



# Knowledge Level of Farmers and Constraints Faced in Adoption of Crop Rotation System

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Crop rotation is one of the major agricultural practices in sustainable farming. A proper crop rotation can increase nutrient uptake and improve soil health along with the decrease in pest and weed infection. In Punjab, usually wheat rice cropping system is followed by the farmers. The present study was conducted in five selected villages of Mohali district (Punjab). A sample of 40 farmers was randomly selected from each selected village on the basis of probability proportional to number of farmers in each land holding category. In this way, total 200 hundred farmers were selected for the present study. From this study it was found that 71.50 per cent of the farmers were belonged to middle age group and an equal percentage (*i.e.* 43.50%) of the farmers had matric level and higher secondary & above education. From total 44.50 per cent of the farmers had more than 5 acres of land holding whereas 37.50 per cent had 2.6 to 5 acres. Study also revealed that 46 per cent of the farmers had low knowledge level about crop rotation whereas 15.50 per cent and 38.50 per cent had moderate and high knowledge level. From different ten aspects, maximum farmers had good knowledge about the effect of crop rotation on annual income and fertilizer input while they had lowest knowledge about recommended crops for crop rotation. Lack of remunerative MSP policy & proper marketing system for alternative crops and high labour cost was the major constraints reported by the farmers.

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## 1. INTRODUCTION

Crop rotation is one of the major agricultural practices in sustainable farming. A proper crop rotation can increase nutrient uptake and availability of soil nutrients simultaneously along with the decrease in pest and weed infection, as well as it avoids soil erosion. Because of the improvement in above characteristics, yield too increases. Balanced crop rotation can improve soil structure and augment nutrient availability in soils besides attaining increased crop production [1,2,3,4]. In 2009, Havlin stated that alfalfa enriched soil by adequate crop rotation with organic matter is at considerable rates of upto 5 Mg ha<sup>-1</sup>. Improvement of soil fertility and increase in yields can be caused by combination of legumes and non- legumes and manures [5] and [6]. Riedill et al. [7] noticed the increase in available and total nitrogen when he applied a crop rotation involving legumes and cereals. Nitrogen availability, soil fertility, soil water nutrient availability and improved soil pH can be increased by legume [8,9,10].

Although crop rotation is so beneficial cultivation practice, large population of farmers don't follow crop rotation. The refusal can be due to the condition of the family, availability of correct information and good seeds. It can be due to degrading quality of the land and water of the area or the labour and machinery cost. To figure out the population of farmers following the crop rotation practices and the reasons of the farmers not following it, we survey few villages around the Chandigarh University. We approached around 200 farmers and discussed about their status, knowledge level on crop rotation and their reasons of non-adoption of crop rotation. Present study was conducted with the objective:

1. To study about the socio-personal status of the farmers.
2. To study the knowledge level about crop rotation and to identify the constraints in the adoption of crop rotation.

## 2. METHODOLOGY OF SURVEY

The present study was conducted during 2018-19, in the Punjab state. Mohali district was select purposively because it had more connectivity with Himachal Pradesh and Haryana as well as more marketing facilities as compare to other districts. Irrigation resources also limited for

Mohali so this type of district required more attention to eliminate rice-wheat cropping system and plan towards crop rotation and diversification. For this investigation, five villages (Mamupur, Gharuan, Khanpur, Bhago Majra, and Sill) were selected. A complete list of farmers was prepared along with the information about their size of land holding. A sample of 40 farmers was randomly selected from each selected village on the basis of probability proportional to number of farmers in each land holding category. In this way, 200 hundred total farmers were selected from five villages of Mohali district. Data were collected through personal interviews with pretested questionnaire. Level of knowledge and constraints faced by the farmers in adopting crop rotation system, were analysed with the help of statistical tools like frequency, percentage, mean etc. Data collection was done through RAWE (Rural Agricultural Work Experience) programme under the guidance of RAWE co-ordinator and with the help of RAWE students.

## 3. RESULT AND DISCUSSION

### 3.1 Socio-personal Status of Respondents

The information regarding socio-personal characteristics of the farmers included age, education, family type, land holding, participation in social groups, annual income, source of information and livestock. The information pertaining to the socio-personal status of the farmers has been presented in Table 1. It is clear from the data that majority (71.50%) of the farmers belonged to the age group of 26-50 years while only 6.00 per cent had less than 26 years of age. From education parameter, an equal percentage (*i.e.* 43.50%) of the farmers had matric level and higher secondary & above education while 21.00 per cent of them were illiterate and only 10.00 per cent of them had primary level education [11,12,13,14,15]. From the total 200 farmers 67.00 per cent had nuclear type family while rest 33.00 per cent had joint family. It can be also observed from Table 1 that 44.50 per cent of the farmers had more than 5 acres of land holding whereas 37.50 per cent had 2.6 to 5 acres. Rest 18.00 per cent farmers had up to 2.5 acres land holding. Data further revealed that only 39.00 per cent of the farmers had participation in social group while rest 61.00 per cent had no participation. More than half

(53.50%) of the farmers had annual income more than one lakh while 27.00 per cent had fifty thousand to one lakh and 19.50 per cent had annual income less than fifth thousand. Data shows that electronic media is used by 39.00 per cent farmers whereas 61.00 per cent used both electronic and print media as source of information. It is also clear from the study that 82.00 per cent of the farmers had livestock while 18.00 per cent had no livestock. These data were as similar to the finding reported by [16,17] Sharma and Kaur, 2013.

### 3.2 Knowledge Level of the Farmers about Crop Rotation

To access the knowledge level of farmers about crop rotation system, total 10 parameters was discussed with the respondent farmers and the observations was presented in Table 2. The data revealed that the farmers had maximum knowledge about effect of crop rotation on annual income and fertilizer input. These two categories got maximum mean score 2.09 and 2.08 with maximum farmers' *i.e.* 52.00 per cent and 49.50 per cent in the high knowledge category. In rank hierarchy Effect on annual income and effect on fertilizer input got first and second position followed by importance, effect on

yield and effect on weed in field of the crop rotation which got third, fourth and fifth rank, respectively. Findings further showed that the effect on soil health got sixth rank with 2.00 mean score followed by effect on crop disease and effect on cost of production which got seventh and eighth rank. From rank hierarchy it is also clear that farmers had less knowledge about the effect of crop rotation on pesticide input and recommendation of crops for crop rotation [19]. Maximum farmers *i.e.* 47.50 per cent and 58.00 per cent for these aspects were fall under the low level of knowledge and placed on last ninth and tenth rank with 1.82 and 1.68 mean score. These data were as similar to the finding reported by Choudhary et al. [16], Rayanagoudar et al. [17], Sharma and Kaur, 2013.

### 3.3 Overall Knowledge about Crop Rotation

To get an overall view regarding farmers' knowledge about crop rotation, the observation collected from farmers was classified into three categories *i.e.* low, moderate and high as given in Table 3. It is revealed from the data presented in Table 3 that maximum 46.00 per cent of the farmers had low level of knowledge

**Table1. Distribution of respondents according to their socio-personal status**

S. No.	Socio-personal parameters	Range	Frequency	Per cent
1.	Age	17-25	12	6.00
		26-50	143	71.50
		More than 50 years	45	22.50
2.	Education	Illiterate	42	21.00
		Primary	20	10.00
		Matric	69	34.50
		Higher secondary or above	69	34.50
3.	Family type	Nuclear	134	67.00
		Joint	66	33.00
4.	Land Holding	0-2.5 acres	36	18.00
		2.6-5 acres	75	37.50
		More than 5 acres	89	44.50
5.	Participation in social group	None	122	61.00
		Member of an organisation	42	21.00
		Own business	36	18.00
6.	Annual income	<50k	39	19.50
		50k-100k	54	27.00
		>100k	107	53.50
7.	Source of information	Electronic media	78	39.00
		Both electronic and print media	122	61.00
8.	Livestock	Have	164	82.00
		Don't have	36	18.00

**Table 2. Distribution of respondents according to their knowledge level about crop rotation (n-200)**

S. No.	Aspects of crop rotation	High Knowledge	Moderate Knowledge	Low Knowledge	Mean Score	Rank
		Frequency (%)	Frequency (%)	Frequency (%)		
1.	Importance	74 (37.00)	57 (28.50)	79 (39.50)	2.07	III
2.	Recommendation of crops	51 (25.50)	33 (16.50)	116 (58.00)	1.68	X
3.	Effect on yield	90 (45.00)	30 (15.00)	80 (40.00)	2.05	IV
4.	Effect on cost of production	50 (25.00)	70 (35.00)	80 (40.00)	1.85	VIII
5.	Effect on soil health	86 (43.00)	28 (14.00)	86 (43.00)	2.00	VI
6.	Effect on weed in field	94 (47.00)	20 (10.00)	86 (43.00)	2.04	V
7.	Effect on fertilizer input	99 (49.50)	18 (9.00)	83 (41.50)	2.08	II
8.	Effect on crop diseases	84 (42.00)	30 (15.00)	86 (43.00)	1.99	VII
9.	Effect on pesticide input	59 (29.50)	46 (23.00)	95 (47.50)	1.82	IX
10.	Effect on annual income	104 (52.00)	10 (5.00)	86 (43.00)	2.09	I

**Table 3 Overall, knowledge levels of respondents about crop rotation**

S. No	Knowledge level	Frequency	Per cent
1.	Low	92	46.00
2.	Moderate	31	15.50
3.	High	77	38.50

**Table4. Distribution of the farmers according to constraints reported in adoption of crop rotation system n=200**

S. No	Constraints	Frequency	Per cent
1.	Unavailability of high quality seed	145	72.50
2.	High labour cost	167	83.50
3.	Lack of remunerative MSP policy	200	100.00
4.	Poor crop insurance coverage	143	71.50
5.	Lack of quality agrochemicals required at farmer level	94	47.00
6.	Lack of mechanization except some major crop	110	55.00
7.	Lack of proper marketing system	183	91.50

about crop rotation whereas 15.50 per cent farmers had moderate knowledge [11,14,15]. It is also clear from the findings that 38.50 per cent farmers had high level of knowledge about crop rotation system. In this way, we can conclude that farmers required a lot of awareness to educate them about crop rotation system which would be helpful to develop sustainability in agriculture.

### 3.4 Constraints faced by the Farmers in the Adoption Crop Rotation System

The information regarding the major constraints faced by the farmers in the adoption of crop rotation system was recorded during this study and given in the Table 4. All the farmers reported that lack of remunerative MSP (Minimum Support Price) policy form alternative

crops is acting as a big barrier for farmers. This is the major reason that farmers are unable to adoption crop rotation. From the total farmers 91.50 per cent and 83.50 per cent farmers also reported the problems regarding the lack of proper marketing system and high labour cost. Study further revealed that 72.50 per cent and 71.50 per cent farmers reported that unavailability of high quality seed and poor crop insurance coverage also create problem in the adoption of crop rotation followed by the lack of mechanization and lack of quality agrochemicals at farmer level which was reported by 55.00 per cent and 47.00 per cent of the farmers. Similar findings reported by Singh and Kaur [18].

#### 4. CONCLUSION AND RECOMMENDATION

The knowledge of the respondent farmers on crop rotation was not as expected. Besides, their attitude towards crop rotation system was negative; we suggest organizing more extensional programmes to the villages to spread latest techniques and new practices to the farmers. We also suggested the farmers to practice rain water harvesting to tackle low availability of irrigation water and to increase the level of ground water. We also recommended them to use drip irrigation and sprinkler irrigation to increase the water use efficiency of the field and crop. From the findings of the study and on the basis of our own observation, we can offer a few recommendations which bear on the specific situation and will help the extension agencies to dissemination the improved practices at a greater pace [11,12,13].

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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