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Cost Benefit Analysis of Strawberry Production in District Khairpur Mir's Sindh, Pakistan

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ABSTRACT

The present study was carried out with the objectives to evaluate the costs and revenue obtained from strawberry, cultivated in District Khairpur Mir's, Sindh province of Pakistan. Aim of this study was to find out physical and revenue productivity and to compute net returns and input output ratio of this crop. For this study, sixty strawberry growers were selected through purposive sampling technique; where, they were interviewed by using a detailed questionnaire. Results show that average age of selected respondent was 43.25 years, about 75 percent of growers were literate and 25 percent were illiterate. The growers have about 3.08 years of strawberry growing experience while 20 percent of farmers had their first experience of strawberry cultivation. The results further show that per acre average revenue was Rs.574025 and average expenditure (per acre) was Rs.244173.25, where they earned net profit of Rs.329851.75 per acre. The strawberry grower had obtained input output ratio of 1:2.35 and the cost benefit ratio was calculated as 1:1.35. This study reveals that the major constraints faced by the growers in the study area, were shortage of water, lack of modern technologies, and lack of storage facilities and higher interest rate of agricultural loans. It is, therefore suggested that the government has to take effective steps to counter those problems by providing technical information, training and easy credit facilities. Agriculture extension assistance should be mobilized to work with strawberry growers with advanced technologies in Sindh Province.

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Introduction

Strawberry is one of the important fruits among the berries, which is originated in France (cultivated as wild crop and known as garden plant) (Singh *et al.*, 2017). Strawberry is an important fruit crop to the U.S. economy, and the U.S.A produce strawberry on large scale worldwide. During the past 10 years, U.S. strawberry production averaged 1.24 million metric tons and was worth $2.12 billion dollars annually (Choi *et al.*, 2017). Strawberry's light red color, sweet test, juicy and pleasant smells these characteristics are widely appreciated. Strawberry is consumed fresh and also in the form of preserved food like chocolate, milkshakes and juice on large scale as a strawberry flavor. Strawberry can be cultivated in tropical and subtropical regions. Above the height of 2640ft from sea level

strawberry crop cultivated as perennial crop and below this height it can be cultivated successfully once a year because the fruit require low chilling temperature for its growth and development (Singh *et al.,* 2017).

In Pakistan, the strawberry introduced in Khyber Pakhtun khwa during 1980 and remained unnoticed until commercial production came from sporadic plantations and due to high profitability and desirable taste it was introduce in Panjab, Sindh (Khairpur, Dadu and Sukkur) and Balochistan (Rajwana *et al.,* 2017). Due to increasing demand do of fruits and alternative income sources, the farmers have started growing exogenous crop verities including fruits like strawberry (Singh *et al.,* 2017). Although the crop has not been grown a scientific scale in the country, to increase the income of small farmers (Parveen et al., 2012), may be because of less awareness among the farmers. When the color of strawberry became pink it is harvested and ready to go in market. After harvesting of strawberry fruit, it divided in two categories fresh market 67 percent of strawberry is packed and consumed fresh and remaining 33 percent of strawberry consumed as preserved food it goes to processed market generally market condition determines the quantity of strawberry that how much it consumed fresh and how much processed as strawberry flavor. Some berries which are not as per standards can be discarded because they cannot be marketed as good quality fruit (Takele 1999). It is commonly believed that future of strawberry's production, preserved and processed food and meet export potential is bright in Pakistan (Parveen *et al.,* 2012). Process of land preparation can be done using traditional tools and sometime grower done themselves. Per acre average cost of land preparation of grower is approximately $375. In strawberry field two types of labor works, labor with machine and labor without machine and their wages per hour is $7.50 and $6.25 respectively. After producer paying 20 to 34 percent additional for benefits includes (medical facility, social security and other possible), wages of both labors with machine operator without machine operator rises about $10.00 and 8.40 per hour respectively (Takele 1999). Unfortunately, the area under strawberry cultivation is very limited so the annual production of fruit in Pakistan is not yielded at the level to export. It is need to increases the area under strawberry to maximize yield at export potential and adding this profitable crop in economy (Parveen *et al.,* 2012). Fertilization system had also a strong `influence upon the total yield. Variant early maturing, fertilized chemical realized the lowest yield 10,70 t/ha and late maturing varieties fertilized organically realized the highest yield 21,10 t/ha (Pop *et al*.,2013; Khoso et al., 2023).

In Sindh province, the growers are still unaware about this Rabi crop that's why the area under cultivation of strawberry is very low, which might be due the lack of lack of its market, unawareness of its economic value, little research, poor agronomic practices in the province. Good market access, skilled labor and introduce high yield verities may boost the future of strawberry crop. Thus, this study is proposed to have look on cost benefits of the crop. Water scarcity is the emerging issues to agriculture, so growers of Sindh look for other options to continue traditional practices of producing crops, growers seem to short-term and more profitable crops. In upper Sindh strawberry is their first choice to grow in their field for their survival.

Strawberry production require a good amount of fertilizer, pesticide and other agricultural inputs hence their cost increases while the rate of strawberry has decline in local markets. By introducing the modern production technologies may boost the yield of strawberry fruit from 500grams per plant to 600grams said agri-business development specialists. By applying modern production technologies bringing down the production cost by reduce the use of fertilizer (DAWN, 2012). Thus, the specific objectives of the study intend to carry out research with the following objectives: (i) to evaluate the costs, and revenue of strawberry in

the study area; and (ii) to study the problems faced by the strawberry growers in the study area.

Material and Methods

This study was based on primary data and that is principal objective of the study, which was collected through field survey of strawberry producers. Khairpur district was selected for this study because it is considered to be the main strawberry growing region in Sindh, Pakistan. A purposive sample selection of strawberry farmers was carried out to insure the generalization of my research findings. I preferred purposive sampling because this type of sampling covers each and every respondent in the study area due limited growers of strawberry. The 120 Strawberry respondents selected from the district purposively. Primary data was collected from the selected respondents, which was interviewed through a well-designed questionnaire developed for the purpose. Question was asked from respondent, while having face-to-face interactions during field visits, which allowed very detailed insights information about their expenditures, problems they face and management practices they applied for strawberry production.

Analytical measures

The data was further analyzed operating Microsoft Excel to estimate the cost and revenue analysis, Average, Mean, estimation of land, labor cost, estimation of returns, total cost of production, net returns, input-output ratio, cost-benefit ratio and other statistical calculation of Strawberry crop productivity.

Arithmetic Mean

Arithmetic mean or average is the sum of a collection of numbers divided by the count of numbers in the collection. Arithmetic mean or average can also be used for tabulated presentation of data. It is true representation of the whole data.

$$\text{Average} = \Sigma Xn/n$$

Where Σ= Total sum, xn = Variable used in analysis, n = no of observation.

Net Return

After deducting all expenditure from total Income generated we have a net return/profit.

$$TP = TR - TC$$

Where TP= Total profit, TR= Total revenue, TC= Total cost

Results and Discussion

In this chapter finding out the respondent's socioeconomic indicators, cropping and marketing information. Socioeconomic includes respondent's age, education, source of income, family size, farming experience, tenancy status, power source and irrigation source. Whereas, the cropping information, growing experience, land preparation, seed rate, sowing method, fertilizer application, irrigation intervals, hoeing and weeding, plant protection and harvesting were also calculated. Marketing is the strategic process by which firms or

individuals attempt to encourage and entice consumers to purchase their goods or services; which, includes packing material, transportation, picking and handling and commission charges.

Status of strawberry cultivation in Sindh

In Sindh the cultivation of strawberry stared few years back. The fruit crop was first introduced at Kacho area along with the Indus River basin in Sindh. Its progress of last five years is computed bellow (see Table 1).

Table: 1 Status of area and production under strawberry in Sindh

Year	Area in acres	Production in Tones
2011-12	201.6	292
2012-13	220.0	312
2013-14	410.4	591
2014-15	429.6	609
2015-16	544.8	767
2016-17	677.1	940
2017-18	704.2	986
2018-19	956.3	795
2019-20	998.3	1378
2020-21	1035.3	1432

Source: http://www.mnfsr.gov.pk/, 2016

The fruit is now being supplied to different markets in the country. Strawberry is Rabi crop it was sown from 15th October to 1st November. the growers have bought the seedling from swat and other northern area of country because is being developed their, 40,000 to 45,000 plant were sown per acre and about 10,000 to 12,000 packets they get from one acre. The table show that the farmer are interested in strawberry production because strawberry cultivation in Sindh has shown impressive growth, and efforts to address challenges can further enhance its contribution to the local economy the above data indicates that area increase of strawberry production 514 percent from last ten year and increase in production 490 percent. As mentioned by Singh *et al.* (2017) that the strawberry is originated in France, which requires low temperature for cultivation, i.e., tropical and sub-tropical regions of the world. Strawberry cultivated on ridges at fertile soil with suitable drainage quality, therefore, the Indus basin lands are suitable for its cultivation (Singh *et al.*, 2017).

Socio economic conditions of strawberry farmers

Socio economic condition shows The effects of an activity, action, business operations, labour shortage, land prices, policy or project on the economic and social well-being of farmers and their families in a society which may be positive or negative

Table: 2 Shows the Socio-economic characteristics

Characteristics	Average
Age (Year)	43.25
Literates percent	74
Illiterate percent	26
Strawberry Growing Experience (Year)	3.08

Total family size (no)		9.46
Full time family workers		2.41
Housing characteristics Percent	Kacha	0.1
	Kacha-pacca	0.62
	Pacca	0.28
Sources of income	Crop cultivation	11.2
	Livestock rasing	15.0
	Crops and livestock	66.0
	Other (job, shop keeping and artisans)	7.8

Table 2 shows that the majority of strawberry farmers are literate and they are quite mature with an average age 43.2 years however, they have decided to produce strawberry on about half of the land. Respondents have full confidence in strawberry production according to their experience this study also revealed that 20 percent of farmers had their first season or second in strawberry growing . Average family size of respondents was 9.46 and 2.41 average full time family worker respondents housing characteristics divided in three categories i.e. Kacha ,Kacha-Pacca and Pacca and average was 0.1, 0.6166 and 0.2833 respectively.

The result shows in table 3 that all respondent's source of income. Agriculture is the main source of income with 76.7 percent and 15.0 percent respondents were those who also involve in livestock farming with agriculture. Respondent employed in different fields beside agriculture were 5.0 percent and 3.3 percent respondents have source of income agriculture with shops.

Cost and returns on strawberry cultivation

In Sindh province the growers are still unaware about this Rabi crop. The area under cultivation of strawberry is very low, which might be due the lack of research work, poor agronomic practices, and lack of market and economic value of strawberry production among the farmers. Good market access, skilled labor and introduce high yield verities may boost the future of strawberry crop.

Table 4 shows the no plants sown per acre in the study area. Field visit result shows that some respondents sown 45,000 plant per acre and some 40,000 plants in one acre, 41,450 is the average plants sown per acre in the field. They bought 1.30 rupees per plant and the average yield per acre is 10,483.33 packets and packets weight is approx 450grams.

Table 4: Shows the plants per acre sown, packets per acre price per plant

Particulars	**Average**
Plant sown per Acre	41450
Per plant price	1.39
Packets Per Acre	10483.33

Figure 1 shows the statuses of strawberry growers, therefore, majority (62 percent) of the farmers were tenants. On the other hand, about 21 percent of the respondents were owners, while only 17 percent of strawberry growers were peasants.

Table: 5 Cost of production per Acre on strawberry Production (Rs./acre)

Particulars	**Average Cost**
Land Preparation	12033.3
Seedling cost	57583.33
Planting/ Rumbo	2041.66
Irrigation	10780
Weeding and Hoeing	5906.66
Fertilizer application	19703.32
Plant Protection	15933.33
Marketing Cost	
Harvesting (Picking, Handling and Packing)	27383.32
Packing Material	60404.166
Commission Charges	17220
Transportation Charges	14850
Total Production Cost	**244173.25**

Results show in table 6 about cost of production per acre on strawberry including fixed and variable costs. Estimated cost per acre on land preparation on strawberry was Rs.12033.3 .It observed that the seedling cost was very high due to transported from northern are at Rs 57916.66 and planting cost estimated at Rs.2041.6 per acre. Strawberry plant needs water every fifth day for a month then 15 day of intervals for 2-3 times so it was observed that average irrigation intervals was 10.633 cost at Rs.10,780 per acre weeding and hoeing estimated average cost at Rs.5906.66 in the study area. It was observed that average cost incurred by the farmers on fertilizer Rs. 19,703.32 and similarly plant protection cost estimated average at Rs.15933.33. Marketing cost of strawberry was estimated at Rs.119, 857. 48 per acre, which includes, Packing material, handling and packing, commission charges and transportation cost. Production cost of strawberry was estimated at Rs. 244173.25 per acre in the study area.

Table: 7 Yields, Price, Total Revenue, Expenditure, Profit, Input-Output Ratio and Benefit Cost Ratio of Strawberry.

Particulars	**Average**
Yield: Packets/acre	10483.33
Price: Rs./packet	54.73
Total Revenue Rs./acre	574025
Expenditure: Rs./acre	244173.25
Net Income: Rs/acre	329851.75
Input-output ratio Rupees	1:2.35
Benefit cost ratio Rupees	1:1.35

Above table results specify that average yield received by strawberry grower was 10483.33 packets per acre. The average price per packet is 54.73 rupees in Khairpur Mir's field. Total revenue received by producer was Rs.574025 per acre. Net income of strawberry growers

was Rs.235831 per acre. Input-output ratio of growers stood at 1:2.35 it means if they invest 1 rupee they get 2.35 returns on it.

Problems faced by the strawberry growers in the study area

It was observed that not availability of canal water ranked first this problem also raise the cost of production while the poor road infrastructure problem is ranked 2nd in the list. lack of technical information of fruit production affecting the total output therefore effective parameters should be taken to minimize these problem which are motioned below.

Table 8: Problems faced on Strawberry production

Particular	Frequency	Rank
Not availability of Canal Water.	60	1st
Poor Road infrastructure	52	2nd
Unavailability of samplings locally	52	2nd
Lack of technical information of strawberry production	50	3rd
Commission charges	40	4th
No cold Storage	38	5th
No Local Market.	32	6th
Packing material	30	7th
Lack of handling during packing/ not skilled labor	28	8th
Not aware about verity of straw berry	27	9rd
Too Much use of Chemical input may cause Environmental Degradation.	18	10th
Increase mortality rate of seedling due to long distance.	15	11th
Cold Weather.	10	12th

Above problems were faced by respondents while cultivating strawberry in district Khairpur Mir's shown in (Table: 8). The data indicate that 100 percent of respondents face lack of irrigation water, 86.6 percent complaining for poor road infrastructure this may affects the quality of fruit because strawberry is highly perishable, as well as non-availability of saplings at local market, this is increasing the cost of the local growers.

About 83.3 percent respondent had lack of technical information of strawberry production, it was also revealed that about 66.6 percent respondents facing high commission charges. No cold Storage was at 5th Rank with 63.33 percent.

In fact there was no local market availability was at 6th rank it was also a serious problem for grower with 53.33 percent. Packing material also issue for growers because timely not availability cause damage and affects the quality of strawberry resulting decrease in gross income was at rank 7th with 50 percent and lack of handling during packing was at rank 8th with 46.66 percent. It was also observed that 45 percent of respondents not aware about verity of strawberry. Too much use of chemical inputs may cause environmental degradation it is strongly suggested to take effective measures to save land degradation like proper production technology, training sessions, guidelines, extension services it was at rank 10th with 30 percent. Increase mortality rate of seedling due to long distance was at 11th rank with 25 percent and cold weather some time at 12th rank with 16.66 percent.

Conclusion and Suggestions

In Sindh Khairpur Mir's district has the central position to producing strawberry. Strawberry is the short-term rabbi crop among fruits and is the main sourer of income of farmers in the study area. The majority of respondents were middle age persons in the study area average

age was 43.25 years. Literacy rate was 75 percent in the study area that includes education level between primary to graduate while 25 percent of respondents were illiterate. Respondents have an average 3.08 years of strawberry growing experience, it was also found that 56.66 percent respondents have 3-5 years of experience and 23.3 percent have 6-10 years of experience of strawberry cultivation this study also revealed that 20 percent of farmers had their first season or second in strawberry growing .Agriculture is the main source of income of the respondents in the study area.

Cost of production per acre on strawberry including fixed and variable costs. Estimated cost per acre on land preparation on strawberry was Rs. 12033.3. It observed that the seedling cost was very high due to transport from northern are at Rs 57916.66.33 and planting cost estimated at Rs.2041.66 per acre. Strawberry plant needs water every fifth day for a month then 15 day of intervals for 2-3 times so it was observed that average irrigation intervals was 10.633 cost at Rs.10,780 per acre weeding and hoeing estimated average cost at Rs.5906.66 in the study area. It was observed that average cost incurred by the farmers on fertilizer Rs. 19,703 and similarly plant protection cost estimated average at 15883.33. Marketing cost of strawberry was estimated at Rs.119, 606.166 per acre, which includes, Packing material, handling and packing, commission charges and transportation cost. Production cost of strawberry was estimated at Rs. 244173.25 per acre in the study area.

Through this study analysis beside all marketing cost grower also pay high costs on commission charges. Total cost of production incurred in strawberry was estimated at Rs. 244173.25 Per acre. The average yield received by strawberry grower was about 10483.33 packets per acre, per packet weight was about 450 grams and average price per packet was Rs. 54.73 in the study area. Through this study, it observed that farmers availed the cost-benefit ratio of (Rs. 1:1.35). .Input-output ratio of growers stood at (Rs. 1:2.35)

The data indicate that 100 percent of respondents face lack of canal water, 86.6 percent complaining for poor road infrastructure this may affects the quality of fruit because strawberry is highly perishable,83.3 percent respondent had lack of technical information of strawberry production, it was also revealed that about 66.6 percent respondents facing high commission charges . No cold Storage was at 5^{th} Rank with 63.33 percent. No local market availability was at 6^{th} rank it was also a serious problem for grower with 53.33 percent. Packing material also issue for growers because timely not availability cause damage and affects the quality of strawberry resulting decrease in gross income was at rank 7^{th} with 50 percent and lack of handling during packing was at rank 8^{th} with 46.66 percent. It was also observed that 45 percent of respondents not aware about verity of strawberry. Too much use of chemical inputs may cause environmental degradation it is strongly suggested to take effective measures to save land degradation like proper production technology, training sessions, guidelines, extension services it was at rank 10^{th} with 30 percent. Increase mortality rate of seedling due to long distance was at 11^{th} rank with 25 percent and cold weather some time at 12^{th} rank with 16.66 percent.

Recommendations

- After conducting research and analysis of the results it recommended that strawberry is the highly perishable commodity the growers imparted with training of handling and packaging of the harvested crop and it is also recommend to provide cold storage to save the quality of strawberry before marketing.
- More than 80 percent of the growers have highlighted that they were collecting saplings from far flung areas like swat valley, therefore there is need to develop saplings locally. This also helping in timely availability of seedling and avoid loss like fears of increasing mortality rate of strawberry seedling due to the 2000km long distance.
- There growers had no proper training regarding the marketing margins. Thus government should take efforts to make this fruit more professional and more profitable by providing training sessions on technical side, proper production technologies and also on growing strawberry with new technology and save the fruit from Post-harvest losses and wastage.
- As it was highlighted by strawberry growers that this fruit crop is high capital intensive, therefore government through commercial banks to introduce agribusiness credit facility especially for strawberry growers as financial support.

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