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PROFITABILITY, PRODUCTION EFFICIENCY AND MARKETING OF SPRING MAIZE IN PUNJAB-PAKISTAN

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ABSTRACT

This study primarily investigates the profitability of spring maize production in district Kasur of Punjab province, using farm budgeting technique. Keeping in view the growing trend in maize area, data were collected through simple random sampling technique, and administered structured questionnaires to a total of 50 respondents. Analysis was performed using descriptive statistics, and analyzed net farm income of the maize farmers. The socio-economic indicators reflected that maize growers were found in productive age group (with average age of 41 years) but generally had lower literacy rate with 7 years of schooling, they were quite experienced as spent averagely 17 years in maize cultivation. The costs and returns analysis indicated that spring maize production was a profitable enterprise with an average net return of Rs.19803/acre and a gross ratio of 0.75. A production efficiency index (1.31) per farmer further supported the profitability of enterprise, that is, the returns sufficiently covered the costs of production. As maize being the staple diet and having profitability in the study area needs attention of policy makers for enhancing its area, production and yield. Strengthening the role of government in provision of quality inputs particularly seed and fertilizers as well as working for market integration is recommended for improving spring maize productivity and profitability on commercial lines.

Keywords: efficiency, marketing, profitability, production, spring maize

INTRODUCTION

Maize is regarded as an internationally prime commodity driving world agriculture because of its diverse uses in the industry, food and feed sectors. China is the leader in production and consumption of maize in Asia. Globally, maize is grown in 184 M ha across 165 countries, with total production of 1016 MMT and average productivity of 5.52 t/ha (FAO, 2014). Similarly, maize has achieved the status as the most produced grain in the world, surpassing rice in 1996 and wheat in 1997. Its production is increasing at twice the annual rate of that of rice and three times that of wheat (Fischer *et al.,* 2014). Maize crop is also of greater

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significance for Pakistan, where rapidly increasing population is facing shortage of food supplies. In Pakistan, maize is the third important cereal after wheat and rice and it is used as a food as well as feed. It contributes 2.2% to the value added in agriculture and 0.4 % to the GDP (GoP, 2016a). During 2015-16, cultivated area of maize crop has increased to 1144 thousand hectares, showing an increase of 0.2 % over the last year's area of 1142 thousand hectares. Maize production stood at 4.920 million tons during 2015-16 showing a decrease of 0.3% over the last year's production of 4.937 million tons (GoP, 2016b). This decrease in yield was due to decline in maize acreage in the reported period. The major contributors of maize are Punjab and Khyber Pakhtunkhwa provinces while Sindh and Baluchistan contribute least in maize production. Targeted area of maize for two major contributing provinces i.e. Punjab and KPK was fixed at same area (500 hectare) but production targets for maize were set at different values i.e. 3708.9 tons for Punjab and 1000 tons for Khyber Pakhtunkhwa. Moreover, during the year 2015-16, maize yield target was fixed at 5.40 tons per hectare in Punjab and 2.00 tons per hectare for Khyber Pakhtunkhwa (GoP, 2016a).

In the irrigated belts of Punjab, maize is cultivated in two seasons like autumn and spring. Hybrid maize is grown in both the seasons in irrigated belts while in raifed areas, conventionally bred high yielding varieties are sown. It implies that maize cultivation in irrigated ecologies now shifted to hybrid varieties of maize. Spring maize is sown from first week of February to first week of March while time for autumn maize starts from mid-May to mid-August. Previously for maize production, farmers used to rely on local seed varieties and maize was not a cash crop in those days. With the change in demand of consumers, there is visible shift in the maize production. Keeping in view this trend, in 1971, two maize and millet research institutes were established with one in Yousafwala (Punjab province) and the other in Pirsabak (KPK province) with major task of development of open pollinated maize varieties in collaboration with CIMMYT. Similarly, a coordinated research program for spread of maize and millet was initiated at Pakistan Agricultural Research Council in 1975. But the annual increase of 20-25% in maize area during spring season is due to arrival of spring hybrids since the active involvement of multinationals in Pakistan during 1970's. These companies are a major supplier of maize hybrid seed as very small amount of locally produced hybrid seed is available in the market. This is one of the main reasons for very high prices of hybrid seed. Still, hybrid maize seed is preferred due to its higher yield levels of 6-7 tons per hectare (Tariq and Iqbal., 2010). Researcher further highlighted that maize has various uses from farm use to processing industry but use of maize in human diet is declining by 0.6 kg/ capita despite relatively good improvement in transportation/ communication and income level than two decades ago. About 54% maize is being utilized in poultry feed, 28% in wet milling, 10% in direct human food and the remaining in other uses (GoP, 2016b). There are 25 wet milling, 55 poultry feed units, 05 food units and 15 seed and other business units engaged in maize enterprise in Punjab province of Pakistan.

The agricultural statistics data shows that traditional spring maize areas in Punjab are Okara, Pak pattan, Sahiwal, Rawalpindi, Faisalabad, Jhang and Toba Tek Sing districts. With the passage of time, this belt is shifting towards Kasur

district where spring maize area has also entered in double digits just like previously mentioned traditional maize areas (GoP, 2009). The area under spring maize in Kasur is increasing from year to year due to arrival of spring hybrids. Keeping in view the rising trend of maize in selected district, present study was designed to investigate actual developments happening in spring maize enterprise with certain specific objectives like study of socio economic characteristics of maize growers, estimation of profitability of spring maize and identification of major constraints related to production and marketing of maize. Ultimate objective was to suggest policy recommendations for improvement in maize productivity and profitability.

METHODOLOGY

The present study was based on the primary data collected from spring maize growers with the help of a structured questionnaire by employing random sampling technique. The data was collected from district Kasur of Punjab province in April 2015 due to increasing prevalence of the crop in study area. Considering the cost and other constraints, 50 farmers were interviewed from the study area by face-to-face interview method. The data about socio-economic variables, inputs used with cost contents and output of maize was collected for the cropping year 2015. The data analysis has been done by using Statistical Package for Social Sciences. The demographic and socioeconomic variables which happen to be in categorical form are analyzed through descriptive analysis by incorporating the frequency of the different variables.

Analytical techniques

Budget technique (net farm income) based on prevailing market prices of inputs and outputs were used to obtain the profitability of the maize growing. Following formulae were used:

Model specification

Budget technique is followed as:

GM=TR-TVC

π = GM-TFC

Where, GM= Gross Margin, TR= Total Revenue, TVC= Total Variable Cost, π = Profit and TFC= Total Fixed Cost

Similarly, production efficiency (PE) per maize farmer was estimated as:

PE = ATR/ATC

Where, ATR= Average Total Revenue and ATC= Average Total Cost

Operating Ratio (OR) = TVC/GI

Gross Ratio (GR) = TC/GI

RESULTS AND DISCUSSION

Socio-economic characteristics of spring maize farmers

Survey results reveal that average age of the respondents was 41 years, which according to Sanusi (2014) is regarded as productive age for labor work. Literacy level of farmers was relatively lower (7 years of schooling). The education level is one of determinants of farmer's awareness and willingness towards adoption of new technologies. Higher level of education encourages the farmers regarding

technology adoption. Farmer's had adequate farming experience in maize production with average of 17 years of farming experience. Size of farm is an important factor in determining quantity and type of technologies required. Therefore, farm size was also calculated. Agricultural Census (2010) includes farmers having landholding between 5 and 25 acres into medium category of farmers. Therefore, maize growers in present study having almost 23 acres of operational holding may be classified as the farmers having medium farm size. Regarding farm traction (power) sources, majority of farmers (86 percent) possessed their own farm tractor. Irrigation water plays a key role in the success of every crop. That was also true for spring maize. Table 1 indicates that all the maize growers used tube-well water as sole source of irrigation for growing of spring maize. This shows that they do not have enough access to canal water.

Table 1. Socio-Economic Characteristics of Maize Growers

Characteristics	Average Estimates	Significance
Age (Years)	41.14	0.401
Education (Years)	7.24	0.319
Farming experience (Years)	16.96	0.496
Total operational land (Acres)	22.96	0.000
Farm Traction Sources	Percent farmers	
a) Own tractor	86.00	0.000
b) Rented tractor	14.00	-
Irrigation Sources	Percent farmers	
a) Tube-well	100.00	-
b) Canal + Tube-well	-	-

Source: Survey data during year 2015

Costs and returns estimates of spring maize

Overall farm results show that total cost of production per acre of maize crop was Rs.62380.00 when maize yield was 90 maunds/ acre and sale price was Rs.907/ maund. The total revenue/ gross income obtained from per acre produce of maize crop were estimated as Rs.82183.00 and gross margin were calculated as Rs.36903.00. The average net farm income of Rs.19803 and percentage profit of 32% reflects that spring maize farming is a profitable enterprise in the study area even after deducting the fixed costs from the gross margins. On account of three major costly items i.e. fertilizers, irrigations and harvesting activities, both the operating and gross ratios were on higher side yet these ratios depict that spring maize is somewhat a profitable venture in the study area. Furthermore, production efficiency index of 1.31 per farmer still indicates that returns exceed costs by 32 percent which advocated the profitability of enterprise. Results are also in coincidence with the average maize statistics of Punjab province as reported by Economics and Marketing wing of Provincial Government over the corresponding period of 2014-15. According to these provincial average values, maize grain yield was 73 mounds/ acre and sale price was Rs.917/ mound and the resultant total costs were Rs.65344/ acre. This comparison reveals that maize farmers of study area were comparatively more efficient in obtaining more output from spring hybrids. During the cost and return analysis, Sanusi (2014) estimated an operating ratio of 0.31, a gross ratio of 0.39 and a production

efficiency index of 2.50 per farmer in the study of small scale maize production in Niger state of Nigeria. Similarly, over the same period, Aina *et al.* (2015) calculated total cost of maize production in Gombe state, Nigeria which in terms of Pak. currency was Rs.6873/ acre and gross revenue was Rs.10660/ acre with net farm income of Pak. Rs.3787/ acre. In Nigeria, total cost of production in these both studies was much lower because input costs particularly on fertilizers and irrigations were much low as compared to Pakistan.

Table 2. Costs and return estimates of spring maize (Rs./ acre)

Variables	**Nos.**	**Rate**	**Total Cost**	**% of TVC**
a) Cost of land preparation			5509.00	12.17
b) Seed cost including sowing charges	7 kg	Rs.762.40	6167.00	13.62
c) Cost of fertilizers and manure			12626.00	27.88
d) Cost of irrigations	18.70		10389.00	22.94
e) Cost of plant protection measures			1843.00	4.07
f) Harvesting costs including cobbing, winnowing or shelling etc.	-	-	8746.00	19.31
Total Variable Cost (TVC)	-		45280.00	100.00
Fixed cost (Land rent for 6 months)	-		17100.00	
Total Cost (TC)			62380.00	
Average Physical Productivity/ Gross Income (GI)	90.59Md	Rs.907.20	82183.00	
Gross Margin (GI-TVC)			36903.00	
Net Farm Income=GI-TC =Profit			19803.00	
PEI=ATR/ATC			1.31	
Percent profit			32 %	
Operating ratio			0.55	
Gross ratio			0.75	

Source: Field survey data of year 2015

Net farm income results also corroborate the findings of Rasheed *et al.* (2014). Those estimated net farm income from spring maize in the range of Rs.18417 to Rs.19489 per acre in their experiments on different planting methods in district Faisalabad of Punjab province of Pakistan. Parallel to the same study period in Punjab, Koondhar *et al.* (2015) in a study on hybrid maize in Sindh province estimated higher gross income from spring maize as Rs.118607 per acre. This was due to less cost of production accompanied by the higher physical output of 104.5 maunds per acre and good sale price of Rs.1135 per maund in Sindh province. On the other hand, Bangladeshi farmers obtained comparatively less gross income of Rs.29834 (in terms of Pakistani currency) upon average yield of 62.25 maunds/ acre (Rahman *et al.*, 2016). Contrary to all these results, Indian farmers of Tamil Nadu were performing well and obtained higher maize yield of 135 maunds per acre. Moreover, cost of maize production in the same period was estimated as Rs.8.19/ kg which when converted to Pakistani currency becomes equal to Rs.13/ kg (Government of India, 2013). But in the study under hand, maize production cost is little higher (Rs.17/ kg) which may be due to comparatively higher prices of certain inputs like fertilizers and irrigations in Pakistan. Overall results given in Table 2 indicate that the farmers

were performing well in maize cultivation despite escalating prices of inputs in Punjab.

Marketing aspects of maize produce

Survey results show that majority of spring maize farmers (74 percent) were selling maize through local traders (Village Beopari). Overall, almost 12 percent farmers sell produce directly to the processing industry Mills. Whatsoever was the pattern of sale, almost three fourth of farmers were receiving payment of produce in cash form. Only a small percentage of maize growers received payment in both cash and credit forms. As there was lack of on-spot payment facility therefore, growers had to wait for couple of days in order to receive their cash. They may have to wait from 1 to 8 weeks for their payment. On an average, majority (56 percent) growers received the payment of their produce within fortnight period in any type of market. There were only few farmers who had to wait for longer period of one or two months for their payment. Main mode of transportation to the market was trolley, therefore, 62 percent respondents had their own source of transportation.

Table 3. Marketing aspects of maize produce

Characteristics	Overall responses	Significance
Sale pattern of produce	Percent farmers	
Local trader	74.0	0.035**
Mill	12.0	-
Grain market	8.0	-
Mixed trend	6.0	-
Mode of payment		
Cash	67.3	0.037**
Credit	24.5	-
Both	8.2	-
In case of credit, length of payment		
1 week	31.3	0.128
2 week	56.3	-
4 week	6.3	-
8 week	6.1	-
Mode of transportation of produce		
Trolley	75.0	
Truck	25.0	
Ownership of transport facility (trolley)		
Own	61.5	0.672
Hired	38.5	-
Availability of maize price information		
Yes	92.0	0.356
No	8.0	-
Any support from processing mills?		
No	100.0	-

**Significant at 5 percent level Source: Survey data during year 2015

Proper marketing requires that price signals should be received to both the buyers and sellers well in time. Results of analysis show that majority of farmers (92) were receiving price signals timely. As some farmers were selling their produce directly to the processing mills yet they were not receiving any technical and financial support from these processing mills regarding production of maize as the case of contract maize producers of Rafhan Maize Products Pvt. Ltd (one of private processing industries) in certain other maize growing regions in Punjab province. During informal discussions, farmers of the study area expressed their willingness to enter into bi-partite contract farming model of maize processing mills like Rafhan Maize Products Pvt. Ltd. in order to avail facilities of agreement and resultantly harvest maximum benefits from maize production. Under the increasing demand for maize in feed and processing industry in Pakistan and relatively higher cost of production, higher investment in maize R and D is required along the whole maize value chain for export of value added maize products to increase competitiveness (Kumar *et al.*, 2014).

Major constraints identified in production and marketing

It was perception of maize growers that weather related constraints like changing patterns of temperature and rain were greatly affecting the crop production. Among other constraints were pests, diseases and lack of inputs like seed drill, thresher and laser leveling machines, etc. Yields could be increased by 25% just by providing the farmers with good seed and fertilizer, because only 34% improved seed is available in the country (Tariq *et al*., 2010). On the marketing side, maize growers were facing problems in local trading, grain market and processing mills. In local level selling, low prices of the produce, malpractices accompanied by under-weighing tactics and delay in payment were three major constraints. However, more than 67% farmers ranked low selling prices of maize as the major constrain in local trade centers.

Table 4. Major constraints identified in production and marketing

Characteristics	**Overall responses**	**Significance**
Constraints in production	Percent farmers	
Weather related constraints	62.0	0.040**
Pests	18.0	
Diseases	12.0	-
Lack of inputs	8.0	-
Constraints in marketing		
A) Problems in marketing with local dealers		
Low selling prices	67.5	0.151 ns
Delay in payments	12.5	
Malpractices during weighing	20.0	-
B) Problems in marketing with whole sale markets		
Commissions by the traders	50.0	0.135 ns
Malpractices during weighing	25.0	-
Delay in payments	25.0	-
C) Problems in marketing with processing mills		
Risk of rejection	66.7	0.762 ns
Delay in payments	33.3	-

**Significant at 5 percent level Source: Survey data during year 2015 ns = non-significant

Similarly, in grain market, exploitation by commission agents through malpractices accompanied by under-weighing tactics and delay in payment were identified as main constraints. Farmers were mainly worried from the commission agents in the grain market. Maize growers had to face bad experience in selling maize to processing mills due to risk of rejection of the produce on account of failure of certain quality tests applied by processors like measuring moisture and oil contents. In these three types of markets, malpractices and under-weighing tactics were common factors badly affecting the marketing of produce. Tariq *et al.* (2010) in his review article on maize in Pakistan also reports similar findings in marketing of maize and accordingly recommends that price stability could be established if grain storage and market facilities are provided to maize growers.

CONCLUSION

In spite of their small land holdings, farmers were able to produce spring maize on profitable lines as evident from production efficiency index of 1.31. However, profit margin may be increased further by reducing costs significantly through adoption of improved recommended crop production technologies. In the meanwhile, efforts for smooth running of market for maize are suggested. For example, by promoting bi-partite contract farming with industries like Rafhan Maize Product Pvt. Ltd. May overcome many marketing constraints like delay in payments as well as under-weighing practices by commission agents, low and fluctuating prices as well as delay in payments to the growers. Lastly, an appraisal of the agriculture extension services is suggested, so as to discover and improve weak points or better modify their plan of activities to bring about better extension delivery to the farmers in order to materialize maize production on commercial lines.

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