



PACE Policy Paper:

## **Promoting Oil Seed Crops in Pakistan: Prospects and Constraints--**

*Prepared as part of the Technical Assistance to the Ministry of National Food Security and Research and the Provincial Agriculture Departments*

February 2022

Authored by:

Abdul Wajid Rana

Sitara Gill

Iqra Akram

**Pakistan Agricultural Capacity Enhancement Program (PACE)**

Funded by

**United States Agency for International Development (USAID) Pakistan**

Implemented by

**International Food Policy Research Institute – Pakistan (IFPRI)**

## **INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE**

The International Food Policy Research Institute (IFPRI), established in 1975, provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition. IFPRI's strategic research aims to foster a climate-resilient and sustainable food supply; promote healthy diets and nutrition for all; build inclusive and efficient markets, trade systems, and food industries; transform agricultural and rural economies; and strengthen institutions and governance. Gender is integrated in all the Institute's work. Partnerships, communications, capacity strengthening, and data and knowledge management are essential components to translate IFPRI's research from action to impact. The Institute's regional and country pro-grams play a critical role in responding to demand for food policy research and in delivering holistic support for country-led development. IFPRI collaborates with partners around the world.

## **AUTHORS**

**Abdul Wajid Rana** ([A.W.Rana@cgiar.org](mailto:A.W.Rana@cgiar.org)) is the Program Leader of Pakistan Agriculture Capacity Enhancement project (PACE) in the Development Strategy and Governance Division of the International Food Policy Research Institute (IFPRI), Islamabad, Pakistan

**Sitara Gill** ([S.Gill@cgiar.org](mailto:S.Gill@cgiar.org)) is a Research Analyst-II in Pakistan Agriculture Capacity Enhancement project (PACE), International Food Policy Research Institute (IFPRI), Islamabad, Pakistan.

**Iqra Akram** ([I.Akram@cgiar.org](mailto:I.Akram@cgiar.org)) is a Research Analyst-I in Pakistan Agriculture Capacity Enhancement project (PACE), International Food Policy Research Institute (IFPRI), Islamabad, Pakistan.

## **Notices**

<sup>1</sup> The boundaries and names shown, and the designations used on the map(s) herein do not imply official endorsement or acceptance by the International Food Policy Research Institute (IFPRI) or its partners and contributors.

<sup>2</sup> Copyright remains with the authors. The authors are free to proceed, without further IFPRI permission, to publish this paper, or any revised version of it, in outlets such as journals, books, and other publications.

---

## CONTENTS

List of Figures .....	iv
List of Tables .....	iv
ACRONYMS .....	v
<b>Executive Summary .....</b>	<b>vi</b>
<b>1. Introduction.....</b>	<b>1</b>
<b>2. The Context: Oilseed - Local Production and Import.....</b>	<b>2</b>
<b>3. Dynamic of Oilseed Cultivation and Production In Pakistan.....</b>	<b>5</b>
3.1. Present Status of Oilseed crops in Pakistan.....	5
3.2. Trends in oilseed production in Pakistan.....	7
3.2.1. Rapeseed and Mustard .....	7
3.2.2. Sunflower.....	8
3.2.3. Sesame .....	9
3.2.4. Soybean.....	10
3.2.5. Groundnut .....	11
3.2.6. Safflower.....	11
3.2.7. Linseed.....	12
<b>4. Institutional Support .....</b>	<b>13</b>
4.1. Pakistan Edible Oil Corporation (PEOC) & Seed Division in Ghee Corporation of Pakistan	13
4.2. National Oilseed Development Project (NODP).....	13
4.3. Pakistan Oilseed Development Board (PODB).....	13
<b>5. Recent Initiatives for Oilseed Sector Development in Pakistan.....</b>	<b>14</b>
5.1. Oilseed Promotion Initiative in Punjab 2017-18 .....	14
5.2. National Oilseed Enhancement Program.....	14
<b>6. Uncertainties and Challenges of Supply and Price Sustainability.....</b>	<b>15</b>
<b>7. Booster to Oilseed/Edible Oil Production: Needs of the Hour.....</b>	<b>16</b>
7.1. National Oilseed Policy:.....	17
7.2. Holistic Farming Approach: .....	18
7.3. Crop Substitution:.....	18
7.4. Trends in Yield of Oilseeds:.....	18
7.5. Improving Yield: .....	19
7.6. Enhancing Farm Productivity:.....	19
7.7. Access to Quality and Hybrid Seed:.....	19
7.8. Spate Irrigated System:.....	19
7.9. Formal Credit to Small Farmers: .....	20
7.10. Incentivizing Farmers:.....	20
7.11. Cluster Identification:.....	20
7.12. Rapeseed-mustard production: .....	21
7.13. Expand the area under sunflower and soybean cultivation: .....	21
7.14. Soybean: .....	21
7.15. Olive Cultivation: .....	22
7.16. Price and Market Stability:.....	23
7.17. Production Technology: .....	23
7.18. Research and Development: .....	23
7.19. Labelling:.....	23
7.20. Training of Farmers and Communication: .....	23

7.21. Improving Oil Extraction Technology and Efficiency: .....	23
7.22. Linkages with the solvent industry: .....	24
7.23. Negative Relationship between Edible Oil Deficit and Food Expenditures:.....	24
7.24. Tariff Rationalization: .....	24
<b>8. Conclusion .....</b>	<b>25</b>
<b>9. References.....</b>	<b>26</b>

## LIST OF FIGURES

Figure 1: Increasing Gap Between Demand and Domestic Production of Edible Oil.....	2
Figure 2: Edible Oil - Domestic Production and Import.....	3
Figure 3: Trend in Import Bill (US\$ billion) .....	4
Figure 4: Trend of Edible Import Bill and Unit Price.....	4
Figure 5: Import Bill of Oilseeds 2019-20.....	4
Figure 6: Import Bill of Edible Oil 2019-20.....	4
Figure 7: Area under cultivation of oilseeds '000' hectares .....	6
Figure 8: Production of edible oilseeds '000' tonnes.....	6
Figure 9: Share of crops in oil production .....	7
Figure 10: Yield (kg per hectare) of RS&M including Canola.....	7
Figure 11: Production '000' tonnes of RS&M by province.....	7
Figure 12: Area and Production of RS&M in Pakistan.....	7
Figure 13: Trends in Area and Production of Sunflower in Pakistan .....	8
Figure 14: Production of Sunflower by Province (tonnes) .....	8
Figure 15: Trends in Area and Production of Sesame in Pakistan.....	9
Figure 16: Production of Sesame '000 tonnes' in provinces.....	9
Figure 17: Trends in Area and Production of Soybean in Pakistan .....	11
Figure 18: Production 'tonnes' of Soybean in Provinces.....	11
Figure 19: Trends in Area and Production of Groundnut in Pakistan.....	12
Figure 20: Production '000 tonnes' of Groundnut in Provinces .....	12
Figure 21: Production '000 tonnes' of Groundnut .....	12
Figure 22: Production 'tonnes' of Linseed.....	12
Figure 23: Total Cultivated Area and Total Production of Oilseeds .....	17
Figure 24: Annual Trends in Total Area, Production and Yield of Oilseeds.....	18

## LIST OF TABLES

Table 1: Vegetable Oil Consumption and Patterns .....	2
Table 2: Duty structure for oilseed imports .....	5
Table 3: Area and Production of oilseeds and oil .....	6
Table 4: Rapeseed Mustard Districts .....	8
Table 5: Sunflower Cultivation Areas .....	9
Table 6: Sesame Cultivation Areas.....	10
Table 7: Oilseed Trend in Punjab: Pre and Post Subsidy Regime .....	14
Table 8: Growth Trend in Different Oilseeds .....	19
Table 9: Water Potential of Rod Kohi .....	20

## ACRONYMS

AARI	Ayub Agriculture Research Institute
AJK	Azad Jammu and Kashmir
CAGR	Compound Annual Growth Rate
FAO	Food and Agriculture Organization of the United Nations
FCR	Feed Conversion Ratio
GCP	Ghee Corporation in Pakistan
KG	Kilogram
KP	Khyber Pakhtunkhwa
MAF	Million Acre Feet
MT	Metric Tonne
NODP	National Oilseed Development Project
OECD	Organization for Economic Cooperation and Development
ORI	Oilseed Research Institute
PAEC	Pakistan Atomic Energy Commission
PARC	Pakistan Agricultural Research Council
PEOC	Pakistan Edible Oil Corporation
PODB	Pakistan Oilseed Development Board
RS&M	Rapeseed and Mustard

## **EXECUTIVE SUMMARY**

Oilseeds in Pakistan characterizes a policy failure as the production of oilseeds as well as edible oil has been on the decline despite various initiatives. The country has been augmenting growing demand-supply gap through imports since early 1970. The domestic production contributes only 13-15 percent of the total consumption while 85-87 percent is met through imports. Per capita consumption of vegetable oil has risen from 5.31 kg in 1973-74 to 20 kg in 2018 and is likely to move to 22 kg by 2028 projecting total consumption to 6.5 million tons by 2028 against current local production of less than 0.5 million tons, widening the demand-supply gap further. The import bill for these products has reached over US\$4 billion in FY2021 which is straining the balance of trade and the balance of payment. With global uncertainties and challenges facing the oilseeds sector including the sharp price fluctuations and market instability and favorable tariffs for imports, the import bill is likely to move upward underscoring the need for well thought out policy and planning.

Local production comprises of eight oil bearing seed crops in Pakistan. These are classified into traditional (cottonseed, rapeseed- mustard, groundnut, sesame, and linseed) and non-traditional (sunflower, safflower, soybean) crops. Among all, cottonseed, rapeseed and mustard, sunflower and canola are major contributors. To improve the edible oil/oilseeds situation in the country, various institutions including Pakistan Edible Oil Corporation (1977), Ghee Corporation in Pakistan (1979), National Oilseed Development Project (1990-95), and Pakistan Oilseed Development Board (1995) were set up over the years but little to no progress has been made in enhancing the cultivated area and production of oilseeds in the country which has remained on the lower side. The devolution of projects of Pakistan Oilseed Development Board, post-18<sup>th</sup> Constitutional Amendment, further paused the progress. The cultivated area declined from 1.1 million hectares in 2003-04 to 0.58 million hectares in 2018-19 while oilseeds production declined from 0.93 million tons to 0.56 million tons during the same period.

Absence of a consistent oilseed policy, price fluctuations, local market instability, weak forward linkages, non-adoption of recommended technology, favorable tariff policy, and cultivation on marginal lands act as major impediments to enhanced oilseed production. The Government of Pakistan and the Government of Punjab has launched initiatives to incentivize the farmers to expand cultivated area and local production.

Oilseeds Promotion Initiative was launched in Punjab during 2017-18 with an aim to enhance canola and sunflower cultivation through subsidy provision at Rs. 5000 per acre and a procurement price of Rs. 2500 per 40kg. As a result of this initiative, a net benefit of Rs. 3.27 billion was earned by spending Rs. 0.675 billion in subsidy. The area under canola and mustard cultivation increased by 20 percent in 2017-18 as compared to 2016-17, with an increase in average yield per acre by 30.55 percent. During 2017-18, cultivation area of sunflower increased by 282.15 percent with an increase in average yield per acre by 16.5 percent.

Globally, sustainable supply and price stability of oilseeds and edible oil are facing uncertainties. Therefore, to increase oilseed production in Pakistan, a consistent national seed policy, holistic farming approach, development of high-yield varieties, enhancing productivity, exploiting spate irrigated areas, adoption of advance oil extraction techniques, tariff rationalization to encourage domestic production and market, and access to formal credit are required to bring additional area under oilseeds through intercropping and sequential cropping. In addition, knowledge empowerment of stakeholders to enhance uptake of improved seed varieties and production technologies should be made a priority. Moving forward, promotion of micro-irrigation techniques, integrated nutrient management, mechanization of oilseed cultivation, timely access of farmers to seed, increasing seed replacement rate, and provision of good storage facilities should be brought under focus. This calls for large investments in research and extension with long-term planning and execution.

## 1. Introduction

**Pakistan's national agriculture policy is largely driven by food security concerns focusing on enhancement of staple food production such as wheat.** To incentivize the farmers to grow more wheat, the Government uses price support mechanism guaranteeing minimum wheat price at which it purchases substantial quantity of produce. Since most of oilseeds crops are Rabi or winter crops, farmers generally opt for wheat over oilseeds because of certainty in demand and price. Similarly, farmers view cotton, rice, maize, and sugarcane as more profitable options compared to sunflower and soybeans, which could be sown and produced during the Kharif or summer season.

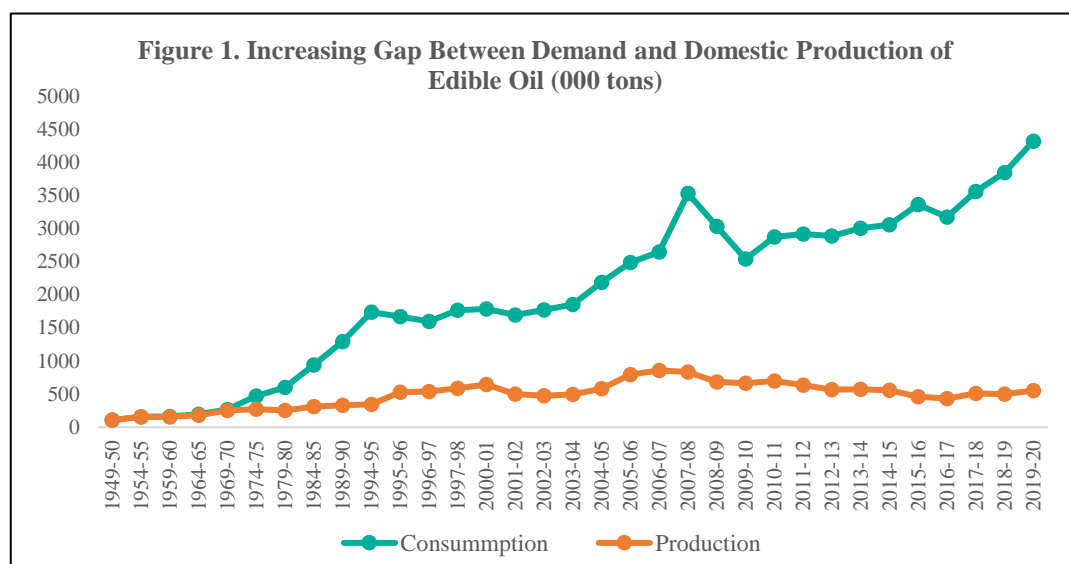
**Oilseeds characterizes noticeable agriculture policy failure in Pakistan.** From a self-sufficiency, the country has turned into a major importer of edible oil since early 1970s. Today, the domestic production is less than 20 percent of consumption while over two-third is met through import, which is an indefensible burden on the foreign exchange resources of the country. While the domestic production doubled since 1969-70, the demand for edible oil/vegetable ghee extracted from oil seed increased 16 times.

**To improve the edible oil/oilseeds situation in the country,** various institutions including Pakistan Edible Oil Corporation (1977), Ghee Corporation in Pakistan (1979), National Oilseed Development Project (1990-95), and Pakistan Oilseed Development Board (1995) were set up over the years but little to no progress has been made in enhancing the area and production of oilseeds in the country. Post-18<sup>th</sup> Constitutional Amendment in 2010, the projects of Pakistan Oilseed Development Board have been devolved to the provinces, where it remained a low priority area. Now, there is a renewed interest in promoting and incentivized cultivation of oil seeds. This paper will review the oilseeds cultivation, production, and extraction of edible oil and proposes various recommendations to invigorate the domestic production. Section 2 provides the context of local production and import of oilseeds and edible oil including strain on the balance of payment. Section 3 highlights the dynamics of oilseeds cultivation and production in Pakistan. Section 4 provides a glimpse of various institutions established to promote oilseeds productions in Pakistan while Section 5 reflects on the recent initiatives of the Government towards this end. Section 6 underlines the uncertainties and challenges of sustainable supply and price stability of oilseeds and edible oil in the international market. Section 7 proposes various suggestions and recommendations for the sector.

## 2. The Context: Oilseed - Local Production and Import

**Pakistan relied on local production with small quantity of imported edible oil till 1960s.**

Edible oil consumption started rising in early 1970s and continued growing while domestic production failed to pace up to this demand trend enhancing import to 41 percent of consumption in 1974-75 and 87 percent in 2019-20. Figure 1 shows the swelling gap between demand and domestic production of edible oil.



Source: Agriculture Statistics of Pakistan, 2018-19, Economic Survey of Pakistan, Ayub Agriculture Research Institute (AARI)

**The increase in vegetable oil consumption at the rate of 8 percent per annum between 1973 and 1992**, which has declined to 4.21 percent per annum between 2009 and 2018, may be attributed to: (i) high population growth; (ii) rapid urbanization; (iii) rising per capita income; (iv) accelerated use of roasted and deep fried, and (v) lower prices relative to desi ghee (butter fat based product produced in cottage industry or at home from liquid milk).

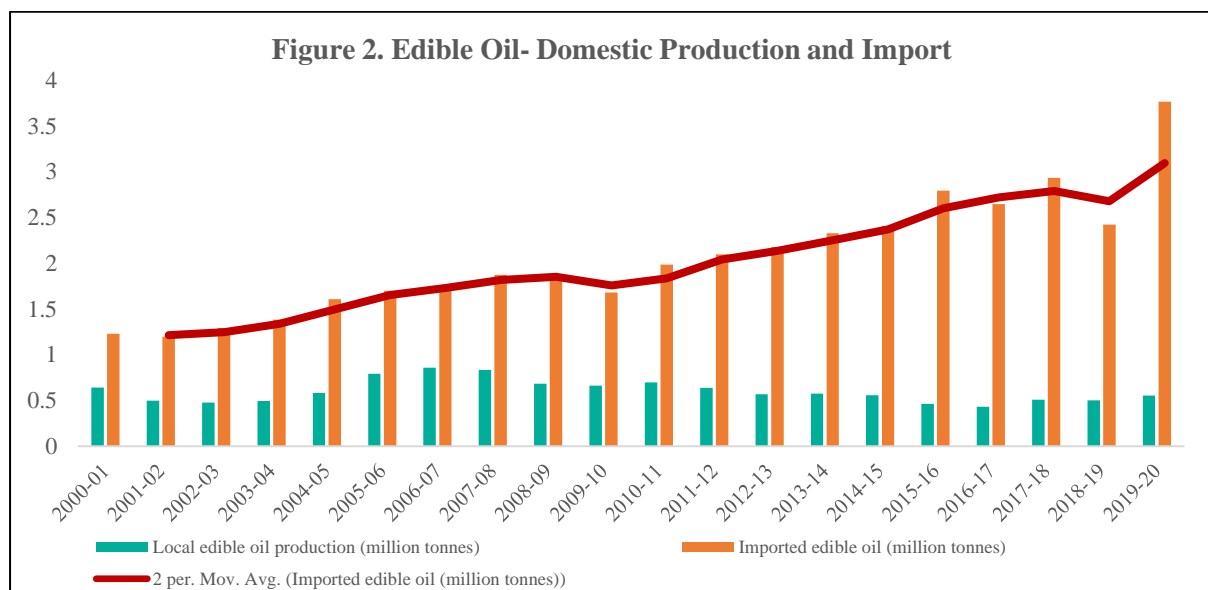
**Table 1. Vegetable Oil Consumption and Projections**

Country	Consumption (000 tons)		Growth(%)		Food (Kg/Capita)		Growth(%)	
	Average 2016-18	2028	2009-18	2019-28	Average 2016-18	2028	2009-18	2019-28
China	37,206	42,246	4.30	1.03	26.4	29.1	3.76	0.69
India	24,238	33,014	4.45	3.07	11.0	14.9	0.96	3.07
Indonesia	13,574	17,698	8.93	1.51	19.7	25.0	3.97	1.33
Iran	1,875	2,450	3.25	2.26	10.7	12.5	0.12	1.48
Malaysia	5,301	6,340	5.04	0.92	27.0	27.8	4.04	-0.39
<b>Pakistan</b>	<b>5,097</b>	<b>6,434</b>	<b>4.21</b>	<b>2.19</b>	<b>20.2</b>	<b>22.1</b>	<b>2.45</b>	<b>0.95</b>
Turkey	2,673	2,900	4.32	0.69	24.3	24.5	1.96	0.09
Japan	2,368	2,452	1.09	0.11	18.5	19.9	1.18	0.48
North America	17,729	19,980	4.04	0.64	39.6	39.2	1.29	0.79
Latin America	20,971	24,076	3.58	1.28	20.1	20.8	0.81	0.58
European Union	22,279	21,891	1.31	-0.43	23.7	23.7	0.36	0.20
World	201,163	239,711	4.24	1.43	18.2	19.7	1.98	0.81

Source: OECD-FAO Agricultural Outlook 2019-2028, (2019). Oil Seeds and Oil Productions

**Average per capita consumption of edible oil in Pakistan has increased from 5.31 Kg in 1973-74 to 20 kg in 2018 and expected to rise further to 22.2 Kg by 2028** as compared to the World Average of 18.2 Kg. Per capita consumption in India is 11 Kg, 10.7 Kg in Iran, 26.4 Kg in China, 18.5 Kg in Japan, and 20.1 Kg in Latin America. The global consumption is projected to rise at the rate of 1.43 percent between 2019 and 2028. Per capita consumption growth in China, Indonesia, Malaysia, and Pakistan during 2009-2018 is showing upward trajectory while all other regions are below these countries. The per capita consumption growth during 2019-2028 is showing downward trend (see Table 1).

**Pakistan augments its domestic oilseed production with imports to bridge the demand and supply gap in edible oil.** Eighty-five percent or more of the edible oil demand is met through imports, given the lack of domestic availability of oil (Aftab et al., 2021). The reliance on imported edible oil is increasing. The total availability of edible oil in the country during 2019-20 was 4.316 million tons. It included domestic oil production of 0.554 million tones (13% of the total requirement) while Pakistan had to import 3.765 million tones (87% of the total requirement) of edible oil and oilseeds to fulfill domestic requirements. The trend in domestic production and import since 2000-01 is at Figure 2.

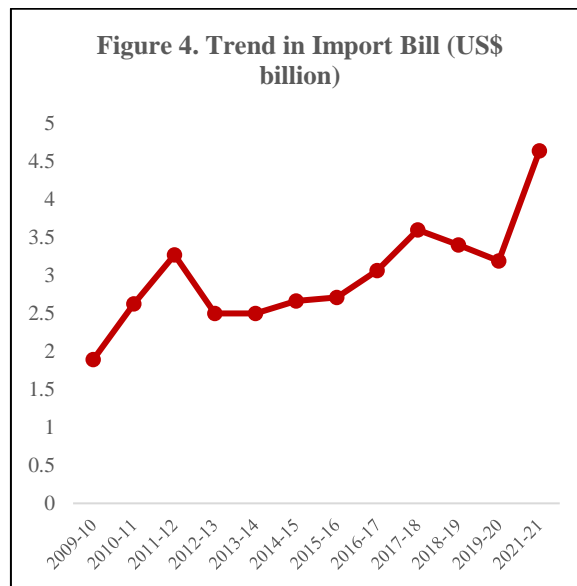
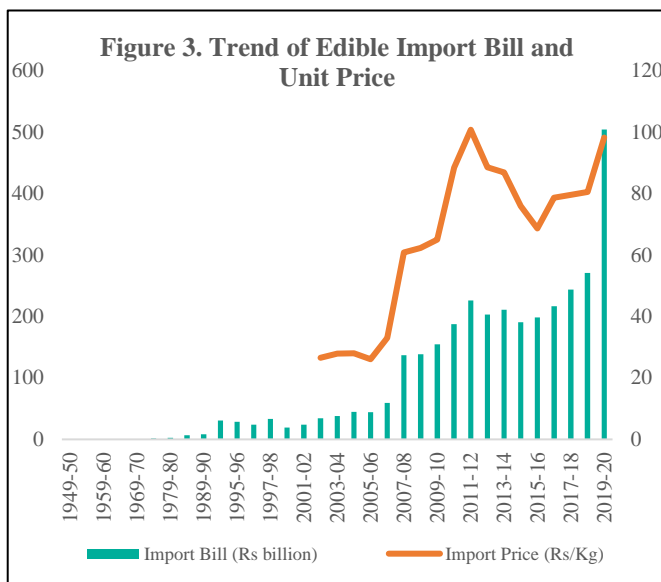


Source: *Economic Survey of Pakistan, Pakistan Bureau of Statistics, AARI*

**Today, edible oil import is ranked third in total imports of the country following petroleum products and machinery.** High volume of edible oil import is burdening the foreign exchange reserves. The import of edible oil is rising in quantity while international market price is showing upward trend. The import bill for edible oil has increased from PKR 37 million in 1959-60 to PKR 742.5 (US\$ 4.640) billion in 2020-21. Likewise, unit price increased from PKR 26.51/Kg to PKR 100.73/Kg in 2011-12, it dipped for a while and started rising since 2015-16 (Figures 3 and 4).

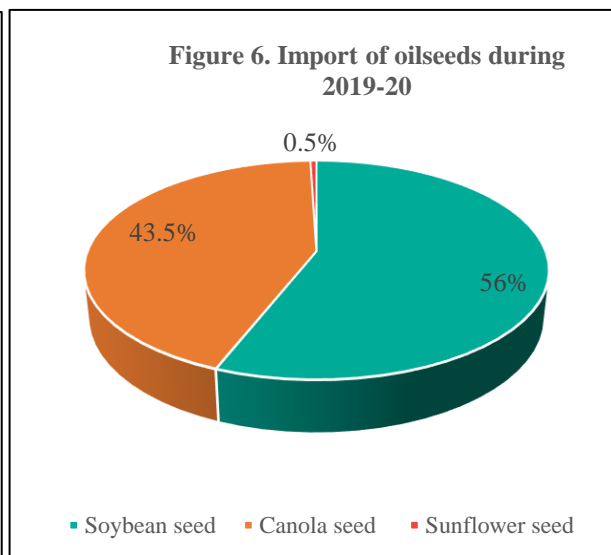
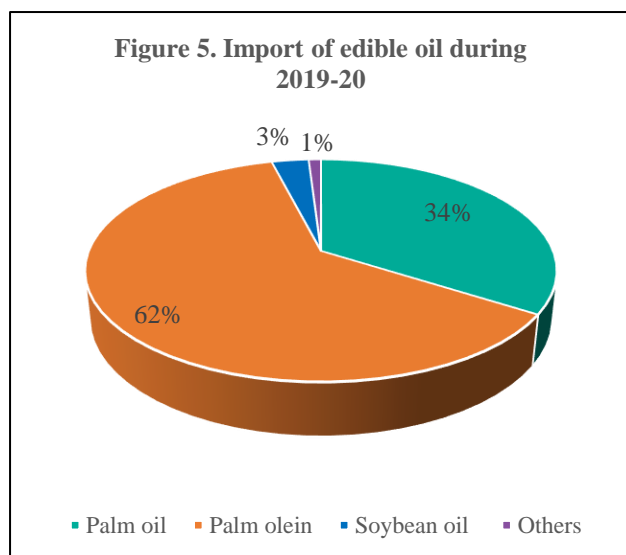
**Palm oil had been trading at around US\$750 per ton in 2020 in the international markets.** Nevertheless, the prices began soaring up in January 2021 and till November, its rate was

around US\$1,348 per ton. Soybean meal, Soybean Oil and Soybeans are showing similar trend and its prices were US\$442, US\$1,440, and US\$551 per MT in November 2021.<sup>1</sup> Palm oil constitutes 90-95 percent of Pakistan’s imports, 75 percent of which is imported from Malaysia and Indonesia, and the rest is Soybean, which is imported from the US and Brazil, and Olive Oil from Spain, Turkey, UAE, and Tunisia.



Source: Economic Survey of Pakistan Various Issues, Annual Reports of State Bank of Pakistan, AARI

**Amongst the imported edible oils**, palm olein constitutes the major share (62 percent) followed by palm oil (34 percent), soybean (3 percent) and others (1 percent) during 2019-20. Among the oilseed imports, soybean seeds constitute a major share (56 percent), followed by canola seed (43.5 percent) and sunflower seed (0.5 percent)<sup>2</sup>. See figures 5 and 6.



Source: AARI, 2021

<sup>1</sup> The World Bank Commodities Price Data (Pink Sheet) <https://thedocs.worldbank.org/en/doc/5d903e848db1d1b83e0ec8f744e55570-0350012021/related/CMO-Pink-Sheet-December-2021.pdf> accessed on December 31, 2021.

<sup>2</sup> Aftab et al., 2021

**Beneficial government policies and reasonable market prices of oilseeds produce is increasing the import bill.** Pakistan’s tariff structure facilitates oilseed imports while shifting value addition to the domestic industry (Table 2). Tariffs on rapeseed, canola, and sunflower seed have been lower than vegetable oil since 2005. The reduced tariff on soybeans in July 2015 and the demand for both oil and high crushing margins are driving its import. Importers have now moved from Indian soymeal to soybean to take advantage of competitively priced soybeans while rapeseed and canola imports are declining. Secondly, demand for soybean meals is expected to grow because of anticipated expansion of the poultry, livestock, and aquaculture sectors in Pakistan. Poultry meat production continues to swell, and poultry producers are increasing the use of soybean meal in poultry feeds as it is relatively a cheap protein source. Some of these producers are reaching the international standards of 35 percent because of higher feed conversion ratio (FCR) with optimum level of 1.5 Kg of feed producing one Kg of live chicken. The industry-wide average for meal inclusion is around 18-20 percent and is expected to reach 25 percent in few years. Similarly, some of the progressive dairy farmers have also started producing dairy feed from soybean.

**Table 2. Duty Structure for Oil Seeds Import (Figures in Percentage and Pak Rupees (US\$ 1=PKR 175))**

Item	Canola	Sunflower	Soybeans	Soybean Meal	Refined Deodorized Palm Oil	Bleached Palm Oil	Crude Palm Olein	Crude Deodorized Soybean Oil
Custom Duty	3%	3%	3%	10%		10,700	9,050	9,050
Duty Discount (Malaysia/Indonesia)	-	-	-	-		15%	15%	N/A
Additional Duty	1%	1%	1%	1%		-	-	-
Regulatory Duty	-	-	-	-		PKR 50/MT	PKR 50/MT	PKR 50/MT
Sales Tax	16%	16%	6%	10%		-	-	-
Central Excise Duty	-	-	-	-		16%	16%	16%
Federal Excise Duty	PKR 400/MT	PKR 400/MT	PKR 400/MT	-		PKR 1,000/MT	PKR 1,000/MT	PKR 1,000/MT

Source: U.S. Department of Agriculture, Foreign Agriculture Service, *Oilseeds and Products Annual, April 2020* <https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Oilseeds%20and%20Products%20Annual%20Islamabad%20Pakistan%2004-01-2019>

### 3. Dynamics of oilseed cultivation and production in Pakistan

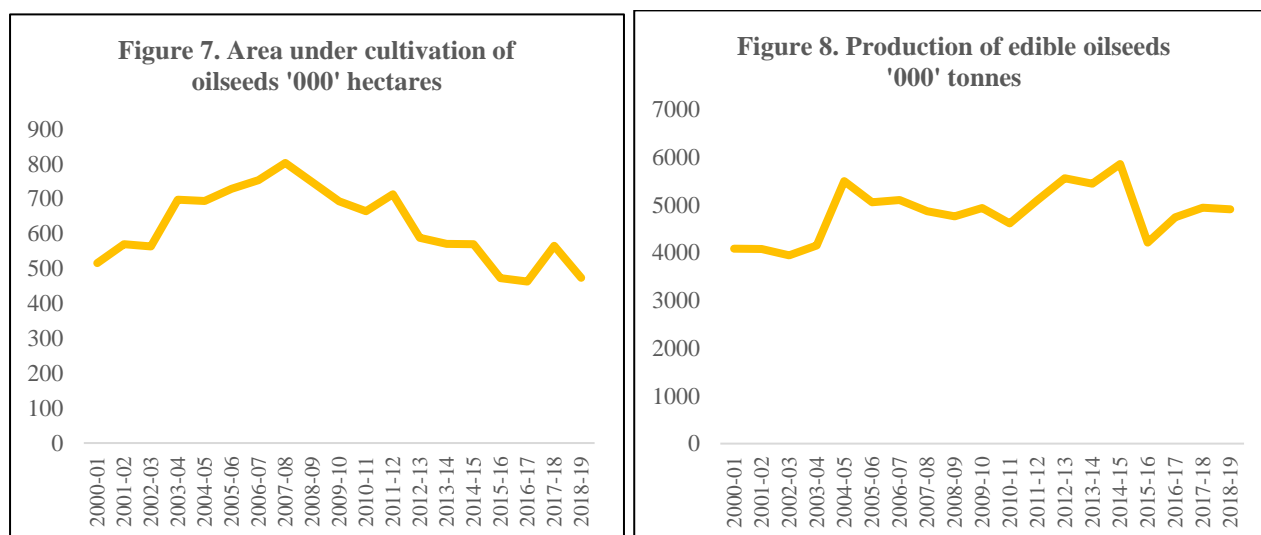
#### 3.1 Present Status of Oilseed Crops and Edible Oil in Pakistan

**Oilseed crops are classified as minor crops in Pakistan that have less established cropping systems despite their importance in the national economy and trade** (Amjad, 2014). Edible oil in Pakistan is extracted from mainly two types of oilseeds:

- Traditional or conventional (cottonseed, rapeseed- mustard, groundnut, sesame and linseed); and
- Non-traditional or unconventional (sunflower, safflower, soybean, Castor).  
The non-traditional crops were introduced in mid-sixties during green revolution, but these crops are cultivated on a significantly lesser area (Dawn, 2002).

**Oilseed production in Pakistan remains low.** Despite being an agrarian economy, domestic production of oilseeds meets only a fraction of national demand (Ali et al, 2008), below 10

percent in the best-case scenario (Aazim, 2017). The area under cultivation of oilseeds has been fluctuating during the last two decades. It peaked in 2007-08 (803,000 hectares) but remained on a declining path (474,000 hectares in 2018-19) since then with the exception of some years (Figure 7). Similar trend has been observed in the production of oilseeds. It peaked in 2004-05 followed by a downward movement till 2010-11, and then a steep decline in 2015-16 before showing some improvement in the next year 2018-19 (Figure 8).



Source: Agriculture Statistics of Pakistan, 2018-19

**Table 3 provides a comparison of cultivated area and production of oilseeds and extraction of edible oil for the year 2005-06 and provisional estimates for 2020-21.** Area under cultivation of oilseed has declined from 3.82 million hectares in 2005-06 to 2.42 in 2020-21, a reduction of 37 percent area. Similarly, production of oilseeds has declined from 4.758 million tons to 2.256 million tons, while domestic oil extraction/production has declined from 793,000 tons in 374,000 tons, a reduction of 53 percent over the same period.

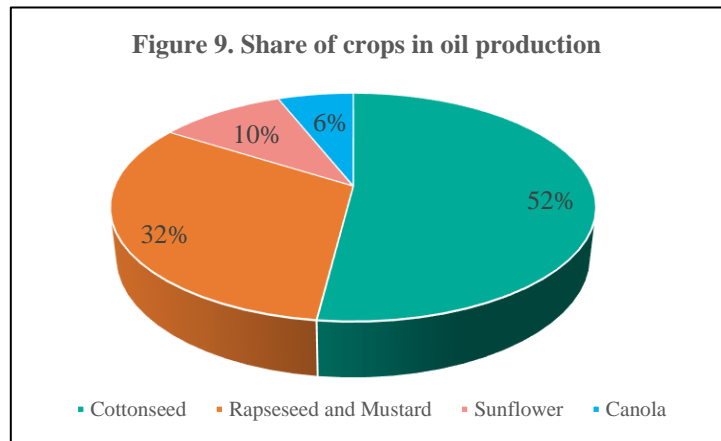
**Table 3. Area and Production of Oil Seed and Oil since 2005-06**

Crops	2005-06			2019-20			2020-21 P		
	Area (000 Acres)	Production (000 tons)		Area (000 Acres)	Production (000 tons)		Area (000 Acres)	Production (000 tons)	
		Seed	Oil		Seed	Oil		Seed	Oil
Cottonseed	7,660	3,796	456	6,243	2342	281	5,137	1,782	214
Rapeseed & Mustard	578	188	59	984	561	179	608	338	108
Sunflower	875	612	220	250	146	55	151	87	33
Canola	323	162	58	125	78	30	77	49	19
<b>Total</b>	<b>9,436</b>	<b>4,758</b>	<b>793</b>	<b>7,602</b>	<b>3,127</b>	<b>545</b>	<b>5,973</b>	<b>2,256</b>	<b>374</b>

Source: Economic Survey of Pakistan, Various Issues

P: Provisional

**During 2019-20, major contribution to local production of edible oil came from cottonseed (52%), followed by rapeseed and mustard (32%), sunflower (10%) and canola (6%). The same trend has been observed in local production during 2020-21 (July-March): cottonseed (57%), rapeseed and mustard (29%), sunflower (9%) and canola (5%). See Figure 9.**

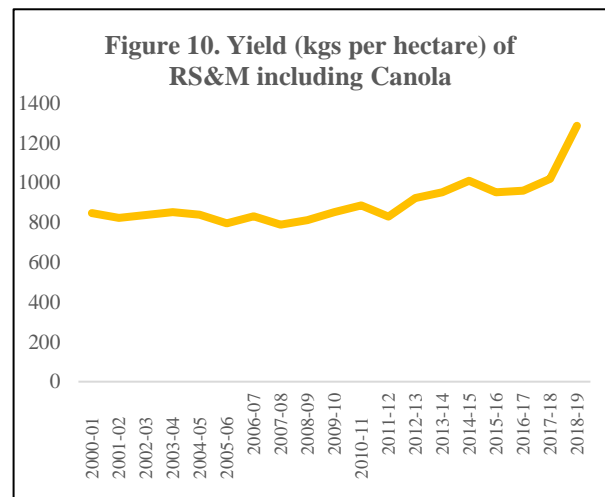


Source: Economic Survey of Pakistan 2020-21

### 3.2 Trends in oilseed production in Pakistan

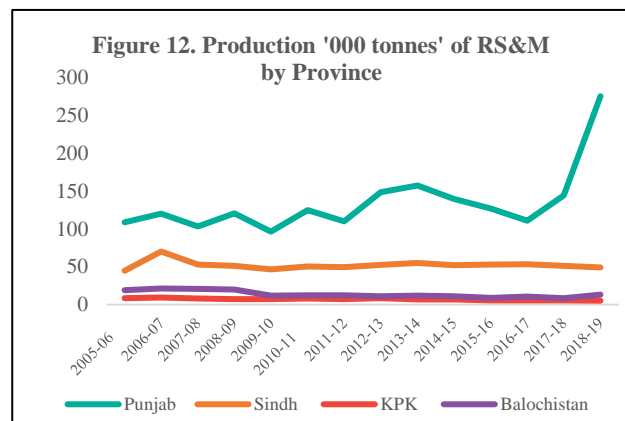
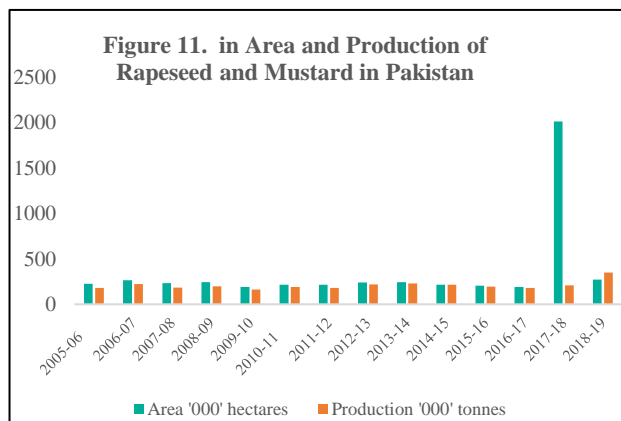
#### 3.2.1 Rapeseed and Mustard

**Rapeseed-mustard is a traditional oilseed crop of Pakistan.** Productivity of RS&M in Pakistan is one of the lowest at an average yield of 951 kg/ha in comparison to the world average at 2144 kg/ha (Ali et al., 2020). This underlines the need to improve productivity of RS&M. The trend in the yield of RS&M including canola is illustrated at Figure 10. The area and production of RS&M in Pakistan has experienced a significant decline over the period 2006-2019. The area under cultivation spiked during 2017-18 but then reverted to historical trend.



Agriculture Statistics of Pakistan 2018-19

**Production of rapeseed and mustered remained low (Figure 11).** Punjab is leading in production of rapeseed and mustard (Figure 12). Analysis of the existing rapeseed and mustard varieties revealed that raya is the dominant variety planted in Pakistan because of the short duration, endurance against stresses, and less shattering during harvesting.



Source: Agriculture Statistics of Pakistan 2018-19

Rapeseed-mustard is predominantly grown in the districts mentioned at Table 4.

**Table 4. Rapeseed-Mustard Districts**

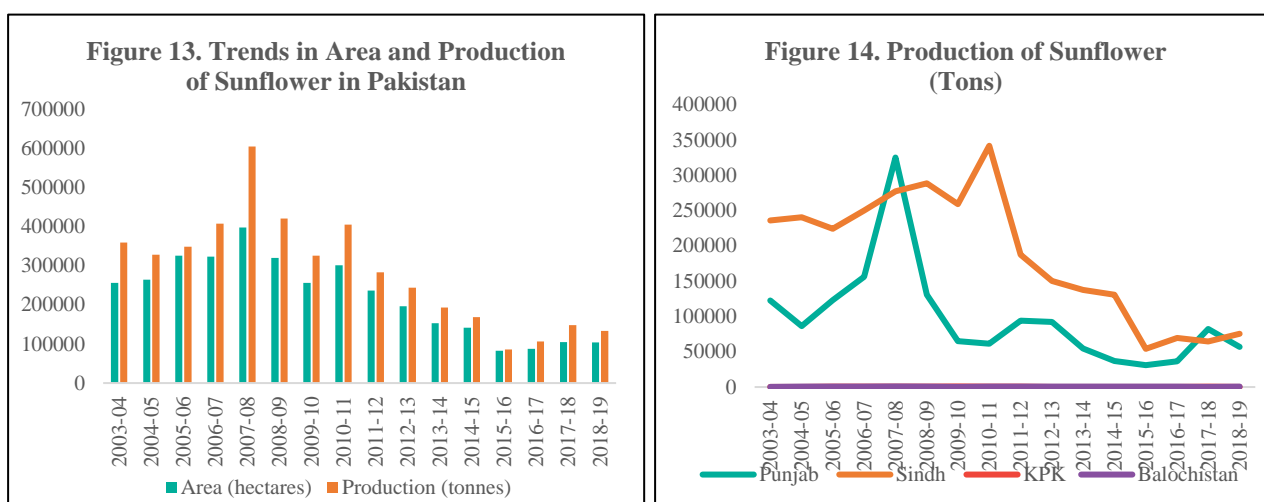
<b>Punjab</b>	Attock, Rawalpindi, Islamabad, Jhelum, Chakwal, Faisalabad, T.T. Singh, Jhang, Kasur, Okara, Sahiwal, Multan, Khanewal, Vehari, Muzaffargarh, Layyah, D.G. Khan, Rajanpur, Bahawalpur, Rahim Yar Khan, Bahawalnagar
<b>Sindh</b>	Khairpur, Ghotki, Sukkur, Naushahro Feroze, Nawabshah, Jacobabad, Kashmore, Shikarpur, Larkana, Kamber, Shahdadkot, Sanghar, Mirpurkhas, Umerkot, Dadu, Jamshoro, Thatta
<b>KPK</b>	Nowshera, Mardan, Swabi, Mansehra, Dir, Swat, Bajaur, D.I.Khan, Kohat
<b>Balochistan</b>	Nasirabad, Jaffarabad, Dera Murad Jamali, Jhal Magsi

Source: Pakistan Agricultural Research Council, 2014

**Major production constraints for RS&M include:** non-availability of high-quality seed, competition with other winter crops such as wheat, uncertain market price, lack of specific harvesting and threshing machines, lack of modern oil expellers and non-adoption of recommended production technology (Aftab et al., 2021 & Amjad, 2014). In addition, farmers also face significant limitations related to the timely availability of agricultural inputs, crop management, low efficiency in oil extraction, high support price of wheat and poor mechanization of oilseed crop. The quality of the produce in some areas poses issues because of the presence of erucic acid and glucosinolate which are harmful for consumption. The oil extraction technology used in the area is obsolete with “*kohlus*”<sup>3</sup> being used as oil expellers in all the clusters, which are quite inefficient. Over 6,000 local *kohlu* expellers are giving only 10-11% oil extraction in the cluster.

### 3.2.2 Sunflower

The area and production of Sunflower has been fluctuating as exhibited at Figure 13 while the province-wise production is at Figure 14.



Source: Agriculture Statistics of Pakistan, 2018-19

<sup>3</sup> Oil extraction from mustard seed dates back to 2000 B.C.(Harappa Civilization) using ox-mill or *kachi ghani*, a cold pressing machine (Dawn, January 1, 2017)

**The area and production increased considerably during 2007-08 due to favorable policies by the government such as availability of hybrid seed and procurement assurance.** Since then, it has been showing a declining trend since 2008-09. Sunflower is predominantly produced in Punjab and Sindh. More than 80% of sunflower is grown in cotton belt of Southern Punjab after the late cotton picking. However, production of sunflower has markedly declined in Punjab and Sindh over the last decade. Wheat act as a major competing crop with sunflower in Pakistan as both the crops have the same sowing time. Since wheat has a better marketing system and support price set by the Government, farmers prefer wheat cultivation over Sunflower. Sunflower is predominantly grown in the districts (Table 5).

**Table 5. Sunflower Cultivation Areas**

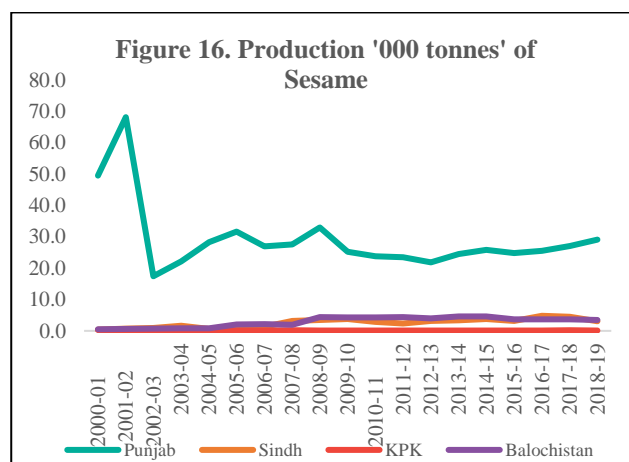
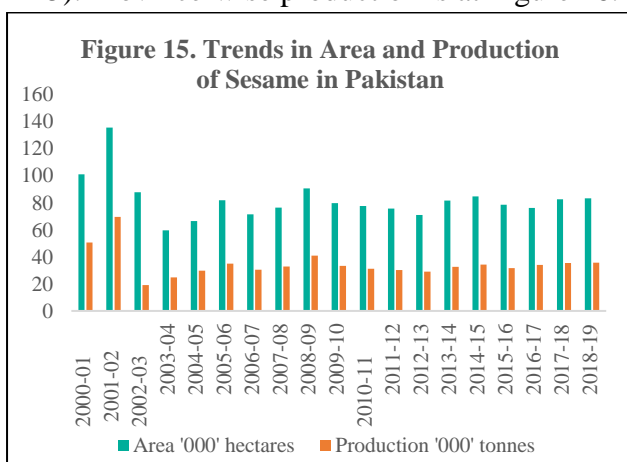
<b>Punjab</b>	<b>Multan, Vehari, Lodhran, Bahawalpur, MuzaffarGarh, Rajanpur, D.G.Khan.</b>
<b>Sindh</b>	Badin, Thatha, Umarmkot, MirpurKhas, Tando Muhammad Khan, Sanghar.
<b>KPK</b>	D.I. Khan, Swabi, Mardan.
<b>Balochistan</b>	Sibi, Nasirabad.

*Source: Pakistan Agricultural Research Council, 2014*

**Farmers face numerous issues in growing sunflowers, especially in the cotton zone, which limit the sunflower production.** These include: (i) delay in cotton sowing due to overlapping of sunflower maturity period; (ii) application of extra fertilizer to cotton after sunflower crop, greater pesticide for cotton sown after sunflower and reduction in cotton yield when sown after sunflower which lowers the profitability and makes the sunflower crop unattractive; (iii) lack of production know-how related to sunflower which results in lower yield; (iv) absence of high-yielding varieties, especially hybrids; and (v) inefficient marketing or procurement systems. The intercropping of sunflower and canola is not being practiced primarily because suitable varieties capable of adjusting in different cropping patterns have not been developed.<sup>4</sup>

### 3.2.3 Sesame

**Punjab is the leading province in Sesame production in Pakistan.** The area under cultivation and production of sesame have been declining in the country since 2001-02 (Figures 15). Province-wise production is at Figure 16.



*Source: Agriculture Statistics of Pakistan, 2018-19*

<sup>4</sup> <https://www.dawn.com/news/44423/drags-on-raising-oilseed-output>

Table 6 reflects predominant areas for Sesame cultivation.

**Table 6. Areas of Sesame Cultivation in Pakistan**

<b>Punjab</b>	Attock, Bhakkar, Bahawalnagar, Chakwal, D.G. Khan, Faisalabad, Hafizabad, Jhang, Kasur, Layyah, Jhelum, Gujrat, Gujranwala, Muzaffargarh, Mia nwali, Mandi Bahaudin, Nankana Sahib, Rajanpur, Narowal, Okara, Pakpattan, Sheikhpura, Sahiwal, Sargodha, Sialkot, Toba Tek Singh
<b>Sindh</b>	Khairpur, NaushahroFeroze, Nawabshah, Tharparkar, Dadu
<b>KPK</b>	Charsadda, D.I. Khan, Mardan, Malakand, Swabi, Kohat, Karak, Hangu, Haripur,
<b>Balochistan</b>	Bolan, JhalMagsi, Lesbella, Jaffarabad, Nasirabad, Sibi, Turbat.

*Source: Pakistan Agricultural Research Council, 2014*

**The constraints in increasing production of sesame in Pakistan include poor marketing system, less availability of quality seed, cultivation on marginal lands, and poor crop management.** The Sesame crop has a huge export potential. During 2018-19, seed worth of PKR 9.55 billion was exported to China, India, Japan, Korea, Kazakhstan, Malaysia and Egypt including some other countries because of favorable international marketing. The Government of Punjab incentivized the farmers to enhance the cultivation of Sesame through subsidy provision of PKR 2000 per acre. It led a large scale increase in cultivation in Punjab in 2020. However, the farmers could not gain the intended benefits as the prices of the produce were depressed due to COVID-19.

### 3.2.4 Soybean

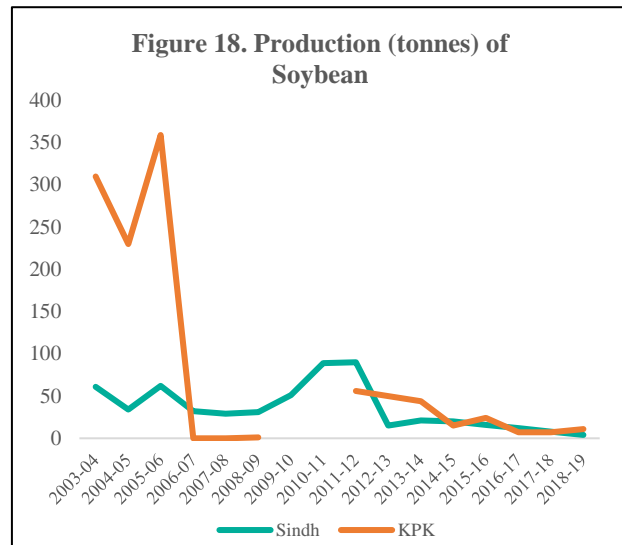
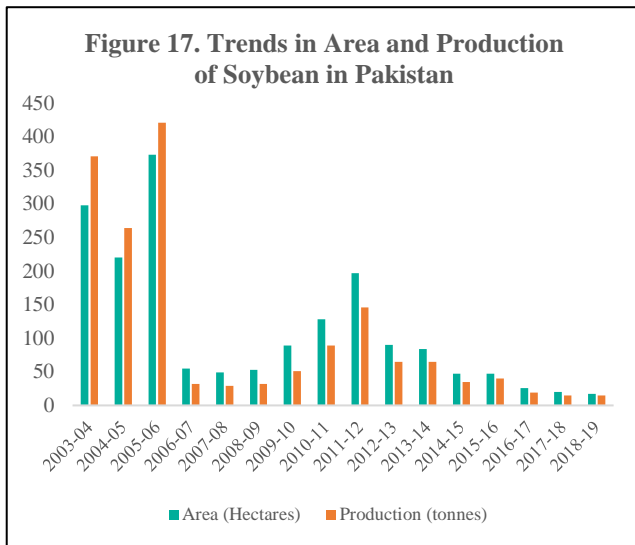
**Soybean has been labelled as golden beans or miracle crop in the literature as it requires minimal amount of fertilizers in comparison to cash crops (Khurshid et al., 2017).** Soybean is mainly grown in the mild climatic regions of major soybean producing countries (Asad, 2020). Soybean crops were introduced in Pakistan in the 1960s and commercial cultivation began in 1970-71. Pakistan Agricultural Research Council (PARC) and provincial research institutes developed eight soybean varieties in 1977-78.<sup>5</sup>

**Soybean is predominantly produced in Sindh and KP in Pakistan.** However, both the cultivated area and production of Soybean has been declining since 2005-06 (Figure 17) while it is almost flat in these provinces since 2015-16 (Figure 18). Major bottlenecks to soybean cultivation and production include: (i) non-availability of high-yielding climate ready varieties; (ii) absence of support price and procurement assurance by the government given the high cost of production; (iii) limited diversity in germplasm; (iv) lack of well-adapted disease resistant soybean genotypes; (v) and lack of photo-insensitive soybean lines for different regions of Pakistan.

**Given the rising import of soybean, it is important to incentivize its cultivation and production for extracting edible oil.** Area under cultivation of soybeans can be increased by exploiting several niches for intercropping of soybean with cereals and pulse crops (Sindh et al., 2017). Soybean fits well in the existing cropping system without clashing with major crops. It can be incorporated in the existing spring as well as summer pattern. Farmers can utilize rice,

<sup>5</sup> <https://tribune.com.pk/story/2328238/chinese-tech-to-lift-soybean-output>

cotton, and rain-fed fallow areas for soybean cultivation. The respective patterns for soybean cultivation in rain-fed, rice and cotton areas are wheat-soybean-wheat, rice-soybean-rice, and cotton-soybean-cotton. The cultivation of soybean after wheat, rice and cotton, that are exhaustive crops, can also help in restoring the soil fertility.<sup>6</sup>



Source: Agriculture Statistics of Pakistan

**Soybean adaptability study of Oilseeds Research Institute Faisalabad suggests that soybean can be successfully grown in comparatively mild climate regions of Punjab having good rainfall** (Aftab et al., 2021) Eastern North Punjab and Western North Punjab have emerged to be suitable areas for commercial soybean cultivation. Also, soybean varieties<sup>7</sup> perform better in Pothohar region, KP, and northern areas of the country having mild climate. The soybean varieties developed by Oilseed Research Institute (ORI), Faisalabad, perform better in Central and Northern plains of Punjab due to better tolerance against high temperature.

### 3.2.5 Groundnut

**Groundnut or peanut is one of the important ‘kharif’ oilseed crops.** It has an oil content of 50 percent as compared to 40 percent in sunflower, 20 percent in soybean and 50 per cent in sesame crop.<sup>8</sup> Groundnut is predominantly grown in rain-fed areas of Punjab, and also, in irrigated areas of Sindh and KPK. The area under cultivation and production of groundnut has been following a steady trend over the last two decades (Figures 19 and 20).

### 3.2.6 Safflower

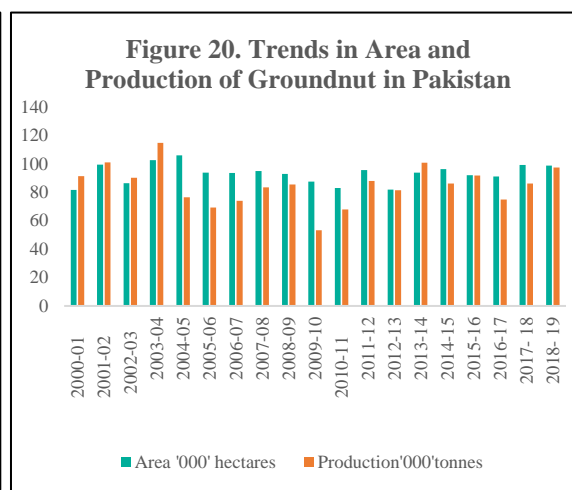
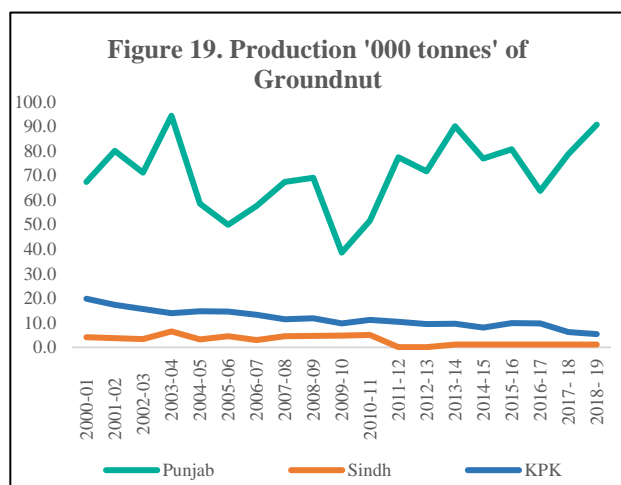
**The area under safflower cultivation is significantly low in Pakistan as the crop is sown on less than 1 thousand acres annually.** Non-availability of good quality seed and absence of a well-established cropping system act as a major limiting factor in safflower production

<sup>6</sup> <https://www.dawn.com/news/1527911>

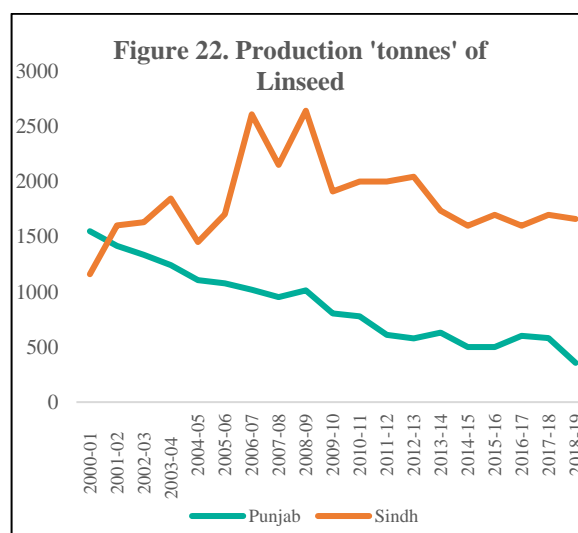
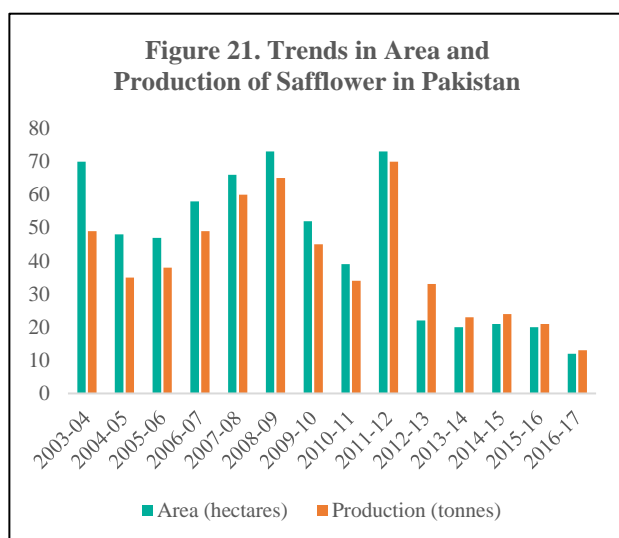
<sup>7</sup> National Agricultural Research Centre (NARC) and Agronomic Research Institute (ARI)

<sup>8</sup> <https://www.dawn.com/news/198611/groundnut-a-potential-crop>

(Aftab et al., 2021). The area under cultivation and production of safflower has been fluctuating over the last two decades and have been exhibiting a declining trend since 2011-12 (Figure 21). Safflower is predominantly grown in Sindh.<sup>9</sup>



Source: Agriculture Statistics of Pakistan 2018-19



Source: Agriculture Statistics of Pakistan

### 3.2.5 Linseed

**Linseed is categorized as a traditional oilseed crop in Pakistan.** It is predominantly cultivated in Punjab and Sindh. It has a low cultivation cost as it requires less water and can grow without fertilizers and chemical input. The crop can be grown after rice field has been ploughed as moisture is already present in the land. The crop, however, is getting inexistent in Sindh province as only a few farmers cultivate it in the rice fields in Jacobabad, Shikarpur, Larkana, and Dadu districts (Khaskheli, 2018). In Punjab, it is a rabi crop grown in districts of Narowal, Gujrat, Mandi Bahauddin, Toba Tek Singh, Faisalabad, Sahiwal, Bahawalpur and Bahawalnagar (Aftab et al., 2021). The production of linseed in both Punjab and Sindh exhibits a declining trend (Figure 22).

<sup>9</sup> <https://www.technologytimes.pk/2017/09/19/safflower-potential-industrial-crop-pakistan/>

#### **4. Institutional Support**

**The Government of Pakistan over the last few decades had taken several initiatives and launched programs at provincial and national level to increase the oilseed production in Pakistan.** Nevertheless, these initiatives have not yielded the desired results and the country's reliance on imported edible oil is rising. These initiatives are discussed below:

##### **4.1 Pakistan Edible Oil Corporation (PEOC) & Seed Division in Ghee Corporation of Pakistan**

**Pakistan Edible Oil Corporation (PEOC) was established in 1977** under the Ministry of Industries with a mandate to initiate work on the promotion of oilseed crops in the country. PEOC was dissolved after two years in 1979 following change of government and a Seed Division was established in the Ghee Corporation of Pakistan (GCP), to focus on crops like sunflowers, safflowers and soybeans. The division took charge of end-to-end services from distribution of local and imported seed directly to growers, procurement of produce from doorstep, and extraction of oil. Under the division, solid production, supply, and marketing chains were established for sunflowers in Punjab and Sindh, and soybeans in Khyber Pakhtunkhwa (Zahid, 2018).

##### **4.2 National Oilseed Development Project (NOPD)**

**National Oilseed Development Project**, supported by the World Bank with a grant of US\$24 million, was implemented during 1995-1996. The project aimed at: (i) achieving a sustainable increase in the production of oilseed, particularly non-traditional oilseeds, to reduce the import bill of edible oil; (ii) increase farm income through diversification; and (iii) provision of support services including research, extension, seed multiplication, credit, and the marketing network. While major targets (area and production) were not achieved from the intervention, local production increased from 0.46 million tons to 0.54 million tons which led to a small decline in the import of edible oil. Canola was first introduced into the cropping system during this Project period. It also created awareness regarding the non-traditional oilseed crops.

##### **4.3 Pakistan Oilseed Development Board (PODB)**

**Pakistan Oilseed Development Board (PODB) was established in 1995** under the then Ministry of Food, Agriculture, and Livestock (MINFAL) and now Ministry of National Food Security & Research (MNFS&R). The Board is responsible to formulate policy for oilseed development, promote research and collaboration with provincial governments, support and design projects on oilseed and maintain data on the oilseed sector (MNFS&R, 2021). In 2007, PODB hosted the D8 countries high professionals' seminar on olive and saffron with an agreement to keep olive production and marketing mutually interactive. PODB was wound up on June 30, 2011 sequel to 18<sup>th</sup> Constitutional Amendment. It was restored in 2013 at a reduced level for federal areas (Zahid, 2018). PODB has also played a role for annual

circulation of targets for oilseeds crops in Pakistan and linking the farmers with the private sector to facilitate them to acquire quality seed. A regular interaction with solvent industry was also done by PO DB to convince them to maintain the profit incentive for oilseed farmers by regularly procuring the produce.

## 5. Recent Initiatives for Oilseed Sector Development in Pakistan

### 5.1 Oilseed Promotion Initiative in Punjab 2017-18

**The Government of Punjab launched Oilseed Promotion initiative in 2017-18 to increase cultivation of sunflower and canola.** Under this initiative, growers of canola and sunflower are provided a subsidy of Rs. 5000/acre through E- voucher scheme. In addition, the Government announced a procurement price of Rs.2500/Maund<sup>10</sup> for canola and sunflower produce. A target of 50 thousand acres for canola cultivation and 200,000 acres for sunflower cultivation in Punjab was fixed in 2017-18. As part of the initiative, Agriculture Extension Wing provided latest technology to the farmers through aggressive campaigns, seminars and print and electronic media.

**The measures taken during program implementation included:** canola and sunflower crops' calendar preparation, cost of production comparison for subsidy provision, fixation of district wise target area for canola and sunflower cultivation, development of canola and sunflower production technology, training of master trainers of agriculture department and private seed companies, mega seminars for motivating farmers and dissemination of production technology. As a result of the oil initiative program, a net benefit of Rs. 3.27 billion was earned by spending Rs. 0.675 billion in subsidy. From 2016-17 to 2019-20, area under canola and mustard cultivation increased by 169% with an increase in average yield per acre by 49 percent and production by 300 percent because of subsidy. Cultivated area of sunflower increased by 88% with an increase in average yield per acre by 18.2 percent and production by 122 percent (Table 7)

**Table 7. Oilseed Trend in Punjab: Pre and Post-Subsidy Regime**

Crop	Non-Subsidy Regime				Subsidy Regime			
	2016-17		2017-18		2018-19		2019-20	
	Area (Acres)	Production (000 tons)	Area (Acres)	Production (000 tons)	Area (Acres)	Production (000 tons)	Area (Acres)	Production (000 tons)
Canola and Mustard	296,200	120.5	355,800	188.8	465,800	275.0	795,900	482.0
Sunflower	48,225	36.3	104,039	82.0	73,934	56.8	90,512	80.5
Sesame	150,630	25.5	165,240	27.0	175,990	29.1	301,000	55.5

*Source: Directorate of Crop Reporting Services, Punjab*

### 5.2 National Oilseed Enhancement Program

**The Federal Government has started National Oilseed Enhancement Program following the success of oilseed promotion initiative in Punjab under the Prime Minister**

<sup>10</sup> A weighing unit equivalent to 37 Kg

**Agriculture Emergency Program.** The total cost of the project is Rs. 10,963 million. The objectives of the program include: (i) enhancing productivity and profitability through increase in yield of oilseeds; (ii) increase cultivated area and production of oilseeds in the country; and (iii) make the country self-sufficient in oilseed production and consequently reducing import bill through making interventions that make potential oilseed crops like canola, sesame and sunflower comparable with other cash crops.

**The key interventions of National Oilseeds Enhancement Program comprise:** (i) registration of oilseed growers for grant of subsidy; (ii) subsidy of Rs. 5000 per acre up to 20 acres; (iii) fifty percent subsidy on purchase of oilseed machinery; (iv) ensuring availability of hybrid seed through national and multinational seed companies and research institutes; (v) national hybrid seed multiplication and varietal development for sustainable production of oilseeds in the country; (vi) establishment of procurement centers in collaboration with All Pakistan Solvent Extractors Association (APSEA); (vii) dissemination of production technology through print, electronic media and SMS; (viii) mega and mini farmer gatherings in the provinces, and (ix) arrangement of demonstration plots in oilseed growing areas.

## **6. Uncertainties and Challenges of Supply and Price Sustainability**

**Indonesia and Malaysia continued to be dominant players in edible oil exports while Argentine is emerging as third largest exporter.** The edible oil export is around 41 percent of global production of which Indonesia and Malaysia share two-third. Nevertheless, this share is expected to contract as domestic demand in these countries rise by 2028. Argentina is expected to reach 7.9 percent (mainly soybean oil) by 2028. More India is expected to continue the largest importer of edible oil with its strong growth in imports at 3.7 percent per annum while European Union remains the largest import of protein meal.<sup>11</sup> In view of concentration of oilseeds production in few regions of the world, uncertainties, such as, weather conditions and price fluctuation apply, which are more pronounced in the oilseeds and palm oil complex. Similarly, the expansion of soybean production in the United States and Brazil is likely to be subject to the outcomes of ongoing trade negotiations between China and the United States. Given the current political situation, expansion of soybean cultivation in Brazil to respond to Chinese demand and concurrent conversion of soybean area to maize in the United States seem more plausible. This could possibly influence demand for other oilseeds from other regions, replacement effects and the global volume for exports.

Secondly, consumers are increasingly concerned regarding high share of soybean production derived from genetically modified seeds and corresponding momentum for certification which may shift feed demand to other protein sources. Thirdly, expansion in palm cultivation area in Indonesia and Malaysia has been slow because of low profitability which is increasing sustainability of supply concerns. Fourthly, environmental concerns are arising out of deforestation to expand soybean cultivation in Brazil and Argentina, both within and outside, as demand for deforestation-free oils and gain support in developed countries. Certification,

---

<sup>11</sup> OECD, op.cit.

labelling, and environmental legislation may restraint area expansion in palm-oil producing countries and procurement by major importers, which can eventually affect supply growth as well as prices.

## 7. Booster to Oilseed/Edible Oil Production: Needs of the Hour

**Pakistan's import quantity of edible oil has been rising since 2010-11 except for some years, so is the import bill which has doubled since 2009-10** (see Section 2, Figures 2-4). The edible oil import has been increasing at Compound Annual Growth Rate (CAGR) of 7.6 percent since 2009-10. Total local consumption of edible oil and *ghee* is around 4.5 million tons and is likely to move upward closer to 5.0-5.5 million tons due to opening of the Afghan trade and projected to be 6.5-7 million tons by 2028. This hike in consumption is coming at a time when local oilseed production is declining at a CAGR of 1.6 percent since 2010-11. Likewise, the import of oilseed is likely to set a record as Pakistan has already imported 2.7 MT since January 2021 while another 0.8 MT was contracted for September-December 2021.<sup>12</sup>

**Considering the growing demand for edible oils, continued deficit, and high cost of imports, scaling up the oilseeds production is vital.** Pakistan has the potential of producing sizeable quantities of oilseeds which can reduce the import bill for oilseeds and edible oil. Currently, the country produces various types of oilseed crops including rapeseed and mustard, canola, sunflower, cottonseed, groundnut, soybean, sesame, safflower, linseed, jojoba, castor, Salicornia and salvadora. As elaborated above, local oil production is only a fraction of the total demand for edible oil leading to heavy reliance on import of oilseeds and edible oil.

**The reasons for decline in cultivated area as well as production of oilseed (Figure 23) include:** (i) absence of high yielding climate resilient seed varieties; (ii) distortionary/indicative price policies for wheat and sugarcane which incentivized the farmers to grow wheat and sugarcane as they see high economic returns; (iii) import supportive policies with favorable tariff structure and free trade agreements for oil importers reducing incentives for local oilseed production (see Table 2 above);<sup>13</sup> (iv) non-availability of formal credit to small farmers, main cultivators of oilseed; (v) absence of adequate and proper machinery including planters, harvesters, and seed driers for crops such as canola and sunflower; (vi) competition of oilseeds with cash crops in the Indus Basin;<sup>14</sup> (vii) lower market prices for oilseeds and lack of properly developed markets.

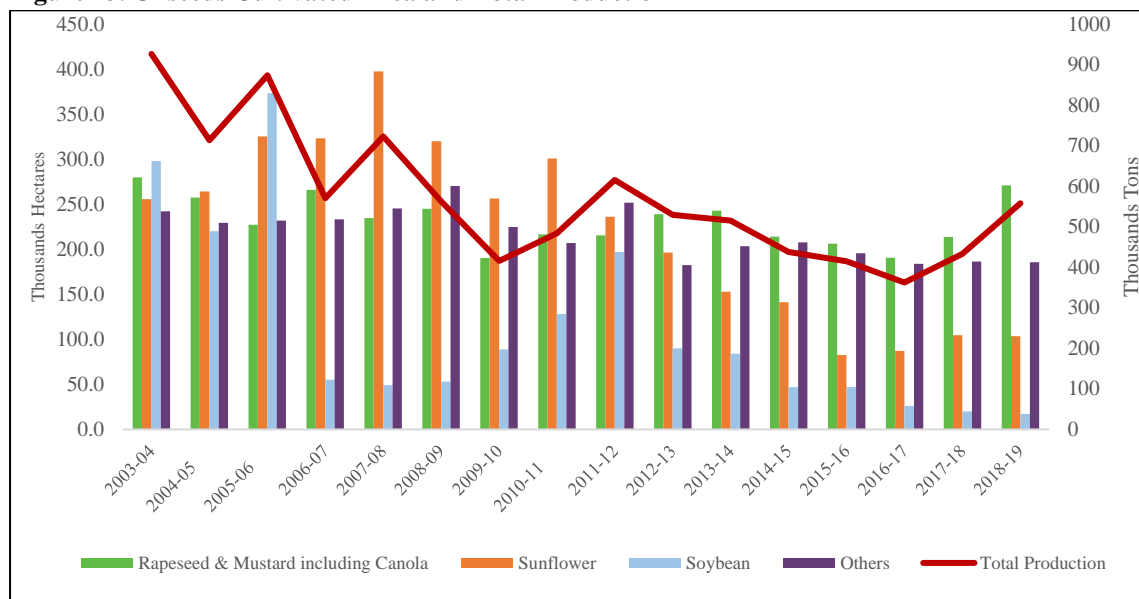
---

<sup>12</sup> <https://www.dawn.com/news/1648260>

<sup>13</sup> Sales tax on soybean was reduced to 6 percent compared to 16 percent on canola or sunflower for solvent extractors in July 2014 even though soybean oil extraction ratio is only 20 percent as compared to 47 percent for sunflower and 43 percent for rapeseed/canola, resultantly the of soybean for solvent extraction went up from a mere 50,000 thousand tons in FY2015 to 2.568 million tons in FY2021. Custom duty on soybean seed was reduced to 3 percent compared to 10 percent on soymeal imports (used in poultry feed) in July 2015, hence resulting in increase in imports of soybean seed compared to soymeal.

<sup>14</sup> Rapeseed, mustard, and canola compete with wheat for limited water as against its total availability of 31.4 MAF during Rabi, Wheat requires 24 MAF leaving little water for other crops and oilseeds.

**Figure 23. Oilseeds Cultivated Area and Total Production**



Source: Agriculture Statistics of Pakistan 2018-19

**Self-sufficiency in edible oils may not be possible in the short run but its prospects in the long run seem plausible given the supportive policy and right incentives.** Currently, the production gap is about 3.8 million tons. Total requirement of edible oils is projected to be 6.434 million tons by 2028 (OECD) with 2.19 percent growth rate while projected level of production will be around 0.5 million tons<sup>15</sup> and the gap would be approximately 6 million tons. Thus, there is an opportunity to shift agricultural production focus from conventional crops to high value agriculture including oilseeds as import substitution crops while enhancing farm productivity of conventional crops. To lessen reliance on imported edible oil and oilseeds and reducing import bill, it is proposed as follows:

**7.1 National Oilseed Policy:** As underlined above, the federal government has taken various initiatives in a disjointed manner to promote oil seed production in the country but these failed to yield the desired results due to lack of consistency in the approach and policy measures. The National Food Security Policy (2018) emphasizes the need to shift agricultural production focus from conventional crops to promote cultivation and utilization of oilseeds as alternate crops for import substitution. However, the National Oilseed Enhancement Program has been initiated in 2020. The Government now needs to move from periodic project-based interventions to formulate a comprehensive and consistent policy framework in consultation with all the stakeholders that addresses the institutional as well as policy constraints including competitive pricing and marketing<sup>16</sup> in the oilseed value chain. The policy must clearly define the federal and provincial responsibilities and goals as it is a devolved subject under the 18<sup>th</sup> Constitutional Amendment.

<sup>15</sup> Compound Annual Growth Rate of local production was negative 1.6 percent during 2009-10 to 2019-20

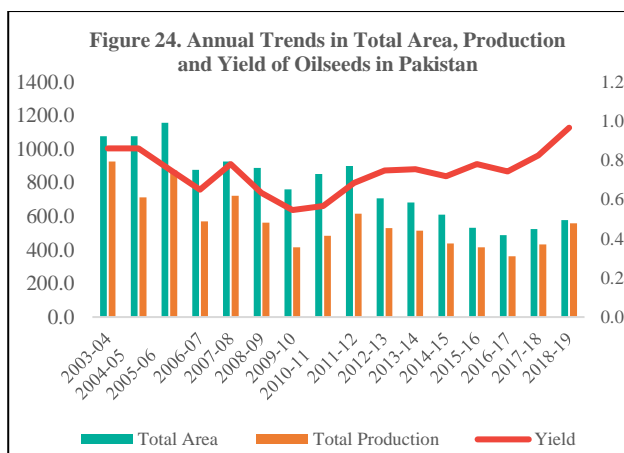
<sup>16</sup> There has been an uneven competition of local production with imported oil as the prices of imported oil dampens when local crop reaches the harvesting stage (Dawn, 2002). Prices of high-quality canola oils have been depressed because of heavy import of the low priced but low-quality palm oil and blended oil (Ali et al., 2020).

**7.2 Holistic Farming Approach:** Canola, sunflower and sesame crops are the potential oilseed crops to overcome the current edible oil situation in the country. Additional area can be brought under cultivation using intercropping and sequential cropping. As a future strategy, surplus area of wheat and sugarcane can be brought under canola and sunflower cultivation. There exists a possibility of increasing oilseed production up to 34.41 percent of the domestic needs using additional area from wheat and sugarcane (Ali et al., 2020). Area under cultivation of oilseeds can be increased by using varieties that are suitable for cultivation in rain-fed rice fallows. This includes cultivation of early maturing paddy in the kharif season. Integrated crop management practices and suitable agronomic practices (seed priming, sowing under zero or minimum tillage condition) should be adopted.

**7.3 Crop Substitution:** Sugarcane was planted on an area of 1.043 million hectares in FY2020 with cane production of 66.4 million tons producing 4.88 million tons of sugar. The country’s requirement is around 3.5 million ton (@16.3 kg per capita consumption). It means that we are producing 1.38 million extra sugar. It implies that 0.3 million hectares of sugarcane is cropped extra. It was 0.6 million hectares in FY2018. This extra cropped area can be used for oilseed cultivation with the right incentives. Similarly, partial wheat cultivated area can be released by increasing farm and water productivity for this purpose.

**7.4 Trend in Yield of Oilseeds:**

**Oilseeds cultivation in Pakistan has declined from 1.1 million hectares of area producing 0.926 million tons in 2003-04 to 0.577 million hectares of area producing 0.557 million tons in 2018-19.** The area under oilseeds has decelerated due to its lower profitability *viz-a-viz* competing crops. Annual production of oilseed crops during 2003-04 to 2018-19 has been negative (Figure 24) for area (CAGR -3.8 percent) and production (CAGR -3.1 percent) while yield of some oilseed crops is improving.



Source: Agriculture Statistics of Pakistan, 2018-19

**The area and production of rapeseed and mustard including Canola declined between 2001-02 and 2016-17 by 16.2 percent and 21.8 percent respectively.** However, the declining trend in area and production reversed during 2017-2019 and increased by 42.5 percent and 93.1 percent respectively because of higher yield which increased by 51.7 percent. Likewise, area and production of sunflower between 2003-04 and 2018-19 decreased by 59.5 percent and 63 percent respectively. Soybean has also registered reduction both in area and production. The higher productivity of castor has been driving the production and there has been marginal reduction in production (-1.8 percent) despite decrease in area of 52.2 percent during the same

period. The groundnut has shown positive trend in areas as well as production with declining yield ( see Table 8).

**Table 8. Growth Trend in Different Oilseeds**

Seed	Period	Percent Increase and Decrease		
		Area	Yield	Production
Rapeseed, Mustard & Canola	2001-02-2016-17	-16.2	+51.7	-21.8
	2016-17-2018-19	+42.5		+93.1
Sunflower	2003-04-2018-19	-59.5		-63.0
Linseed	2001-02-2018-19	-45.1	+35.5	-25.6
Castor	2001-02-2018-19	-52.2	+105.6	-1.8
Soybean	2003-04-2018-19	-94.3		-96.0
Groundnut	2001-02-2018-19	+21.0	-11.9	+6.6
Sesame	2001-02-2018-19	-17.5	-14.4	-29.4
Safflower	2002-02-2016-17	-82.9		-73.5

*Source: Agriculture Statistics of Pakistan.*

**7.5 Improving Yield:** Table 9 reflects tremendous potential for enhancing yield of various oilseed crops, such as, Rapeseed and Mustard including Canola, Sunflower, Soybean, Groundnut, Sesame, and Safflower by adopting appropriate technology to increase production. Pakistan needs to exploit its unrealized yield potential in production of oilseed crops. To accomplish this effectively, the cultivation of individual oil crops may be attached priority on the basis of their oil yields, climatic requirements and consistency with other national objectives. Per acre yield can be increased by introducing higher yielding hybrids, early maturing hybrids, hybrids resistant to insects, pests and diseases, availability of other inputs such as fertilizers, irrigation etc. and adoption of modern technology.

**7.6 Enhancing Farm Productivity:** It is vital that the oilseed policy must focus on strategies/interventions to enhance farm productivity which may include: (i) seed production and distribution of by high-yield varieties and hybrid seeds; (ii) low cost technologies with high impact on productivity resulting in higher profitability; (iii) facilitating investment efficient and eco-friendly technologies with high return; (iv) exploring non-traditional seasons and regions for oilseed crops for cultivated area expansion and integration into major cropping system.

**7.7 Access to Quality and Hybrid Seed:** Several projects are already underway to develop quality oilseeds. Pakistan Agriculture Research Council (PARC) has developed a hybrid canola seed variety and planted the same in Northern Punjab and KP. Furthermore, the olive plantation has been initiated in the Pothohar valley. Despite this, more focus is still required on production of quality hybrid seeds locally mainly to reduce input costs of ultimate beneficiaries.

**7.8 Spate Irrigated System<sup>17</sup>:** Spate irrigated areas are generally ranked second to canal irrigated areas. Given the shortage of water during Rabi season with competing preferred crop,

<sup>17</sup>It is known as *Rod Kohi* in the KP Province, and *Sailaba* in Punjab and Baluchistan. Commonly, spate irrigation is also generally referred as flood irrigation. Flood water of the hill torrents is diverted into a plain area, locally known as *Damaan*.

it has been suggested to introduce oilseeds outside the Indus basin in spate irrigated areas. A large varieties of oilseed including rapeseed, mustard, Canola, sunflower, safflower, sesame, and linseed have shown promising results in spate irrigated areas. However, to achieve better results, water efficient crops like safflower, rapeseed and mustard, linseed and sesame may be grown in uneconomical wheat areas while Canola and sunflower can be grown in spate irrigated areas or rain-fed areas. The quality olive plantation in temperate climate of Balochistan, part of KP, and Pothohar can not only produce edible oil, but also would provide surface cover.

Spate irrigated areas currently comprises of 1.5 million hectares or 8 percent of the total irrigated area (Table 9) in Pakistan. The total water potential of *Rod Kohi* is at Table 9.<sup>18</sup>

**Table 9. Water Potential of Rod Kohi**

Province	Potential Area (Million Acre)	Potential Water (MAF)	Ratio of Water to Area (acre feet/acre)
Federal	0.67	2.84	4.2
Khyber Pakhtunkhwa	2.13	4.56	2.1
Punjab	1.41	2.71	1.9
Sindh	1.36	0.72	0.5
Balochistan	11.56	7.85	0.7
Total	17.3	18.68	1.1

The sowing of oilseeds in spate irrigated areas can facilitate shifting from low value to high value, and from high delta to low delta of water crops. However, this is only possible with assured availability of flood water which can be provided through water storages to ensure water availability during dry period and critical time of crop growth.

**7.9 Formal Credit to Small Farmers:** Small farmers comprise more than 70 per cent of the farming community who have difficulty to access formal credit and have to rely on informal channels for credit. A little incentive and availability of formal credit to smallholder farmers can yield promising results.

**7.10 Incentivizing Farmers:** The success of pilot subsidy program in Punjab providing PKR 5000 per acre for up to twenty acres to promote cultivation of canola and sunflower crops (see Table 7) indicates that subsidy can be effective in behavioral change of farmers and a shift to high value crops provided the farmers get the market and right price for his produce. This model may be scaled up in Punjab and may be replicated in other provinces to promote oilseeds production. Sindh is also contemplating to start this program through smart subsidy.

**7.11 Cluster Identification:** Long-term gains in productivity can be realized by identifying clusters that produce high yield and declaring them as “Oilseed Zones”. Extensive market linkages and specialized extension services may be provided in these clusters to maximize benefits. The Pothohar area, has great potential to bring the import burden of the country to

<sup>18</sup> Muhammad Asif, Col Islam-ul-Haque. Hill Torrents Potentials and Spate Irrigation Management to Support Agricultural Strategies in Pakistan. American Journal of Agriculture and Forestry. Vol. 2, No. 6, 2014, pp. 289-295. doi: 10.11648/j.ajaf.20140206.20

meets its edible oils demand. The potential is also found in the Balochistan areas which include Khuzdar, Loralai, Quetta, Pishin, Zhob and Sibi etc. (Chaudhry, 2008). The weather conditions (high rain falls) in the northern part of the Punjab, and the Hazara area in NWFP are quite suitable for the olive oil cultivations. The policy-makers may explore and design a strategic framework for the olive oil cultivations to achieve the economic growth either via government interventions or bringing private investments (Amir, 2006). Cluster identification can help in effectively targeting subsidies in high potential areas instead of adopting a generalized approach. Organization of farmers in a cluster at village level and then clustering all village level may be needed to streamline the process. (Ali et al., 2020).

**7.12 Rapeseed-mustard production:** It can be increased by intercropping RS&M with September grown sugarcane in sugarcane areas. Punjab and Sindh are the leading provinces in the production of RS&M followed by Khyber Pakhtunkhwa (KP) and Balochistan. Rapeseed and Mustard Cluster Feasibility and Transformation Study<sup>19</sup> has identified four RS&M clusters. These include: (i) **Southern Punjab Cluster** (Bahawalpur, Bahawalnagar, Rahim Yar Khan, and Rajanpur districts); (ii) **Northern Punjab Cluster** (Chakwal district and Chakwal tehsil of Chakwal district); (iii) **Balochistan Cluster** (districts of Jaffarabad, and Naseerabad); and (iv) **Sindh Cluster** (includes Mirpur Khas, Sangha, S.B Abada, Jaccobabad, Larkana, and Thatta). These clusters have climate conditions suitable for RS&M production and established linkages with the markets. Oil extraction can be improved by using small-scale modern solvent expellers at village level. (Aftab et al., 2021).

**7.13 To expand the area under sunflower cultivation,** rice-sunflower-rice rotation has been suggested as a possible approach in literature. In addition, potato growing areas also have a good potential for sunflower cultivation.

**7.14 To increase soybean cultivation, Pakistan Agricultural Research Council (PARC) has started distributing soybean seeds to farmers free of cost in some districts of KP.** The Pakistan Atomic Energy Commission (PAEC) has also developed soybean lines for spring and autumn cultivation and its intercropping with sugarcane and maize. Currently, only 2-5 soybean cultivars are available in the country, which produce economical yield only under short-day conditions (autumn seasons) (Haider, 2021). In addition, China is helping Pakistan in stimulating the local soybean production by introducing advanced maize-soybean intercropping technology from the Sichuan Agricultural University.<sup>20</sup>

Under the intercropping technology, farmers can grow soybean without restricting the cultivation area of existing crops like maize, sugarcane, and corn. This intercropping technology is beneficial given the climatic conditions of Pakistan as it does not require any extra land while maize can shade and cool soybeans to produce high yields in high temperatures and strong sunlight.<sup>21</sup> The technology is under implementation in Bahawalpur, Khairpur Tamewali, Rajanpur, Rahim Yar Khan, Shekhupura, Sargodha, Kasur, Talagang, Khairpur,

---

<sup>19</sup> Planning Commission of Pakistan, Ministry of Planning Development and Special Initiatives, 2020.

<sup>20</sup> <https://tribune.com.pk/story/2328238/chinese-tech-to-lift-soybean-output>

<sup>21</sup> <http://cpecinfo.com/china-to-aid-pakistan-in-advanced-agricultural-technology/>

Tandojam, Hyderabad, Faisalabad and Burewala. The total demonstration area of maize-soybean strip intercropping technology in Pakistan increased to about 217 acres, indicating a 117% year-on-year increase.<sup>22</sup>

**7.15 Olive Cultivation:** Olive cultivation can be a potential alternative option for edible oil in the country as Pakistan has climate, land and soil that are suitable for the plantation and cultivation of a variety of olive trees. Olive orchards require less water, fertilizers, pesticides and fuel energy as compared to other major annual oilseed crops. The available potential area for olive cultivation is about 10 million acres in Punjab, particularly the Pothwar region, Balochistan, Khyber Pakhtunkhwa, Azad Jammu and Kashmir (AJK) and Gilgit-Baltistan. Pothohar region has been termed as the “olive valley”.<sup>23</sup>

Olive oil production in Pakistan started in 2010 through agricultural cooperation with Italy and Spain<sup>24</sup> and commercial cooperation with China. To boost olive oil production, Agriculture Research Council, Agriculture Research Institute Peshawar, Balochistan Agricultural Development and Research Centre and Agriculture and Research Institute Quetta have made effective contributions to plantation of 3.6 million olive trees on 30,000 acres of land in 22 districts including Rawalpindi Division.<sup>25</sup> Bari Agriculture Research Institute has provided over 1.2 million olive saplings to the farmers to enhance olive cultivation considerably in Pothohar region. Free of cost live saplings have been provided to eligible farmers of the region including Rawalpindi, Chakwal, Jhelum, Attock and Khurshab districts with an aim to boost olive oil production.<sup>26</sup> The National Bank of Pakistan and the National Highway Authority has signed a Memorandum of Understanding in January 2020 for plantation of olive trees alongside highways in KP.<sup>27</sup> Promoting similar projects in other provinces can help the country in increasing production and reducing its import of refined oil.

To date, various government departments have set up 15 olive oil extraction units in Pakistan. An initiative is being funded by Public Sector Development Program (PSDP) with a purpose to bring degraded, marginal, and less productive lands under olive cultivation on 50,000 acres of land.<sup>28</sup> A cold pressed extraction unit has also been set up in the area that can extract oil from 600 kg of olive fruit in just one hour. The International Olive Council (IOC) has decided to admit Pakistan as its full member as the country has the potential not only to meet domestic requirement but for export as well. Olive Oil Development Board is expected to receive funds from IOC. Currently, plans are underway to grow 10 million plants over 75,000 acres of land.<sup>29</sup>

---

<sup>22</sup> <https://tribune.com.pk/story/2328238/chinese-tech-to-lift-soybean-output>

<sup>23</sup> <https://tribune.com.pk/story/2275101/potohar-region-termed-olive-valley>

<sup>24</sup> Spain is producing about 45 percent of the total world’s edible oil from olive cultivation on 2.6 million hectares while Pakistan despite having a vast suitable area of 4.4 million hectares for olive farming, almost double the Spain (Profit, 2020), is importing around 85 percent edible oil for its domestic consumption.

<sup>25</sup> <https://www.thenews.com.pk/print/897161-3-6m-olive-trees-planted-in-22-districts>

<sup>26</sup> <https://tribune.com.pk/story/2275101/potohar-region-termed-olive-valley>

<sup>27</sup> <https://www.dawn.com/news/1533443> dated February 10, 2020, Edible Oil Needs Attention

<sup>28</sup> <https://www.thenews.com.pk/print/897161-3-6m-olive-trees-planted-in-22-districts>

<sup>29</sup> <https://www.dawn.com/news/1653307>

**7.16 Price and Market Stability:** The price of oilseeds fluctuates in the domestic as well as international markets. Given the conducive tariff structure, the import of oilseed at the time of harvest dampens prices in the domestic market. It affects the profitability of farmers, especially when there is no assured public sector oilseeds procurement system. Therefore, farmers may be organized into a formal or informal cooperative to consolidate their cultivated area, extract edible oil and market the oil to get higher returns. Policy support can motivate local farmers and industry for local production of edible oils.

**7.17 Production Technology:** Olive, oil-palm, coconut, soybean, camelina and safflower cultivation should be promoted with complete package of production technology in potential areas as alternative options to achieve self-sufficiency in edible oil. The stakeholders should be empowered by disseminating adequate information about the improved varieties and production technologies through training programs and field days. Farmer access to high yield quality seeds be improved by making seeds available at the local level and at the right time. Avenues may be explored to increase the seed replacement rate. Proper storage facilities should be established for seeds.

**7.18 Research and Development:** Research institutes are required to be incentivized to take up extensive R&D to resolve the issues in various identified clusters. Research may aim at improving farmers' and traders' capacities, enhancing productivity, uptake of appropriate technology, and development of suitable varieties of seed. Collaboration with private sector must be encouraged to increase investment in oilseed production and advanced cropping techniques. In addition, research may also focus on finding new end uses for specific oilseeds and derived products, both for food and non-food uses, such as development of cannabis (cannabinoids) for medicinal purposes.

**7.19 Labelling:** Regulatory agency for oilseed must enforce Truth-n-Labeling mechanism to ensure quality control and standards.

**7.20 Training of Farmers and Communication:** The provincial government must build capacity of their extension agents in this area to enable them to educate farmers to understand the new techniques of farming and encouraging oilseed cultivation. Communication and awareness needed to be developed in small landholders to motivate them to shift to oilseed crops as well as to maximize efficiency and productivity.

**7.21 Improving Oil Extraction Technology and Efficiency:** Oil extraction methods from oil seeds include conventional methods (solvent and mechanical extraction) and nonconventional or advanced techniques (supercritical fluid extraction, ultrasound, microwave, and enzyme assisted extraction. These nonconventional techniques are innovative and have potential to improve oil extraction rates, shorten extraction times, and minimize deterioration of the oil quality. The nonconventional methods have been used successfully to reduce some of the loopholes of the conventional methods of oil extraction. While conventional method of mechanical pressing is simple and involves low cost but considered as an inefficient method because of low oil recovery when compared with chemical extraction methods.

Advanced techniques mentioned above are eco-friendly techniques and can easily overcome the shortcomings of the conventional methods and holds the potential to meet the ever-increasing demand of edible oils. These techniques provides less extraction time, high extraction yield, minimized solvent consumption, and ensure quality of oil.<sup>30</sup> Pakistan needs to employ advanced techniques for oil extraction and improve oil extraction efficiency by reducing wastages, modernization of oil extraction industry and revival of solvent extraction industry through incentives. There is a need to allocate sufficient credit for the purpose of working capital during the harvesting season to these industries.

**7.22 Linkages with the solvent industry:** Strong linkages should be developed between the solvent industry and the producers of oilseeds. Currently, the processing capacity of over 4.5 million tons of solvent industries is not being utilized properly (Ali et al., 2020).

**7.23 Negative Relationship between Edible Oil Deficit and Food Expenditures:** Edible oil deficit has negative and significant long run relationship with food expenditure of a household while relationship between per capita GDP and food expenditure is positive. The relationship between food subsidy and food expenditure is found to be insignificant suggesting that Government's food support programs are not effective, on account of improper targeting; and consumers' perception about quality and accessibility of subsidized food.<sup>31</sup> Negative relationship between edible oil deficit and food expenditure suggests that edible oil has been produced much more efficiently in the edible oil exporting countries which enables its import at lower prices, specially with favorable tariff regime. While it may be beneficial for the consumers but from the macroeconomic perspective, it exerts pressure on balance of payments in the long run, as it is happening now.

**7.24 Tariff Rationalization:** As highlighted above, current favorable tariff structure encourages import of oilseed and edible oil. It is vital to rationalize tariff structure aligned with the national policy to promote domestic oilseed production. The rationalize tariff structure may be aligned to: (i) discourage import of low-quality oil to promote high-quality domestic production of edible crop, such as, canola; (ii) gradual substitution of imported oilseed and edible oil with domestic production, may be 10-15 percent every year; (iii) to dampen import of oilseed during harvesting seasons in Pakistan to ensure reasonable price for domestic producers; (iv) establish a reasonable ratio between import level and domestic investment in oilseed related activities including seed, technology upgradation, and local production; and (v) to encourage value addition in the country. Countries where import tariffs on oilseeds and oilseed products were increased to shield domestic producers and increase local production include Chile, Colombia, Lithuania, Nigeria, Sri Lanka, and Turkmenistan

---

<sup>30</sup> Divine Bup Nde and Anuanwen Claris Foncha (2020). Optimization Methods for the Extraction of Vegetable Oils: A Review, *Processes* 2020, 8, 209; doi:10.3390/pr8020209 [www.mdpi.com/journal/processes](http://www.mdpi.com/journal/processes), accessed on January 3,2022

<sup>31</sup> Muhammad Ali, Syed Arifullah, And Manzoor Hussain Memon (2008). Edible Oil Deficit and Its Impact on Food Expenditure in Pakistan, *Pakistan Development Review* 47 : 4 Part II (Winter 2008) pp. 531–546

## 8. Conclusion

**The demand of oilseed/edible oil need to be counter-balanced by increase in production growth.** This may require, effective allocation of acreage, developing new high yielding varieties, enhancing crop productivity through efficient crop management, creating awareness among farmers on improved farming technologies and exploiting spare irrigated areas for producing oilseeds. The oilseed sector has immense potential for growth through technological development embedded in the low cost to no cost technologies, with value addition leveraging technologies (Kumar and Tiwari, 2020). Extension services that focus on uptake of technology and not just information dissemination should be developed with a focus on downward accountability. Moreover, a robust procurement mechanism should be established to ensure remunerative process to farmers. Marketing policies should be revised where it should be made mandatory for edible oil manufacturers to cover part of their raw material requirements through domestic market rather than imports.

Looking at the future uncertainties and challenges in oilseeds and edible oil industry, it is important to plan necessary mitigation measures now as discussed in Section 7 above. This will help the country in coping with the evolving edible oil price hike in the international market as well as saving foreign exchange. The key is developing the national oilseed policy which may include recommendations made in this paper above.

## REFERENCES

- Aazim, M. (2017, July 24). Oiling the oilseed business. *DAWN*. Available at: <https://www.dawn.com/news/1347140>
- Aftab, M., Mahmood, T., Mustafa, H. S. B. (2021). Prospects of Oilseed Crops in Pakistan. Edition 2<sup>nd</sup>, ISBN: 978-969-7954-17-7. *Directorate of Oilseeds, Ayub Agricultural Research Institute, Faisalabad*. Available at: [https://www.researchgate.net/publication/351577097\\_Prospects\\_of\\_Oilseed\\_Crops\\_in\\_Pakistan](https://www.researchgate.net/publication/351577097_Prospects_of_Oilseed_Crops_in_Pakistan)
- Ali, M. A., Ali, M., and Aqsa, Y. (2020). Rapeseed and Mustard Cluster Feasibility and Transformation Study. Cluster Development Based Agriculture Transformation Plan. Vision 2025. Project No. 131(434) PC/AGR/CDBAT-120/2018. *Planning Commission of Pakistan, Islamabad, Pakistan and Center for Agriculture and Biosciences International (CABI)*. Available at: [https://www.pc.gov.pk/uploads/report/Rapeseed\\_Mustard\\_Cluster\\_Report.pdf](https://www.pc.gov.pk/uploads/report/Rapeseed_Mustard_Cluster_Report.pdf)
- Ali, M., Arifullah. S., and Memon M. H. (2008). Edible Oil Deficit and Its Impact on Food Expenditure in Pakistan. *The Pakistan Development Review*, 47(4), 531-546.
- Amir, Intikhab (2006). Plea for Large-scale Olive Cultivation: Potential Seen for \$3.5bn Export. *Daily Dawn*, 30 August, 2006
- Amjad, M. (2014). Oilseed Crops of Pakistan. *Plant Sciences Division. Pakistan Agricultural Research Council, Islamabad*. Available at: <https://www.semanticscholar.org/paper/OILSEED-CROPS-OF-PAKISTAN-Amjad/d3a178cf668b7e3fe3449eb2bae928f7c2c1b1f2>
- Asad, S.A. (2020, January 2013). Agriculture: Soya bean a miracle crop for national food security. *DAWN*. Available at: <https://www.dawn.com/news/1527911>
- Asif, Muhammad Asif and Haque, Col Islam-ul (2014). Hill Torrents Potentials and Spate Irrigation Management to Support Agricultural Strategies in Pakistan. *American Journal of Agriculture and Forestry*. Vol. 2, No. 6, 2014, pp. 289-295. doi: 10.11648/j.ajaf.20140206.20
- Business Recorder (December 16, 2019). Cultivation of oilseed crops to be promoted in Punjab, Available at: <https://www.brecorder.com/news/553517>
- Chaudhry, M.G., A. Mahmood, and G. M. Chaudhry (1998) Pakistan's Edible Oil Needs and Prospects of Self-sufficiency. *The Pakistan Development Review* 37:4, 205–216
- Dawn (June 26, 2006). Groundnut: A potential crop, Available at: <https://www.dawn.com/news/198611/groundnut-a-potential-crop>
- Dawn (October 22, 2021). Pakistan to become full member of International Olive Council. Available at: <https://www.dawn.com/news/1653307>

Dawn (June 24, 2002), Drags on raising oilseed output. Available at: <https://www.dawn.com/news/44423/drags-on-raising-oilseed-output>

Food and Agriculture Organization, "Policies affecting the oilseeds, oils and meal sectors. Food and Agriculture Organization. Available at: <https://www.fao.org/3/Y0911E/y0911e04.htm>

Food and Agriculture Organization. Review of major policy developments in the oilseeds sector, 1995-97, Available at: <https://www.fao.org/3/w8488e/w8488e03.htm>

Global Village Space (June 19, 2021). Olive oil cultivation in Pakistan: A step towards self-reliance?, Available at: <https://www.globalvillagespace.com/olive-cultivation-in-pakistan-a-step-towards-self-reliance/>

Government of Pakistan, Ministry of Finance, Economic Survey of Pakistan, various issues

Government of Pakistan, Agricultural Statistics of Pakistan. (2018). *Ministry of National Food Security & Research. Government of Pakistan*. Available at: <http://www.mnfsr.gov.pk/pubDetails.aspx>

Government of Pakistan, National Food Security Policy (2018). Ministry of National Food Security and Research. Islamabad. Government of Pakistan. Available at: <http://www.mnfsr.gov.pk/mnfsr/userfiles1/file/12%20Revised%20Food%20Security%20Policy%2002%20June%202017.pdf>

Government of the Punjab, Ayub Agricultural Research Institute, Linseed, Available at: [https://aari.punjab.gov.pk/linseed\\_oilseed](https://aari.punjab.gov.pk/linseed_oilseed)

Government of the Punjab, Directorate General of Extension and Adaptive Research, National Oilseed Enhancement Program, Available at: [http://ext.agripunjab.gov.pk/oilseeds\\_project](http://ext.agripunjab.gov.pk/oilseeds_project)

Haider, M. (2021, June 07). PAEC develops soybean lines for spring, autumn cultivation. *The News*. Available at: <https://www.thenews.com.pk/print/845789-paec-develops-soybean-lines-for-spring-autumn-cultivation>

Haq, Rashida (1991). Estimating demand and supply of edible oil in Pakistan Online at <https://mpr.ub.uni-muenchen.de/38948/> MPRA Paper No. 38948, posted 22 May 2012 15:40 UTC

Khaskheli, J. Agronomists betting on a crop that almost went extinct in Sindh. *The News* (November 11, 2018).. Available at: <https://www.thenews.com.pk/print/392208-linseed-agronomists-betting-on-a-crop-that-almost-went-extinct-in-sindh>

Khurshid, H., Baig, D., Jan, S.A., Arshad, M., and Khan, M. A. (2017). *MOJ Biology and Medicine*, 2(1). Available at: <https://medcraveonline.com/MOJBM/miracle-crop-the-present-and-future-of-soybean-production-in-pakistan.html>

Kumar, V., and Tiwari, A. (2020). NABARD. Department of Economic Analysis and Research.

Mahmood, A., Edible import bill may swell up 30pc this year. *DAWN* (September 25, 2021). Available at: <https://www.dawn.com/news/1648260>

Mittaine, J. M., and Mielke, T. (2012). The globalization of international oilseed trade. *Oilseeds and Fats Crops and Lipids*, 19(5), 249-260. Available at: [https://www.ocl-journal.org/articles/ocl/full\\_html/2012/05/ocl2012195p249/ocl2012195p249.html](https://www.ocl-journal.org/articles/ocl/full_html/2012/05/ocl2012195p249/ocl2012195p249.html)

Nde, Divine Bup and Foncha, Anuanwen Claris (2020). Optimization Methods for the Extraction of Vegetable Oils: A Review, *Processes* 2020, 8, 209; doi:10.3390/pr8020209 [www.mdpi.com/journal/processes](http://www.mdpi.com/journal/processes), accessed on January 3, 2022

Organization of Economic Cooperation and Development-FAO Agricultural Outlook 2019-2028, (2019). *Oil Seeds and Oil Productions*. Available at: [https://www.oecd-ilibrary.org/agriculture-and-food/vegetable-oil-projections-consumption-food\\_0f9664e9-en](https://www.oecd-ilibrary.org/agriculture-and-food/vegetable-oil-projections-consumption-food_0f9664e9-en)

Pakistan Agriculture Research Council (2021). History of Olive in Pakistan. (2021), Available at: <http://www.parc.gov.pk/index.php/en/olive-history-of-olive-in-pakistan>

Profit (July 29, 2020). Pakistan's olive oil producers prepare to enter global market: report. Available at: <https://profit.pakistantoday.com.pk/2020/07/29/pakistans-olive-oil-producers-prepare-to-enter-global-market-report/>

Rehman, M. S. (2020). Oilseeds and Products Annual. *United States Department of Agriculture. Foreign Agricultural Service. Global Agricultural Information Network*. Available at: [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Oil seeds%20and%20Products%20Annual\\_Islamabad\\_Pakistan\\_04-01-2019](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Oil%20seeds%20and%20Products%20Annual_Islamabad_Pakistan_04-01-2019)

Singh, A. K., Kumari, A., Choudhry, A. K., and Kumar, R. (2017). Towards oilseeds sufficiency in India: Present status and way forward. *Journal of AgriSearch*, 4(2). 80-84. Available at:

[https://www.researchgate.net/publication/317617548\\_Towards\\_oilseeds\\_sufficiency\\_in\\_India\\_Present\\_status\\_and\\_way\\_forward](https://www.researchgate.net/publication/317617548_Towards_oilseeds_sufficiency_in_India_Present_status_and_way_forward)

State Bank of Pakistan, The State of Pakistan's Economy. Third Quarterly Report for FY 2018. Available at: <https://www.sbp.org.pk/reports/quarterly/fy18/Third/Chap-2.pdf>

Technology Times (September 19, 2017). Safflower - A Potential Industrial Crop in Pakistan. Available at: <https://www.technologytimes.pk/2017/09/19/safflower-potential-industrial-crop-pakistan/>

The Chinese Radio Portal, China to aid Pakistan in advanced agricultural technology (2021, April 10). Available at: <http://cpecinfo.com/china-to-aid-pakistan-in-advanced-agricultural-technology/>

The Express Tribune (December 8, 2020). Potohar region termed Olive Valley, Available at: <https://tribune.com.pk/story/2275101/potohar-region-termed-olive-valley>

The Express Tribune (November 7, 2021). Chinese tech to lift soybean output. Available at: <https://tribune.com.pk/story/2328238/chinese-tech-to-lift-soybean-output>

The Express Tribune (October 19, 2021). Chinese farm technologies ‘to flow into Pakistan’. Available at: <https://tribune.com.pk/story/2325497/chinese-farm-technologies-to-flow-into-pakistan>

The Nation (April 26, 2021). Olive cultivation to make Pakistan self-sufficient in edible oil. Available at: <https://nation.com.pk/26-Apr-2021/olive-cultivation-to-make-pakistan-self-sufficient-in-edible-oil>

The News International (March 2, 2021). China’s maize-soybean strip intercropping technology led to high yield, Available at: <https://www.thenews.com.pk/print/797957-china-s-maize-soybean-strip-intercropping-technology-led-to-high-yield>

The News International (October 3, 2021). 3.6m olive trees planted in 22 districts. (2021, October 03). *The News*. Available at: <https://www.thenews.com.pk/print/897161-3-6m-olive-trees-planted-in-22-districts>

Zahid, F.M. (2018, September 01). History of Pakistan’s Edible Oil Sector - the ‘change’ it needs. *Daily Times*. Available at: <https://dailytimes.com.pk/291002/history-of-pakistans-edible-oil-sector-the-change-it-needs/>

Zaidi, S. M. H. (2014). Edible Oil Imports in Pakistan, *South Asian Journal of Management Sciences* Vol. 8, No. 1, (Spring 2014) 1 – 8 2410-8537 (Online), 2074-2967 (Print) © 2014. Published by ORIC, Iqra University, Main Campus, Karachi PAKISTAN. This is an open access article under the license <http://creativecommons.org/licenses/by-sa/4.0/>