

## PROFITABILITY AND VARIOUS CONSTRAINTS IN POTATO CULTIVATION

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The study was carried out to determine cost of production, profitability and constraints in potato cultivation. Data were gathered from Okara and Kasur districts of Punjab. Autumn crop was selected for the year 2002-03, since this crop occupied more area than spring crop. A total of 100 respondents, 50 from each district were interviewed using purposive sampling technique. Crop budgets were made to determine significant factors affecting the yield of potato in both districts. Gross income per acre and per kg from potato cultivation was higher in Okara than those in Kasur. Net returns per acre and per kg were negative in both districts as prices remained extremely low during this period. Availability of funds, access to good quality seed, provision of cold storage and transportation facilities and stable potato price could increase potato production in the province.

**Keywords:** Potato, profitability, constraints, Okara, Kasur, Punjab

### INTRODUCTION

In the present era of technological developments and innovative breakthroughs, there is a dire need to help the rural poor, which are mainly landless or own small chunks of farmland. This will be possible only through a change from the existing traditional system of cropping pattern to a more innovative and commercial farm business. Such an approach will not only help in the alleviation of poverty through higher farm incomes but would also generate employment opportunities for the small farm households and the landless. Among the available options for improving the welfare of the rural poor, the one most suited must begin with an understanding of the resource base of these households. Seen in this context, majority of our farming community owns less than 5 hectares of land, but has surplus labour force. Both these characteristics most appropriately fit into those farm enterprises, which are not only labour intensive but also promise higher productivity and income. It is perhaps time now to bring about a major shift in our approach towards farming business keeping in view the challenges and prospects that will confront Pakistan in future. We will essentially have to change the face of our traditional agricultural exports by bringing in new products possessing comparative advantage in the international market. Such potential products in the short run are vegetables. Vegetable cultivation generally requires more labour, thereby creating productive employment opportunities and generating higher incomes (AVRDC, 2000; Abedullah *et al.*, 2002). In spite of all this, vegetable cultivation is limited to vicinity of cities and comprises only one and two percent of total cropped area in Pakistan and Punjab respectively (Government of Punjab, 2002) as compared to fifteen percent in Taiwan (Ali 2000). This indicates low availability of

vegetables to consumers. Because of this, monthly per capita consumption of vegetable is extremely low (3.8 kg) in Pakistan (Government of Pakistan, 2001).

A large number of vegetables are cultivated in various districts of the Punjab province. Concentration of different vegetables varies from district to district. Potato occupies the larger share of area. The second important vegetable is onion. From economic and nutritional points of view, potato plays an important role in the economy of Pakistan in general and that of the Punjab in particular. On one hand, it accounts for 5.71 percent in total cropped area of the Punjab providing economic benefits in short duration of time and creating employment opportunities for the rural poor (Ahmad *et al.*, 2004). On the other hand, it supplements food of increasing population on low prices compared to grains, meat and chicken.

Unfortunately, however, very little research effort has been made pertaining to the input use, seasonal pattern of production and other practices followed by the farmers and nurserymen for the production of potatoes. Individual researchers, provincial organizations, and universities undertook studies on the economics of potato production; however, these studies were limited to small sample of farmers. Ali (1979) carried out study on cost of production and profitability of potato in Okara district. In 1993-94, Ayub Agricultural Research Institute undertook a cost of production study on potato on the basis of a small sample of farms in two Punjab villages. The Agricultural Prices Commission of Pakistan has also conducted studies on the cost of production of potato (Government of Pakistan, 1994). Ahmad *et al.*, (1993) estimated cost of production and profitability of potato by using estimates derived from consultation with experts. Such studies mainly concentrated on cost of production, while aspects regarding factors affecting

yield and various production and marketing constraints were not examined. Moreover, very little is known about the input use, cost of production and profitability of potato, and factors effecting potato cultivation. Therefore, potato research is needed to explore the ways and means to put this remunerative industry on scientific lines and to ensure that it can bring prosperity to the growers and the country. All this requires conducting study to search out various inputs contributing towards higher yield also to estimate constraints in production and marketing of vegetables in general and potato in particular. Keeping in view such points, the present study has been designed to determine profitability, various factors affecting yield and constraints relating to production and marketing of potato cultivation. The results will be helpful for the potato growers in making future plans regarding growing of potato crop and also guide them to tackle various factors that reduce the yield. The findings of the study will give some policy implications which would help to minimize uncertainty in the demand and supply of potato crop if the recommendations are followed in full letter and spirit.

## MATERIALS AND METHODS

Singh and Sikka (1992) found that vegetable cultivation concentrates more on irrigated area than does cultivation of cereal crops. Potato cultivation is concentrated mainly in irrigated districts as compared to arid districts of the Punjab province (Ahmad *et al.*, 2004). For the purpose of this study, at first four districts i.e. Okara, Sahiwal, Pakpattan and Kasur being the most important in terms of area were selected. Out of these districts, two districts, namely Okara and Kasur, were randomly selected. Share of Okara and Kasur in total potato area in the Punjab province was found to be 24.24 and 9.11 percent respectively (Ahmad *et al.*, 2004). Two potato crops namely autumn and spring are cultivated in a year in the Punjab province; however, more area is concentrated under autumn crop compared to spring crop. Because of this fact, data for autumn crop was collected from Okara and Kasur.

Major potato growing villages were purposively selected with the consultation of Department of Agricultural Extension (Agriculture Officer) in Okara and Kasur districts. A total of 100 farmers, 50 from each district were taken by using purposive sampling technique. A well structured and field pre-tested comprehensive interviewing schedule was used for the collection of detailed information on various aspects of potato crop of the year 2002-03. The method of cost estimation of each individual input followed by Ahmad

*et al.* (2003, 2004) was adopted for the purpose of this study. Profitability (net returns) was found by deducting the total cost from gross income. It is represented by the formula:

$$\text{Profitability} = GI - TC$$

where GI is gross income per acre. It was calculated by multiplying output per acre with price of output. Similarly, net returns per kg were determined as

$$\text{Net Returns / Kg} = \frac{GI}{\text{Output}}$$

GI is the same as defined earlier while output was yield of potato in Kg.

To identify factors affecting potato yield, analysis was made on the basis of districts and F test was used to determine the significant difference between two districts.

For ranking constraints either production or marketing in potato cultivation, following steps were taken:

- a) Determining frequency of each constraint
- b) Weighing every constraint to determine its seriousness
- c) Adding seriousness and frequency to get total score
- d) Ranking constraints on the basis of total score

## RESULTS AND DISCUSSION

Potato crop requires a lot of inputs before and during growing period. Huge cost incurs for well prepared seed bed preparation, seed, fertilizer and weed control. Plant protection measure is another item that require sufficient amount of finance. All such inputs used in quantity and factor share are given in Table 1 and described below.

### Input use and cost in potato cultivation

Potato vegetable needs well and thoroughly prepared seed beds for maximum germination of seed. It was found that the potato growers of Okara district used 6.46 tractor hours per acre for land preparation while those of Kasur applied relatively more tractor hours. But this difference was statistically non-significant. Similarly, quantity of seed determines population of plants in the field and thus, yields per acre. So, appropriate amount of seed used improves the produce of any crop. The respondents of Okara used larger quantity of seeds compared to those of Kasur. Quantity of seed used was statistically different between the two districts. Department of Agriculture, Punjab, has recommended a seed rate of 1200-1500 kg per acre for potato crop (Government of Punjab, 2003). It was learnt that the farmers of both districts used seed in the range of recommended doses.

### *Profitability and various constraints in potato cultivation*

Quantity of farmyard manure applied was statistically different between the selected districts. Overall, fertilizer use (NPK) was almost the same between two districts. While considering application of individual nutrients (not reported in table I), it was learnt that nitrogen, phosphorus and potash were statistically different between Okara and Kasur. However, the respondents of Kasur applied more nitrogen nutrient, whereas the farmers of Okara made more use of phosphorus and potash. Recommended quantities of nitrogen, phosphorus and potash by the Department of Agriculture, Punjab are 100 kg, 75 kg and 50 kg, respectively (Government of Punjab, 2003). The results of the study indicate that the potato growers

because they are risk averse due to limited financial resources. Therefore, cost per acre was estimated for potato crop as well as cost per kg of potato produce to determine its economic viability between the selected districts. It was estimated that total cost per acre was statistically higher in Kasur as compared to Okara. Nevertheless, higher cost per kg in Kasur indicated low economic efficiency of resources, since yield in this district was considerably low (discussed later). Such higher costs were the result of more use of farmyard manure, application of irrigation and higher land rent in Kasur. These results become more meaningful by comparing factor share between the selected districts (Table I).

**Table I. Input use and factor share in potato cultivation.**

Particulars/District	Okara		Kasur	
	Quantity	Factor share	Quantity	Factor share
Land preparation (Tractor hours)	6.46 <sup>a</sup>	7.27	6.88 <sup>a</sup>	6.36
Seed (kg)	1328.40 <sup>a</sup>	33.06	1232.00 <sup>b</sup>	33.79
Farmyard manure (trolley)	1.20 <sup>a</sup>	2.36	1.99 <sup>b</sup>	7.88
Fertilizer: NPK (kg)	223.06 <sup>a</sup>	21.70	213.00 <sup>a</sup>	17.30
Irrigation (No.)	10.82 <sup>a</sup>	5.65	12.62 <sup>b</sup>	6.30
Plant protection measures (No.)	3.82 <sup>a</sup>	5.10	3.28 <sup>a</sup>	3.80
Labour (Hours)	199 <sup>a</sup>	9.36	198 <sup>a</sup>	7.84
Miscellaneous	1521.58	5.72	1754.26	5.55
Land rent	2601.58	9.78	3533.82	11.18
Total cost (Rs/acre)	6601.05 <sup>a</sup>		31608.37 <sup>b</sup>	
Cost per kg	3.16 <sup>a</sup>		3.96 <sup>b</sup>	

Different superscript in a row implies that the hypothesis of equality in parameter values between the districts was rejected, while the same superscript in a row implies that the hypothesis of equal parameter value cannot be rejected at the 15% level by using F-test.

were mainly using nitrogenous fertilizers and applications of these fertilizers were also above the recommended level. Nevertheless, the use of nitrogen was around 40 percent above the recommended level in Kasur while in Okara district, this use was above by 16 percent. Application of phosphorus was slightly above the recommended level in Okara; however, its application was about 19 percent below the recommended one in Kasur. As far as application of potash is concerned, its use was estimated below the recommended level in both districts. Moreover, application of potash was very low in Kasur (74 percent below the recommended one) as compared to that in Okara (around 45 percent below the recommended level).

Cost of production is an important indicator for the selection of any enterprise. Higher cost along with risk makes such enterprise unviable and especially the farmers are reluctant to go for such enterprises

### **Yield and returns from potato cultivation**

Higher gross returns per acre were estimated for the potato growers of Okara as compared to those in Kasur, since the respondents of Okara obtained higher yield per acre and price of the produce. Higher yield was the result of mainly difference in the use of quantity of seed and adoption of different varieties (not given here due to space limitation). Gross margin per acre is a crucial indicator for continuation of any enterprise. It also indicates the situation when the farmers decide to shut down their current business activity because shut down situation approaches when the farmers are not able to get back enough returns required to meet the running costs. In the case of present study, gross margin per acre were not sufficient to meet total variable cost of production and these returns were negative in Kasur district. However, situation was a little better in case of the respondents of Okara where positive gross margin per acre and per

kg were estimated. Another alarming indication in the profitability of potato cultivation was negative net returns per acre and per kg estimated for both districts. Nevertheless, they were very low in Kasur than those in Okara. The negative net returns were mainly the outcome of low price of the potato during the study period (Table II).

**Table II. Profitability of potato cultivation in the selected districts.**

Particulars/Districts	Okara	Kasur
Yield (kg/ac)	8396.80	7971.52
Price of output (Rs/kg)	2.97	2.53
Gross returns (Rs/ac)	24938.50	20167.94
Gross margin (Rs/ac)	1054.63	-7789.77
Gross margin (Rs/kg)	0.12	-0.98
Net returns (Rs/ac)	-1662.55	-11443.40
Net returns (Rs/kg)	-0.20	-1.44

\*Gross margin = Gross returns – total variable cost (variable cost included cost of all the inputs and practices except land rent and water charges)

#### Production and Marketing Constraints in Okara

The most serious problem in potato marketing was the low price of the produce in Okara. Due to this fact, the farmers were not able to recover the cost incurred on potato cultivation. However, this problem should be viewed keeping in mind that potato pricing in Punjab is a cyclical phenomenon and one year data may not be used as an indicator. Other constraints in an ascending order were inadequate funds, shortage of canal water, high input prices, transportation problem, high cost of cold storage, insect attack, non-availability of good quality seed, disease attack and adulterated inputs especially pesticides (Table III). Ahmad *et al.* (2004) pointed out almost the same production and marketing constraints in vegetable cultivation.

**Table III. Production and Marketing Constraints in Okara.**

Constraints	Frequency	Seriousness	Total score	Ranking
High input prices	30	23.4	53.4	4
High cost of cold storage	17	10.6	27.6	6
Inadequate funds	47	40.4	87.4	2
Shortage of canal water	33	22.8	55.8	3
Non-availability of good quality seed	13	6.8	19.8	8
Insect attack	15	10.6	25.6	7
Adulterated inputs	3	4.0	7.0	10
Disease attack	6	4.8	10.8	9
Low price of the produce	50	48.5	98.5	1
Transportation problem	18	13.0	31.0	5

Growing potato vegetable is a costly farming practice with sufficient income if the reasonable price of the output is prevailing in the market. With limited financial resources, potato growers were not in a position to apply nutrients, irrigation and plant protection measure at proper time. Moreover, they had to rely on input dealers for such needs and the input dealers were exploiting the poor farmer by charging high prices for various inputs. On the other hand, continuous increase in the prices of diesel, electricity and fertilizer influenced financial viability of the resource poor farmers who were already suffering. Due to financial constraints, they were not able to purchase seed of good quality and high yielding varieties of potato and also, this constraint forced them to sell their produce at through away prices.

#### Production and Marketing Constraints in Kasur

Like Okara district, low price of the potato produce was the crucial limiting factor reducing the income of the potato growers in Kasur. This factor drastically affected financial condition of the respondents. High input prices and inadequate funds were the second and third respective constraints. Non-availability of good quality seed was next crucial problem. This constraint forced the potato-growing farmers to use their own seed. Farmers owned seed was not in such a condition to give higher yield because of poor storage facilities. Other important constraints categorized in an ascending order were insect attack, high cost of cold storage, commission fee, adulterated inputs, shortage of canal water, transportation problem and disease attack (Table IV). Guiji and Pretty (1992) identified non-availability of good quality inputs such as seed and fertilizer, lack of access to credit, price fluctuations, high cost of irrigation water and labour as major constraints/problems in potato production.

Table IV. Production and Marketing Constraints in Kasur.

Constraints	Frequency	Seriousness	Total score	Ranking
High input prices	44	35.6	79.6	2
High cost of cold storage	22	8.6	30.6	6
Inadequate funds	38	29.8	67.8	3
Shortage of canal water	10	5.4	15.4	9
Non-availability of good quality seed	22	17.6	39.6	4
Insect attack	21	10.4	31.4	5
Adulterated inputs	11	5.4	16.4	8
Disease attack	6	2.6	8.6	11
Low price of the produce	49	46.0	95.0	1
Commission fee	12	6.0	18.0	7
Transportation problem	7	2.5	9.5	10

### SUGGESTIONS

On the basis of the findings, following recommendations are made for increasing the yield and income of the potato growers.

- The optimum dose and recommended varieties of potato could enhance yield per acre coupled with the increased income of the growers.
- Majority of the farmers made use of nitrogenous fertilizers ignoring the needs of crop and soil. Nitrogen was applied above the recommended level, especially by the potato growers in Kasur. Hence, their yield per acre remained very low. Nevertheless, application of potash was below the recommended one in both districts. But, high yielders applied more potash than low yielders in selected districts. The balanced use of fertilizer i.e., 100 kg of N, 75 kg of P and 50 kg of K could result in yield gains.
- As it was observed that majority of the potato growing farmers were using fertilizer either below or above the recommended level and in improper proportion. This necessitates the role of extension workers. Extension workers should provide information to the concerned people regarding use of various inputs especially fertilizer. They should provide latest information relating to production techniques and technology. They should also provide and motivate the farmers to use seed of high yielding and recommended varieties.
- The potato growers obtained negative net returns in both districts because the prices remained extremely low during the survey period. There is a need to make targets for potato production according to demand for each district. These targets should be implemented by Department of Agriculture. Low cost, better and ample quantity of storage facilities can also help a lot to avoid this problem.
- Potato cultivation is an input intensive farming practice generally requiring more funds to raise a successful crop. However, small and medium farmers lack needed funds and have not enough financial resources to grow potato efficiently. They are not able to take advantage of micro credit scheme run by formal institutions because of lack of collateral requirement. Private sectors should be given incentives to provide loans to the potato growers on easy terms and conditions.
- Adulterated inputs especially pesticide and fertilizer were reported in the study areas. Steps should be taken to abandon adulterated inputs. Department of Agriculture is already working on this line especially relating to pesticide. There is a need to broaden and strengthen its roles and it should be given more authority to control these malpractices.
- Marketing institutions should be strengthened for smooth processing of marketing the produce of potato. On the other hand, marketing margins are very high, so, there is a need to raise producer share in consumer rupee. This requires setting up marketing institutions on modern lines and providing latest information to the growers. Cold storage facilities should be provided on large scale.

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