Acta Scientific AGRICULTURE (ISSN: 2581-365X)

Volume 7 Issue 2 February 2023

Review Article

Legume Crop Cultivation Status in Punjab with Reference to Problems Faced by Farmers During Its Production

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Received: February 15, 2022

Published: January 09, 2023

Abstract

The fertility of the soil is decreasing day by day due to cultivation of only rice and wheat as they have high nutrient demand. So, the inclusion of pulses crops in the cropping system will not only reduce the degradation of soil fertility with lesser use of chemical fertilizers. These crops also improve the nitrogen content of soil through nitrogen fixation by root nodule formation. Even, the pulses have high nutritive value which is important for better human health and low risk crops, their inclusion in the cropping pattern will be a boost for farmers' income for that proper steps need to be taken by the government and extension officers to encourage farmers by providing adequate quantity and quality of seeds along with improved technology for legume cultivation.

Keywords: Legume Crop; Punjab; Production; Cultivation

Introduction

Legumes like pea (*Pisum sativum*), pigeon pea (*Cajanus cajan*), chickpea (*Cicer arietinum*), etc. belong to the family Leguminosae. Thirty three percent of the human protein nitrogen requirement is supplied by legumes [1]. Soybean and groundnut contribute 35% to total oil production of world. Legumes are high in proteins (20-30%) [2]. However, deficiency of sulphur has been observed in legumes. If managed properly, they can enhance the milk production in cattle. Legumes are used as green manures, green fodder, vegetables, soil reclamation etc. from centuries, production of meat and dairy is dependent on forage legumes [3]. Animal health is maintained by forage legumes (*Wattiaux and Howard, 2001)*.

- **Legume status in Punjab:** Punjab has highest contribution of rice and wheat in national agriculture production, but it lags behind as far as pulses production is concerned. Out of total 3.969 m ha under cultivation, only 11,700 ha were under pulses like *Cajanus cajan, Vigna radiata* and *Vigna mungo* crops which is just 0.74 percent of whole agriculture area. According to Punjab Agriculture Department, in 1990-91, area under pulses was 74,470 ha with production of 5.63 lakh tonnes but in next decade, it reduced to 42.9 thousand ha with 2.9 lakh tonnes production. In last two decades, the decline is very sharp in area as well as production, only 11 thousand ha of land with only 0.74 lakh tonnes production.

- **Moong (*Vigna radiata*):** In the year 2018-19, 3.2 thousand ha area was under this crop with 2.7 thousand production and productivity was 8.34q/ha. It is rich source of nutrients and antioxidants which protect from lower "bad" LDL cholesterol, improve blood sugar levels. It is mainly grown in Amritsar, Fazilka, Firozpur and Bathinda but productivity is highest in Sangrur district. Fazilka is leading in production which accounts to be 0.7 thousand tonnes from an area of 0.8 thousand hectares.

- Mash: during 2018-19, total area was 2000 ha and production was 1.1 thousand tonnes with 5.55q/ha of productivity. Mash bean is low in saturated fatty acids and have high nutrient content. Its consumption helps in reducing risk of cancer and preventing fatty liver. Pathankot district is leading in area (1.3 thousand ha) and production (0.6 thousand tonnes), but Mohali has highest productivity(874kg/ha).

- **Arhar:** 2.3 thousand ha area was under arhar with total production of 2.4 thousand tonnes and 10.47q/ha of productivity. Arhar is good source of K, Ca, Fe, Vit. B-6, protein, and carbohydrates. It is mainly used for cooking purposes by mixing with other pulses. It is grown is Amritsar, Barnala, Jalandhar, Ludhiana, Moga, Mohali, Sangrur, and Tarn Taran. Average yield of Arhar was 1047kg/ha in 2018-19.

- **Soybean:** it is used as food and animal feed, and for industrial purpose as well. Soybean is consumed fresh or in the form of soymilk. Bakery productions and antibiotics [5] are other uses. Soybean is decent source of fat (20%) and carbohydrates. It is high in protein (40% crude protein), vitamins and minerals. Oil content of soybean varies from 18 to 22%.

- **Gram:** it is a rabi season legume crop. In Punjab, during the 2018-19, 1.9 thousand hectares land was under gram with total production of 2.9 thousand tonnes. The average yield was 13.30q/ha. In Punjab, Barnala, Bathinda, Fazilka, Hoshiarpur, Mansa, Pathankot, and Mohali. More than 50% area under gram is in Fazilka district with 1.5 thousand tonnes of production, but Mansa has highest productivity(1854kg/ha).

- **Groundnut:** it is also called peanut or monkey nut. Peanut is rich in Mg (42%), Vitamin B-6(15%), Fe (25%), and protein (22-30%). Oil content in peanut is about 45-56%. Decent amount of vitamin E, antioxidants and folic acid is also present in groundnut. 1500hectares of and is under groundnut cultivation in Punjab. Total production of the state is 2100 tonnes. In Punjab, groundnut is grown in Hoshiarpur district and some near villages accounting to an area of 1.3 thousand hectares and 1980 tonnes production.

- **Sesame:** it is also known as 'Til'. C:N ratio of Sesame is higher than other legume crops. It is an allrounder crop because it contains good amount of protein, vitamin B-1 and dietary fibres. Also, an excellent source of P, Fe, Ca, Mg, Cu and Zn. Sesamin and sesamolin are the unique substances present in sesame. sesame was cultivated on 2900 hectares of land. total production of sesame is 800 tonnes. Mean yield was 2.73q/ha. In Punjab, Amritsar, Firozpur, Gurdaspur, Hoshiarpur, Jalandhar, Pathankot, Ropar, and Tarn Taran are the districts where sesame is cultivated. Amritsar and Tarn Taran are leading in area (0.6 thousand hectares each). However, production was higher in Tarn Taran that is 0.2 thousand tonnes but in average productivity, Jalandhar tops the table with productivity of 523kg/ha.

- **Guara:** Guara is mainly utilised as green manure, forage, and vegetable. It is known for drought resistance and soil renovation qualities. It is also fed to animals and gum extracted from it, is used for export. Gum is useful in industry as well as food products. Guara meal which remains after extraction is turn to feed cake and used as animal feed as it is rich in protein. It is a good nutritious animal fodder. Sesame was cultivated in Fazilka, Bathinda, Mansa, and Shri Muktsar Sahib. However, Faridkot leads in productivity with 1750kg/ha of yield. Fazilka has highest area (11.2 thousand hectare) and production (8.5thousand tonnes) of Guara.

- **Dhaincha (*Sesbania aculeata):*** it is used mainly as green manure. It enhances soil nitrogen. Overall soil fertility and properties are improved by Dhaincha. It is tolerant to both sodic and saline soil conditions.

- **Sunhemp:** it is used as green manure and fibre. Sunhemp is quick growing crop. Like dhaincha, sunhemp is tolerant to drought conditions, salinity and acidity, this property of sunhemp, is utilised for reclaiming sodic soils. Along with improving physical condition of soil, it prevents the leaching and losses of nutrients, conserve soil moisture.

- **Cowpea:** it requires more water, so it is recommended to be grown in irrigated area. Cowpea is mixed with maize, bajra and sorghum to get higher yield as well as increased nutrients from the green fodder. It enables the dairy cattle to maintain good milk yield during the hot and dry summer.

- **Berseem:** Berseem serves dual purpose as it is used a green manure and fodder as well due to highly nutritive value. Generally grown in irrigated areas of Punjab. It was cultivated on 2.3 lakh hectares of land in 2018-19.

- **Lucerne (Alfalfa):** it is highly nutrition fodder crop belong to leguminous crops group. During 2018-19, it was grown on 2.2 thousand hectares of land in Punjab. Lucerne is quick growing crop and gives higher amount of fodder from a limited area.

- **Lentil and linseed:** the cultivation of these two crops in not much in Punjab but still lentil accounts for 0.7 thousand hectares of area and 0.5 thousand tonnes of production during the year 2018-19. The mean productivity was 7.1q/ha. Amritsar, Gurdaspur, and Mohali are the major district in which cultivation of lentil (massar) is done. Mohali leads in area (400hectares), production (300tonnes) and productivity (750kg/ha). Cultivation of linseed is only done in Gurdaspur, Hoshiarpur, and Rupnagar districts.

- **Shaftal and Senji:** shaftal is also known as Chhattala or Bhukal is high nutritious legume fodder. Its average fodder yield is 390q/acre. Senji which is also known as sweet clover is also a forage legume. It can be grown in less moisture conditions and can tolerate wide range of climate and soil. Its yield is 128q/acre.

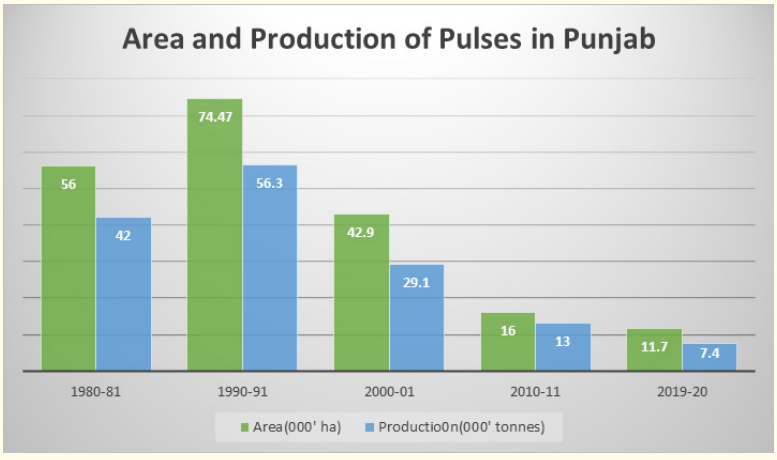

Figure 1: Area and production of pulses in Punjab.

Figure 2: Bengal Gram, Location: Khalsa college, Amritsar, Punjab (on 19/03/2021).

S. no.	Fodders	Crude protein (%)	Total digestible nutrient (%)
1	Sorghum	9.0	55.6
2	Guinea grass	10.8	62.4
3	Guara	18.1	60.0
4	Cowpea	22.5	61.2
5	Berseem	18.0	60.5
6	Shaftal	21.0	58.5
7	Lucerne	22.0	59.5
8	Senji	18.0	62.0

Table 1: Nutritive value (on dry matter basis) of legume fodders.

S. no.	Crop	Area (in thousand hectares)	Production (in thousand tonnes)	Yield (kg/ha)
1	Moong	3.2	2.7	834
2	Mash	2.0	1.1	555
3	Arhar	2.3	2.4	1047
4	Groundnut	1.3	2.6	1980
5	Sesamum	2.9	0.8	273
6	Guara	20.4	16.9	829
7	Gram	1.9	2.5	1330
8	Lentil	0.7	0.5	681

Table 2: Area, production, and yield of various legume crop in 2018-19.

Problems faced by farmers during production of legumes

- **Soil texture:** most of the legume crops requires sandy soil for good growth and development. But in the last two decades the texture of soil in Punjab has changed to loamy in which all the legumes cannot perform at their best. This change in texture is due to lifting of the upper layer of sandy soil for using it in making houses or increase the level of various paths or roads to avoid water stagnation on low level roads. Most of the 'tibba' i.e., heap of sand in Bathinda have disappeared on which mostly legumes were grown as they are not able to provide nutrients for wheat and rice. Even due to tibba's the land was not levelled which made it difficult to provide irrigation. Legumes thrive well at sandy soil.

- **Water table:** majority of area in Punjab is facing issue of lower water table. However, there is a higher water table in Firozpur, Fazilka and Muktsar. Due to which the legume cultivation is not possible in this region. Because legumes require less amount of water. this rising of water level is causing water logging in these areas. This increase is in 18% of north western region of Punjab. On monitoring, 115 wells which covers 17% of the area, the water rise was 0-2m in 2016. In May 2016, a study was conducted in southwest Punjab and Mukerian region of Hoshiarpur which indicated that 0-2m rise in water table in 3% wells of Fazilka and Muktsar district which accounts for 2% area of whole state. The rise was 2-5m in some parts of Gurdaspur, Bathinda and Faridkot. So, ultimately the legume cultivation is hampered by water logging.

- **Water quality:** the quality of water has been declining. The increasing water table has the poor quality of water as that is saline in nature. Except sunhemp and dhaincha, other legume crops cannot with stand high salinity conditions whether it is saline soil or saline water both are pretty much harmful for legumes. The yield of the crop gets reduced which ultimately leading to farmer stop growing wheat or rice which can give better yield under saline conditions also. Even, due to heavy fertilization soil pH has changed. The leaching of the fertilizers from soil to groundwater has decreased the quality of it making it saline which is unfavourable for the legume crops as growth is inhibited by higher saline conditions leading to crop failure risks.

- **Post-harvest technologies:** the pulse crops from the group of legumes requires various post-harvest processing whether it is drying, cleaning, polishing, oil extraction, etc. all this requires high investment equipment's or machine and time to maintain the high quality of the produce which can be marketed at a good price. But majority of the farmers of Punjab are small scale farmers having less than 5acre of land, they cannot afford these equipment's. So, they grow according to their household which has decreased the area and legumes and pulses.

- **Research:** the research work done in case of rice, wheat and maize is commendable. But in legumes the scientific research done is very limited which is another reason for the declining area and production of legumes in Punjab. As in rice and wheat crops, various high yielding and disease resistant varieties are launched every year which reduces the risk of crop failure. For legumes, disease control and resistant variety are very limited even they are not much effective as compared to other crops.

- **Marketing:** the farmers want to earn more profit for their hard work. MSP pf the most crop had been setup. But apart from rice and wheat, farmers did not get MSP for their crops. It leads to insecurity of income to the farmers. They don't want to risk as agriculture is their main source of income.

Wheat and rice are sold within few days of harvest. For legumes, they might have to wait for longer period in hope of increase in price till then they have stored the harvest crop which also requires space and in case high production, may be store house is required which not possible for a small-scale farmer. Sometimes, the price doesn't even increase and in the waiting period some part of the crop gets deteriorated leading to further loss to the alone farmer. All this leads to farmer avoiding the cultivation of these legume crops for commercial purpose even though they are easy to cultivate and less labour requiring.

- **Irrigation:** The canal system of Punjab has been improving since independence which made the irrigation water available to every part of the state, making it possible for the farmers to grow crops like rice which requires huge amount of water. Before the well-developed canal system, some parts of Punjab farmers were forced to cultivate legumes as they require less water which was mainly through rainfall. Even, due to advancement in technology, deep water pumps are available which can support the crops requiring high amount of water for a good yield. Only reason for rice not grown was due to lack of available irrigation water, so as soon irrigation water was made available, farmers moved from less economic to a high-income crop that is rice. And area under legumes declined further.

- **Pest and diseases:** the legume crops are affected by various diseases and pest attacks. In case of beans, there is no seed treatment which makes it susceptible to various diseases which can lead to total crop failures [6]. Pest attack is also common in legumes and the resistance pesticides for their control are very limited and expensive also. Reduced yield and crop failures are the reasons that farmers are not growing them for commercial purpose.

- **Cropping pattern:** majority of farmers in Punjab are following rice-wheat or cotton-wheat which are more productive and safe crops for small farmers is concerned. even all the resources like certified seed, pesticides, secured MSP etc which makes obvious that farmer will go for these crops. Legumes are now mostly grown for household consumption and animal feed. As legumes are very good fodder so still in form of forage crop, these are grown by farmers for fodder purpose and as green manure after the wheat harvest [7-13].

Conclusion

Legume crops are very valuable for human and animal as well but due to lesser crop and price security, cultivation of legumes has been decreasing from last two decades. Punjab is not even producing 3% of its total requirement. They are now mainly utilized as animal fodder and to some extent as green manure, but commercial cultivation is not that much as wheat, rice and cotton are more productive than legumes that is why they are replacing legumes. However, many initiatives are being taken by government of Punjab and agricultural department of Punjab to increase area under legumes and enhance production because now Punjab is depending on other states for legumes and the adverse effects of rice-wheat cropping pattern are becoming very serious and are in need of a control soon. Training camps are being organised for the farmers and 4kg kits are being given to the farmers with any payments, so that they can multiply the seed. After cultivating these 4kg kits, it will provide seeds for 20acre.

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