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## Assessing factors influencing in farmer producer organizations and challenges faced by farmers in Varanasi district of Uttar Pradesh

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### Abstract

This study employs a comprehensive analytical framework to unravel the key factors influencing farmer's motivation to participate in Farmer Producer Organizations (FPOs) while also shedding light on the challenges encountered by both FPO members and non-members. Through the tool of Principal Component Analysis (PCA), this research discerns crucial variables that significantly encourage farmers to engage with FPOs, prominently including improved market access, risk reduction, and diminished input costs. Further insights emerge from Garrett's ranking technique, revealing distinct constraints faced by FPO members. Foremost among these are the absence of requisite infrastructure, limited access to credit facilities, and the volatility of prices across seasons. Concurrently, secondary constraints include issues related to untimely, costly, and quality inputs, lack of communication, awareness about grading and packaging, and intermediary exploitation. For non-members of FPOs, the study uncovers distinct constraints through the same ranking technique. Predominant challenges encompass delayed payments, exploitation by intermediaries, and a dearth of accessible credit facilities. Conversely, minor constraints encompass matters such as suboptimal inputs, inadequate transportation infrastructure, communication gaps, limited awareness about grading and packaging, and the scarcity of market information. These findings illuminate the multifaceted dynamics that shape farmer's engagement with FPOs, elucidating the pivotal role of factors like market access and risk reduction. Moreover, the study underscores the pressing need for addressing critical constraints faced by both FPO members and non-members, ranging from infrastructural inadequacies to credit access challenges. By offering an empirical foundation for policy formulation, these insights stand to contribute significantly to the enhancement of FPO participation and the amelioration of agricultural practices.

**Keywords:** FPO, principal component analysis, Garrett's ranking technique

### Introduction

Around 51% of India's land area is already under cultivation, but more than 85% of these small and marginal farmers have land holdings of less than 2 ha (Jena *et al.*, 2022) <sup>[8]</sup>. In Uttar Pradesh, 63% of the total households are engaged in agricultural activities. The average size of the land is 0.80 hectare as compared to the all India average of 1.15 hectare. About 2.33 crore farmers in the state have a combined landholding of 176.22 lakh hectares. But 92% of them are small and marginal farmers. The average size of marginal holding is 0.40 hectares while small farmers hold 1.43 hectares on an average (NAFIS, 2021). Majority of the small farmers are involved in labour-intensive high-value crops production but constraints like low scale of production, lack of capital, storage, quality inputs and improved technology act as barrier to market access (Gurung *et al.*, 2022) <sup>[6]</sup>. Even if they can reach markets, they are forced to accept lower pricing because of their reduced negotiating strength due to their incapacity to combine and add value to the items (Gyau *et al.*, 2016) <sup>[7]</sup>.

Despite being the actual producer of food, small farmers only earn a little portion of the actual value paid by the final consumers. However, as a result of the decline in crop prices, input costs have increased significantly while returns have decreased, further reducing income levels (Gurung *et al.*, 2022) <sup>[6]</sup>. In order to meet the specific needs of small and marginal farmers,

effective technology distribution systems are needed. Increasing the profitability of Indian farmers should be the hour's main goal. There are many options available to overcome the obstacles, but one potential option for effective e farming, information exchange, input delivery, marketing, and profit making is mobilizing farmers for group action through developing farmer's organizations, which are a crucial part of the delivery system and help farmers make decision collectively for local agricultural development that will increase income.

In India, the concept of Producer Company evolved in 2002 under the chairmanship of economist Y. K. Alagh by introducing a new part IX A into the Companies Act, 1956 (Verma *et al.*, 2021) [9]. Farmer Producer Organizations are operated by farmers and owned by farmer members, who are shareholders based on their share capital contribution.

The FPOs and producer firms were highly helpful in enhancing the value chain of agricultural products, which led to their success in obtaining fair prices for their goods. FPOs address all issues farmers are now facing and to raise the level of living by ensuring that they receive the exact amount that the consumer or end user paid by doing away with middlemen (Alur *et al.*, 2017) [1]. The primary objective of the FPOs is to unite small farmers for backward and forward linkages, including collective selling, processing, and market driven agricultural production, as well as forward linkages, including seeds, fertilizers, financing, and insurance. A well-known method for tackling the problems that small-scale farmers face in the agriculture industry is collective action. These farmers can unite through consolidation and aggregation to benefit from economies of scale and collective bargaining (Gummagolmath *et al.*, 2022) [5]. Objectives of the study are:

- To Analyses the factors that affects the member of FOPs.
- To identify the constraints faced by members and non-members of FPOs.

## Materials and Methods

**Sampling Design:** The present investigation was conducted in Varanasi district of Uttar Pradesh during 2022-23.

**Selection of FPOs:** There are 654 FPOs which were registered and functional in Uttar Pradesh and are functioning under National Bank for Agriculture and Rural Development (NABARD), small farmer Agribusiness Consortium (SFAC) and National Cooperative Development Corporation (NCDC). Out of 33 FPOs present in district, 5 FPOs were randomly selected. The selected FPOs belong to kasha Vidyapith, Sevapuri, Baragaon and Arajiline blocks. Namami Gange Farmer Producer Company Limited (NGFPCL), Badagaon Agro farmer Producer Company (BAFPC), Barkacha Agro Produce Company Limited (BAPCL), Jaya seed Producer Company Limited (JSPCL), Rameshwar Farmer Producer Company Limited (RFPCL) are the selected FPOs.

**Selection of Respondents:** Form each selected FPOs, 24 respondents were selected randomly from the villages covered by each FPOs. 16 of the 24 responders were FPO members, while 8 were not. The list of farmers obtained from the FPOs served as the basis for the random selection. Where total of 120 respondents were selected for all the five FPOs collectively, out of which, 80 were FPO members and 40 were non-FPO

members.

**Collection of data:** Primary data were gathered from FPO member farmers, non-FPO members, and data collect through field surveys, interviews, and the recall memory method with the aid of a pre-tested and well-structured schedule.

**Analyses Procedure:** Used PCA to examine the factor more responsible for the preference of Farmer Producer Organization as stated by Jolliffe (2002) Shlens (2014) has proposed the computation of PCA in the following steps:

1. Arrange data as an  $m \times n$  matrix, where  $m$  represents the number of measurement types and  $n$  symbolizes number of samples.
2. Subtract off the mean for each measurement type.
3. Compute first the correlation matrix and then eigen values of the correlation matrix.

**Deriving principal components:** Derivation of principal components prescribed by Jolliffe (2002) is given by  $\text{Var}\{\alpha_1 x\} = \alpha_1 \sum \alpha_1$

The Variable used in the derivation is  $\alpha_1 \alpha_1 = 1$ , that is, the sum of squares of elements of  $\alpha_1$  equals one. In general, the  $k$ th PC of  $x$  is  $\alpha_k x$  and  $\text{Var}\{\alpha_k x\}$

Data were subjected to XLSTAT 2023 and principal component analysis was performed. Eigen values, variance percentage and cumulative percentage were found. Screen plot and score plot were also obtained in order to decide how many principal components are sufficient to describe the relationship.

Garrett's Ranking Technique is used to identify and rank the constraints of farmer producer organization in study area. The ranks assigned by the respondents were converted into scores by using Garrett's Ranking Technique (Gautam *et al.*, 2022).

$$\text{Percent position} = 100 \times \frac{(R_{ij} - 0.50)}{N_j}$$

Where,

$R_{ij}$  = Rank given for the  $i$ th factor by  $j$ th individual

$N_j$  = Number of problems ranked by  $j$ th individual

The present position of each rank was converted into scores using the table given by Garrett. The scores of various respondents were added and mean values were calculated. The mean values were arranged in the descending order

## Results and Discussion

The important attributes influencing the farmers to join farmer producer organization were analyzed using principle component analysis. In principle component analysis, the first step is to check the acceptability of principle component analysis with the help of Kaiser-Meyer-Olkin (KMO) measure and Barlett's Test (Table 1).

KMO measure was 0.738, which shows that the factors extracted will responsible for moderate amount of variance. The chi-square value for Barlett's test was significant and therefore, rejecting the null hypothesis of independence among variables.

**Table 1:** KMO and Bartlett's test to analyze the factors influencing the farmers to join producer organizations

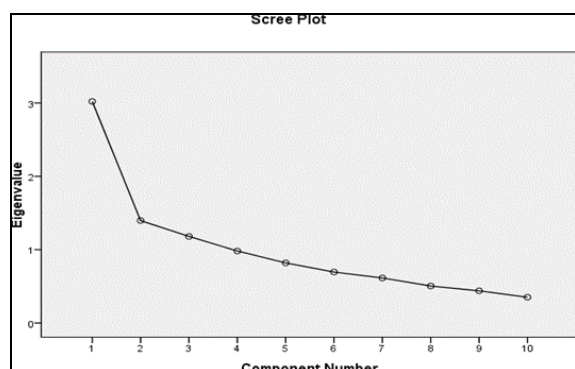
KMO and Bartlett's Test		
Kaiser-Mayer-Olkin major of sampling Adequacy		0.738
Bartlett's Test of Sphericity	Approx. Chi-square	232.23
	Degree of freedom	45
	Significance level	0.00

Eigen value greater than one are considered for deciding the number of factors and with the help of scree plot, the factors are decided (Figure 1). The scree plot is an alternate technique of determining the number of factors to extract through factor analysis since it shows the greatest decrease in the Eigen values of the factors, highlighting that the factor would not explain a significant amount of the variance of scale items.

Three factors were found to have Eigen values greater than one throughout analysis, and as a result, only three were kept. There were a total of 9 attributes chosen, including average farm income, financing availability, market accessibility, bulk selling, crop diversification, farmer education and experience, input cost reduction, and risk management. These characteristics were divided into three main variables, PC1, PC2, and PC3, as shown in table 3. These factors accounted for 55.97%, 44.17%, and 30.21% of the overall variance in PCs 1, 2, and 3. PC1 demonstrated the greatest benefit (30.21%), with a component's positive value matching to variable market access. PC2 demonstrated the positive value of the component corresponding to risk mitigation and explained 13.96% of the variance. PC3 demonstrated a positive value for the component corresponding to an input cost reduction and explained 11.80% of the variance. The parts that arrive before the break are thought to be significant and are kept, but the parts that come after the break are thought to be trivial and are not retained. Figure 1 makes evident that there is a pause after three components of the FPO, and it is acknowledged that these components are significant and crucial in motivating farmers in the Varanasi District to engage in the FPO. Average farm income was the major factor influencing the farmer to join farmer producer organizations followed by market access and access to credit (Table 2).

**Table 2:** Eigen value for each factor

Factor	Eigen value	Variability (%)	Cumulative %
F1	3.021	30.210	30.210
F2	1.396	13.963	44.173
F3	1.180	11.805	55.978
F4	0.982	9.816	65.793
F5	0.819	8.191	73.984
F6	0.695	6.946	80.931
F7	0.614	6.135	87.066
F8	0.504	5.038	92.104
F9	0.351	3.511	100.000

**Fig 1:** Scree plot for factor influencing farmers to join farmer producer organizations**Table 3:** Factor influencing the farmers to join farmer producer organizations

S. No.	Attributes	Factor		
		PC1	PC2	PC3
1.	Average Farm income	0.206	-0.497	0.288
2.	Market Access	0.522	-0.022	0.045
3.	Access to credit	0.383	-0.377	-0.069
4.	Bulk Selling	0.367	-0.374	0.025
5.	Diversification of crop	0.118	0.166	0.412
6.	Reduction in input cost	-0.022	0.009	0.749
7.	Farmer training & knowledge	0.368	0.375	0.162
8.	risk mitigate	0.374	0.530	0.043
9.	Market Linkages	0.272	-0.143	-0.314

Extraction Method: Principle Component Analysis

### Constraints of members of Farmer Producer Organizations

Constraints perceived by members of farmer producer organizations in Table 4. It was evident from the result that the members need the lack of proper infrastructure, lack of credit facilities, price fluctuation over the year, delay in payment, untimely, costly and poor-quality inputs, lack of communication, lack of awareness about grading and packaging, exploitation by middleman, lack of transportation facility, lack of market information were the major constraints which had impact on members of farmer producer organizations with a Garrett's score of 73.62, 67.67, 66.72, 60.61, 53.26, 46.12, 42.62, 32.96, 27.86 and 26.20 respectively. Where lack of proper infrastructure ranks first in the list of constraints faced by members of farmer producer organizations.

**Table 4:** Constraints faced by the members of farmer producer organizations

S. No.	Particulars	Sum of Garrett score	Members	
			Mean Score	Rank
1	Lack of proper infrastructure (implements, irrigation facilities, etc.)	5890	73.62	I
2	Lack of transportation facility	2229	27.86	IX
3	Exploitation by middleman	3690	46.12	VI
4	Delay in payment	4849	60.61	IV
5	Untimely, costly and poor-quality inputs	4261	53.26	V
6	Lack of communication	3410	42.62	VII
7	Lack of awareness about grading and packaging	2637	32.96	VIII
8	Price fluctuation over the year	5338	66.72	III
9	Lack of credit facilities	5414	67.67	II
10	Lack of market information	2096	26.20	X

### Constraints of various Non-members

Constraints perceived by non-members of farmer producer organizations in Table 5. It was evident from the result that delay in payment, exploitation by middleman, lack of credit facilities, the lack of proper infrastructure, price fluctuation over the year, lack of market information, untimely, costly and poor-quality inputs, lack of transportation facility, lack of

communication, lack of awareness about grading and packaging were the major constraints which had impact on non-members of farmer producer organizations with a Garrett's score of 68.75, 62.54, 59.35, 58.37, 56.92, 48.02, 45.60, 39.50, 32.22 and 28.85

respectively. In which delayed in payment ranks first in the list of constraints faced by the non-members of farmer producer organizations.

**Table 5:** Constraints faced by various non-members of FPOs

S. No.	Particulars	Sum of Garrett value	Members	
			Mean Score	Rank
1	Lack of proper infrastructure (implements, irrigation facilities, etc.)	2335	58.37	IV
2	Exploitation by middleman	2498	62.45	II
3	Lack of credit facilities	2374	59.35	III
4	Delay in payment	2750	68.75	I
5	Untimely, costly and poor-quality inputs	1824	45.60	VII
6	Lack of market information	1921	48.02	VI
7	Lack of awareness about grading and packaging	1154	28.85	X
8	Lack of transportation facility	1580	39.50	VIII
9	Lack of communication	1289	32.22	IX
10	Price fluctuation over the year	2277	56.92	V

### Conclusion

The government should create initiatives to entice small and marginal farmers to join FPOs so they may profit from things like economies of scale and Ensure effective market linkage by offering technical support to FPOs in the areas of extension and marketing services. Based on the above findings, it can be concluded that non-members were more acutely aware of the need to teach farmers proper grading and packaging techniques. The government should also build more storage facilities and warehouses in the area to enable farmers to store their produce for extended periods of time, which was noted as a key issue by both members and non-members. In the study area, it is also important to emphasize the provision of transit infrastructure by the government and supporting organizations. To encourage wider adoption of technology and practices, it is necessary to secure the financial stability of existing FPOs.

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