AN ECONOMIC ANALYSIS OF POTATO PRODUCTION IN PRAYAGRAJ DISTRICT OF UTTAR PRADESH

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Abstract: Potato (Solanum tuberosum L.) is an annual plant which belongs to Solanaceae family. A crop that has traditionally been "the poor man's friend" is the potato. It has become one of the most widely grown crops in this nation for vegetables and also known as **"King of Vegetable"**. Purposive-cum-multistage stratified random sampling technique was used for the selection of district, block, villages and farmers. Prayagraj district of Uttar Pradesh was selected purposely because of convenience of investigator and to avoid difficulties for collection of data due to shortage of time and budget constraints. The data were collected during the agricultural year 2023-24 for this study. The study indicates that calculated value of cost C_3 came to Rs. 113437.55, 132990.70 and 132902.50 on marginal, small and medium size group of farms, respectively along with average value i.e. Rs. 117585.97. On an average cost A_1, B_1, B_2, C_1, and Cost C_2 worked out were Rs. 84385.84, 86813.67, 95758.95, 97951.04 and 106896.34 per ha., respectively. The gross income per hectare was observed maximum under marginal farms i.e. Rs. 200038.67 followed by small farms Rs.(305589.50) and medium farms Rs.(327576.15), respectively. On an overall average, gross income came to Rs.224117.22 whereas average net income was Rs.106531.23 per hectare. Cost of production per quintal of potato was computed to be Rs.371.44, Rs.394.20 and Rs.395.58 on marginal, small and medium farms, respectively with an average of Rs.378.72. Benefit-Cost ratio related to cost C_3 was highest on medium farms (1:2.46) followed by small farms (1:2.29) and marginal farms (1:1.76) with an Average Benefit-Cost ratio on cost A_1, cost B_1, cost B_2, cost C_1, cost C_2 and cost C_3 were worked out and came to 1:2.65, 1:2.58, 1:2.34, 1:2.58, 1:2.09 and 1:1.90, respectively.

Keywords: Potato, cost of cultivation, cost of production, cost concepts, farm income measures and Benefit-Cost ratio.

Potato (Solanum tuberosum L.) is an annual plant which belongs to Solanaceae family. The total potato produce in the world was 376.82 million tonnes from 18.33 million hectares of area. The potato is revered as a source of power worldwide, with a 59.74 million tonnes fresh weight production from 2.35 million hectares. A crop that has traditionally been "the poorman's friend" is the potato. Over 300 years have passed since the cultivation of potatoes began in our nation. It has become one of the most widely grown crops in this nation for vegetables. Economical and a source of energy for the human diet, potatoes are a popular food. Starch, vitamins (particularly C and B) and minerals are abundant in potatoes. Its composition is 20.6% carbohydrates, 2.1% protein, 0.3% fat, 1.1% crude fibre, and 0.9% ash. The important amino acids Lucien, tryptophan, isoleucine, etc. are also present in good amounts in potatoes. (Agricultural statistics at a Glance, 2022) Agriculture plays a significant role in the process of economic development of any country, particularly in countries where per capita real income is low. Agriculture has helped countries to a greater extent in the process of their industrialization. Therefore, agriculture development and industrialization are not alternatives but are complimentary and are mutually supporting with respect to both inputs and output. An increase in agricultural output and productivity tend to contribute substantially to an overall economic development of apredominantly agricultural and overpopulated country like India. Therefore, the level and pace of development in the country have been and continued to be significantly influenced by the pace of its agricultural development.

India is the world's second-largest country in terms of area and potato output, behind China and the Indian Federation. When compared to Poland (7.08mt.) and the

Netherlands (6.67mt.), India's production of potatoes (54.23mt.) is high and relatively extremely low, respectively. This might be because there are significant differences in the agro-ecological environments in the various regions of the nation (Food and agriculture organization, 2022). Several industrial processes involve potatoes, including the manufacturing of starch and alcohol. Farina, a potato starch, is used in laundries and textile mills to size yarn (Ramchandra et. al.2012)..

In India, potato is cultivated in almost all states under diverse agro-climatic conditions. About 85 percent of potatoes are cultivated in Indo Gangetic plains of North India. The state of Uttar Pradesh, West Bengal, Punjab, Bihar and Gujarat accounted for more than 80 percent share in total production. Potato production in India 59.74 million tonnes in 2022, with an area of 2.35 million hectares (D.Ahongsanbam et.at.2020).

The production of potatoes in Uttar Pradesh 15.89 million tonnes. The state's economy and the farmers' well-being are both significantly impacted by it. There is still a significant difference between the actual (21- 27 t/ha) and potential yields (40–45 t/ha), even though the state's productivity in producing potatoes is third only behind Gujrat and West Bengal. (National Horticulture Board, 2022).

In Prayagraj district of eastern Uttar Pradesh potato occupies an area of 13059 hectare**s** and total production was 2656850 quintals along with productivity was 203.45 q/ha, (District statistical bulletin, 2022-23).

In the light of vital importance of production of potato consumption among majority of population and having commercial production in the context of farmers consideration keeping in their cropping sequence.

Research Methodology

Purposive-cum-multistage stratified random sampling design was used for the selection of district, block, villages and farmers. Prayagraj district of Uttar Pradesh was selected purposely because of convenience of investigator and to avoid difficulties for collection of data due to shortage of time and budget constraints. A list of all 23 blocks of Prayagraj district was prepared and one of the block Soaron was selected proportionally for this study. A list of all villages of selected block was prepared separately along with their area under potato cultivation. Five villages from the block were selected randomly. A list of all Potato growers of selected villages was prepared along with their size of holding and further it was grouped into three categories i.e. marginal farmer (below 1.0 ha), small farmer (1.0-2.0 ha) and medium farmer (2.0 to 4.0 ha), 80 growers were selected randomly in proportion to their number of universe in each size groups. The reference period for the study was agricultural year 2023-24.

RESULTS AND DISCUSSION

Cost of cultivation of potato:

The per hectare costs of on various input factors in potato cultivation were worked out and its details are presented in the evident from Table 1: that overall cost of cultivation of potato/ha was Rs 117585.97. Maximum cost of cultivation was associated with small farms i.e., Rs.132990.70 followed by medium Rs.132902.50 and marginal farms Rs.113437.55. The further distribution of the cost on different operations indicates that maximum expenditure was involved on seed 34.74 per cent followed human labour i.e 15.25 per cent, manure, and fertilizer 12.68 per cent machinery 07.87 per cent irrigation 04.43 per cent and plant protection (03.37) per cent. Highest cost of cultivation in small size of farms as compared to the medium and marginal farms occurred due to heavy expenditure on interest on fixed capital (Kushwaha RR et.al.2019).

Measures of cost and income of potato crop in study area:

Table 2: indicate that calculated value of cost C_3 was worked to Rs. 113437.55 on marginal, Rs. 132990.70 small and Rs. 132902.50 medium farms with an overall average of Rs. 117585.97. Gross income was maximum on medium farms that were Rs. 327576.15 followed by small and marginal size group of farms i.e. Rs. 305589.50 and Rs. 200038.67, respectively. The gross income per hectare was highest on medium farms due to intensive cultivation and more use of FYM, compost on these farms for higher productivity. Benefit-Cost ratio for marginal, small and medium farms were 1:1.76,1:2.29 and 1:2.46 on cost C3. In respect of overall average, Benefit-Cost ratio were 1:2.65, 1:2.58, 1:2.34, 1:2.29, 1:2.09 and 1:1.90 on basis of cost A1/ A 2, B1, B2, C1, C2 and cost C3, respectively. The net income per hectare was found Positive trend with farm size. It was because of more increase in yield against the increased input factors at increasing size of farms (Singh R. et.al 2020).

Table 1: Per hectare cost of different input used in potato production (Rs. /ha.)

S.No.	Particulars	Size group of farms			
		Marginal	**Small**	**Medium**	**Overall average**
1.	Human Labour	18421.65 (16.24)	16534.12 (12.43)	15346.75 (11.55)	17931.48 (15.25)
a.	Family Labour	12351.31 (10.89)	7395.31 (05.56)	5251.73 (03.95)	11137.38 (09.47)
b.	Hired Labour	6070.34 (05.35)	9138.81 (06.87)	10095.02 (07.59)	6794.10 (05.78)
2.	Machinery Charges	8651.72 (07.63)	11213.15 (08.43)	11979.51 (09.01)	9253.50 (07.87)
3.	Seed	39016.32 (34.39)	47355.28 (35.61)	48152.92 (36.23)	40845.16 (34.74)
4.	Manure and fertilizer	14790.66 (13.04)	15125.05 (11.37)	15715.36 (11.82)	14905.98 (12.68)
5.	Irrigation	5829.75 (05.14)	5885.63 (04.42)	5891.24 (04.43)	5842.03 (04.97)
6.	Plant Protection	3915.20 (03.45)	4095.27 (03.79)	4179.67 (03.14)	3959.78 (03.37)
7.	**Total working capital**	**90625.30 (79.89)**	**100208.50 (75.35)**	**101265.45 (76.19)**	**92740.99 (78.87)**
8.	Interest on working capital	2718.76 (02.39)	3006.25 (02.26)	3037.95 (02.28)	2782.15 (02.37)
9.	Operational Cost	93344.06 (82.28)	103214.75 (77.61)	104303.41 (78.48)	95523.24 (81.24)
9.	Rental value of land	8880.31 (07.83)	9055.12 (06.81)	9426.23 (07.09)	8945.28 (07.61)
10.	Interest on fixed capital	900.68 (00.79)	8630.77 (06.49)	7090.82 (05.33)	2427.82 (02.06)
11.	Sub total	103125.05 (90.91)	120900.64 (90.91)	120820.46 (90.91)	106896.34 (90.91)
12.	Managerial Cost @10% of sub-total	10312.50 (09.09)	12090.06 (09.09)	12082.04 (09.09)	10689.63 (09.09)
Grand Total		**113437.55 (100)**	**132990.70 (100)**	**132902.50 (100)**	**117585.97 (100)**

Note: *Figures in parentheses indicate percentage of the total.*

Summary of Findings and Conclusion

Per hectare overall cost of cultivation of potato/ha. was Rs 117585.97. Maximum cost of cultivation was associated with small farms i.e., Rs.132990.70 followed by medium Rs.132902.50 and marginal farms Rs.113437.55. The further distribution of the cost on different operations indicates that maximum expenditure was involved on seed 34.74 per cent followed human labour i.e 15.25 per cent, manure and fertilizer 12.68 per cent machinery 07.87 per cent irrigation 04.43 per cent and plant protection (03.37) per cent. Highest cost of cultivation in small size of farms as compared to the medium and marginal farms occurred due to heavy expenditure on interest on fixed capital.

The per hectare cost C_3 was worked to Rs. 113437.55 on marginal, Rs. 132990.70 small and Rs. 132902.50 medium farms with an overall average of Rs. 117585.97. Gross income was maximum on medium farms that were Rs. 327576.15 followed by small and marginal size group of farms i.e. Rs. 305589.50 and Rs.

200038.67, respectively.

Benefit-Cost ratio for marginal, small, and medium farms were 1:1.76, 1:2.29 and 1:2.46 on cost C_3. In respect of overall average, Benefit-Cost ratio were 1:2.65, 1:2.58, 1:2.34, 1:2.29, 1:2.09 and 1:1.90 on basis of cost A_1/ A_2, B_1, B_2, C_1, C_2 and cost C_3, respectively. The net income per hectare was found Positive trend with farm size. It was because of more increase in yield against the increased input factors at increasing size of farms.

Table 2: Per hectare costs and income measures of Potato production (Rs./ha.)

Note: Figures in parentheses indicate percentage of the total.

S. No.	Particular	Size group of farms			Overall average
		Marginal	Small	Medium	
1.	Cost A_1/A_2	80992.75	95819.44	99051.68	84385.84
2.	Cost B_1	81893.43	104450.21	106142.50	86813.67
3.	Cost B_2	90773.74	113505.33	115568.73	95758.95
4.	Cost C_1	94244.74	111845.52	111394.03	97951.04
5.	Cost C_2	103125.05	120900.64	120820.46	106896.34
6.	Cost C_3	113437.55	132990.70	132902.50	117585.97
7.	Productivity (qt/ha)	192.53	265.73	269.61	208.37
8.	Gross income	200038.67	305589.50	327576.15	224117.22
9.	Net income	86601.12	172598.80	194673.65	106531.23
10.	Family laborincome	109264.93	192084.17	212007.42	128358.25
11.	Farm businessIncome	119045.92	209770.06	228524.47	139731.37
12.	Farm investment income	106694.61	202374.75	223272.74	128593.98
13.	Cost of Production (Rs/qt.)	371.44	394.20	395.58	378.72
14.	**Benefit-Cost ratio**				
(i)	On the basis of A_1/A_2	1:2.46	1:3.18	1:3.30	1:2.65
(ii)	On the basis of B_1	1:2.44	1:2.92	1:3.08	1:2.58
(iii)	On the basis of B_2	1:2.20	1:2.69	1:2.83	1:2.34
(iv)	On the basis of C_1	1:2.12	1:2.73	1:2.94	1:2.29
(v)	On the basis of C_2	1:1.94	1:2.53	1:2.71	1:2.09
(vi)	On the basis of C_3	1:1.76	1:2.29	1:2.46	1:1.90

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