Olive Cultivation in Pakistan (current state and future prospects)

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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.

According to International Olive Council (IOC), global virgin olive oil was 3207,000 tons in which maximum oil was produced by Spain (1125, 300 tons), Italy (366,000 tons), Tunisia (350, 000 tons), Greece (275, 000 tons), Turkey (225, 000 tons), Morocco (145, 000 tons) and Portugal (140,500 tons). The total Olive Oil production of the IOC member countries in 2020/21 was 2,999,500 tons comprising of 93.8% of the world total production, a decrease of 0.3% compared to the last year. Olive fruit production for 2019-20 amounted to 3,057,500 tons, an increase of 5.5% compared to the last year. Among the IOC member countries, Spain stands out for its weight in world production (15%), despite a 22.5% drop. Egypt's production has increased by 25% compared to the 2018-19 campaign, contributing 24.5% of the world total. According to estimates for the 2020- 21 campaign, production could increase by 2.5% compared to 2019-20, reaching 3,134,000 tons, and consumption would increase by 0.4%. Olive cultivation in Pakistan has been gaining momentum in recent years due to the favorable climate and the government's efforts to promote olive farming as a potential cash crop. Here is some information about olive cultivation in Pakistan:

SUITABLE REGIONS FOR OLIVE CULTIVATION IN PAKISTAN

Olive trees grow well in warm climates, tolerate drought, and are highly sensitive to frost. This means regions in which summers are hot and dry, winters are relatively cool, and frost is rare are suitable for cultivation of olives. Olive plants need very little water, and therefore they can survive extended dry spells. Once fully grown, olive trees are among the most drought-resistant trees in the world, but the olive tree is not a desert plant. It needs regular watering to thrive. Olives can grow in rigid terrains and wastelands that are not suitable for the cultivation of staple crops. Olive can be grown in most parts of Pakistan. The possibilities of olive cultivation in Sindh province are also supportive. Potential avenues for olive cultivation in Sindh, where parts of the soil and climate are acceptable for productive yields are to be explored. Other provinces include:

1. **Punjab**

In Punjab, the olive cultivation belt extends across the Pothohar region, which includes districts such as Rawalpindi, Chakwal, Attock, and Khushab. The hilly terrain and moderate climate of this region provide ideal conditions for olive trees to thrive.

2. **Khyber Pakhtunkhwa (KP):**

Olive cultivation in KP is mainly concentrated in the districts of Mansehra, Abbottabad, Swat, Mardan, and Haripur. These areas possess the necessary climatic and topographic features, including suitable temperature ranges, soil types, and elevations, for successful olive cultivation.

3. **Balochistan:**

Olive farming in Balochistan is primarily practiced in the districts of Quetta, Pishin, Ziarat, and Qilla Abdullah. The moderate climate and well-drained soils in these regions make them suitable for olive cultivation.

VARIETIES OF OLIVE IN PAKISTAN

Barani Agricultural Research Institute, Chakwal developed two olive varieties as BARI Zaitoon 1&2. These varieties have been developed through selection from exotic germplasm imported from Italy. Both varieties showed good adaptability to the Pothowar and adjoining plains of the Punjab. The fruit tree has medium plant vigor with spreading nature of growth along with profuse branching. It's medium

to late maturing variety which starts fruiting after four years of planting. Flowering starts in the month of March and fruit mature in the month of September to October. The fruit is of medium size having elongate shape. The average fruit weight has been recorded to be 2.8 g with medium width of stalk cavity which is elliptic in shape. The color change of the fruit starts from apex and attain dark violet color at full maturity. The average yield of variety is 23 kg/plant with oil content of 19.34%.

Sr. No.	Variety Name	Year of Release	Ripening time	Potential Yield (Kg/Plant)	Oil Recovery (%)	Salient Features
1	BARI Zaitoon-1	2011	September	19	13.4	Medium elliptic shape, fruit with week conspicuous of marbling, Strong stature of plant
2	BARI Zaitoon-2	2011	Sep-Oct	20	18	Erect nature with strong growth, Smooth tree trunk and Oil purpose variety
3	Jerboui	2019	September	14.39	20.18	Narrow elliptic fruit shape, fruit with week conspicuous of marbling
4	Picual	2019	October	18.83	15.02	Medium fruit size, elliptic fruit shape, Medium marbling on frui
5	Hojiblanca	2019	Sep-Oct	17.83	16.63	Large fruit size, Ovoid fruit shape, Round apex, Truncate bas
6	Manzanilla	2019	October	21.64	16.41	Spreading tree branches, Large fruit size, ovoid fruit shape, Pointed apex, Truncate base
7	Pendolino	2019	September	19.69	13.69	Spreading tree branches, Elongated fruit shape, round base, Obvious fruit nipple
8	Gemlik	2019	September	24.23	15.36	Large Bold fruit, Concaved, Tenuous Nipple
9	Koroneiki	2019	Sep-Oct	20.26	16.22	Short plant stature, Erect branching habit, Elongated fruit shape, Obvious nipple
10	Hamdi	2019	October	22.66	15.85	Drooping plant branches, Twisting leaves, Ovoid fruit shape, tunicate base of fruit
11	Ascolana	2019	Sep-Oct	19.49	14.41	Large & ovoid fruit, Round apex of fruit, Elliptic lanceolate leaves
12	Arbequina	2021	October	18.05	17.29	Medium tree canopy, Erect branches, Concaved fruit shape
13	Chemlali	2021	October	19.22	15.57	Strong plant vigor, Drooping branches, narrow fruit shape
14	Earlik	2021	October	25.71	16.2	Strong plant stature, Spreading branches, Large and Bold fruit, obvious nipple

15	Gohar	2022	October	22.1	16.15	Strong plant stature, Large fruit size, Bold fruit shape

Centre of Excellence for Olive Research and Training (CEFORT), Barani Agricultural Research Institute, Chakwal

Agriculture is one of the mainstays of our economy, a way of life for many of our people, and an essential part of our culture and tradition. Balochistan does not have the agricultural natural resources that other provinces possess. Pakistan's water crisis, compounded by climate change, is a major challenge, with adverse effects on agriculture and livestock management. Pakistan imports olive worth 2.17 Billion PKR for consumption. The region is not only adaptable for new orchards but is also home to wild olive trees, which can be grafted with improved varieties.

PROCESS OF OLIVE CULTIVATION

Following steps were involved in olive cultivation process:

Site selection:

Olive trees require well-drained soil with good water-holding capacity. Sloping terrains are preferred to ensure proper drainage. Site selection plays a crucial role in the successful cultivation of olives. Here are some key considerations for site selection when planning to grow olives:

Climate:

Olive trees thrive in a Mediterranean climate characterized by mild, wet winters and hot, dry summers. Ideal temperature ranges for olive cultivation are between 15°C and 30°C (59°F to 86°F) during the growing season. Avoid regions with extreme cold temperatures, as severe frost can damage olive trees. Choose locations with adequate heat units and a frost-free period of at least 150 days.

Sunlight:

Olive trees require full sun exposure for optimal growth and fruit production. Select a site with unobstructed sunlight throughout the day, as shade can negatively impact tree vigor and fruiting of the plant.

Soil:

Olive trees prefer well-drained soils with good water-holding capacity. Avoid areas with heavy clay soils that retain excessive moisture, as it can lead to root rot and other diseases. Sandy loam and loamy soils are considered ideal for olive cultivation. Conduct a soil analysis to assess the pH level, nutrient content, and soil structure.

Slope and Drainage:

Choose a site with a gentle slope to ensure proper drainage and prevent waterlogging. Excessive water accumulation can lead to root damage and negatively affect tree health. Avoid areas prone to flooding or where water tends to stagnate.

Wind Protection:

Olive trees are susceptible to damage from strong winds, particularly during flowering and fruiting. Consider natural windbreaks like hills, forests, or existing vegetation that can provide some protection. Alternatively, establish artificial windbreaks such as hedges or shelterbelts to mitigate the impact of strong winds.

Elevation:

Olive cultivation is possible within a wide range of elevations, but specific varieties may have preferred elevation ranges. Generally, olive trees can be grown from sea level up to 1000 meters (3300 feet). Consult with local experts or agricultural extension services to determine suitable elevation ranges for olive cultivation in your region.

Water Availability:

While olive trees are known for their drought tolerance, they still require regular and sufficient irrigation, especially during the establishment phase and periods of drought. Ensure access to a reliable water source or the ability to provide supplemental irrigation when necessary.

Proximity to Markets and Infrastructure:

Consider the proximity to markets, processing facilities, and transportation networks. Being close to infrastructure and markets can reduce logistics costs and facilitate the marketing of olive products.

Local Expertise and Support:

Seek advice from local agricultural extension services, universities, or experienced olive farmers in your region. They can provide valuable insights into site selection, specific regional considerations, and best practices for olive cultivation.

Remember that site selection criteria can vary depending on the specific region and local conditions. Consulting with experts and conducting a thorough feasibility study based on the local context will help ensure the best site selection for successful olive cultivation.

Planting:

Olive trees can be propagated through seeds, cuttings, or grafting. Grafted saplings are commonly used to ensure desirable traits. Planting is usually done during the dormant season, between November and March.

Irrigation:

Olive trees have moderate water requirements. Initially, regular watering is necessary, and once established, they can tolerate drought conditions. Drip irrigation is a commonly used method to provide controlled water supply.

Pruning:

Pruning is essential for maintaining tree shape, managing vegetative growth, and promoting fruit production. It is typically performed during the dormant season to remove deadwood, thin out branches, and shape the tree.

Fertilization:

Proper fertilization with balanced nutrients is important for optimal tree growth and fruit development. Soil testing is recommended to determine nutrient deficiencies and tailor fertilizer application accordingly.

Pest and disease management:

Common pests and diseases affecting olive trees in Pakistan include olive fruit fly, olive moth, olive psyllid, olive knot disease, and Verticillium wilt. Integrated pest management (IPM) practices are encouraged, including monitoring, biological control, and judicious use of pesticides.

BENEFITS & CHALLENGES OF OLIVE CULTIVATION

Economic benefits:

Olive cultivation offers economic opportunities through the sale of olives, olive oil, and other value-added olive products. It can diversify farmers' income sources and contribute to rural development.

Health benefits:

Olive oil is widely recognized for its health benefits, including being rich in monounsaturated fats, antioxidants, and anti-inflammatory compounds.

Environmental benefits:

Olive trees are known for their ability to adapt to arid conditions and resist soil erosion. They require less water compared to many other fruit crops, making them environmentally friendly.

Challenges:

- Limited demand of olive in local community as consumers are price sensitive and our cuisine includes foods that require deep frying, over cooking etc., where olive oil is not beneficial.
- Limited awareness and technical knowledge among farmers regarding olive cultivation practices, including orchard management, pruning techniques, and pest control.
- Availability of quality planting material and certified olive saplings is often limited, requiring the establishment of reliable nurseries and improved access to high-quality varieties.
- Insufficient infrastructure, including processing and storage facilities, hampers the quality and value addition potential of olive products.
- Marketing and market access for olive products, both domestically and internationally, need further development to ensure fair prices and wider market penetration.

CURRENT STATUS OF OLIVE CULTIVATION IN PAKISTAN

Pakistan has a growing population and an increasing import bill for edible oil and oil seeds to cater to the consumer demand for cooking oil and animal feed inputs. Pakistan’s edible oil import bill, which includes imported oils and oilseeds, is USD 3.52 Billion in 2020, up around 12 percent from USD 3.15 Billion in the previous year. This rising demand for edible oil is anticipated to grow annually as per the industry experts[4], and its import bill is expected to surge by 30 percent in the fiscal year 2021-22, amid a fall in local production, hike in global prices, and rise in local consumption. With a per capita consumption estimated at 22 kg annually, Pakistan is one of the leading consumers of edible oil in the world.

To alleviate the growing burden on the country’s import bill, the Government of Pakistan is working on a number of measures to promote import substitution that are in-line with its “Make in Pakistan” policy. One such measure is to reduce dependency on imported oil and oilseeds by focusing on increasing the local production of edible oil. One proposition is to increase the production of olives in Pakistan for extraction and sale of olive oil as a replacement for other imported edible oils.

Olive Plantation in Pakistan (2012-22)

Provinces/ Region	PIDSA (2012-16)	PSDP (2014-22)	Olive Valley (2015-20)	5 million Olive (2013-19)	Private Plantation	Total Plants /(Acre)
Balochistan	159,379	1,147,982	-	-	2,500	1,309,861 (10,475)
Khyber Pakhtunkhwa	265,273	538,202	-	590,000	25,000	1,418,475 (12,925)
Punjab	116,772	577,250	1,320,116	-	10,000	1,914,433 (15,449)
ICT	35,768	114,621	-	-	-	150,389 (1,215)
AJK	421	65,795	-	-	-	66,216 (507)
G.B	2,545	30,751	-	-	-	33,296 (253)
Sindh	-	61,904	-	-	-	61,904 (460)
TOTAL (Acre)	580,158 (5,802)	2,536,505 (19,410)	1,320,116 (9,797)	590,000 (5,900)	37,500 (375)	4,954,574 (41,282)

(Pakistan Oilseed Department, NARC)

GOVERNMENT INITIATIVES FOR OLIVE PROMOTION

The project "Promotion of Olive Cultivation for Economic Development and Poverty Alleviation" was awarded to the Government of Pakistan by the Italian Government under the Debt Swap Agreement. The project is in operation through National Agricultural Research Council (NARC) and its extended research facilities in KPK, Baluchistan, FATA and Punjab provinces. The aim of the project is to primarily increase the local production of edible oil by cultivating olives to utilize wastelands, and to improve livelihoods and promote a cleaner environment. The Government of Pakistan is working on the promotion of olive cultivation on a commercial scale through its 'Olive Promotion Project' executed by the NARC. It is estimated that 2.9 million plants have been planted on 25,600 acres across Pakistan. The project's aim is to:

1. Expand the cultivation of olives in selected areas such as Potohar region in Punjab, KPK, and Baluchistan.
2. Conduct technical studies and provide training and assistance to farmers.
3. Set up olive processing facilities with supporting infrastructure and equipment.
4. Promote the cultivation of olives and the use of the olive oil through different means.
5. Stimulate Public Private Partnerships (PPPs) for sustainability and long-term viability of the project.

In phase 1 of the project, the government has provided olive plants free of cost to the farmers, subsidized water and drip irrigation, and provided technical assistance. There is currently limited information available on the cultivated acreage, number of olive trees planted and number of trees bearing fruits, because no baseline surveys have been conducted or published for public information. It is estimated that approximately 2.5 million olive trees have been planted across an area of 35,000 acres throughout the three provinces. Not all plants are at the fruit bearing stage and since no baseline surveys have been conducted, official production figures of olives are unavailable. However, amongst the three provinces, olives grown in Baluchistan have the highest oil extraction content of 18-20 percent whereas olives grown in Punjab typically yield 12 percent oil.

The focus of the Government's olive project and initiatives has been to increase supply of olives. The Government seems to have been, in large, successful in developing local olive varieties, nurseries, and

demonstrating a proof of concept that olives can be grown at Pakistan. Experiments on various varieties have shown encouraging results. Olives grown in Pakistan have a yield of up to 15 kilograms per plant and oil content varies from region to region, but it is in par with international standards of 12-20 percent. Sufficient successful trials have been conducted by several farmers to certify that olives can be grown successfully in Pakistan.

The olive promotion project, led by the NARC, has worked on capacity building of farmers through extensive trainings in pre- and post-harvest orchard management, importing oil extraction plants, providing subsidies to farmers for oil extraction and water management systems like drip irrigation. All these interventions by the government have helped stir great interest and enthusiasm in farmers for olive cultivation.

Olive Tree Tsunami Project

Launched in 2012, this project is a collaborative effort between the Pakistan Agriculture Research Council (PARC) and provincial governments. Its aim is to plant millions of olive trees across the country, establish nurseries, and set up olive oil extraction units.

Punjab Olive Cultivation Project

The government of Punjab initiated this project to promote olive farming in the province. It provides financial incentives, including subsidies for establishing olive orchards, technical assistance, and training programs for farmers.

Balochistan Olive Plantation Project

The Balochistan government has taken steps to support olive cultivation through technical support, training, and subsidies to farmers.

ROLE OF ZTBL IN OLIVE CULTIVATION & PROCESSING

Zarai Taraqiati Bank Limited is the only agriculture development financial institution of the country that caters the financing needs of small/marginalized farmers. Following are some aspects where ZTBL can play its role for promotion of olive cultivation in Pakistan:

1. **Capacity building of the farmers**

Olive production could improve if farmers have easy access to a recommended bundle of olive-based techniques based on scientific evidence. ZTBL can play its vital role in agriculture promotion through its capacity building initiatives for farming community. Through ZTBL Zarai Baithaks (an awareness session for the farmers), the experts from different universities, research institutes and other allied bodies provide necessary information and knowledge to farmers to enhance their production and reduce post-harvest losses. Farmers may be encouraged to produce olives across the country.

2. **Development of special financing products**

The key role of ZTBL is to provide financing and banking services to its borrowers. ZTBL in collaboration with Federal/Provincial Governments may launch special product for olive cultivation as it is a long process and olive trees produce fruits after 5-7 years of cultivation. Initially, subsidized schemes may be offered to attract farmers and share their financial burden in the long-term benefit of the country. Furthermore, ZTBL may introduce financing products as group loans for value addition of olive. 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.

3. **Facility of Olive oil extraction**

For facilitation of the farmers, ZTBL has already installed an Olive Oil Extraction Machine at its farm in Islamabad. The farmers of nearby areas are benefitted by timely extraction of oil from olive fruit and

thus, minimizing their post-harvest losses.

4. **Establishment of linkages**

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. Through its wide network of branches, ZTBL may act as a facilitator for its olive farmers to connect them with marketing, processing or packaging companies for olive produce. This will not only help farmer to gain premium price but will also affect the repayment capacity of the borrowers.

CONCLUSION/ RECOMMENDATIONS FOR THE WAY FORWARD

Pakistan has approximately 15% desert areas of its total area. Desert areas can be utilized by cultivating olive trees. India cultivated 260 ha of Rajasthan's desert in 2008 which is successful fruiting. Thar and Cholistan desert has the same climatic conditions as Rajasthan's desert of India. Olive cultivation can be a good source of income for people living in desert areas of Pakistan. Furthermore, it would lead to the establishment of new olive nurseries, manufacturing of olive medicinal products, olive orchards, and oil extraction mills, pickle industries, daily paid labor, technical workers, fruit picking and marketing opportunities all over the Pakistan that would open new ways for generating income in these impoverished areas. Olive cultivation will be magnificent source of olive oil export and source of foreign exchange earnings business. Last but not the least; it would help to save the foreign exchange of the country that may be used for other purposes.

The future of olive cultivation in Pakistan appears promising due to favorable climatic conditions and increased government support. Continued investments in research and development, including the introduction of new olive varieties and improved cultivation practices, can enhance productivity, quality, and disease resistance. Strengthening the value chain, developing processing and storage infrastructure, and creating marketing channels for olive products can boost the sector's growth, benefit farmers, and contribute to the national economy. It is important for prospective olive farmers to consult with local agricultural authorities, experts, and successful olive growers in their respective regions for detailed and region-specific guidance.

Conduct Export Market Analysis

International markets can potentially be lucrative for olive producers and processors in Pakistan. However, there is little or no work done on the market feasibility. Pakistan does not have a consistent supply of olive oil that can cater to international buyers' requirements. Moreover, international standards and certifications are also not in place. It will take Pakistan many years to export olive oil and compete with the internationally recognized brands. Pakistan needs to work on the complete supply chain, improve packaging, create market linkages, involve exporters and the private sector in general, and also work on Government policy and regulations. But if the plan is to tap into lucrative international markets, then the ground work for this should start at the outset.

It is recommended that key export markets are first identified, and olive products from Pakistan are sampled and promoted there through food trade shows and events (for example participation in Gulf Foods, FruitLogistica etc.). Pakistan's exporters and government trade officers should make the effort to identify and meet the requirements of product quality, packaging, import volumes, pricing, and most importantly complete certifications to access markets abroad.

Implement and Strengthen Supply Side Strategy

The flaw in the government's olive strategy has been the over-emphasis on augmenting production/ supply before even having thoroughly assessed the market dynamics and consumer demand for olive oil and its products. Essential questions on the target market (domestic/international), consumer preferences, selling price, product mix tailored to market and other demand driven data has been missing. Once all these questions are answered, the government may fine-tune its approach to encouraging production of olives. This includes determining which varieties to grow, what value-added products to focus on, how to improve the fruit quality and reduce pre- and post-harvest losses, increase yields, and most importantly setting up the required infrastructure for processing olives into its various products.

The following supply side interventions are recommended:

a) Conduct a Baseline Survey

As a first step, the need for conducting a baseline survey is recommended. The government should immediately conduct a survey of all the olive growing areas, and record the cultivable acreage, number of plants, cultivable varieties and their respective yields, annual production and any other critical data. Without the data, the food processing industry cannot plan olive or olive oil purchase for their business requirements. Yearly surveys should be conducted and forecasts be shared publicly on how much annual olive crop is expected to be produced.

b) Plan Crop Cultivation as per the Demand

Olive farm acreage, number of plants, varieties and all such production/volume parameters should be based on the demand for olive oil and its products that exist in the domestic market and estimated international trade which Pakistan can potentially capture. Failure to do this will either result in having an excess supply of olives, which will hurt the growers, or a shortage of the crop which will lead to inefficient and inconsistent supplies.

c) Upgrade Technology and Conduct Capacity Building of Local Vendors

Currently, all the processing equipment for olive oil extraction has to be imported. These oil extraction plants are either brought in from China, Turkey or Europe. The existing olive oil extraction mills were mostly brought in by the government for small scale processing. These are located in the various agricultural research departments and the processing capacity ranges from 100 to 500 kilograms per hour. The government should encourage the local engineering companies and agriculture machinery manufacturers to manufacture extraction plants locally so that they can be sourced easily and affordably. The same should be encouraged for other tools and equipment which are needed, such as harvesting equipment, graders, olive pitting machines, slicers, and storage racks or containers for oil.

<u>Encourage Private Sector Investment Mobilization</u>

For robust growth and development of any sector, active participation of the private sector and commercial players is imperative. The olive segment is no different and so far, there has been little to no private sector investment at a significant scale in the olive business in Pakistan. The local food business operators, multinationals, edible oil manufacturers and other FMCG companies of Pakistan have in-house technical expertise, market knowledge, customer base, brand recognition and distribution channels within Pakistan and abroad as well. Their role will be vital for bolstering the olive segment and the government along with the farmers should be engaged with these companies for rolling out the olive program at a commercial level.

The government should also engage foreign brands and established olive segment players to invest in the Pakistani olive arena, through conducive business enabling policies. Such companies already have established marketing channels and repute with international buyers. They also have technical expertise and can supplement the olive farming and processing business through their vast experience and brand image. A key country in this regard can be Turkey, which is one of the largest producers and top exporters of olive oil globally. Such collaborations should also be explored.

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