International Journal of Agriculture and Biosciences 2024 13(2): 167-171.
https://doi.org/10.47278/journal.ijab/2024.099

RESEARCH ARTICLE
eISSN: 2306-3599; pISSN: 2305-6622

Adoption Challenges and Awareness Level of Sunflower Growers in District Khanewal, Punjab, Pakistan

Muhammad Qayyum[1], Abdulaziz Thabet-Dabiah[2], Shoukat Ali[1], Ahsan Ali[1], Muhammad Saeed Shahbaz[3], Asghar Ali[1,*], Muhammad Saleem[1] and Muhammad Asghar[1]

[1]Institute of Agricultural Extension, Education and Rural Development, University of Agriculture, Faisalabad
[2]Department of Agricultural Extension and Rural Society, College of Food and Agriculture Science, King Saud University, Riyadh 11451, Saudi Arabia
[3]College of Humanities and Development Studies, China Agricultural University, Beijing, China
*Corresponding author: asgharali2878@gmail.com

ABSTRACT

Pakistan is the fourth largest country that imports edible oil, spending more than $4 billion on it. Pakistan's per capita edible oil consumption is rising, with current consumption estimated to be between 4.5 and 4.8 million MT. Domestically produced oilseeds only satisfy 18% of the total demand. Heavy dependence on edible oil imports poses a grave risk to national food security and the economy. The government hoped to reduce the import bill by expanding the sunflower production area, but unfortunately, the desired results were not achieved. Therefore, this study investigated farmers' awareness level regarding sunflower crop and the obstacles that hinder its adoption. Using the snowball sampling technique, a total sample of 80 respondents was selected from two tehsils of district Khanewal. Results revealed that the following factors impede the adoption of sunflower: low market rates, unavailability of buyers, adverse effects on subsequent crops and low per-acre yield, lack of mechanization, crop lodging, and dearth of quality seed. This research recommends that the government reevaluate the current marketing structure to ensure sunflower farmers get a fair price. It also recommends broadening sunflower extension services through the agriculture department (extension).

Keywords: Sunflower, Extension services, Adoption Challenges, Edible oil

Article History
Article # 24-618
Received: 18-May-24
Revised: 28-May-24
Accepted: 03-Jun-24
Online First: 04-Jun-24

INTRODUCTION

Pakistan's edible oil requirements amount to 4.5-4.8 million MT; however, the domestically produced oilseeds only satisfy 18% of the total demand (Ajmal et al., 2022; Punjab, 2024). Thus, edible oil is the major food import in Pakistan, with palm oil taking the largest share of imports, amounting to $3.8 billion in 2022 (Bint Zaman et al., 2010; Zaidi, 2014). Palm oil imports in Pakistan are rising, with an average growth of 12.3% in the last 20 years. (Pakistan, 2021). Per capita edible oil consumption in Pakistan increased from 5.31 kg in the 1980s to 20 kg in 2018 and is expected to reach 22 kg in 2028 (Rana et al., 2022). Therefore, the government has taken serious steps to reduce the import bill by launching schemes to increase the yield per acre of oilseed crops and the area under oilseed crops. (bin Mustafa et al., 2024).

Among oilseed crops, sunflower has a significant potential to cut down on edible oil imports in Pakistan. It has favorable climatic conditions and can fit into existing cropping patterns across Punjab. For example, about 20% of the rice and cotton zone can be designated for cultivating sunflowers. It can also be intercropped with tomatoes and sugarcane crops (Amjad, 2014). Therefore, there is a dire need to harness the potential of sunflower cultivation across the country (Arshad & Amjad, 2012; Shah et al., 2013).

Keeping in view the importance of sunflower, the Agriculture Department, the government of Punjab has executed the "National Oilseed Enhancement Program," which includes 5000 per acre subsidy for the cultivation of sunflower, sesame, and canola crops, quality seeds, mechanization support and awareness through demonstration plots. A sunflower - specific project,

Cite this Article as: Qayyum M, Thabet-Dabiah A, Ali S, Ali A, Shahbaz MS, Ali A, Saleem M and Asghar M, 2024. Adoption challenges and awareness level of sunflower growers in district Khanewal, Punjab, Pakistan. International Journal of Agriculture and Biosciences 13(2): 167-171. https://doi.org/10.47278/journal.ijab/2024.099

A Publication of Unique Scientific Publishers

"Popularization of Sunflower Cultivation," was also executed during 2002-04 on similar objectives (Khan, 2000; Pakistan, 2002). Regrettably, despite the efforts made by the government and private sector, the cultivation of oilseed crops has not met the desired targets and expectations. Heavy dependence on importing edible oil and raw materials poses a high threat to food security and a burden on the national economy. Moreover, price fluctuations and unstable international markets affect local prices and cause food inflation. (Hameed & Azeem, 2017; Hussain et al., 2023).

Considering the partial success of oilseed enhancement programs involving sunflower, it is imperative to collect farmers' feedback and understand their issues before the launch of another effort by the government. This study seeks to explore the level of awareness regarding agronomic practices related to sunflower. It also aims to uncover the challenges and limitations that farmers encounter when considering the adoption of sunflower, as reported by the farmers themselves.

MATERIALS & METHODS

The present study was conducted in the district of Khanewal for two reasons: first, the 32% decrease (200 hectares to 93 hectares) in area cultivation under sunflower, and second, it is one of the top districts in Punjab in terms of yield per acre aligned with Bahawalnagar and Sialkot. (Punjab, 2021). Two out of four Tehsils of district Khanewal were selected randomly for sample selection.

The population of the study was farmers who had cultivated sunflowers at least once in the past three years. As sunflower is not a major crop like wheat, cotton, and so on, the district has a very small population of sunflower growers. With the help of the Agricultural extension department and snowball sampling technique, we found 92 respondents in the selected two tehsils of Khanewal. A validated and pre-tested interview schedule was developed for data collection. Professors assessed the validity of the interview schedule at the Institute of Agricultural Extension, Education and Rural Development, University of Agriculture Faisalabad, and internal reliability was checked by Cronbach's Alpha (0.81). Pre-testing was done on 12 farmers before final data collection; the remaining 80 respondents were selected as a study sample. After pre-testing, the interview schedule was updated and divided into three different parts: i) the socio-economic characteristics of the respondents, ii) the awareness level of the respondents regarding agronomic practices of sunflower, and lastly, iii) factors affecting the cultivation of sunflower. Data analysis such as descriptive (frequency, percentage, etc.) statistics was run by Statistical Package for Social Sciences (SPSS).

RESULTS And DISCUSSION

Socio-economic characteristics of the respondents, such as age, land holding, and income sources, are presented in Fig. 2. Part "A" of Fig. 2 depicts that nearly one-fifth of the respondents aged more than 50 years, and an overwhelming majority, 82% of the respondents aged less than 50%. Part "B" of Fig. 2 shows that most respondents had less than 12.5 acres of land, and slightly more than one-fifth (21%) of the respondents had 12.5 to 25 acres of land. The "C" part of Fig. 2 reveals that a vast majority of the respondents had agriculture as a profession, and slightly less than one-fifth (19%) of the respondents had agriculture + business as a way of their earning, whereas one-tenth (10%) of the respondents had agriculture + jobs as a profession.

Table 1 revealed a diverse range of awareness levels among respondents as a vast majority (70%) of the respondents were familiar with recommended seed varieties, and 38.8% of respondents had an awareness of sowing time, followed by 31.2% of participants with land

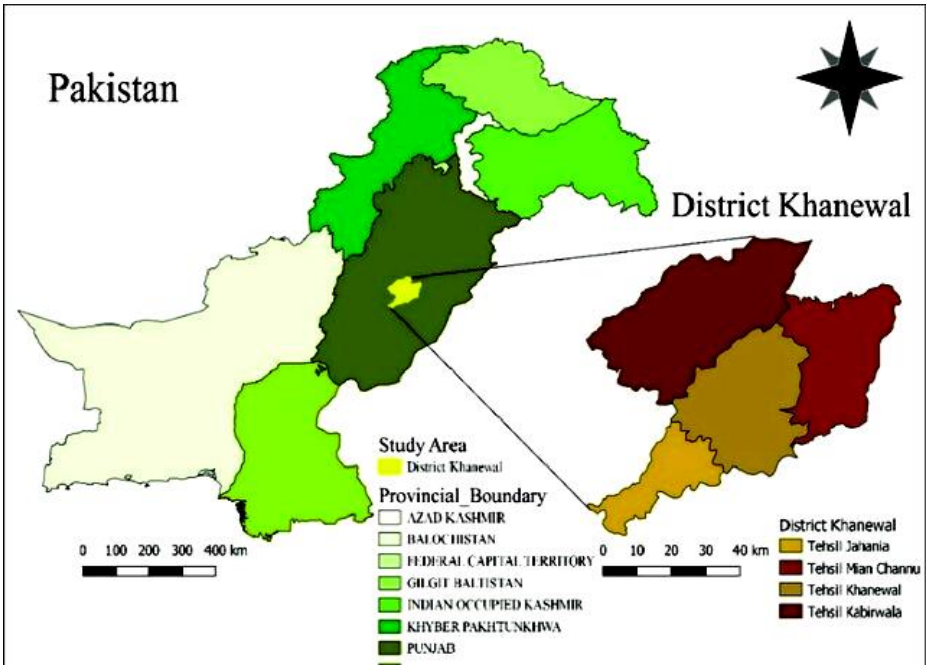

Fig. 1: Map of the study area (adapted from Shirwany et al. 2024).

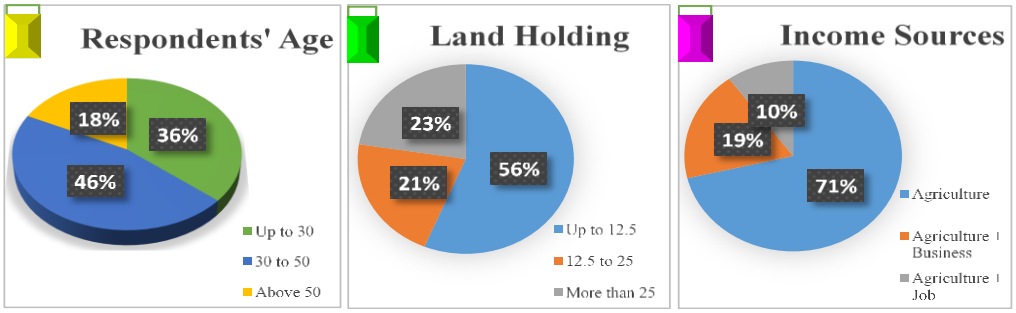

Fig. 2: Socio-economic characteristics of the respondents.

Table 1: Information level of respondents concerning recommended agronomic practices of the sunflower crop

Awareness regarding agronomic practices of sunflower	Yes	
	Frequency	Percentage
Do you know recommended seed varieties?	56	70
Are you aware of the recommended sowing time?	31	38.8
Do you have awareness regarding Land preparation?	25	31.2
Do you have awareness regarding harvesting techniques?	24	30
Are you aware of harvesting time?	20	25
Do you know about the recommended seed rate?	14	17
Do you have awareness regarding the sowing method?	12	15
Do you know the number of irrigations and time?	7	8.8
Do you know about the amount of fertilizer requirement and time?	6	7.5

preparation techniques. Furthermore, respondents' awareness levels regarding harvesting time and harvesting methods of sunflower cultivation were 30 and 25%, respectively. Only 15% of the respondents were aware of sowing methods, suggesting a need for educational intervention. Similarly, 17% of respondents were aware of the recommended seed rate. Respondents' knowledge regarding the number of recommended irrigation, fertilizer, and dosage was limited to only 8.8 and 7.5%, respectively.

Respondents (86.2%) faced a major challenge in adopting sunflower cultivation (Fig. 3) was the low price of harvest offered at the local market, followed by the difficulty in finding purchasing parties in the same market (82.5%). In addition, a significant majority of respondents (77.5%) emphasized the adverse impact of sunflower on subsequent crops, while 65% identified the low yield per acre as a barrier. Other prominent factors reported by farmers involved the unavailability of harvesting machinery (62.2%), the lodging problem of the sunflower crop (52.5%), and the unavailability of pure seed in the local market (30%).

The results show that 82% of respondents are under the age of 50 years, indicating that younger farmers are more inclined to adopt sunflowers. Young farmers are more often predisposed to new agricultural practices than old-generation farmers. (Azam & Banumathi, 2015; Sennuga et al., 2020). According to a study by Yu et al. (2023), the age of farmers has a significant negative relation to the adoption of innovative crops. Farmers are less inclined to embrace innovation as they become older. Similar are the results of Canessa et al. (2024) Who found a significant relationship between higher age and lower technology adoption.

Agriculture Department (Extension) Govt. of Punjab approves the recommended sunflower production practices for the farmers every year. A booklet regarding the production technology of sunflower has been published, and extension workers are responsible for creating awareness about these recommended practices among the farming community. Our research revealed that a significant portion of farmers demonstrated knowledge

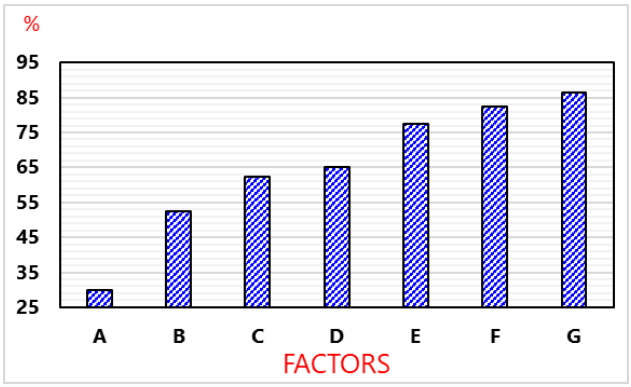

Fig. 3: Factors affecting the adoption of sunflowers in the study area, i.e., A) the non-availability of pure seed at the local market; B) the lodging problem of the sunflower crop; C) the unavailability of harvesting machine in the surroundings; D) the low yield/acre; E) the adverse effects of the sunflower on the descendent crops; F) the unavailability of purchasing parties in the local market; and G) the low rate of produce at the local market.

of the best practices concerning seed varieties, sowing time, and land preparations. Surprisingly, the level of awareness among farmers regarding various agricultural practices such as harvesting techniques, time of harvest, seed rate, and sowing techniques could have been better, while irrigation and fertilization practices awareness among farmers were extremely low, with only 8.8% and 7.5%. The major possible factors contributing to these results might be i) the poor extension services as Yaseen et al. (2016) highlighted that the agricultural department (extension) still needs to fulfill its role in educating and guiding the farming community. Several studies have discussed the ineffectiveness of extension advisory services and infrequent field visits by extension officers, ii) the extension approaches used by the extension department are outdated (Khan et al., 2012; Baloch & Thapa, 2018), iii) farmers seem to rely on traditional knowledge and information from fellow farmers for sunflower cultivation (Ullah et al., 2022). This significant difference in awareness levels about recommended practices among participants impedes the adoption of sunflower (Joyo et al., 2016).

Fig. 2 explains that the low market rate and unavailability of purchasing parties in the local market are major factors impeding sunflower cultivation in the study area. Owing to no marketing infrastructure and support from the government, farmers become disheartened when they do not get a fair price for their produce and shift to alternate crops (bin Mustafa et al., 2024). Market dynamics are pivotal in influencing farmers' decisions regarding crop selection. Wheat and sunflower crops compete with each other, and farmers have to choose between them. The high support price for wheat influences the choice of farmers (Badar et al., 2002; Bint Zaman et al., 2010).

The third major factor contributing to the non-adoption of the sunflower crop was the perceived negative effect of the sunflower crop on the next crop. The vast majority (77.5%) of the farmers reported that sunflower hamper the yield of the next crop i.e. wheat etc. They supposed sunflower exhausts the soil's nutrients, decreasing the yield of subsequent crops. This might be due to the allelopathic effect of sunflower on the descending crop. According to Bashir et al. (2012) sunflower crop residues release allelochemicals in soil that can cause adverse effects on subsequent crops like rice and wheat. They calculated that farms with sunflower residue incorporation produce 34% lower yield in some rice varieties due to the allelopathic effects. Muhammad and Majeed (2014) found that aqueous extracts of sunflower crop have inhibitory effects on seed germination and growth of maize and wheat. Similar effects of sunflower were recorded on wild barley and mustard crops as well (Ashrafi et al., 2008; Bogatek et al., 2006).

Low per-acre yield is the next major concern of farmers. There can be many reasons for that, but low education among farmers and the non-availability of quality seed are major factors contributing to lower yields. There are some locally produced quality seed varieties, but due to improper seed multiplication and dissemination infrastructure, seeds still need to be put in farmers' reach. Moreover, the imported hybrid seeds have adaptability problems and high-cost (bin Mustafa et al., 2024).

Sowing, harvesting, and processing sunflowers is difficult without proper machinery. Farmers reported that sunflower-specific harvesting machinery was not available in the study area. Farmers adopted combine harvesters with some modifications for this purpose. A sunflower thresher was accessible, but the mechanization was unaffordable for small farmers. The availability of efficient machinery can reduce production costs, and post-harvest losses and save time (Iqbal et al., 2015; Hussain et al., 2023).

The lodging problem in standing crop is another significant issue, with 42% of respondents reporting damage to their crop. There are many factors behind sunflower lodging, including environmental factors such as winds, heavy rains and floods, high planting density, poor soil, unbalanced application of fertilizers, and genetic susceptibility in certain sunflower varieties. Lodged crops are difficult to harvest and produce lower-quality seeds, decreasing yield substantially. Lodging is a prominent problem in sunflower because the overheavy head on the tall stem is vulnerable to strong wind and heavy rainfall (Sposaro et al., 2010). The lodging problem can be prevented by growing lodging-resistant varieties and by using proper soil management techniques. According to Jabeen and Ahmad (2012), sunflower crop suffered from lodging due to over-fertilization.

Conclusion and Recommendations

Major hindrances to the adoption of sunflower cultivation are market rates, the unavailability of buyers, negative effects on subsequent crops, and low per-acre yield. Lack of awareness about recommended agricultural practices among the respondents is also a concern. The government has ambitions to increase the area under sunflower and increase yield per acre, but this cannot be achieved without addressing the major concerns of farmers, particularly marketing issues, taking measures to strengthen extension services regarding sunflower and supporting scientists to produce high-yield, climate-resilient varieties. The problem can be tackled by announcing support prices for sunflower seed and ensuring its purchase from farmers at the local market. The government should consider setting up procurement units at the tehsil level in collaboration with other private sector stakeholders. Agricultural scientists should be encouraged to produce high-yield, climate-resilient varieties adaptable to local conditions. Farmers' access and affordability to quality seed should be ensured. Extension advisory services should be mobilized to educate and motivate farmers about recommended practices.

Authors' Contributions

Conceptualization: M.S.S and A.A; Methodology: A.A.; Data curation: A.A and S.A; Formal analysis: A.A., M.Q and S.A.; Investigation: M.Q.; Resources: A.T.D.; Writing original draft preparation: A.A, A.A., M.S.S., M.Q. and M.A.; Writing, review, and editing: S.A., M.S and A.T.D.

REFERENCES

Ajmal, M., Bedale, W., Akram, A., & Yu, J.-H. (2022). Comprehensive review of aflatoxin contamination, impact on health and food security, and management strategies in Pakistan. *Toxins*, *14*(12), 845.

Amjad, M. (2014). Oilseed crops of Pakistan. *Pakistan Agricultural Research Council Islamabad, (PARC)*, 1-59.

Arshad, M., & Amjad, M. (2012). Medicinal use of sunflower oil and present status of sunflower in Pakistan: A review study. *Science, Technology and Development*, *31*(2), 99-106.

Ashrafi, Z., Sadeghi, S., Mashhadi, H., & Hassan, M. (2008). Allelopathic effects of sunflower (Helianthus annuus) on germination and growth of wild barley (Hordeum spontaneum). *Journal of Agricultural Technology*, *4*(1), 219-229.

Azam, M. S., & Banumathi, M. (2015). The role of demographic factors in adopting organic farming: A logistic model approach. *International Journal of Advanced Research*, *3*(8), 713-720.

Badar, H., Javed, M. S., Ali, A., & Batool, Z. (2002).

Production and marketing constraints limiting sunflower production in Punjab (Pakistan). *International Journal Agriculture Biology*, *4*(2), 267-271.

Baloch, M. A., & Thapa, G. B. (2018). The effect of agricultural extension services: Date farmers' case in Balochistan, Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *17*(3), 282-289.

Bashir, U., Javaid, A., & Bajwa, R. (2012). Allelopathic effects of sunflower residue on growth of rice and subsequent wheat crop. *Chilean Journal of Agricultural Research*, *72*(3), 326.

bin Mustafa, H. S., Zulfqar, M., Hasan, E. U., Mahmood, T., Qamar, H., Hassan, M., Shahzad, S., Riaz, M., Mohyo-ud-Din, A., & Gill, A. N. (2024). Rachna Canola (RBN-13016): A High-Yielding Rapeseed Cultivar Enriched With Omega-3 And Omega-9 Fatty Acids. *Plant Bulletin*, *3*(1), 10-18.

Bint Zaman, S., Majeed, S., & Ahmad, S. (2010). Retrospect and prospects of edible oil and bio-diesel in Pakistan-A review. *Pakistan Journal of Agricultural Research*, *23*(3-4).

Bogatek, R., Gniazdowska, A., Zakrzewska, W., Oracz, K., & Gawronski, S. (2006). Allelopathic effects of sunflower extracts on mustard seed germination and seedling growth. *Biologia Plantarum*, *50*, 156-158.

Canessa, C., Ait-Sidhoum, A., Wunder, S., & Sauer, J. (2024). What matters most in determining European farmers' participation in agri-environmental measures? A systematic review of the quantitative literature. *Land Use Policy*, *140*, 107094.

Hameed, K., & Azeem, K. (2017). Pakistan need to be self sufficient in edible oil production. *Journal of Energy Technologies and Policy*, *7*(2), 48-57.

Hussain, N., Malik, A. M., Ali, M., Nawaz, M., Shakoor, A., Naqvi, S. M. H., & Arif, M. B. (2023). Impact of Mechanization on Productivity of Major Grain Crops in Punjab (Pakistan). *Journal of Asian Development Studies*, *12*(4), 634-640.

Iqbal, M. A., Iqbal, A., Afzal, S., Akbar, N., Abbas, R. N., & Khan, H. Z. (2015). In Pakistan, agricultural mechanization status and future prospects. *American-Eurasian Journal of Agricultural & Environmental Sciences*, *15*(1), 122-128.

Jabeen, N., & Ahmad, R. (2012). Improvement in growth and leaf water relation parameters of sunflower and safflower plants with foliar application of nutrient solutions under salt stress. *Pakistan Journal Botony*, *44*(4), 1341-1345.

Joyo, M. A., Ram, N., Koondhar, M. A., & Abbasi, F. (2016). Impact Analysis: Farmer's Knowledge and Economics of Sunflower Production in Golarchi District of Badin Sindh Province of Pakistan. *Available at SSRN 2788424*.

Khan, A., Akram, M., Farooq, G., Nawab, K., & Pervaiz, U. (2012). Language as a tool for effective communication between farmers and change agents in Khyber Pakhtunkhwa, Pakistan. *Sarhad Journal of Agriculture*, *28*(4).

Khan, A. R. (2000). *Spring crops of sunflower. Economics and Business Review*.

Muhammad, Z., & Majeed, A. (2014). Allelopathic effects of aqueous extracts of sunflower on wheat (Triticum aestivum L.) and maize (Zea mays L.). *Pakistan Journal Botony*, *46*(5), 1715-1718.

Pakistan, G. O. (2002). *Report on Popularization of Sunflower Cultivation (2002-2004)*.

Pakistan, S. B. O. (2021). *Special Section: Pakistan's Rising Palm & Soybean Imports: Understanding the Drivers and Challenges to Domestic Oilseed Production. First Quarterly Report 2021-22*.

Punjab, G. O. (2021). *Final Estimate of Sunflower Crop Punjab 2020-21*. https://crs-agripunjab.punjab.gov.pk/system/files/SunFlower%20Final%202020-21.pdf

Punjab, G. O. (2024). Sunflower-oilseed. Ayub Agricultural Research Institute. https://aari.punjab.gov.pk/sunfloweroilseed. Access on 22.3.2024

Rana, A. W., Gill, S., & Akram, I. (2022). *Promoting oil seed crops in Pakistan: Prospects and constraints*. Intl Food Policy Res Inst.

Sennuga, S. O., Fadiji, T. O., & Thaddeus, H. (2020). Factors influencing adoption of improved agricultural technologies (IATs) among smallholder farmers in Kaduna State, Nigeria. *International Journal of Agricultural Education and Extension*, *6*(2), 382-391.

Shah, N., Aujla, K., Muhammad Ishaq, M. I., & Arshad Farooq, A. F. (2013). Trends in sunflower production and its potential in increasing domestic edible oil production in Punjab, Pakistan.

Sposaro, M. M., Berry, P., Sterling, M., Hall, A. J., & Chimenti, C. A. (2010). Modelling root and stem lodging in sunflower. *Field Crops Research*, *119*(1), 125-134.

Ullah, A., Saqib, S. E., & Kächele, H. (2022). Determinants of farmers' awareness and adoption of extension recommended wheat varieties in the rainfed areas of Pakistan. *Sustainability*, *14*(6), 3194.

Yaseen, M., Xu, S., Yu, W., & Hassan, S. (2016). Farmers' access to agricultural information sources: Evidences from rural Pakistan. *Journal of Agricultural Chemistry and Environment*, *5*(1), 12-19.

Yu, Y., Zhang, J., Zhang, K., Xu, D., Qi, Y., & Deng, X. (2023). The impacts of farmer ageing on farmland ecological restoration technology adoption: Empirical evidence from rural China. *Journal of Cleaner Production*, *430*, 139648.

Zaidi, S. M. H. (2014). Edible oil imports in Pakistan. *South Asian Journal of Management*, *8*(1), 1-8.