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RESEARCH ARTICLE

COST AND PROFITABILITY ANALYSIS OF CHERRY PRODUCTION: THE CASE STUDY OF DISTRICT QUETTA, PAKISTAN

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ABSTRACT

This project had been conducted in Quetta, Balochistan which is one of Pakistan's most important cherry production areas, for the aim of organic cherry production opportunities project, started in 2016. The main scope of this study is to determine whether cherry production is rational when compared with unit cost and net return per unit, and also to provide suggestions by using data obtained from cherry farmers in Balochistan district of Quetta using face-to - face survey method. The research included Pishin, Ziarat, Zhob and Loralai that are adjacent to the district of Quetta. The sample size for the study is calculated using a proportional sampling formula that takes into account 90 per cent confidence interval and 10 per cent error margin. Accordingly, the research has included 62 farmers. The data in this study was from the production of cherry in 2016 through 2019. Firstly, this analysis revealed socio-economic characteristics of cherry farmers. Then economic analysis was carried out on cherry production. Yield per hectare and per tree, marketing structure and farmer prices, variable and fixed cost per hectare, and net profit per hectare, were determined at this stage of the study. The results from this study showed that cherry production in Pakistan is more competitive and a sustainable activity.

KEYWORDS

Cherry Production, Quetta, Socio-economic characteristics, Economic Analysis, Profitability Analysis.

1. INTRODUCTION

Cherry is a fleshy fruit of stone that belongs to the Rosaceae family genus Prunus. Most of the edible cherries are derived either from Prunus avium, wild cherry (sometimes called sweet cherry), or from the sour cherry, Prunus cerasus. Sweet cherries are grown on a commercial scale and sour cherries are known as the cooking cherries. Cultivated cherries have a narrow genetic base; the sour cherries in particular, and the varieties within a group, are all similar. There are different types of Heart and Bigarreaus in the sweet cherry; cardiac forms are smoother and juicier than Bigarreaus. There are some cherry varieties that are grown not for their fruit but for their esthetic and decoration purposes and some cherry trees are prized for their wood. Cherries hold a high nutritional and medicinal significance. Cherry berries consist of high content of anthocyanin (red pigments) that decreases pain and inflammation and helps with cardiac disease and diabetes.

According to the data published by the United States Department of Agriculture, its nutritional value per 100g (3.5 oz) is equal to 60 kcal (260 kJ) energy; Carbohydrates 16g and Sugars 13g; dietary fiber 2g; Fat 0.2g; protein1.1g; vitamin C 7mg and Iron 0.4mg. Annually total world production of cultivated cherry fruit during 2007 was about two million tones. Currently, overall world cherry production is 4.9 million tons. Around 42% of world production originated in Turkey, Europe and around 14% in the United States. According to Chile's Department of Agricultural Policy Research, in 2018 cherry exports exceeded 180,000 tons, with a staggering growth of up to 126%. Iran is producing 398,140 tons annually. Major cherry producing countries include Turkey, USA, Iran, Uzbekistan, Chile, Italy and Russia as shown in Figure 1. In developing countries, cheery yield is 4 tons per acre, while in advanced countries it is 12 tons per acre due to high-density plantation.

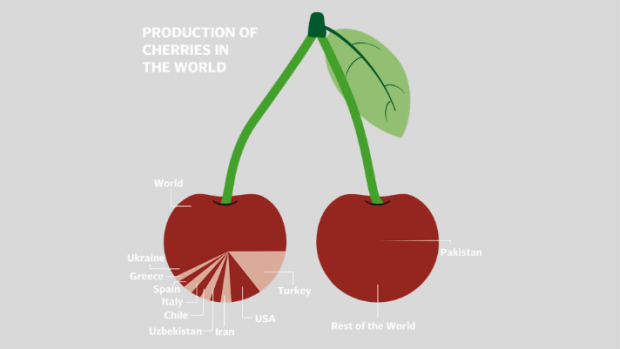

Figure 1: Cherries production in the world

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Cherry is cultivated in Pakistan, but little is known about this exotic fruit for lack of verifiable data. In Pakistan, cherry cultivation is successfully being done at temperate zones including Quetta, Pishin, Ziarat, Kalat, Zhob Mastung, Loralai, Swat and Murree. According to the UN data, Pakistan produces a little over 2,000 tons of cherry per year, while its share in exports is zero.

Cherry is grown in Pakistan but for lack of verifiable evidence, little is known about this exotic fruit. Cherry cultivation in Pakistan is accomplished successfully in temperate zones including Quetta, Pishin, Ziarat, Kalat, Zhob Mastung, Loralai, Swat and Murree. According to UN data, Pakistan produces a little more than 2,000 tons of cherry per year, while its export share is nil.

However, according to farm experts and traders, the annual production of cherry is much higher, but due to lack of recorded data, they do not have the exact figures. The sale quantity is approximately 20 tons of cherry per day during the season. Pakistan ranks 46th in the world with only 0.1 per cent production share (Figure 1), harvesting 2,067 tons of cherry in 2017 (Figure 2).

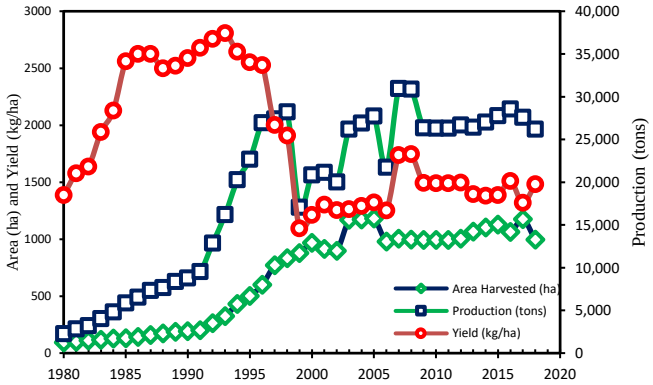


Figure 2: Annual area harvested, yield and cheery production of Pakistan

According to United Nations Food and Agriculture dataset in Figure 2, it is obvious Pakistan's cherry production is too little to export however, Pakistan can grow much more than it is currently growing. Farmers in Ziarat and Kalat, who have traditionally been cultivating apple and apricot, are now switching to cherry (FAOSTAT, 2019). Good quality cherry is cultivated in Kalat, Ziarat and Khanozai areas. The best thing about Pakistani cherry is that it is 100 per cent organic. Cherry is also grown in parts of Baluchistan on about 611 hectares on commercial basis with an annual production of about 1,563 tones (Govt. of Balochistan, 2000- 2001). Quetta region ranks first among the cherry producing region in Pakistan. According to the data of the same year, Quetta region produced 47% of the total cherry production (Pak. Bureau of Stat., 2019). According to the data 2017, about 11% of Baluchistan cherry production was in Loralai. Other leading areas in cherry production are Pishin (18%), Ziarat (10%) and Zhob (14%).

There are three kinds of rootstocks used for the propagation of cherry. They are Mahaleb, Colt, Mazzard and Mahaleb. The most commonly used mazzard rootstock is one. Mazzard roots are equally tolerant of wet, poorly aerated soils as the roots of peach, almond or apricot. Formerly, Mahaleb rootstocks were collected from wild trees in France and Italy. This rootstock is useful for nursery people but is not tolerant of damp soils, so trees on it do not survive if trees on mazzard rootstocks in the same circumstances. Mahaleb seedlings are form and growth highly variable. Colt rootstock is a clonal rootstock developed in England for cherry use. This rootstock is used in this manner rather than mazzard rootstock as it is resistant to plant-borne diseases and poorly aerated plant.

The 50 cherry varieties commonly grown in Pakistan; 0900 Ziraat, Earlyburlat, StarksGold, Lambert, Van, Stella, Gılli and MertonLate (Sansavini and Lugli, 2005). Quetta, Balochistan is famous for its early and quality cherry. Research has been conducted so far for the economic analysis (Piagnani et al., 2002; Akcay and Uzunöz, 2006; Yilmaz et al., 2017; El-Shazly et al 2013; Seufert et al., 2012; Demircan et al., 2006; Aydın et al., 2016; Litskas et al., 2011). However, these researches should be repeated in different regions over time and suggestions should be produced for the solution of producers' problems. No significant cherry research was conducted in Pakistan yet. A study to be carried out in Quetta district to reveal the economic aspects of cherry, and it can make important contributions in terms of revealing the effective factors in the entrepreneurs' orientation to this area and developing cherry production. In this research, the cost and profitability analysis of cherry cultivation was made in the light of the data collected by the survey method from the producers, some problems were identified, and some suggestions were made.

2. Study Area Description

In Baluchistan cherry is grown on about 897 hectares on commercial basis with an annual production of about 1,507 tones (Government of Balochistan, 2002-03). In Pakistan Quetta, Pishin, Kalat, Zhob, Mastung, Loralai and Swat are ideal temperate zones for commercial cherry growing. In Balochistan cherry is cultivated mainly in Quetta, Ziarat and Kalat districts. The Ziarat cherry is famous throughout Pakistan (Ali et al., 2003-04). In this study, Quetta, Pishin, Ziarat, Zhob and Loralai are selected for cost and profitability analysis of cheery production. The study area map is shown in Figure 3. Balochistan province covers 43.6% area of Pakistan and largest city is Quetta. Physically, Balochistan is an extensive plateau of rough terrain.

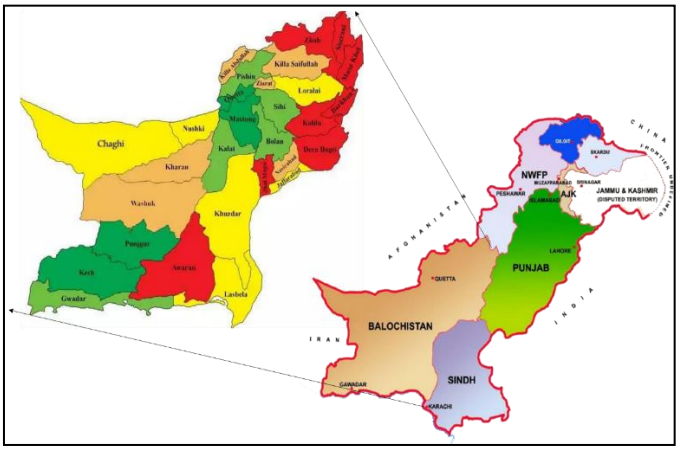
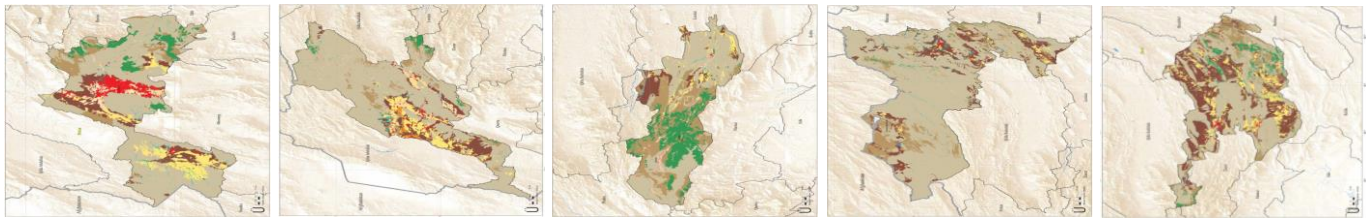


Figure 3: Study area location map

Land cover distribution of selected districts is given in Table 1. Quetta has varying summer and winter temperatures and irregular rainfall. Summer season is delightful while winter can be bitterly cold in Pishin. Ziarat temperature often falls below 0°C in winter while summer climate is refreshingly cool with most rainfall. Zhob climate is generally cold with heavy rainfall during summer. Zhob River is used for irrigation. Loralai district have very cold windy winter while summer is mild. The districts mainly produce wheat, barley, cumin, chickpea, peas, lentil, sorghum, millet, maize, mung, mash, beans, tobacco, cotton, fodder, and vegetables. Major fruits include apple, apricot, almond, grapes, peach, plum, pomegranate, pistachio and cheery.

Many farmers are now avoiding fruits like apple as it requires a lot of water and is attracting some diseases too, so farming trend is switching to cherry production and that the potential to increase the production is huge. The cherry season in Balochistan lasts for 40 to 60 days, between May and June. If Pakistan starts exporting cherry to China, they would have fresh cherries from Gilgit-Baltistan (G-B) and Balochistan for almost four months. According to the Crop Reporting Services of Provinces in Pakistan, only Balochistan produces cherry in an area of 978 hectares and produce 1,629 tons of cherry (2006-2007). Since 2001, this quantity has not moved beyond this limit except 2004-2005 when a small fragment had reached to the height of 2,080 metric tons.

Table 1: Land cover distribution of selected study districts of Balochistan



Selected Districts	Land cover classification, color and percent distribution									
	Orchards	Crop rainfed	Forest-natural trees and mangroves	Natural vegetation in wet areas	Range lands-natural shrubs and herbs	Built up	Bare areas	Bare areas with sparse natural vegetation	Wet area	Crop in floodplain and irrigated
Quetta	1.1%	9.0%	5.5%	1.5%	7.5%	4.6%	9.9%	59.0%	0.0%	1.8%
Pishin	2.2%	8.3%	1.7%	1.0%	6.3%	1.3%	10.3%	67.5%	0.1%	1.4%
Ziarat	1.7%	4.8%	16.8%	0.8%	26.0%	0.4%	6.6%	42.7%	0.2%	0.0%
Zhob	0.1%	2.0%	0.6%	1.7%	11.1%	0.2%	11.8%	72.1%	0.2%	0.1%
Loralai	0.4%	9.9%	4.4%	1.4%	12.3%	0.7%	26.3%	44.3%	0.3%	0.2%

2.1 General characteristics of cherry production

Pakistan can grow much more than it is growing nowadays. Reason being the low cultivation cost compared to traditional apricot and apple fruits, cherry cultivation costs are nearly zero. The only cost is picking and packaging the fruits. Cherry's biggest advantage is that it needs a very short period of time to grow. Balochistan's cherry season lasts from 40 to 60 days, between May and June. The season begins in the last week of April while at G-B and continues until the first week of July. Cherry 's got a very slight shelf life. To avoid financial losses, farmers try to sell their produce as quickly as possible. This is the main reason why our farmers do not see cherry as a preferable option. After harvest Cherry 's life is hardly three to four days. In Pakistan, the dilapidated road infrastructure means that nearly 20 to 30 per cent of cherry is wasted after harvest. A vast majority of cherry growers (about 71 percent) are small-scale farmers who sell their goods to wholesalers who supermarkets because they cannot afford to ship their crops to the markets where they can get a decent price.

Lack of cool chain operations, marketing information system, packaging and manufacturing facilities and adding value also contribute to the cherry export hurdles. Delivery system do not have cool chain refrigerators that could be used to bring tinned cherry, which is why farmers depend only on small markets where they do not get the right quality. The first step can be to package. Growers should be provided with clamshell packaging which guarantees security, visibility, versatility and above all zero fraud. Apart from wrapping, value-adding is another important factor. Cherry is a delicate and easily perishable fruit but with fresh and crispy taste and aroma, the frozen, pre-cooled, packaged cherries have a shelf life of over a few weeks. The quality of the cherry fruit's edible flesh differs from region to region, but buyers prefer value added. The customer buys with eyes, which is why the packaging and the fruit appearance make a difference on the export market and the product's sale. The experts agree that if Pakistan decides to export to China, cherry production would have to be given a significant boost. There are things farmers need to think for, such as pollination, flowering and fruiting. There are also some issues that growers need to take care of as they influence the growth.

Climate and soil: High chilling hours are needed for sweet cherry. It is successfully grown in areas between 2,000 and 2,700 m above sea level, during winters, requiring 1,000-1,500hr chilling period. A well-distributed annual rainfall of 100-120 cm is ideal, but high rainfall during flowering results in strong blossom wilting. At the time of maturity heavy rains may cause a fruit cracking and producer may face a great loss. Heavy rains may cause a negative impact on its quality in the shape of fruit cracking at the time of maturity. Deep sandy loam soil quality with pH ranges from 6.5-7.0 considers ideal , which is quite helping to grip the moisture during summer. The cherry plant is very sensitive to water logging, so it is important to avoid heavy soil. The sweet cherry tree must experience enough winter chilling to properly break the dormancy and bloom in the summer over a relatively few days.

Planting: Growing cherry is confined to hilly areas on sloppy lands. The plantation is performed on contour or terrace system. Nonetheless, square layout method for setting up an orchard is recommended in valley areas. The distance to planting depends on the fertility of the soil and on the rootstock used. Trees can grow to 12 m above sea level and with good management. The cultivation of cherry produces significant crops from around 6 years and can continue to produce fruit for about 100 years. For plants reared on seedling rootstock, a spacing of 6 m x 6 m is suggested. One month before planting, pits of 1 m x 1 m x 1 m size are dug and filled with a mixture of 35-40 kg manure from the farmyard and half kg super phosphate. The pits are filled at last up to 15 cm above the ground level.

Pest management: Several diseases, insects, animal pests and environmental conditions may lead to severe loss of sweet cherry. The most serious complications with the disease are brown rot, cherry leaf blot, and bacterial canker. Common insect plagues include borers of cherry aphids, plum curculio, cherry fruit fly, and peach tree. Unwashed cherries or dump them into a shallow pan in a single layer of plastic containers, then lined with plastic wrap to prevent bleeding. Store the cherries in the refrigerator and should last up to a week in good condition. Trees are slightly pruned until the third season after they come into production. Sweet cherries are qualified to become a central leader or a changed group of central leaders. Annual pruning is used to grow and sustain tree size and form during dormancy. Pruning also opens the canopy for better coverage of the pesticides. Harvest and storage: Hand-harvested fresh market sweet cherries leaving the pedicels intact. Color and the use of a refractometer to calculate the number of soluble solids (sugar) will determine fruit maturity. Cherries should have removed field heat immediately following harvest. As the fruit has a very short shelf-life, it is important to push the cherries to market as early as possible. Sweet cherries can be kept at 32 ° F for a maximum duration of 10 to 14 days.

Rural farmers have cultivated the mountain patches much wisely and have produced a wide variety of heavenly fruits in the area. However, over the decades, mountain farmers have been suffering from poor farm to market infrastructure, agricultural technology, fertilizers, pest control services, soil-testing facilities, marketing agencies, agricultural financial services, packaging and irrigation issues etc. Moreover, the absence of cold storages and air-conditioned transportation facilities for fruits like cherries

increase the risks of damage to fruits. There is also a need to ensure supply of fertilizers to the fruit growers at subsidized rates. There is a need to encourage the local farmers to form alliances and improve their production and marketing strategies to optimize the potential of the area to reflect in the national annual revenues and GDP. Government is doing efforts in this regard to improve the livelihood of the mountain farmers in the years ahead. These services offer a great agro-ecological potential to scale up the cherry production and a variety of fruit and crops that can positively influence the existing rural poverty situation in the area.

3. Materials and Methods

This research study was carried out in Balochistan province which is important in terms of cherry cultivation. The study area included Quetta district and its neighborhoods that are included in the scope; Pishin, Ziarat, Zhob and Loralai. According to the data of Quetta District Directorate; A total of 632 producers, including 240 in Pishin, 112 in Ziarat, 115 in Zhob and 165 in Loralai, were registered in the Farmer Registration System. In the research, it was decided that it would be appropriate to interview some of them by sampling method instead of meeting with all producers. For this purpose, the following proportional sample volume formula was used (Newbold, 2013).

$$n = \frac{Np(1-p)}{(N-1)\sigma_{px}^2 + p(1-p)}$$

In the formula:

n = Total number of producers, p = Cherry producers' rate (0.5 for maximum sample volume),

N = Sample volume,

σ_{px}^2= Variance of the ratio.

As a result of the calculation based on 90% confidence interval and 10% margin of error, the sample volume was determined to be 62. In determining the number of producers to be discussed in each neighborhood, the shares of the neighborhoods within the total number of producers were taken as basis. As a result of the process, it was revealed that 19 in Pishin, 10 in Ziarat, 20 in Zhob and 13 in Loralai should be discussed. In determining the producers to be interviewed, random numbers table was used. The research is based on the data for the four cherry production periods (2016-19). Surveys of the research were carried out in January 2020.

In the analysis of the data obtained, primarily the socio-economic characteristics of the enterprises were revealed. Businesses at this stage; the age and education of the producers were examined in terms of family population, labor force and use, land use, and capital. Businesses were first handled as a whole, and then cherry branch was examined independently. In the research, yield in cherry production, prices obtained by the producer, input quantities used and production costs, gross and net revenues obtained has been revealed. Cherry production costs consist of variable and fixed costs. Variable cost elements; labor and hammerhead costs, material (fertilizer, medicine, etc.) costs, and fixed cost items; interest, sum of management, land rent (5% of the bare land value) and facility costs are the amortization share. In calculating the interest reserve for the sum of expenses, T.C. Half of the annual interest rate (8%) applied for crop production loans was considered (Yilmaz et al., 2017; Barrett et al., 2017). 5% of the value of the bare land was taken as land rental. In calculating the management provision, 3% of the total expenses were taken.

In determining the depreciation share of the facility period; Expenses incurred in the establishment period were accumulated at the end of the fourth year using an 8% interest rate, and then the value found was divided into economic life (30 years). In order to calculate net income from cherry, total production costs are subtracted from gross production value. Labor costs were calculated by adding family labor provisions to the wages paid for temporary workers in enterprises. In calculating the material costs, the input amounts used by the producers and the current prices paid for these inputs are taken as basis. In order to ensure homogeneity in the calculation of machine hammer costs, unit land processing fees (tool rental) in the region are also taken as basis for producers using their own tool-machine. Indeed, this method has been applied in many studies (Ucar et al., 2017; Singh et al., 2018).

4. Results and Discussion

Information on the socio-economic characteristics of the companies producing cherries is presented in Table 2. The average age of the producers was 37.80 and the average training period was 2.5 years. The ages of the producers vary between 23-63, and the training period is between 5-16 years. The average household size is 5.3 people. Men constitute 57.65% of the total population. The distinctive total population; 4.2% of them are 0-6 years old, 8% are 7-14 years old, 68.3% are 15-49 years old, 18.3% are 50-64 years old and 1.2% are 65 years old and older.

Table 2: Socio-economic characteristics of businesses

Average age of producers	37.80
Average training period of producers (years)	2.5
Average household size (person)	5.3
Using family labor potential (%)	71.3
Average land size (ha)	3.1
Average number of parcels	5.3
Equity ratio (%)	85.7

The average family workforce potential was 2.93 as the Male Business Unit and 879 as the Male Business Day (Yilmaz et al., 2017). 61.77% of the family workforce potential is male population. As for ages; 77.82% of the population is 15-49 years old, 16.38% is 50-64 years and 5.80% is 7-14 years old. 67.90% of the family workforce potential is used in businesses. The average land width was 3.2 hectares. The average number of parcels was determined as 5.3 and the average parcel per person as 5.3 hectares. 85.54% of the total operating land consists of property, 13.37% are jointly operated and 1.09% are rented land. Land assets constitute 95.54% of total assets. Land assets account for 69.65% and assets for 23.37%. 90.51% of the liabilities constitute equity.

The average cherry production area was 2.4 hectares in the examined enterprises. The number of trees per enterprise was 801 and the number of trees per hectare was 340 (Table 3). In a study conducted, the number of trees per hectare was determined to be 450 (Seufert et al., 2012). It has been determined that Salihli (0900 Ziraat) variety is used in the studied enterprises, followed by Napoleon, Early Burlat, Sapıkısa, Kırdar, Bing and Macesse varieties respectively. Average cherry per hectare in enterprises yield was calculated as 9447.3 kg and average cherry yield per tree as 30.2 kg (Table 4). When cherry yield per hectare was examined in previous studies; 1400 kg (Aydın et al., 2016) and 738 kg (Seufert et al., 2012) and 1600 kg (Litskas et al., 2011).

Table 3: Number of Cherry growing areas and trees

Total cherry land (ha)	151
Average cherry land per enterprise (ha)	2.4
Total number of trees (pieces)	50221
Average number of trees per business (pieces)	801
Number of trees per hectare (pieces)	340

Table 4: Yield per hectare and per tree in cherry growing

Total cherry production (ton)	1403.87
Cherry production per enterprise (ton)	22.64
Cherry yield (kg/ha)	9447.3
Cherry yield per tree (kg/tree)	30.2

The research found that cherry producers mostly market their products to wholesalers, traders, exporters and processing companies. There are also manufacturers that market products to greengrocers and peddlers. Some manufacturers market their products directly to consumers (Figure 4). According to the research results; The average price of cherries received by the producers was determined as 934.71PKR/kg. The highest sales price was determined as 1134.36 PKR/kg and the lowest sales price was 567.18 PKR/kg. Fruit type and local conditions play an impressive role in determining the establishment period in fruit growing (Ucar et al., 2017). In this study, it was deemed appropriate to evaluate the facility costs as four years in line with the research conducted in the region. Facility costs; labor and hammer costs, material costs, the total interest costs, management allowance and land rental (5% of the bare land value).

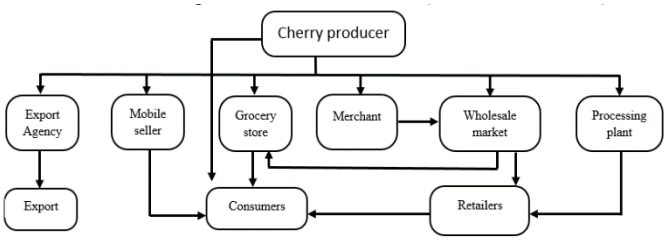


Figure 4: Cherry marketing channels in study site

When the facility costs were analyzed, it was seen that the most important cost elements were the tillage, sapling and bare land value (Table 5). Production does not take place in the first three years as cherry trees have not yet produced fruit. In the fourth year, the yield per tree was calculated as 12.5 kg and the total production as 415 kg. In cherry cultivation in the region, the last year of the plant period, that is, in the fourth year, the product was started to be purchased and the gross production value to be obtained with the amount of the product purchased can mostly cover the facility cost of that year. Cherry production period costs; labor and towing power costs consist of the sum of expenses, management provision, land rent (5% of the value of the bare land) and the cost of the facility. When the production costs were analyzed, it was seen that the most important cost elements were the equivalent of land cultivation, harvest, water and bare land value (Table 6).

In the research, it was determined that 46.43% of the total production costs constitute variable costs. When the interest provision of variable expenses is added, this rate rises to 48.29%. On the other hand, the value of agricultural lands in Quetta can be higher than other districts due to its proximity to the city center and its industrial zone. For this reason, 5% of the bare land value is also an important expense factor and decreases the rate of variable costs. The share of variable expenses in researches conducted in different studies was examined; 55%, 65.44%, 72.19%, and 62.24% and 63.73% (Shazly et al 2013; Seufert et al., 2012; Piagnani et al., 2002; Litskas et al., 2011; Aydın et al., 2016). In the research, considering the production costs per hectare and the yield level per hectare in cherry cultivation, the unit cherry cost was found to be 934.71PKR/kg (Table 7). In this way, it turns out that 37.43% of the average cherry price received by the producer is allocated to expenses. This rate; It was determined as 53.91% and 50% and 48.46% (Seufert et al., 2012; Aydın et al., 2016; Litskas et al., 2011). Gross production value per hectare from cherry cultivation was calculated as 8830480.94 PKR and net income per hectare was calculated as 8400233.26 PKR (Table 7). In the research, the share of the total production cost in the gross production value is 37.38%. It was calculated as 48.47% and 53.41% and 50.00% (Litskas et al., 2011; Aydın et al., 2016; Seufert et al., 2012).

Table 5: Plant costs in cherry growing (PKR/ha)

Cost elements	Field activity	Cost elements			
		2016	2017	2018	2019
Labor and towing costs	Land cleaning and leveling	20452.44	-	-	-
	Soil cultivation	36451.40	20940.21	20940.21	20940.21
	Pitting	16498.08	1701.53	-	-
	Planting	18528.57	3403.07	-	-
	Fertilization	13639.50	13639.50	13639.50	13639.50
	Irrigation	18328.93	18328.93	18328.93	18328.93
	Hoeing	6806.14	6806.14	6806.14	6806.14
	Pruning	-	8121.99	8121.99	8121.99
	Harvest	-	-	-	11981.23
	Fertilizer	17019.88	6908.23	6908.23	6908.23
Material cost	Water (electricity, diesel oil, etc.)	19501.85	9195.09	9195.09	20304.98
	Sapling	190571.84	51046.03		
Total variable costs (TVC)		35779.86	14009.07	11797.08	10678.38
Fixed costs	Total interest on costs (4%)	1431.10	560.37	471.89	427.20
	Management provision (3%)	1073.33	420.17	353.92	320.34
	Bare land value (5%)	17015.34	17015.34	17015.34	17015.34
Total fixed costs (TFC)		19519.77	17995.88	17841.15	17762.88
Total production costs (TFC+TVC)		55299.64	32004.95	29638.23	28441.26

Table 6: Production costs in cherry growing (PKR/ha)		
Cost elements	**Field activity**	**Cost (PKR/ha)**
Labor and towing costs	Soil cultivation	38080.34
	Fertilization	11831.33
	Irrigation	17319.35
	spraying	14803.35
	Pruning	11926.62
	Harvest	23338.24
	Transport	19794.52
Material costs	Fertilizer	449080.72
	Spray	10411.12
	Water (electricity, diesel oil, etc.)	43679.52
	Packaging (safe, etc.)	2867.65
Total variable costs (TVC)		199776.00
Total interest expense (4%) Management provision (3%) Other costs (5% of bare land value)		799.04 599.39 17015.34
Installation costs depreciation share		4633.39
Total fixed costs (TFC)		23047.17
Total production costs (TFC+TVC)		43024.77

Table 7: Unit product cost and net income in cherry growing	
Cherry yield (kg/ha)	9447.3
Total production cost (PKR/ha)	430247.68
Unit cherry cost (PKR/kg)	934.71
Gross production value (PKR/ha)	8830480.94
Total production cost (PKR/ha)	430247.68
Net income (PKR/ha)	8400233.26

5. Conclusion

Research results show that cherry cultivation can be done economically in the region. Therefore, it is possible to say that it is an important alternative for enterprises that will invest in agriculture and fruit growing. However, various problems are encountered in cherry production and marketing in the region. The main problems faced by cherry producers in production are; Diseases and pests encountered in cherries, high prices of production inputs (fertilizer, medicine, diesel oil, etc.), low quality of medicines, lack of technical knowledge of producers, inefficiency of agricultural institutions in the region, high irrigation costs, high credit terms and payment conditions in loans high interest rates, changes in climate conditions, disruptions in contract production and insufficient support for rent. The problems they face in marketing are; cherry is a perishable product, excess transportation costs due to the distant state, price fluctuations, packaging costs, residue levels in export, low income due to excessive interruptions and disruptions in state payments. In the light of the results obtained in the research, some suggestions have been made below in terms of solving and developing the problems of cherry cultivation as well as directing and encouraging entrepreneurs in this field:

Technical and economic conditions should be analyzed well by the manufacturers and entrepreneurs. Producers and entrepreneurs should be encouraged on organic and good agricultural practices. Planting ranges differ in the plants studied. Mostly seedlings are planted close to each other. Frequent planting increases the cost as it will cause more labor use especially during pruning, spraying and harvest periods. Therefore, producers should be informed about planting seedlings at standard intervals. In order to prevent frost damage, the species and variety should be determined in the garden facility in accordance with the regional ecology. In addition, cherry trees should always be kept healthy and necessary cultural procedures should be done without disruption. Producers should be informed about the use of inputs by publishing works. Extending the integrated and biological control in cherry production and informing the producers on this issue will be important for the protection of the environment and human health. Workforce planning should be done in businesses. Irrigation cooperatives in the region should be developed. Varieties suitable for the demand of the food industry should be grown in the region. In order to prevent the producers from being affected by the low prices, it should be ensured that the cold storage depots where they can hold their products are installed in the region. Producers should be informed about export and the use of production methods suitable for export should be expanded.

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Conflict of Interest

Authors showed no conflict of Interest at any point for this manuscript

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Author Contributions

Author 1: *Rana Shahzad Noor* contributed in Conceptualization of research study, Design & Development of the experiment, Data collection, Formal Analysis, Investigation, Methodology, Visualization, writing an original draft, reviewed, supervised and Write-up editing.
Author 1: *Fiaz Hussain* contributed in Data collection, Formal Analysis, Investigation, Methodology, Visualization and Writing an original draft.
Author 3: *Muhammad Umair* contributed to perform formal analysis of this manuscript.

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