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ECONOMICS AND MARKETING OF OLIVE IN PUNJAB, PAKISTAN

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ABSTRACT

The recent re-emergence of agrarian crises in Punjab has again drawn the attention of policymakers towards the viability of alternative crops. In this context, the study attempts production and marketing of one of the alternatives and viable crops (i.e., Olive) considered for the farmers in Punjab, Pakistan. The study was carried out in the Pothwar region of Punjab, and a total of 100 farmers were interviewed from four districts of Pothwar. The study results revealed that olive is a profitable crop since the benefit-cost ratio, net present value, and internal rate of return at a 10% rate of discount were 2.20, Rs. 263,338.00, and 31%, respectively. The findings also revealed that the channel with the least number of intermediaries was more efficient than the channels with more intermediaries. The study suggested that to take advantage of this new crop, controlled marketplaces with improved marketing facilities are needed to allow farmers to minimize their transport costs and achieve better prices for their products. Besides, linking fresh produce with agro-processing industries can go a long way in ensuring the returns from this crop.

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INTRODUCTION

Olive (*Olea europea* L.) is a tree-borne oilseed crop that grows well in subtropical climates. The oval-shaped fruits of this tree are primarily used to extract non-drying edible oil from them and eaten raw in soups, salads, pickles, and other dishes. A Mediterranean climate makes olives common in the region. Olive is gaining popularity in Pakistan because of its socio-economic value and numerous health benefits. Olive is an introduced crop in Pakistan, and its cultivation is still in its infancy stage. During the last decade, more than 8966 acres have been cultivated in Pothwar under ADP Project "Developing Pothwar into an olive valley" and 9806 acres under the Olive Promotion Project supported by the Federal Government (Akhtar et al., 2021a; Awan et al., 2012; Rehman et al., 2013). Pakistan is the fourth largest importer of edible oils with a per capita consumption of 16 kgs and meets 75% of its edible oils demand through imports. The export volume of olive oil is 1,300 tons. Total olive production is around 20 tons compared to 0.5 million tons of other edible oils (cottonseed oil/rapeseed oil/sunflower seed & canola oil) (GOP, 2021). The import bill of edible oil during the fiscal year 2020-21 was 284.546 billion rupees (2.710 billion US$) that is increasing at an alarming rate in Pakistan (GOP, 2021; Haq et al., 2021). This increasing trend is because of a continuous increase in the population and less oilseed crop production (Akhtar et al., 2019; Iqbal et al., 2019). Pakistan has potential for production as well as extraction of olive oil for consumption. The latest report by Punjab Economic Research Institute, Lahore (PERI) put forth a promising figure of 1.84 million tons: the potential capacity to produce olive oil domestically that can fetch over $ 6 billion (Tahir and Anwar, 2016). Based on information synthesized from different sources, the same report reiterates the huge production, i.e., 15.4 million hectares in Pakistan is suitable for olive cultivation. All these figures indicate tremendous socioeconomic benefits waiting to be capitalized with government & donors' thoughtful investments (Akhtar et al., 2021b).

In the past, all efforts to increase the area under other oilseed crops such as Brassica, canola, sunflower, or soybean have not resulted well because these oilseed crops replace other food and cash crops (Iqbal et al., 2019; Sumrah et al., 2021). Lands with higher productivity potential are usually allocated to traditional food and cash crops in the Province. Therefore, the area under any cash or food crop is very hard to replace with any oilseed crop. Pakistan is among the top countries on a list of most per capita edible oils consumption due to eating habits of excessive use of fats. This creates serious health issues, particularly in cities, increasing pressure on health facilities. This demand identifies new and high-quality edible oil with the maximum amount of easily digestible mono-saturated fatty acids that are not harmful

and dangerous to human health. The best fit in this context is Olive cultivation for which marginal lands can be utilized, as olive can grow successfully on these and is among the healthiest edible oils (Ansari et al., 2009).

Since the introduction of olive farming, the mindset of farming community has changed even toward enlightening productivity and sustainability in agriculture. As a result, their farm income increases, and they gain employment. Introducing Olive as a horticulture crop in Pakistan has resulted in a low yield per acre, comparing to other countries (i.e., Spain, Italy, Turkey, USA, Egypt, etc.) (Naz et al., 2019). Inadequate agronomic practices, lack of awareness of economic and market value among farmers, weak extension services, and a lack of systematic research may all contribute to this (Faisal et al., 2021; Hussain et al., 2016). Although olives are capable of being grown in the area, farmers continue to struggle with cultivating the crop. Since, farmers need to be imported from outside the production zones; the purchasing price of the runners is high.

This study was undertaken in order to develop appropriate policies for promoting this high-value crop, which is more profitable for farmers. A study was conducted to estimate the cost of production and net returns of olives, as well as to identify the various marketing channels in the study area. Finally, policy guidelines are suggested based on study findings.

METHODOLOGY

Sampling and Study Area

Study area and farm households were chosen using a multi-stage stratified random selection technique. The first step is the Punjab province as the main study area. At the second stage, the Pothwar region was purposively selected because it was the first region where the Olive project "Developing Pothwar into an olive valley" under ADP project was implemented in 2015. This region also ranked first in the Province in terms of area under olive and amount of olive production. At the 3rd stage, four districts from the Pothwar region (Chakwal, Jhelum, Rawalpindi, and Attock) were selected. In the fourth step, a total of 25 olive farmers from each district were selected (interviewed) for further consideration. To select farm households in the study area, a formula developed by Yamane (1967) was utilized, which is detailed below:

$$n = \frac{N}{(1+N.e^2)} \quad (1)$$

n = Sample size
N = Total number of olive growers
e = Margin of error, used as ±15% (0.15)

Analytical Approaches

In the case of fruit or orchard businesses, the situation is much different; establishing fruit trees is a long-term commitment. High costs and low returns characterize the first few years of such businesses. To deal with such a challenge, the following analytical methodologies were used to determine the profitability of olive farming. Fruit tree cultivation yields differ based on the age of the trees. The first few years are all about costs and modest returns. As a result, expenses and returns are assessed by discounting future benefits and costs, referred to as discounted benefits and discounted costs, respectively. The profitability of olive trees was determined using financial analysis. Two approaches, Net Present Worth (NPW) and Benefit-Cost Ratio (BCR), were utilized for this objective as discussed by (Gupta and George, 1974; Vaidya, 1991) and (Hassan et al., 2006).

Profitability Analysis

To compute profit, cost and revenue theories proposed the following formula (Mankiw, 2014; McConnell & Brue, 2005).

$$\pi_i = TR_i - TC_i \quad (2)$$

Where π_i denoted the profit of olive farmers, TRi represented the total revenue, and TCi represented the total cost of olive farmers, which was calculated as follows:

$$TC = TFC + TVC \quad (3)$$

TFC and TVC denoted total variable and fixed costs, respectively, while total revenue was computed as:

$$TR = Q * P \quad (4)$$

Where Q is the total sale of the olive oil product and P is the respective price of the oil. Following the Mehdi et al. (2016). The fixed costs paid in the production of the olive, such as the machinery purchased by the farmer, or the costs incurred in the development of the olive orchard, such as land, time, and plantation, were not included in the study. The topics have been covered over time and continue to be relevant for both traditional and modern supply chain players. The entire variable cost was separated into seven categories: land preparation cost (LPC), fertilizer cost (FC), irrigation cost (IC), plant protection cost (PPC), watch and ward cost (WWC), post-harvest cost, logistic cost, and farmer land rent (LR). These were described as follow:

$$TVC = LPC + FC + IC + PPC + \text{WWC} + PHC + LR \quad (5)$$

After these, all calculations the benefit-cost ratio of the olive farmers were calculated by the following formula.

$$BCR = \frac{TR_i}{TC_i} \quad (6)$$

The Net Present Value (NPV) of an investment is the discounted value of all cash inflows and outflows of the project during its life. The investing literature generally agrees that if a firm's goal is to maximize profit or wealth, the NPV is the right approach to analyze investment decisions (Tauer, 2002). The NPV is the total present value of future revenue and Cost of an activity (Uzunöz & Akcay, 2006). Furthermore, among the measurements of investment returns over time, the NPV better indicates project worth (Lowenberg-DeBoer and Swinton, 1997). It can be computed as,

$$NPV = \sum_{i=1}^{n} Bn - Cn / (1+i)^n \quad (7)$$

Olive Marketing Channels

Focus group discussions with various stakeholders, including farmers, agricultural extension agents, commission agents, retailers, and consumers, were held to determine the existing marketing channels.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Olive Farmers and Farm

The socioeconomic characteristics of the 100 olive farmers are shown in Table 1. Descriptive statistics for the variables utilized in the analysis are given in Table 1. The study included two types of variables: discrete choice dummy variables and continuous variables. The average age of the farmers was 52.87, with a 12.7 average year of schooling. Farmers had an average of 14.28 years of olive farming experience. The average distance between the farm and the main metropolitan market was 13.42 kilometers. It was observed that the average area under olive cultivation of the sampled farmers was 8 acres with a minimum of 0.25 acres and a maximum of 100 acres. About 35 % of farmers have access to the extension/Barani Agricultural Research Institute, Chakwal services, and 75 % have off-farm income sources. Pothwar is a barani area most people depend on other than agricultural sources of income.

Table 1. Summary characteristics of descriptive tools.

Variables	Description	Mean	Std. Dev.	Min.	Max.
Age	Age of respondent in years	52.87	8.29	30.00	74.00
Education	Years of schooling of respondent	12.7	3.15	0.00	18.00
Olive Farming Experience	Olive Farming experience in years	7.29	2.46	3.00	13.00
Distance from Market	Distance in kilometers	13.42	5.15	6.00	27.00
Olive Fruiting Orchard Size	Area in Acres	8.00	15.81	0.25	100.0
Extension agent/BARI	Dummy extension/BARI services (if yes =1; otherwise = 0)	0.35	0.47	0.00	1.00
Off-farm income	Dummy off-farm income source (if yes =1; otherwise = 0)	0.75	0.43	0.00	1.00

Source: Field survey, 2020.

Per Acre Cost of Production

Table 2 and Table 3. Shows the cost of production of olive. Table 2 shows the average cost by item for the establishment year and for other areas. The cost of starting a business is an investment that will pay off over time (Sharp and Cooley, 2004). The average yearly total cost for the first year of olive plantation establishment was Rs. 67677.81 per acre. The whole fixed cost for the next five years was divided into five categories: land preparation and olive plantation costs, fertilizer and manure, plant protection methods, Watch and Ward, and irrigation costs. The total cost of planting materials and transplantation was Rs. 46415. Fertilizer and manure cost Rs. 40271, irrigation cost Rs. 42,399, while watch ward and plant protection measures cost Rs. 90000 and 15038, respectively. Suppose we talk about the variable cost which is running year cost. The average variable cost was 75102, which was divided into seven items. They included land Preparation cost, fertilizer and manure, plant protection measures, watch and Ward, irrigation cost, harvesting & crushing, land rent. The total variable cost incurred on land preparation cost was Rs. 2568. Fertilizer and manure cost was estimated to be Rs. 16225, watch ward was estimated 18000, irrigation was 15491, plant protection measures, and land rent was 5367 and 11451 respectively.

Benefit-Cost Analysis of Olive Farmers

In the case of the current study, output is determined by the number of trees planted per acre and the amount of fruit produced by one olive tree; the average number of trees planted per acre was calculated to be 135. During the current year, the average output of olive fruit (Y) was 729 kg per acre, and the average yield of olive oil (Y) was 69 liters per acre. The cost of olive oil was 2500 PKR per litre

Gross margins were estimated by subtracting the total revenue form total variable cost, and net margins were the subtraction of the total cost from total revenue. Benefit-cost ratio was calculated as the ratio of total revenue to the total cost, and it can be seen from Table 4 that BCR is 2.20.

Financial Viability of Olive Cultivation

Costs and returns are not valid yardsticks for assessing whether or not to invest in olive production. This is because the expenses and rewards from olive cultivation are incomparable without subtracting such costs and returns. The current cost and benefit value has been assessed at 10% interest rate or discount rate. As already said, olive trees do not begin to bear fruits in early years; hence production and return from the first to four years are presumed to be zero. Output and returns were examined from the beginning of the five years onward since output was created in sufficient quantities to be marketed throughout that time period.

Table 5 represents the financial analysis of olive, which is found by calculating BCR, NPV and IRR. BCR shows those olive farmers obtaining a Rs. 2.20 against their Cost of Rs. One, which showing that investment in olive cultivation can be considered substantial and economically justifiable. Net present value was calculated to be 263,338 which shows that investment in olive cultivation is worthwhile as money received from an investment is greater than money invested. The internal rate of return was found to be 31 percent which indicates that the investment is acceptable as the IRR is greater than the market rate of interest

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Table 2. Per-acre fixed cost of production of Olive (fixed cost).

Sr. No	ITEM	No. of Operations	Price Cost in Rupees					Total
			Years					
			1	2	3	4	5	
1	*Land Preparation & Olive Plantation*							
a	Ploughing	2	841.56	754	984	900	924.36	7,883.48
b	Lay out of orchard @ 135 /plant	1	2581.25	0	0	0	0	2,581.25
c	Digging of pits and filling of 135 pits/ @ 70 Rupees	135	9450	0	0	0	0	9,450.00
d	Cost of F.Y.M @ 1250/ trolly for pit filling	2	2500	0	0	0	1250	6,250.00
e	Price of Plants & Transportation Charges Rs. 120/ Plant)	135	16200	0	0	0	0	162,00.00
2	*Irrigation*							
a	Number of tubes well irrigation	-	15	12	12	12	12	63.00
b	Irrigation Charges	-	10800	7800	7488	8124	8124	42,336.00
3	*Watch and Ward*							
a	Watch and ward (1500/M)	12 Month	18000	18000	18000	18000	18000	90,000.00
4	*Fertilizer*							
a	DAP	1.5	3925	4025	4189	4189	4200	22,628.00
b	Potash	1.5	3240	3200	3145	3258	3200	17,643.00
5	*Plant Protection Measures*							
a	Pesticides and weedicides	1	0	650	748	800	800	2,998.00
b	Hoeing 2 Times/Year	2	0	1520	1500	1500	1500	12,040.00
	Total Fixed Cost	-	67677.81	35961.00	36066	36783	38010	230,072.73

Table 3. Per-acre cost of production of Olive (running year).

Sr. No	Name of operation	No. / Qty.	Rate/Unit (PKR)	Expenses
1	*Land Preparation Cost*			
a	Ploughing	2	1284	2568.00
	Sub Total			2568.00
2	*Cost of fertilizers*			
a	DAP bags	2	3941.31	7882.61
b	Potash bags	1.5	3293.38	4940.07
c	Micronutrients (Boron & Zink)	1.5	226.66	340.28
d	Farm yard ManureTrolly/Acre	2	1530.93	3061.86
	Sub Total			16225.00
3	(watch and ward /Labour Charges	12	1500	18000.00
	Sub Total			18000.00
4	*Cost of irrigations*			
a	Tube well irrigation	15.63	767.23	11991.84
b	Abiyana	0	0	0.00
c	labour for irrigation	1	3500	3500.00
	Sub Total			15491.84
5	*Plant protection charges*			
a	Pesticides Charges (Insecticide + fungicide)	1.5	597.67	896.50
b	Pruning cost	1	2659	2659.00
c	Weedicides	1	550	550.00
d	Hoeing	1	1261	1261.00
	Sub Total			5367.00
6	*Harvesting and Packing Charges*			
a	Harvesting and Packing Charges	1	1500	1500.00
b	Plastic Box Charges			1000.00
c	Olive Crushing Charges/Liter	1	100	6000
c	Sub Total			2500.00
7	*Land Rent*	1	11451.2	11451.22
8	*Total Expenditure*			75102.00

Table 4. Benefit-cost analysis of Olive farmers.

Activity	Unit (PKR)
Total Expenditure For 5 years (Fixed Cost)	230,197.73
Exp. For 1 years (Avg. life 100 years)	2,301.23
Grand Total cost (TC=FC+VC)	77404.00
Yield of olive Fruit (Y) [kg/acre]	729.00
Yield of olive oil (Y) [Liter/acre]	69.00
Price of the olive oil (P) [PKR/Liter]	2,500.00
Total revenue (TR) [PKR]	172,500.00
Gross margins (GM) [PKR]	96498.00
Net profit/ net margins (NM) [PKR]	94,196.00

Table 5. Financial analysis of Olive.

Particulars/ years	Year									
	1	2	3	4	5	6	7	8	9	10
Expenditure on 1 acre of olive	67678	35961	36066	36783	38010	39911	41906	44002	46202	48512
Benefits from I acre	0	0	0	0	72596	108894	163341	245012	269513	296464
Incremental cashflow	-67678	-35961	-36066	-36783	34586	68983	121435	201010	223311	247952
NPV (Benefits@,10%)	533,263									
NPV (Costs@,10%)	269,925									
NPV (Cash flow@,10%)	263,338									
Internal rate of return	31%									
Benefit Cost Ratio (BCR)	2.20									

Marketing Channel of Olive

The value chain concept is quickly gaining acceptance as a viable and profitable strategy in agricultural and food systems. Agricultural and food production can achieve sustainable development goals by systematically integrating social, environmental, and economic factors into all value chain processes and activities (Utomo et al., 2021). It is important to identify the various channels that farmers use in order to determine which channel is best for both farmers and consumers. There is a shortage of proper agricultural markets in underdeveloped nations like Pakistan. Farmers, agricultural extension agents, commission agents, retailers, and consumers participated in focus group discussions to determine the existing marketing channels in the research area.

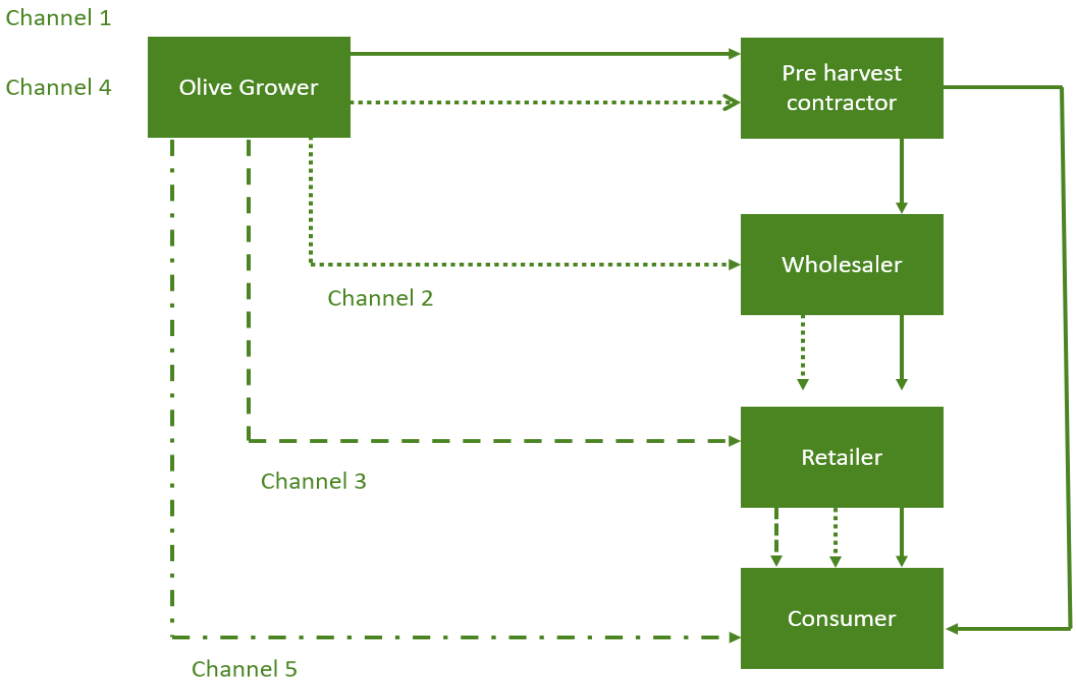

Figure 1. Identification of Marketing Channels.

Figure 1 depicts the different market channel, in the first channel, the farmers sold their produce to the pre-harvest contractor and the pre-harvest contractor sold the olive to the wholesaler. The olive is auctioned off, with the lowest acceptable price going to the highest. After deducting the commission, the produce is sold to the retailer. The product was sold to the final customer by the retailer. In second channel, the olive grower sold their produce to commission agent to retailer and retailer then sold the products to end consumer. In the third channel, the produce is sold to the retailer after taking the commission. The retailer sold the product to the final customer. The olive farmers in this channel (fourth) sold their produce to the pre-harvest contractor and sold the olive to consumers. In the last one channel, consumer directly purchase the produce to the farmers at farm gate. Trade flows of the olive oil supply chain is shown in Figure 2.

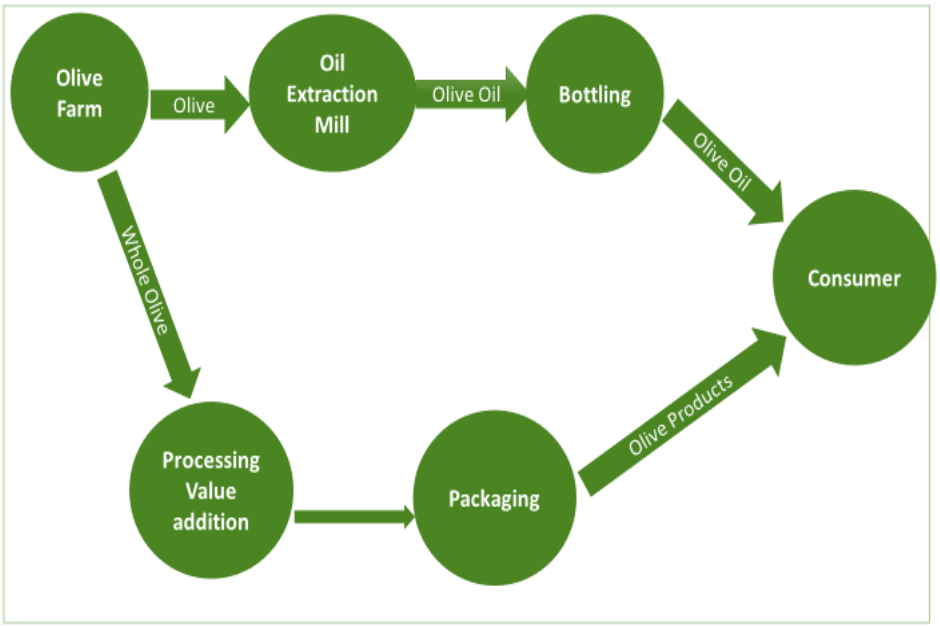

Figure 2. Trade Flows of the Olive Oil Supply Chain.

CONCLUSIONS AND RECOMMENDATIONS

The study was undertaken in the Pothwar region of Punjab, Pakistan, to study the cultivation and marketing system of Olive. For finding the economic viability of olive orchards, Benefit-Cost ratio, NPV and IRR at 10 percent discount rate was calculated to be 2.20, Rs. 263,338.00, and 31%, respectively indicate that olive is a profitable crop. These findings indicate that the returns on olive cultivation are high, and Pakistani farmers could earn a large profit if olive orchards are built on a commercial scale. In this way, the olive growers can benefit handsomely on the one hand while also contributing to Pakistan's foreign exchange reserves on the other hand. Five marketing channels were discovered to distribute olive from producer to customer. Channel 1 had the most intermediates, followed by Channel 2 and Channel 5, while Channel 5 had direct contact between producers and customers.

According to the study's findings, the following policies may be implemented:

1. Crop's marketing was discovered to be a major issue. Farmers must lease out their orchards to PHCs or pay high transportation costs to sell their produce in distant markets due to the risk of marketing because there is no huge fruit market in the study area. As a result, to address the marketing challenge, the government should establish regulated markets with improved marketing facilities.
2. Olive fruits are perishable and require suitable packaging, storing, and transporting capabilities. On the other hand, farmers do not have access to such facilities. If these amenities were made available to farmers right at their doorstep, olive cultivation would skyrocket.
3. Olive production could improve if farmers have easy access to a recommended bundle of olive-based techniques based on scientific evidence. To increase olive cultivation and output in the Punjab province, the role of the Barani Agriculture Research Institute Chakwal and the agricultural extension department should be expanded.
4. In the olive industry, there is a research void. The future of olive farming needs increased research facilities, research personnel, research training and greater collaboration between researchers and olive growers. In particular, researchers should devote more attention to small farmers.
5. The present is the value addition. Olives should be processed into jam, pickle, olive tea and other value-added products. This would raise the demand for olives and lead to higher incomes for the producers of olives. To do this, it will be a wise option in the appropriate way to establish manufacturing industries in olive growers.
6. The current study used a modest sample size. It is advised that extensive research with a bigger sample size be done

to determine the profitability of various farm companies. This will help planners, policymakers, administrators, and farmers make more informed decisions on how best to allocate precious farm resources to best alternative ventures

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