are china, Russia Ukraine and India. India, the third largest producer after China and Russia, constituted 7.65 per cent of world production from 7.53 per cent of world area under potato in 2005-06. In India, Uttar Pradesh topped the list of potato growing states sharing 33.00 and 34.40 percent of total area and production respectively. The corresponding figures for West Bengal were 24.00 and 33.70 percent in the period 2005-06. Potato grows more or less extensively in almost all districts of West Bengal. In 2005-06, Hooghly district of West Bengal produced 23.56 thousand tones of potato from an area of 92.17 thousand hectare having a share of 26.00 and 31.57 percent of the area and production of West Bengal respectively. Percentage share of West Midnapore district of total area and production of the state observed to be 20.13 and 20.36 followed by Burdwan district with percentage contribution of 12.23 and 12.22 to the state total respectively. Keeping in view the economic importance in the leading potato growing districts in particular and West Bengal in general in respect of augmenting farm income and its potentiality to generate employment opportunity in the form of wage labours required for crop cultivation and as intermediaries for providing services in different market channels, it is pertinent to examine cost effectiveness of potato cultivation especially in a situation when input prices are galloping day by day.

MATERIALS AND METHODS

Survey for data collection was conducted in two purposively selected villages of West Midnapur district of West Bengal for the period 2007-08. Data source mainly comprised of 57 potato growers, 28 and 27 from each of the two selected villages, selected randomly by following Simple Random Sampling without Replacement (SRSWOR) technique. Relevant information was collected with the help of pre-tested schedule by personal interview method. Sample respondents were classified into four groups depending on total operational holding size to facilitate analysis. To study total cost of potato cultivation, total and net return, cost concept used in Farm Management Practices have been employed and alternatively, prime cost concept have also been used to find out profitability in practical sense. Mainly tabular and simple percentage analysis method has been applied to draw some meaningful conclusions.

RESULTS AND DISCUSSION

Persistent rise in prices of agricultural commodities in recent times is the biggest ever challenge experienced by Indian economy since post economic liberalization period. People belonging to all economic classes find it difficult to maintain minimum standard of living, particularly, those who belong to lower and lower middle classes. Wage earners working in unorganized sectors are worst

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affected by sky rocketing rise in prices of essential commodities and are in great distress to collect square meals. In West Bengal, along with grocery items, price of potato has risen beyond imagination and become a bone of contention between rival political parties that proves the importance of this vegetable in this state in spite of being second largest producer, in the country. A comparative study on growth rate of area, production and productivity of potato between India and West Bengal will further strengthen the fact of its relative importance in the state as this vegetable add source of cash income to farm family (Table -1). Potato economy of the state grew up at faster rate in terms of exponential growth rate of area, production and productivity in comparison to India average during the entire period 1980-06, and splitting entire period into two equal parts i.e. 1980-93 and 1993-06. Before entering into economic aspects of potato cultivation, a quick look at land holding pattern of sample farmers seemed important on ground of assumed impact on cost and return structure of potato cultivation. State of affairs regarding land holding pattern of sample farmers found to be similar to that of West Bengal as a whole i.e. farmers having operational holding less than one hectare and ranging between 1 to 2 hectare dominated the sample and operated area under the possession of sample farmers constituted a small percentage of total cultivated land. Both categories of farmers comprised 68.42 percent of the sample and shared 32.92 percent of total holdings whereas 48.79 percent of cultivated land concentrated in the hands of 19.30 percent of sample farmers having operational holding size greater than 3 hectares (Table -2). Potato cultivation being a capital intensive and risky in terms of high susceptibility to adverse climatic conditions and market price fluctuation making crop production non-remunerative, marginal and small landholders are generally apprehensive of allocating higher percentage of land to potato. Farmers with operational holding size greater than 3 hectare allocated 94.27 percent of the total cultivated LAND to potato whereas lowest percentage distribution of land (70.00%) was recorded in case of farmers having operational holding size less than equal to 1 hectare i.e. percentage share of area under potato showed upward trend with increase in holding size.

Table 1:Distribution of sample farmers in to different size groups according to operational holding size

Sl.No.	Farm size group	Number of farmers	Total holding size groups	Average holding size groups	Total area under potato
1	1	25 (43.86)	11.5 (13.18)	0.46	8.05 (10.39)
2	1-2	14 (24.56)	17.22 (19.74)	1.23	14.67 (18.94)
3	2-3	7 (12.28)	15.96 (18.29)	2.28	14.60 (18.85)
4	3	11 (19.30)	42.57 (48.79)	3.87	40.13 (51.82)
5	Total/ Average	57 (100.00)	87.25 (100.00)	1.53	77.45 (100.00)

**Figures within parentheses indicate percentage to total.*

Table 2: Exponential growth rate of area, production and productivity of potato for period 1980-1993 and 1993--2006

Period	Exponential growth rate(%)					
	West Bengal			India		
	Area	Production	Productivity	Area	Production	Productivity
1980-94	5.8 (94.6)	7.5 (91.7)	4.4 (9.4)	3.3 (93.7)	5.2 (89.8)	1.8 (62.1)
1994-06	3.2 (742)	5.9 (5.5)	2 (21.9)	1.1(27.5)	2.4 (38.7)	1.2 (30.9)
1980-06	4.6 (94.5)	4.8 (80.2)	1.4 (9.4)	2.6 (86.3)	4.1 (86.9)	1.5 (72.5)

**Figures in the parentheses indicate percentage to total.*

High rise in potato price in the current year may be due to increase in aggregate demand over supply arising out of low production. Government of central and state level tried their best to arrest price level by strengthening public distribution system, cracking down hoarders and other possible measures, but in vain. Government of West Bengal started selling through fair price shop at Rs. 13/ kg for few weeks with expectation to bring potato price under control, but ended in despair. For the past few years, the state produced huge surpluses over and above yearly consumption requirement bringing price level down within the reach of common people. Current year production was as low as only to meet state's domestic requirement, but out flow to neighbouring states aggravated demand-supply imbalances that might be thought of possible reason for recent price hike. This out flow in normal production year considered to be innocuous even beneficial to keep harvest price remunerative. If shortage in production

and inefficient marketing system assumed to be primarily responsible for unwarranted rise in potato price, impact of input price hike by leaps and bounds on overall cost structure, at least to some extent, coupled with effect of risk premium can't be over ruled. Hence, estimation of cost of potato cultivation with the help of farm management and prime cost concept might be thought of right approach to reveal assumed influence on present shooting potato price. Four cost concepts evolved and used in farm management studies (Kahlon and Singh,1981), prime cost concept (Panse and Vokil, 1966) have been applied in finding out cost of cultivation. First concept i.e., cost A_1, represents all cash and kind expenses (out of pocket costs) actually incurred by farmers (Table -3). When all sample respondents were taken together, farmers needed a cash expenditure amounting Rs. 38258.70 / ha of which fertilizer and seed constituted 23.29 and 21.75 percent respectively. Hired human labour and cost of land preparation constituted 17.85 and 14.77 percent of total cost A_1 respectively. Inter-farm variation of cost A_1 revealed direct proportional relationship between farm size and cost A_1. This difference in cost A_1 may be attributed to higher cost incurred by large farmers on inputs like fertilizer, hired labour and tillage. Sample farmers having holding size less than equal to 2 hectare spent higher percentage of cost A_1 on seed and lower percentage on hired labour may be due to dependence on own farm production seed and family labours. Absence of tenant operators among sample farmers made estimation of cost A_2 immaterial. Again, addition of imputed rental value on owned land and interest of fixed capital gives cost B. Actually, rental value of owned land assumed equal to opportunity cost of land included as cost on ground of sacrificing rent for not leasing out land and hence, should be treated as cost. Generally, 30 percent of gross return is considered as equivalent to opportunity cost of owned land. 30 percent of the output (main product and by-product is to be considered as rental value of owned land or existing rental values in the villages (Raju and Rao, 1993). Basically, this cost concept assumes significance from commercial point of view, otherwise, inclusion of this component will increase cost of cultivation resulting reduction in net return. Obviously, farmers yielding higher gross return per hectare will have to add higher amount to cost A_2 to obtain cost B (Table-4). In absolute terms, this component showed an upward movement with the increase in farm size, but in terms of percentage contribution to cost B, it behaved reverse. When all sample farmers were treated together, this component constituted 36.91 percent of cost B and generally varied between 35.70 to 38.73 percent. By adding imputed value of family labours to cost B of respective farm size category, we obtain cost C, the total cost of potato cultivation as designated in the farm management studies. Across the farm size group, this cost component behaved reversely in absolute terms and similarly in terms of percentage contribution to total cost C as that of cost B. Higher magnitude of this items in both count for farmers belonging to farm size category with operational holdings size less than equal to 2 hectare indicated higher dependence on family labours in comparison to other groups. On an average, this component accounted for 6.91 percent of cost C and ranged between 5.59 to 10.36 percent across various farm size groups. Cost C is most comprehensive cost and represents the estimate of the farm cost when farming is considered to be a strictly commercial proposition (Mukhopadhyay, 1990).

Total return is obtained by multiplying total physical output with price and net return is the difference between total return obtained and total cost incurred for potato production. Total return showed a direct relationship with farm size may be due to application of higher doses of fertilizer, plant protection chemicals, irrigation, better quality seed etc. which was manifested in cost structure (Table-5). Net return per hectare over cost A_1, cost B and cost C estimated to be Rs. 44151.00, Rs. 19106.50 and Rs. 14178.27 with return –cost ratio 2.03, 1.28 and 1.19 respectively when all sample farmers a were considered together. Inter-farm variation discerned a proportional relationship between farm size and net return.

Table 3:Estimation of costA_1 for potato cultivation in different size group of farms classified according to operational holdings of sample farmers

(Rs. ha^{-1})

Sl.No.	Farm size group	Area under potato	Tractor	Bullock labour	Seed	Fertilizer	Plant protection chemicals	Irrigation
1	1	8.05 (10.39)	941.4 (2.93)	3532.75 (10.99)	7680.3 (23.89)	6444.98 (20.05)	2288.95 (7.12)	3702.49 (11.52)
2	1-2	14.67 (18.94)	1434.93 (3.93)	3529.4 (9.65)	8161.78 (22.33)	8345.95 (22.83)	2588.98 (7.08)	4743.53 (12.98)
3	2-3	14.60 (18.85)	2419 (5.91)	2974.05 (7.27)	8359.28 (20.43)	9562.5 (23.37)	3009.68 (7.36)	4851.85 (11.86)
4	3	40.13 (51.82)	4615.6 (9.60)	3159.9 (6.57)	9087.43 (18.910	11284.5 (23.48)	3247.18 (6.76)	5080.63 (10.57)
5	Total/ Average	77.45 (100.00)	3000 (7.84)	2651.18 (6.93)	8322.18 (21.75	8909.48 (23.29)	2978.14 (7.02)	4594.6 (11.98)

**Figures within parentheses indicate percentage to total.*

Heavy dependence on natures which might effect adversely in some cases and inclusion of imputed rental value of owned land may make crop cultivation non-remunerative when estimated with the help of four cost concept used in farm management practices. So, economic feasibility analysis using prime cost concept seemed to be more reasonable and practical on ground of inclusion of only out of pocket costs along with imputed value of family labour actually incurred. According to prime cost concept, total initial investment requirement estimated to be Rs. 39222.77/ha as against Rs. 68461.30/ha worked out by applying farm management concept of cost. Human labour including both hired and family labours, the highest cost component, constituted 26.24 percent of the total cost. Fertilizer and seed contributed 18.63 and 17.41 percent to total cost (Table 6). Inter –farm variation of per hectare cost of potato cultivation may be attributed to fluctuation of fertilizer, seed, labour cost coupled with minor differences in other variable costs. Human labour constituted 21 percent of the total product cost of potato (Rahim, A. 1978). Farmer, having holding size less than equal to one hectare and between one to two hectare made investment expenditure amounting Rs. 2932.35 and 33342.03 / ha of which human labour comprised 30.17 and 25.75 percent respectively. The highest contribution of human labour component to total cost of potato cultivation indicated that it has immense potentiality to generate employment opportunity for agricultural labours, particularly for unemployed family labours. Potato cultivation has become a very lucrative activity as it generates huge employment opportunities (Dutta, Som, 2009).

Table 4 : Estimation of cost B f or potato cultivation in different size group of farms classified according to operational holdings of sample farmers

(Rs. ha^{-1})

Sl.No.	Farm size group	Area under potato	Total costA1	Imputed rental value of owned land	Cost B
1	1	8.05 (10.39)	32144.18	20322.51 (38.73)	52466.69
2	1-2	14.67 (18.94)	36557.23	22572.67 (38.17)	59129.89
3	2-3	14.60 (18.85)	40919.28	25602.92 (38.49)	66522.20
4	3	40.13 (51.82)	48066.75	26692.16 (35.70)	74758.91
5	Total/ Average	77.45 (100.00)	38258.70	25044.50 (36.91)	63303.20

**Figures within parentheses indicate percentage to total.*

Summarily, potato cultivation being capital intensive, large well-off farmers allocated higher percentage of total operational holdings to potato cultivation. Cost of cultivation, total return and net return per hectare showed increasing trend with increase in size of holdings measured by applying four cost concept used in farm management practices as well as prime cost concept. Large farmers generally incurred higher cost in case of inputs to be purchased from market and family supplied inputs

were used in higher doses by farmers having operational holding size less than equal to one hectare. Return-cost ratio indicating return per rupee investment was also observed to be highest large farmers in both counts,, i.e. 1.2, and 1.84 when measured by using farm management and prime cost concept respectively. Higher contribution of human labour cost signified the potentiality of the crop to create huge man days for engagement of rural labours specially, for unemployed family labours.

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Table 5 : Estimation of Cost B for potato cultivation for different size group of farms classified according to operational holdings of sample farmers (Rs. ha^{-1})

Sl. No.	Farm size group	Area under potato	Cost B	Imputed value of family laour	Cost C
1	1	8.05 (10.39)	52466.69	6064.35 (10.36)	58531.04
2	1-2	14.67 (18.94)	59129.89	5341.35 (8.28)	64471.24
3	2-3	14.60 (18.85)	66522.20	4435.7 (6.25)	70957.90
4	3	40.13 (51.82)	74758.91	4728.5 (5.59)	79487.41
5	Total/ Average	77.45 100.00)	63303.20	5158.1 (6.91)	68461.30

**Figures in the parentheses indicate percentage to total.*

Table 6: Estimation of Total Return and Net Return over different cost concepts for various operational holding groups of sample farmers (Rs. ha^{-1})

Sl.No.	Farm size group	Area under potato	Total return	Net return over cost A	Return - cost ratio	Net return over cost B	Return - cost ratio	Net return over cost C
1	1	8.05 (10.39)	67740.88	35596.70	2.11	15274.19	1.29	9209.84
2	1-2	14.67 (18.94)	75240.60	38683.38	2.06	16110.71	1.27	10769.36
3	2-3	14.60 (18.85)	83408.80	42489.53	2.04	16886.60	1.25	12450.90
4	3	40.13 (51.82)	96536.95	48470.20	2.01	21778.05	1.29	17049.55
5	Total/ Average	77.45 (100.00)	87409.31	44151.00	2.03	19106.50	1.28	14178.27

**Figures in the parentheses indicate percentage to total.*

Table 7: Estimation of Net Return over Prime cost for different operational holding size groups of sample farmers (Rs. ha^{-1})

Sl.No.	Farm size group	Area under potato	Power tiller	Bullock labour	Seed	Fertilizer	Plant protection chemicals	Irrigation
1	1	8.05 (10.39)	941.4 (2.46)	3532.75 (9.25)	7680.3 (20.10)	6444.98 (16.87)	2288.95 (5.99)	3702.50 (9.69)
2	1-2	14.67 (18.94)	1434.93 (3.42)	3529.4 (8.42)	8161.78 (19.48)	8345.95 (19.92)	2588.98 (6.18)	4743.54 (11.32)
3	2-3	14.60 (18.85)	2419 (5.33)	2974.05 (6.56)	8359.28 (18.43)	9562.5 (21.08)	3009.68 (6.64)	4851.85 (10.7)
4	3	40.13 (51.82)	4615 (8.74)	3159.9 (5.99)	9087.43 (17.21)	11284.5 (21.37)	3247.18 (6.96)	5080.63 (9.62)
5	Total/ Average	77.45 (100.00)	3000 (6.27)	2651.18 (5.54)	8322.18 (17.41)	8909.48 (18.63)	1621.18 (6.29)6.	4594.6 (9.61)

**Figures within parentheses indicate percentage to total.*