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An Economic study of production and value addition in potato

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ABSTRACT

A study was undertaken to find out cost of cultivation and value addition of potato. For this study, the Banaskantha district of Gujarat state where potato is grown extensively was selected purposively. For the study, five potato growing villages, 18 farmers and 10 processors from each village were purposively selected. In all, 90 farmers and 50 processors were selected for detailed study. The study was pertaining to the agricultural year 2006-07 and data were collected by survey method. On an average, the total cost of cultivation per hectare on the basis of Cost-C2 was ₹ 59,900. It was lowest (₹ 58,526) for small farmers and highest (₹ 61,209) for large farmers. Cost of manual processing per quintal potato was ₹ 915.58 for wafer and potato stick where as for perforated wafer it was about ₹ 988.58 due to higher cost in processing and less production. The investment cost, raw materials cost and labour cost for wafers and potato sticks was ₹ 121.00, ₹ 559.58 and ₹ 235.00 where as for perforated wafer, it was ₹ 121.00, ₹ 557.58 and ₹ 310.00, respectively. Farmers got ₹ 89 per quintal raw potato where as the processors got ₹ 326 per quintal processed potato. If the farmers sell potato after processing, they may get additional income of ₹ 326 per quintal potato.

Key words : Potato, cost of cultivation, value addition, processing

Potato (*Solanum tuberosum* L.) belonging to the family solanaceae is one of the most popular vegetables grown all over the world. It can be rightly called as the "King of Vegetables." The average per capita consumption of potato in India is less than 15 kg. Potato is a global crop and is a nourishing food that has sustained civilizations for centuries in South America and Europe. Potato has been the most useful food during war time experiences of American and European countries bearing testimony to the great value of potatoes as food. Potato is a winter crop with very high yield potentiality as compared to other food crops. It is an efficient food producer and has the potential to become a supplementary staple food besides cereals in the country. It has been recognized as a wholesome food and the richest source of energy in most of the countries where it forms an important part of the human diet. Potato cultivation in the state of Gujarat is largely concentrated in North and middle Gujarat comprising of Banaskantha, Mehsana, Kheda, Sabarkantha, Anand and Gandhinagar districts. Among these six districts, Banaskantha is having the first rank in terms of area and production. In Banaskantha district, potato was grown in 1,54,000 hectares with production of 46,06,000 tonnes during 2005-2006. Potato is a versatile food because it can be used in various forms both as staple and vegetables. At least 50 per cent of the total production of fruits and vegetables in the country is lost due to wastage and its value is estimated to be ₹ 50,000 crores each year. More recently, greater consideration is being given towards improving post-harvest storage systems and the development of export markets and processing as a means for disposal of the surplus. Potato processing in India has become important in view of the rising employment of women in cities leading to growing demand for processed products and the general increase in demand for processed foods in urban areas. Processing also helps in reducing demand for storage space and adds value to the crop leading to better returns to the growers. More processing means more value addition and better returns to the farmers. Potatoes can be processed into a number of products like chips, French fries, flakes, dice, granules, canned potatoes on commercial scale and home scale. Processing of

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potatoes can also be done to prepare dehydrated products like dehydrated chips, papad *etc.* Potato chips or wafers are one of the most popular snack items consumed throughout world. There is a need to expand potato-processing industries in India at small and large scale. Keeping this in mind a study was undertaken to work out the economics of home scale potato processing by the processors and to know the value addition in potato.

METHODOLOGY

The present investigation was done in Gujarat State with the overall objective of calculating the cost of cultivation of potato and enquiring into economics of processing and specific objective of estimating cost of processing at different stages for wafer, perforated wafer and potato sticks and to find out value addition in potato by processing. In order to achieve the objective of the present study, the purposive sampling technique was adopted for this purpose. Potato cultivation in the state of Gujarat is largely concentrated in Banaskantha, Mehsana, Kheda, Sabarkantha and other districts among which Banaskantha is having the first rank in terms of area and production which is about 50.49 % and 56.08% respectively. Hence, Banaskantha district was selected purposively for the study. From Banaskantha district, Deesa taluka was purposively selected for study due to more area and production under potato cultivation than any other taluka of the district which is about 70.28 % and 74.97 %, respectively. From the selected Deesa taluka, five villages, having larger area under potato cultivation, were purposively selected. From the selected five villages, 18 farmers and 10 processors were selected from each village. For that, a list of farmers and processors from the selected villages was prepared and six farmers were selected purposively category wise into small (up to 2.0 ha), medium (2.01 to 4.0 ha) and large (above 4.0 ha) farmers and processors having and higher quantity of potato used for processing as compared to other processors in the village were purposively selected for the present study. The final sample that emerged thus comprised of 90 farmers and 50 processors and the requisite data were collected from them with the help of well-structured and pre-tested interview schedules by personally contacting the individual farmers and processors. Most commonly used conventional tabular method of analysis was used to estimate the costs. The primary data obtained relates to agricultural year 2006-07.

RESULTS AND DISCUSSION

Cost of Cultivation of Potato

It is well known that potato being labour intensive crop requires relatively higher investment than other field crops. Factor-wise distribution of total cost per hectare is exhibited in the Table 1. The table reveals that on an average, total cost per hectare for potato crop was ₹ 59,900. On reviewing the size-wise total cost per hectare, it can be seen that it was highest (₹ 61,209) for large farmers followed by medium farmers (₹ 59,964) and small farmers (₹ 58,526). On an average, among the total cost per hectare, it was observed that seeds covered the lion's share of 38.17 per cent (₹ 22,863) of the total cost. The share of seed cost in all the farm categories was higher due to higher price of potato seed, but in the studied area during the year the price of seed was high ranging from ₹ 900 to ₹ 1,200 per quintal. Whereas, fertilizer accounted for 13.86 per cent (₹ 8,303) of the total cost, followed by cost of irrigation (7.69 %) and rental value of own land (6.92 %). Among the different categories of farmers, it was observed that seeds ranked the prime place in the range of ₹ 22,325 for small farmers to ₹ 2,3370 for medium farmers. Fertilizer cost was the highest (₹ 8,900) for large farmers and the lowest (₹ 7,910) for medium farmers while the irrigation cost was high (8.33 %) for medium farmers and low (6.63 %) for small farmers. The rental value of owned land varied in the range of ₹ 4,250 for medium farmers to ₹ 4,027 for small farmers. The average yield of potato for the selected farmers was 229 quintals per hectare. The yield was highest for large farmers (240 quintals) and lowest for medium farmers (220 quintals). The gross income per hectare was ₹ 80,033 for selected farmers. It ranged from ₹ 79,100 for small farmers to ₹ 84,000 for large farmers. On an average, potato growers realized net income of ₹ 20,133 from one hectare of potato cultivation. It was ₹ 20,574, ₹ 17,036 and ₹ 22,791 per hectare for small, medium and large farmers, respectively. The findings are supported by Singh and Gupta (1983), Gupta *et al.* (1984), Sinha (1998) and Leua (2001).

Cost of potato processing and value addition in potato at home scale

Home scale processing of potato involves following seven stages: (1) Buying - Raw potatoes are bought mainly from the local market or from the main potato research station of Deesa. (2) Grading - Raw potatoes bought from the market are graded in good and

Table 1 Factor wise distribution of total cost of potato crop per hectare in Banaskantha district of Gujarat state for the year 2006-2007

Particulars	Small farmers			Medium farmers			Large farmers			Average farmers		
	Physical Unit	Value (₹)	Per cent to total cost	Physical Unit	Value (₹)	Per cent to total cost	Physical Unit	Value (₹)	Per cent to total cost	Physical Unit	Value (₹)	Per cent to total cost
Hired labour	40.25	2214	3.78	51.20	2816	4.69	58.55	3220	5.26	50.00	2750	4.59
Bullock labour	7.50	1200	2.05	7.20	1152	1.02	6.75	1080	1.76	7.15	1144	1.91
Seed (kg)	2350	22325	38.15	2460	23370	38.98	2410	22895	37.40	2407	22863	38.17
Manure	8.92	3123	5.34	7.01	2454	4.09	8.15	2854	4.66	8.03	2810	4.69
Fertilizer (kg)												
N	275			265			260			267		
P	150	8100	13.84	143	7910	13.19	163	8900	14.54	152	8303	13.86
K	237			231			281			250		
Irrigation		3881	6.63		4995	8.33		4946	8.09		4608	7.69
Insecticides		500	0.85		415	0.69		405	0.67		441	0.74
Miscellaneous cost		2830	4.84		2690	4.48		2535	4.14		2685	4.48
Depreciation		515	0.88		480	0.80		494	0.80		496	0.83
Interest on working capital		1786	3.05		2017	3.36		1990	3.25		1931	3.22
Cost : A		46474			48299			49319			48031	
Rental value of own land		4027	6.88		4250	7.08		4160	6.80		4146	6.92
Interest on fixed capital (Excluding land revenue)		415	0.70		380	0.64		456	0.75		417	0.70
Cost : B		50916			52929			53935			52594	
Family labour	41.09	2290	3.92	28.8	1584	2.65	31.1	1710	2.79	33.66	1861	3.11
Cost : C1		53206			54513			55645			54455	
10 % of cost C1		5320	9.09		5451	9.10		5564	9.09		5445	9.09
Cost : C2		58526	100		59964	100		61209	100		59900	
Production												
Main product (q)		226			220			240			229	
Gross income (₹)			79100			77000			84000			80033
Net income (₹)		20574			17036			22791			20133	

Table 2 Cost of manual processing per quintal potato by the selected processors in Banaskantha district during the year 2006-2007

Particulars	Wafers				Perforated Wafers				Potato sticks			
	Physical unit	Qty. (kg.)	Value (₹)	Per cent to total cost	Physical unit	Qty. (kg.)	Value (₹)	Per cent to total cost	Physical unit	Qty. (kg.)	Value (₹)	Per cent to total cost
[A] Investment cost												
Peeling knife	1.00	-	5.00	-	1.00	-	5.00	-	1.00	-	5.00	-
Slicing knife	1.00	-	5.00	-	1.00	-	5.00	-	1.00	-	5.00	-
Hand slicing machine	1.00	-	100.00	-	1.00	-	100.00	-	1.00	-	100.00	-
Annual depreciation @ 10 %	-	-	11.00	-	-	-	11.00	-	-	-	11.00	-
Total	-	-	121.00	13.21	-	-	121.00	12.24	-	-	121.00	13.21
[B]Raw materials cost												
Potato	-	100.00	500.00	-	-	100.00	500.00	-	-	100.00	500.00	-
Salt	-	0.50	3.50	-	-	0.50	3.50	-	-0.50	3.50	-	-
Raw woods	-	15.00	45.00	-	-	15.00	45.00	-	-15.00	45.00	-	-
Alum	-	0.013	0.075	-	-	0.013	0.075	-	-0.013	0.075	-	-
Bags	-	4.00	10.00	-	-	3.20	8.00	-	-4.00	10.00	-	-
Candle	-	1.00	1.00	-	-	1.00	1.00	-	-1.00	1.00	-	-
Total	-	-	559.58	61.12	-	-	557.58	56.40	-	-	559.58	61.12
[C] Labour cost												
Transportation	0.31	-	25.00	-	0.20	-	25.00	-	0.31	-	25.00	-
Grading	0.08	-	6.50	-	0.05	-	6.50	-	0.08	-	6.50	-
Washing	0.08	-	6.50	-	0.05	-	6.50	-	0.08	-	6.50	-
Peeling	0.95	-	75.00	-	0.60	-	75.00	-	0.95	-	75.00	-
Slicing	0.95	-	75.00	-	1.20	-	150.00	-	0.95	-	75.00	-
Boiling	0.23	-	18.20	-	0.15	-	18.20	-	0.23	-	18.20	-
Drying	0.19	-	15.00	-	0.12	-	15.00	-	0.19	-	15.00	-
Bagging	0.21	-	13.80	-	0.13	-	13.80	-	0.21	-	13.80	-
Total	3.00	-	235.00	25.67	2.50	-	310.00	31.36	3.00	-	235.00	25.67
Total cost =[A]+[B]+[C]	-	-	915.58	100	-	-	988.58	100	-	-	915.58	100

damaged potatoes. The good potatoes are used for processing and the damaged potatoes are discarded immediately. (3) Peeling - The good potatoes are peeled with knife costing ₹ 5. It is laborious and time-consuming process. The care is exercised to ensure that potatoes are not damaged. Each labour is paid on the quantity of peeled potatoes. About ₹ 75 are paid for grading of a quintal potato. (4) Boiling - The peeled potatoes are boiled in water with salt and alum for 10-15 minutes. Mainly fire wood is used to boil potatoes. (5) Slicing - The boiled potatoes are sliced with the help of hand slicing machine, which is separate for all the three products viz, wafer, perforated wafer and potato sticks having the market price of ₹ 100. (6) Drying - Wafer, Perforated wafer and potato sticks are dried under sun for two to three days. Sun drying is the most preferred method for drying and (7) Packing - The dried products are packed in plastic bags of 5 kgs and 10 kgs capacity locally available in the market.

The cost of processing is studied under three major heads namely (1) Investment (2) Raw materials and (3) Labour cost. It is apparent from the table 2 that the processors have to incur cost of ₹ 915.58 for wafer and potato sticks where as ₹ 988.58 for perforated wafer. The investment, raw materials and labour cost share 13.21, 61.12 and 25.67 per cent of the total processing cost for wafer and potato sticks where as the share for perforated wafer is about 12.24, 56.40 and 31.36, respectively. The major costs being labour and raw materials cost which indicated that processing at home scale is labour intensive and highly capital intensive. The investment cost is the least accounting for only 13.21 per cent for wafer and potato sticks and 12.24 per cent for perforated wafer. The investment cost for potato processing works out to ₹ 121 per quintal potato for all the three products out of which the price for peeling knife and slicing knife is similar (₹ 5) where as for hand slicing machine the present value is ₹ 100. Here it should be kept in mind that a peeling knife and a slicing knife once bought works for three to five years and a hand slicing machine works for two to three years. Raw materials cost for processing came to ₹ 559.58 for wafer and potato sticks and ₹ 557.58 for perforated wafer. Again among the raw materials cost, the highest cost was for raw potato (₹ 500) and the lowest (₹ 0.013) for alum for all the three products. Among the labour cost, the highest cost accounted for slicing, which was about ₹ 150 for perforated wafer where as ₹ 75 for wafer and potato sticks. The total labour cost for wafer and perforated wafer was ₹ 235 for wafer and potato sticks and ₹ 310 for perforated wafer. Thus, the total processing cost for wafer and potato sticks was ₹ 915.58 and ₹ 988.58 for perforated wafer (1). The annual depreciation @ 10% (₹ 11) is calculated in investment cost. These findings are supported by Goutam *et al.* (1988), Sikka *et al.* (1989), Subrahmanyam *et al.* (1992) and Mayura *et al.* (1995).

In the present study, on an average, the net profit of processors for all the three products was about ₹ 326 for a quintal potato while net income of farmers for raw potato was about ₹ 89 per quintal potato which can be seen from Table 3. Thus, the farmers can earn ₹ 326 more for processed potato products as compared to raw potato per quintal potato and there might be value addition of ₹ 326 for a quintal potato.

Table 3 Estimated net profit due to processing for the farmers of Banaskantha district for a quintal of potato

Particulars	Total cost (₹)	Price (₹/qtl.)	Net profit (₹)
Potato	261	350	89
Processed potato	940	1266	326

CONCLUSION

Per hectare average total cost (Cost-C_2) of potato was ₹ 59,900. It was the highest (₹ 61,209) for large farmers followed by medium farmers (₹ 59,964) and small farmers (₹ 58,526). Further, the breakup of total cost for selected farmers indicated that seeds accounted for the lion's share of 38.17 per cent, followed by fertilizer (13.86 %), irrigation charges (7.69 %) and rental value of owned land (6.92 %). Cost-A shared about 80.19 per cent of total cost for selected potato growers. It varied from 79.40 per cent for small farmers to about 80.00 per cent for medium and large farmers. On an average, the total cost of cultivation per hectare on the basis of Cost-C_2 was ₹ 59,900. It ranged from ₹ 58,526 for small farmers to ₹ 61,209 for large farmers. The net income of potato growers were ₹ 20,574, ₹17036 and ₹ 22,791 per hectare for small, medium and large farmers, respectively. Thus, on an average, potato growers realized net income of ₹ 20,133 from one hectare of potato cultivation.

Potato processing at home scale is vital for converting raw potato into wafer, perforated wafer and potato sticks. The major cost components in processing are raw materials and labour cost. The total processing cost per quintal raw potato came to ₹ 915.58 for wafer and potato sticks and ₹ 988.58 for perforated wafer. It was observed that peeling and slicing are important operations at home scale which enables the farmer to obtain remunerative prices. The farmers got ₹ 89 per quintal raw potato where as the processors got ₹ 326 per quintal from processed potato. If the farmers sell potato after processing, they may get additiona income of ₹ 326 per quintal potato.

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