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Production and Marketing Constraints Limiting Sunflower Production in Punjab (Pakistan)

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ABSTRACT

Pakistan is a net importer of edible oil and is spending millions of dollars on its import every year, which is a major drain on the foreign exchange reserves of the country. Sunflower, a non-traditional oilseed has the potential to bridge the gap that exists between the domestic demand and supply due to its high oil and protein contents. Despite the hectic efforts of the Government, the area and production of sunflower have not increased up to the expectations due to certain production and marketing constraints associated with this crop. The research article in hand attempts to investigate these constraints that are limiting sunflower production in the Punjab by employing analytical techniques.

Key Words: Production; Marketing; Constraints; Sunflower; Cobb-Douglas

INTRODUCTION

Oilseed sector, due to ever increasing consumption of edible oil, has attained critical importance in the economy of Pakistan. Local production accounted for 32% of the domestic requirement while the remaining 68% of the country's domestic requirement was met through imports. The import bill for edible oil, which was Rs. 2.3 billion in 1979-80, has gone up to Rs. 40.5 billion (or US $ 788 million) in 1998-99. This is almost 10% of our total import bill (Husain, 2000). The non-conventional oilseed crops such as sunflower, soybean, and safflower were introduced in mid sixties during the era of green revolution but the area under these oilseed crops is still very small.

Sunflower over the years has emerged as an important oilseed crop in the world. It has acquired an eminent position in agriculture of Pakistan as well because it is bestowed with some special characteristics. It is a successful crop both in irrigated and in barani (rainfed) areas of Pakistan (Naeem, 1991). Although, there is a clear upward trend in the sunflower production in the country but yield per hectare in Pakistan is far less than the other countries. Highest yield per hectare of sunflower in the world in 1996-97 was 2288 kg obtained in Switzerland whereas, in Pakistan yield per hectare was 1302 kg (Anonymous, 1998). However, under favourable conditions at experimental stations in Pakistan, seed yields as high as 2500 kg ha^{-1} have been obtained (Hatam & Abbasi, 1994). So, there is wide gap between the potential yield of sunflower and yield actually obtained in the field in Pakistan Therefore, the objective of this paper is to figure out those production and marketing constraints which are limiting the production of sunflower in the province of Punjab (Pakistan).

RESEARCH METHODOLOGY

This study is based on the primary data collected from tehsil Melsi of district Vehari and tehsil Daska of district Sialkot. These tehsils were selected on the basis of their production statistics and area under sunflower. From each tehsil, five villages were selected representing average agronomic conditions. Seven farmers from each village were interviewed from each village. A sample size of 35 respondents was selected from each tehsil. Total sample thus comprised of 70 farmers from both the districts.

Table I. The distribution of sampled farmers into different categories

Districts	Small farmer	Medium farmer	Large farmer	Total
Vehari	11 (31.43)	10 (28.57)	14 (40)	35 (50)
Sialkot	13 (37.15)	12 (34.29)	10 (28.57)	35 (50)
Total	24 (34.29)	22 (31.42)	24 (34.29)	70 (100)

Figures in parenthesis indicate the percentage

A well- designed, comprehensive and pre-tested questionnaire was used to collect required data from both the districts. The data was analyzed through computer package i.e., S.P.S.S (Statistical Package for Social Scientists).

The constraints associated with the adjustment of sunflower in the cropping pattern as well as constraints faced by the farmers in the marketing of sunflower have been worked by employing statistical techniques like averages and percentage. Regression analysis was used to identify production factors affecting the yield of sunflower. Cobb-Douglas type of function was visualized for this data.

The modified form of the model used is as under:

$$Y = A_o \Pi X_i^{\beta i} e^{\Sigma \alpha i D i + \mu i}$$

This equation can be linearized in the following way.

$$Ln\ Y = \beta_o + \sum_{i=1}^{n} \beta_i Ln\ X_i + \sum_{j=1}^{n} \alpha_i D_i + \mu_i$$

Where i = 1,2,3,4,5 & j = 1,2

Model. The yield of sunflower is affected by several factors. Data was analyzed with Cobb-Douglas function to observe the effects of different factor on sunflower yield. Following equation was formed for factors affecting the yield of sunflower in Punjab as under

$$Ln\ Y = \beta_o + \beta_1 Ln\ X_1 + \beta_2 Ln\ X_2 + \beta_3 Ln\ X_3 + \beta_4\ Ln\ X_4 + \beta_5\ Ln\ X_5 + \alpha_1\ D_{1+}\ \alpha_2\ D_2$$

Where;

Y = Yield of Sunflower in maunds per acre; β_o = Constant term (Intercept); β_i = The elasticity coefficient of ith independent variable (Where i= 1,2…5); α_I = The elasticity coefficient of jth dummy variable(Where j = 1, 2); X_1 = Number of Ploughings; X_2 = Seed Rate (Kg / Acre); X_3 = Number of Irrigations; X_4 = No. of bags of Urea; X_5 = No. of bags of DAP; D_1 = Dummy variable for sowing method (1 stands for the use of Drill sowing and 0 for Broadcast sowing.); D_2= Dummy variable for pest attack (1 stands for the Pest Attack and 0 for absence of pest attack.)

RESULTS AND DISCUSSION

Analysis of the data shows that three types of constraints were limiting sunflower production in the province of Punjab. These constraints were: 1) adjustment problems of sunflower in the existing cropping pattern, 2) factors constraining per acre yield of sunflower, and 3) problems associated with the marketing of sunflower. These constraints have been discussed in detail as under.

Constraints associated with adjustment of sunflower in the cropping pattern. Although sunflower is agronomically suitable to climatic conditions of both rice and cotton zones, yet farmers were facing problems in adjusting it in their existing cropping pattern. The nature of this problem was different in both zones.

i) Rice zone. In the sample area of the rice zone, farmers were taking three crops in a year. Rice-potato-sunflower was the main crop rotation followed by the farmers. In this zone, farmers are to make choice between sunflower and wheat for acreage allocation. Time of sowing of both the crops is same. Farmers can sow either sunflower or wheat due to their almost same sowing time. Owing to comparatively better procurement price fixed by the government in the last years and better-established marketing system, farmers allocated major chunk of their farm area to wheat instead of sunflower. In rice zone, small farmers allocated 20.11% area of their total cropped area to wheat and 18.97% to sunflower. Per cent allocation to wheat and sunflower in case of medium farmers was 24.85 and 14.49, respectively. Whereas, these percentages in case of large farmers in rice zone were 17.96% for wheat and 18.76% for sunflower (Table II).

The results of our study were supported by Ashiq and Ahmed (2001). The study confirmed the profitability of wheat as compared to sunflower. According to their study, cultivation of sunflower over an acre instead of wheat entails a loss of Rs. 2,376 (1,924 as a loss for not cultivating wheat and Rs. 452 as a loss from sunflower cultivation) at current rupee or a loss of 3,323 (2,655 + 668) constant (1999-00) rupees. As per this study average social cost benefit Ratio for wheat was 0.60, which was lower than sunflower 1.13 again showing an edge in wheat cultivation over sunflower (Table III).

Table III. Cost, income and returns per acre of wheat, sunflower: average 1990-91 through 1999-2000

	Wheat	Sunflower
Cost in current rupees	2,862	3,930
Income evaluated at current c & f prices	4,786	3,478
Net returns in current rupees	1,924	-452
Net returns in constant (1999-00) rupees	2,655	-668
Social Cost-Benefit Ratio	0.60	1.13

Ashiq and Ahmed (2001)

ii) Cotton zone. Besides wheat, sunflower also has production conflicts with cotton in cotton growing areas. As per survey results, almost all the farmers in Vehari district were facing problems in adjusting sunflower in their cropping pattern. Farmers reported that sunflower crop had serious production conflicts with the cotton crop. These conflicts were as under.

Table II. Cropping pattern of sampled sunflower growers

	District Vehari			District Sialkot		
Crops	**Small farmer**	**Medium farmer**	**Large farmer**	**Small farmer**	**Medium farmer**	**Large farmer**
Cotton	9.32 (50.03)	19.3 (40.39)	64.21 (50.30)	0 (0)	0 (0)	0 (0)
Rice	0 (0)	0 (0)	0 (0)	8.02 (38.32)	15.67 (37.38)	75.85 (39.19)
Sunflower	7.12 (38.22)	8.2 (21.13)	18.25 (14.30)	3.97 (18.97)	7.33 (14.49)	36.3 (18.76)
Wheat	2.10 (11.27)	11.3 (28.39)	41.04 (32.15)	4.21 (20.11)	10.42 (24.85)	34.75 (17.96)
Potato	0 (0)	0 (0)	0 (0)	4.12 (19.68)	6.25 (14.91)	42.3 (21.86)
Vegetables	0 (0)	0 (0)	1 (0.78)	0 (0)	0 (0)	2.22 (1.15)
Fodder	0.09 (0.005)	1 (2.52)	1.36 (1.07)	0.61 (2.91)	2.25 (5.37)	2.1 (1.08)
Sugarcane	0 (0)	0 (0)	1.79 (1.40)	0 (0)	0 (0)	0 (0)
Total cropped area	18.63	39.8	127.65	20.93	41.92	193.52

*Figures in parenthesis are percentages

a) Delay in cotton sowing. Harvesting of sunflower crop starts in May and continues until the first week of July. This period overlaps with the sowing time of cotton crop, due which sowing of cotton crop is delayed. Almost all the farmers irrespective of their category reported delay in cotton sowing. Small farmers reported on an average 20 days, medium farmers 19 days and large farmers 21 days delay in cotton sowing when sown after sunflower (Table IV).

Table IV. Per cent of farmers facing sunflower adjustment problems with cotton

	District Vehari			
Effects	**Small farmer**	**Medium farmer**	**Large farmer**	**All**
Delay in cotton planting	11 (100)	10 (100)	14 (100)	35 (100)
Extra fertilizer application	10 (90.91)	10 (100)	12 (85.71)	32 (91.43)
Increased insect attack	7 (63.64)	8 (80)	12 (85.71)	27 (77.14)
yeild loss.	11 (100)	10 (100)	14 (100)	35 (100)
Delays (days)	20	19	21	20
Yield loss Mds. / acre	4.72	4.85	4.25	4.61

b) Extra application of fertilizers. Sunflower crop is an exhaustive crop. It severely depletes the soil of its nutrients. Farmers needed to apply extra fertilizer to cotton in order to supplement the soil nutrient deficiencies in order to avoid losses in yield of cotton. The per cent of farmers, who applied extra fertilizer to cotton after sunflower, in case of small farmers were 90, medium farmers 100%, and large 86%.

c) Increased insect attack on cotton crop. Due to sunflower, the attack of different insects on the cotton crop sown in sunflower fields also surges. The per cent of farmers who reported increased insect attack on cotton crop was 64% in case of small, 80% medium and 86% large farmers (Table IV). This increased insect attack increases the cost of production of cotton when sown after sunflower.

iv) Yield loss of cotton crop. The farmers in district Vehari experienced yield loss of cotton crop when it is sown after sunflower crop. The yield losses of cotton in case of small medium and large farmers were 4.72, 4.85, and 4.25 maunds per acre. On overall basis yield loss of cotton was 4.61 maunds per acre (Table IV).

Factors constraining per acre yield of sunflower. To isolate the factors contributing and constraining yield per acre of sunflower, Cobb-Douglas type of model was considered appropriate. As a result of analysis, following Cobb-Douglas type of function was estimated for sunflower production.

$$\text{Ln } Y = 2.9156 + 0.1741\ X_1 - 0.5704\ X_2 + 0.2020\ X_3 + 0.1037\ X_4 + 0.0758\ X_5 + 0.07154\ D_1 - 0.1691\ D_2$$

(0.2134)* (0.0553*) (0.1737*) (0.0678*) (0.0168*) (0.01167*) (0.0356*) (0.0411*)*

* *Standard errors of the respective elasticity coefficients*

R-Square= 0.858843, Adjusted R-Square= 0.842906, Durbin-Watson Statistics= 1.56741, Observations= 70.

Explanation of the model. The model estimates indicate the impact of various factors on the yield of sunflower. Ploughings (X_1), application of irrigations (X_3), Urea (X_4), and DAP (X_5), and use of drill sowing method were contributing positively to the per acre yield of sunflower in the study area. Where as seed rate and pest attack were found to be the factors constraining the per acre yield.

i) Seed rate (X_2). The results indicates that coefficient of seed rate of sunflower had negative sign indicating that the sunflower seed rate has negative relationship with the yield of sunflower. The value of coefficient of seed rate of sunflower was - 0.5704. The coefficient was significant at one per cent. The coefficient indicates that by one per cent increase in seed rate of sunflower beyond recommended rate, the yield of sunflower decrease by 0.5704 maunds per acre. Recommended rate of sunflower seed for sowing is 2-3 kg per acre. Increase in seed rate beyond this range results in a high density of plants, which is more than desired level. It results in increased competition among plants for nutrients and water that leads to decline in yield per acre.

ii) Pest attack (D_2). The coefficient for this variable is negative and is -0.1691. It is significant at one per cent level. This means that pest attack negatively affects the yield of sunflower as these pests destroys significant portion of the yield per acre of the sunflower. The coefficient shows pest attack decreases the yield of sunflower by 0.1691%. Therefore, yield loss due to pest attack is one of the major constraints in limiting per acre yield of sunflower.

Constraints associated with marketing of sunflower faced by the growers. Besides the constraints relating to yield pre acre and adjustment of sunflower in cropping pattern, the major constraint faced by the sampled farmers in the cotton and rice zone was the non-existence of market for sunflower farmers. More than 62% farmers reported this problem (Table VI). The survey results showed that there were no regulated markets for sunflower produce in both the zones where farmers could sell their produce at competitive prices.

Table V indicates the mode of disposal of sunflower in the cotton and rice zone. Government procurement system was found completely lacking. No government procurement center was present in both the study areas. Therefore, the farmers were compelled to dispose of their produce in three ways i.e., to village beoparies, to oil mills, and to private companies. A vast majority of farmers (90%) sold their produce to the village beoparies, 9% farmers oil mills and only one% farmers disposed it off to the private companies (Table V). Non-existence of the market and absence of government procurement center provided an opportunity to the village beoparies (middleman) to exploit the farmers. Analysis of the data reveals that farmers were being exploited by the village beoparies in the following way.

i) Low price of the produce. Analysis of the data showed that owing to the absence of government procurement

Table V. Mode of disposal of sunflower produce

	District Vehari			District Sialkot			Total
Mode of disposal	**Small farmer**	**Medium farmer**	**Large farmer**	**Small farmer**	**Medium farmer**	**Large farmer**	
Village beopari	10 (90.91)	9 (90)	10 (71.43)	13 (100)	12 (100)	9 (90)	63 (90)
Oil mill	0 (0)	1 (10)	4 (28.43)	0 (0)	0 (0)	1 (10)	6 (8.57)
Private company	1 (9.01)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.43)

Table VI. Sunflower marketing constraints

	District Vehari			District Sialkot			Total
Category	**Small farmer**	**Medium farmer**	**Large farmer**	**Small farmer**	**Medium farmer**	**Large farmer**	
Market Non-existent	9 (81.81)	7 (70)	11 (78.57)	8 (61.54)	4 (33.33)	5 (50)	44 (62.86)
Low product price	11 (100)	10 (100)	14 (100)	13 (100)	12 (100)	10 (100)	70 (100)
Undue deductions	5 (45.45)	3 (30)	7 (50)	6 (46.15)	11 (91.66)	7 (70)	39 (55.71)
Delayed payments	4 (36.36)	4 (40)	9 (64.29)	3 (23.08)	6 (50)	3 (30)	29 (41.43)

*Figures in parenthesis are %s

Table VII. Average price obtained by the sunflower growers of their produce (Rs. per 40 kg)

District Vehari				District Sialkot			
Small farmer	**Medium farmer**	**Large farmer**	**Average**	**Small farmer**	**Medium farmer**	**Large farmer**	**Average**
407	410.5	435.36	417.62	427.31	435	444	435.54

centers, growers of sunflower were not receiving the announced support price for sunflower procurement. The farmers were compelled to sell their produce unwillingly to various types of middlemen. In Vehari district, small, medium and large farmers received a price of Rs. 407, Rs. 410.5, and Rs. 435.36 per 40 kg of sunflower respectively (Table VII). On an average, farmers in Vehari district received a price of Rs. 417.62 per 40 kg of their produce. Where as, in Sialkot district, small farmers received Rs. 427.31, medium farmers Rs. 435 and large farmers Rs. 444 per 40-kg for their sunflower produce. On an average, farmers in Sialkot received Rs. 435.54 per 40 kg. As is evident from the Table VII that the plight of the small farmers was even worse. They received lower price than the other categories of the farmers.

ii) Deductions for moisture and inert matter. Another problem faced by the sunflower grower was the discretionary deductions made by the purchasers for moisture content and inert matter in the produce. In case of small farmers average per 40 kg deductions in Vehari district was 1.09 kg in comparison with 1.04 kg for medium and 0.95 kg for large farmers. The situation was same for small farmers in Sialkot district. The small farmers faced deduction at the rate of 1.92 kg while the deductions for medium and large farmers was 1.62 kg and 1.35 kg per 40 kg respectively (Table VIII).

Table VIII. Deductions made by the middleman (kg per mounds)

Vehari			Sialkot			All
Small farmer	**Medium farmer**	**Large farmer**	**Small farmer**	**Medium farmer**	**Large farmer**	
1.09	1.04	0.95	1.92	1.62	1.35	1.33

iii) Delayed payments. It was the complaint of more than 41% of the farmers that they were not paid on the spot (Table VI). Small farmers had to visit the middlemen several times to receive their payments. Where as the plight of the medium and large farmers was relatively less severe due to their influence.

CONCLUSIONS AND RECOMMENDATIONS

The results of the study indicate that sunflower growers were facing three types of constraints. In cotton zone, farmers were facing problems in adjusting sunflower in their cropping pattern. They could sow either wheat or sunflower. Moreover, sunflower had production conflict with cotton crop. Sowing of cotton crop is delayed due to harvest of sunflower. When sown after sunflower, fertilizer requirement of cotton is enhanced and insect attack is also increased. Sowing of cotton after sunflower significantly reduces yield per acre of cotton as well. As shown by the model higher seed rate (more than the recommended) and pest attack significantly reduced per acre yield of sunflower. Major marketing constraints were non-existence of proper markets for sunflower produce and absence of Government procurement centers. Owing to this fact middlemen were exploiting sunflower growers by paying low price for their produce, and by making discretionary deductions for moisture content and inert matter and by delaying payments to the farmers for their produce.

Following suggestions may prove helpful for the planners in increasing the production of sunflower in the country.

1. Government has now restricted its support price system to only four major crops. Now the market forces like demand and supply will determine the prices of the sunflower crop. Nonetheless, government still should play its role in safeguarding the interests of the farmers by streamlining the private sector. It should encourage the private sector to setup their purchase points and storage centers in the major sunflower producing areas. Setting up of expellers either in the private or public sector for the processing of sunflower in the production areas will not only contribute to enhanced oilseed production but also will greatly benefit the farmers. Government should act as watchdog to monitor the price mechanism of the private sector.
2. Research efforts should be made to overcome the problem of conflict of sunflower crop with the cotton crop. Emphasis should be given on the development of the early maturing varieties of the sunflower, so that the problem of late sowing of cotton crop could be avoided.
3. Attack of pests is one of the major factors contributing towards the decline of per acre yield of the sunflower. Concerned departments should help the farmers in this regard by suggesting proper methods and techniques in vogue for the control of pests to avoid yield losses.
4. Farmers in general are not fully aware of the production technology of the sunflower which affects yield of sunflower. Therefore, Extension department should provide technical guidance to the farmers relating to the production technology. Printed material should also be provided to them.

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