



# **A Study on Impact of Farmer Producer Organisation on Farmers' Income in Andhra Pradesh**

**R. Vedasri<sup>1\*</sup> and R. K. Mishra<sup>2</sup>**

<sup>1</sup>College of Agriculture, OUAT, Bhubaneswar, India.

<sup>2</sup>Department of Agricultural Economics, College of Agriculture, OUAT, Bhubaneswar, India.

## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/AJAEES/2021/v39i830619

Editor(s):

(1) Dr. Roxana Plesa, University of Petrosani, Romania.

Reviewers:

(1) Aleksandr N. Sekisov, Kuban State Agrarian University, Russia.

(2) Raju R., ICAR-Indian Agricultural Research Institute (IARI), India.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/71904>

**Original Research Article**

**Received 11 May 2021**

**Accepted 23 July 2021**

**Published 28 July 2021**

## **ABSTRACT**

The present paper gives the information about the impact of Farmer Producer Organisation on farmers income. The data was collected from both the members of FPO and non- members regarding the socio-economic factors and farming details of farmers. Logistic regression which was a binary regression model was used for determining the factors influencing the farmers to join as group members and then ordinary least square regression was estimated to study the impact of FPOs on farmers income by including inverse mills ratio which was calculated in logistic regression model, to remove the selection bias. The results showed that education, distance to market and age are the factors determining the farmers to join as members of FPO. The impact study results showed that group membership, hired labour, crop production area, share of crop sold and market size are the factors that are positively significant and increasing the farmers income.

**Keywords:** *Farmer Producer Organisation (FPO); farmers income; group membership; inverse mills ratio; Andhra Pradesh.*

## **1. INTRODUCTION**

Small and marginal farmers constitute the largest group of cultivators in Indian agriculture, about

85 per cent of operated holdings are smaller than two hectares and amongst these holdings, 66 per cent are less than one hectare. Indebtedness is often cited as the immediate reason for distress.

\*Corresponding author: E-mail: [ravadavinitha@gmail.com](mailto:ravadavinitha@gmail.com);

Deeper issues are related to vulnerability to risks in agricultural production. These issues include lower scale of operation, lack of information, poor communication linkages with the wider markets and consequent exploitation by intermediaries in procuring inputs and marketing fresh produce, access to and cost of credit and, in isolated cases, aggressive loan recovery practices. Monthly per capita consumption expenditure is higher than the monthly per capita income for small and marginal farmer households [1].

Many approaches have emerged in response to the problems faced by the small and marginal farmers. Agricultural co-operatives, formed under the Co-operative Credit Societies Act, 1904, is the dominant form of farmer collectives for long time; the experience with cooperatives point to many limitations that prevent effective collective action. Hence the Indian government has been promoting a new form of collectives called Farmer Producer Organizations (FPOs) to address the challenges faced by the small and marginal farmers, particularly those to do with enhanced access to investments, technological advancements, and efficient inputs and markets [1]

Economic benefits mainly income, is the primary motivation for producers to join these farmers' groups; failing to get the desired benefit could threaten their participation in such entities. While aiming at increasing farmers income by providing services at lower costs and better prices for their produce, the expected role of farmer organizations could be challenged by various problems such as poor infrastructures, lack of investment, inadequate service provision, poor extension services, competition with local traders, etc. The present study seeks to contribute to the existing body of literature and research on farmer organizations in Andhra Pradesh. Furthermore, by comparing producer members of farmer organizations and non-members, the study analyzed the effects of group membership on farm income among producers (Emmanuel *et.al* 2016).

## 2. METHODOLOGY

### 2.1 Sampling Procedure

In India there were a total of 7374 FPO's as on march 31, 2019 functioning both under SFAC and NABARD. Government of India was planning to promote 10,000 new FPO's over the next five years. Out of 28 states in India, Andhra Pradesh

has been selected purposefully for the study which is having 108 FPOs functioning both under NABARD and SFAC.

In Andhra Pradesh there were 108 FPO's which were registered and functional and were functioning under Small farmers Agribusiness Consortium (SFAC) and National Bank for Agricultural and rural development (NABARD). For the purpose of study Andhra Pradesh had been divided into three regions which were North coastal Andhra, Coastal Andhra and Rayalaseema. Out of these three regions Vishakhapatnam and Vizianagaram from North Coastal Andhra, Krishna and Guntur Districts from Coastal Andhra region and Chittoor from Rayalaseema regions have been selected for the present study.

### 2.2 Selection of FPOs

In North Coastal Andhra region there were 17 FPO's and in Coastal Andhra region there were 49 FPOs and in Rayalaseema region there were 27 FPOs. Out of which two FPOs were selected from each region which were having external linkages. The two selected FPOs from each region were one with highest membership and other with lowest membership. The selected FPOs were under Paderu and Parvathipuram revenue divisions in North coastal Andhra region, Vijayawada and Guntur revenue divisions in Coastal Andhra region and Tirupati revenue division from Rayalaseema. From Paderu revenue division Andhra Kashnir Producer Company (1034 members) and from Parvathipuram revenue division Rythula jattu Kuragayala Bellam Utapttidarula Producer Company (500 members) were selected. From Vijayawada revenue division Chandragudem Jasmine collection centre (400 members) and from Guntur revenue division Mangaladri Agri Producer company Ltd (3500 members) and from Mandanapally revenue division Sri Siddeswara FPO (500 members) and Kisan suvida FPO (4500 members) were selected.

### 2.3 Selection of Respondents

From each village farmers were selected randomly comprising of twenty member farmers selling their produce through FPO's and twenty non FPO farmers from each selected Mandal. The random selection was done based on list of farmers collected from the FPOs. Thus from the three regions 5 districts with 6 mandals and 6 villages were selected. From each village 40

farmers were selected comprising of 20 member farmers who sell their produce through FPOs and the remaining 20 farmers were non-FPO members. In this way a total of 240 farmers were selected for the study in which 120 are FPO members and 120 are non FPO farmers.

Primary as well as secondary data were collected to fulfill the designed objectives. Well structured pre-tested Schedule was developed for the collection of primary data as per the objectives. The data was collected in the agricultural year 2020-2021.

### 3. TOOLS OF ANALYSIS

#### 3.1 Factors Influencing Farmers to Join as Members in FPO

A total of 6 FPOs were selected purposively which were having external linkages. From each region of Andhra Pradesh with minimum and maximum membership so for analyzing factors to join farmers as members in FPO multinomial Logistic regression model was estimated using STATA software.

Logistic regression is used to model nominal outcome variable in which log odds of the outcomes are modeled as a linear combination of the predictor's variables. Factors influencing farmers to join as members of FPO is specified as per equation [2].

$$M_{(j,0)} = \beta_j X_i + \epsilon_{ij}$$

Where  $M_j$  is a vector of the Group membership ( $j=1$  for Group members,  $j=0$  for non member).

$X_i$  is the factors responsible for the farmers to join as members.

$\beta_j$  = Constant.

$\epsilon_{ij}$  = Random error term.

$$M_{(j,0)} = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + X_6 + \epsilon_i$$

$X_1$  = Age (No. of years).

$X_2$  = Family size (No. of members in the family).

$X_3$  = Education (No. of years)

$X_4$  = Land ownership (No. of hectares land owned)

$X_5$  = Farm size (No. of hectares held by farmers both owned and leased in)

$X_6$  = Distance from market (in Kms)

$M_j$  = Group Membership.

Age is farmers actual age taken in years.

Family size refers to the number of household members present in the family.

Education level is referred to as literacy level of the farmers taken in years.

Land ownership is referred to the size of the land that is owned by farmer in hectares.

Farm size is referred as the total arable land present with the farmer which includes both rental and owned land in hectares.

Distance to market is referred as the total distance from the farm to the market taken in kms.

#### 3.2 FPO Impact Model

Ordinary Least square (OLS) estimation would lead to biased estimates so, the inverse mills Ratio was generated from multinomial logit model and then included as explanatory variable in the impact regression to control selection bias. The inverse mills Ratio (IMR) corrects the error terms in the impact equations to achieve consistent unbiased estimates. The following econometric model was employed for impact of FPO on farmer income.

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + IMR + \mu_i$$

$X_1$  = Age (No. of years).

$X_2$  = Education (No. of years).

$X_3$  = Labour used (Man days/ha).

$X_4$  = Family labour (No. of persons in family working as labour).

$X_5$  = Market price (Rs/kg).

$X_6$  = Share of crop sold ( % of crop sold).

$X_7$  = Production area (Area sown in ha).

$X_8$  = Distance to market (in kms).

$X_9$  = Group membership (Yes=1; No=0)

Labour used was referred to as hired labour used for the farm work and is taken as labour mandays/ha.

Family labour was referred to as the number of family members working on the farm.

Market price was referred to as the price at which farmers sell their produce in market (in Rs).

Share of crop sold was referred to as quantity of crop sold to total crop harvested which is taken in percentages.

Production area was referred to as total area of crop sown to the arable crop land.

## 4. RESULTS AND DISCUSSION

### 4.1 Impact of FPOs on Farmers' Income in North Coastal Andhra Region

A study on impact of FPOs on farmers income shows the improvement in the sustainable livelihood and income of the small and marginal farmers.

### 4.2 Factors Influencing Farmers to Join as Members in Andhra Kashmir FPO

Multinomial logit model, was used to analyse the factors determining the farmers to join as members in FPO. Since the coefficients were not directly interpreted, so, the marginal effects were also estimated to express the probability of willingness to join as members (Table 1).

Age is positively related and significant coefficient, indicating that for every unit increase in the age of farmers the probability of participation to join as group members increases by 0.07 per cent. Participation of older farmers is more in joining as the group members. The older farmers had more land resources, so they own their land in large amounts than younger farmers who depend on inherited land.

Education of house hold was significant and positively related to group members which revealed that tendency to of educated farmers to join as group members increases by 0.35 per cent. The educated farmers had an idea of the benefits of FPO and were interested to join as members in FPO.

Distance to market was significant and positively related to Group membership and for every unit increase in the distance to market the tendency to join as members increased by 0.17 per cent. The farther the distance to the market the farmers tend to join as members because FPOs provide transport facilities to take produce to the market from their farm.

The results also indicate that family size, land ownership and farm size are positively related and insignificant likelihood ratio was 33.59 with a probability value of 0.00 tells that the model was fit and the results were similar to previous studies [3].

### 4.2.1 Impact of Andhra Kashmir FPO on farmers' income

The producers join in farmers group mainly to benefit the agricultural services (farm input, farm tools, training etc.) but they also expect higher farm income desired from production. Results Table 2 indicates the results of regression model on farm income.

Results of the model confirm a statistically significant and positive effect on group membership on producers farm income. Inverse mills ratio corrects the possible selection bias and yields consistent estimates in the income model. Inverse mills Ratio was insignificant and showing that there was no selection bias. By participating in farmers group farmers could significantly increase the income from turmeric production. Group membership on average, was able to increase the participants farming income by Rs 48541.30 per cultivation.

Another important factor that influences farmer income was share of crop sold, farmers try to maximize their income by increasing the share of crop sold. Share of crop sold and price of crop are proportional to each other and statistically significant as the price of crop increases share of crop sold increases by having better yields. Share of crop sold and price of crop are significant at 1 per cent LOS and positively related. Farmer who had access to higher market price were able to secure higher income. Production area was significant at 1 per cent LOS and positively related. One hectare increase in the cultivation of turmeric would increase the farm income by RS 275710.42. The results were similar to [3].

### 4.3 Factors influencing farmers to join as members in Rythula Jattu Kuragayala Bellam Utpattidarula producer Company

Multinomial logit regression was used to analyse the farmers to join as members in FPO. Then Inverse mills ratio was analysed to remove selection bias. The results were shown in the Table 3.

As the age of the farmers increases the probability of joining in FPO increases by 5 per cent. This showed that younger farmers are less likely to join in FPO than older farmers because they are forced to wait longer before they own ample production resources which could enable them to participate in farmers group.

Education of household was significant at 10 per cent and was negatively related to participation in farmer groups and this showed that tendency of educated farmers to stay away from farmers groups by 13 per cent. The reason could be mostly educated farmers are better off farmers.

An increase in farm size increases the probability of group participation by 4 per cent. The majority of the farmers are resource poor and cultivating

on larger farm sizes require more resources and investment which could be overcome by participating in farmer groups.

From the Table 3 it was showed that LR Chi<sup>2</sup> value was 75.28 with the p- value 0.00 which indicates that the model was fit. The remaining variables such as family size, landownership and distance to market were positively but insignificant.

**Table 1. Factors affecting farmers to join as members of Andhra Kashmir Farmer producer company**

**Dependant Variable: Group Membership**

Variable	Logit estimates	Marginal effects
Constant	24.23(16.40)	
Age	0.31(0.18)*	0.07(0.04)*
Education	1.44(0.83)*	0.35(0.25)*
Family Size	0.55(0.86)	0.13(0.21)
Land Ownership	1.08(1.21)	0.26(0.30)
Farm size	1.70(1.26)	0.44(0.30)
Distance to Road	0.72(0.31)**	0.17(0.07)**
LR chi <sup>2</sup> (6) =35.59	P-value=0.00	Pseudo R <sup>2</sup> =0.67

\*\* = 5 % level of Significance, \* = 10% Level of Significance, Values in the parenthesis show standard error

**Table 2. Impact of Andhra Kashmir Farmer Producer Company on farmers' income**

**Dependant Variable: Farm income**

Variable	β-Coefficients	Standard error
Group membership	48541.3*	25921.63
Age	144.22	454.72
Education	53.02	1522.36
Family labour	155.57	2028.00
Hired labour	2810.69	1793.53
Share of crop sold	3363.16***	266.14
Price of crop	48.25***	15.18
Distance to markets	3498.77***	1246.83
Inverse mills ratio	7053.45	13126.20
Constant	787146.4	174296.71
Farm Size	275710.4***	5254.08
R <sup>2</sup> =0.99	P-value=0.00	F(10,29)=559

\*\*\* = 1 % level of significance (LOS), \* = 10% level of significance

**Table 3. Factors influencing farmers to join as members in Rythula Jattu Kuragayala Bellam utpattidarula producer company**

**Dependant Variable: Group Membership**

Variables	Logit estimates	Marginal effects
Constant	0.15(2.21)	
Age	0.06(0.02)	0.05**
Education	-0.13(0.07)	-0.01*
Family size	0.05(0.12)	0.04
Land ownership	0.33(0.69)	0.03
Farm size	0.51(0.29)	0.04*
Distance to market	-0.43(0.35)	-0.04
LR chi <sup>2</sup> (6)=75.28	P- value =0.00	Pseudo R <sup>2</sup> =0.68

\*\* = 5% level of significance, \* = 10% level of significance, Values in the parenthesis show standard error

**4.3.1 Impact of Rythula Jattu Kuragayala bellam utpattidarula producer company**

Results presented Table 4 give the outcome of regression model on farm income. Inverse mills ratio corrects the selection bias.

From the Table 4 Group membership was significant at 10 per cent and was positively related to the farm income. By participating in farmer groups farmer could increase the income by RS 281286. Labour use also had significant and positive relation on farm income at 5 per cent indicating that farmers who used more labour had higher incomes. Labour intensive farming system in the study where higher availability of labour and use may enhance production and increase the income of the farmers. Production area had a positive and significant impact on farm income. As the area under cultivation of vegetables and sugarcane increases the income of the farmers' increases by 10 per cent. The price of the crop was significant at 10% and positively related. The

higher market prices were able to secure higher incomes. Share of crop sold also had positive impact on farmers income and significant at 1 per cent. The higher the market price the higher the share of crop sold. For every unit increase in crop sold increases the income by Rs 414013. Inverse Mills ratio was positive but insignificant which showed that there was no selection bias.

**4.4 Impact of FPOs on farmers' income in Coastal Andhra region**

**4.4.1 Factors Influencing farmers to join as group members in Mangaladri Agri producer company**

To analyse the willingness of farmers to join as group members in Mangaladri agri producer company Multinomial Logit model was used. The coefficients cannot be interpreted, so, marginal effects were also calculated to study the magnitude. The results were shown in the Table 5.

**Table 4. Impact of Rythula Jattu Kuragayala bellam utpattidarula producer company on farmers income**

**Dependant Variable: Farm income**

Variables	Coefficients	Standard error
Constant	281286	0.14
Group membership	741348*	381774
Age	37421.92	176719.7
Education	186767.10	479573.9
Labour hired	14677.29**	5687.39
Family labour	-329451.26	781430
Production area	571988.00**	337101
Distance to market	-808928.30	772860
Price of crop	1310.73**	2093.40
Share of crop sold	414013.00***	12673
Inverse Mills Ratio	206.12	237.97
R <sup>2</sup> =0.31	P value =0.00	F(10,29) = 3.36

\*\*\* = 1% level of significance, \*\* = 5 % level of significance

**Table 5. Factors influencing farmers to join as group members in Mangaladri Agri Producers Company**

**Dependant Variable: Group Membership**

Variable	Logit estimates	Marginal effects
Constant	15.560(13.07)	
Age	1.15(0.16)	0.03(0.03)
Education	4.19(3.02)	0.34(0.18)*
Family size	-0.66(-0.53)	-0.10(0.19)
Land ownership	2.22(2.24)	0.19(0.24)
Farm size	4.62(6.15)	0.37(0.31)
Distance to market	0.28(0.16)	0.31(0.14)**
LR chi <sup>2</sup> (6)=40.30	P value=0.00	Pseudo R <sup>2</sup> =0.72

\*\* = 5 % level of significance, \* = 10% level of significance, Values in the parenthesis show standard error

Education of household was significant and positively related to group membership and revealed that the tendency of joining the educated farmers as group members increased by 34 per cent. As the educated farmers are having higher qualification they had an idea about the benefits accrued through joining in farmer groups.

Distance to market is significant at 5 per cent and positively related which showed that the farther the market to farms the tendency of joining as group members increased by 30 percent as the FPO provided the transport facilities to the farmers and they provide the machines for processing of turmeric.

Table 5 showed that the likely hood chi square was 40.30 with a p-value of 0.00 which indicates that model was fit. The remaining variables such as age, farm size and land ownership were positively related but insignificant. Family size was negatively related to group membership and insignificant.

#### 4.4.2 Impact of Mangaladri FPO on farmers' income

After identifying the factors to join as members in farmer groups, OLS was used to analyse impact of FPO on farmers' income. Inverse mills ratio was used to remove selection bias. The results were presented in the Table 6.

Group membership was significant at 5 per cent and was positively related to farmers' income. For instance on an average group membership was able to increase the participants income by Rs 7451.63 for cultivation of turmeric. Share of

crop sold was also significant and influence the farmers income by Rs 1771.09 for every unit increase. The price of turmeric also had significant impact on farmers income. The price of crop and share of crop sold are proportional and significant at 1 per cent, as the price of crop increases share of crop sold increases. The access to higher market prices increases the share of crop sold which leads to better farm income. As the area sown under turmeric increased by 1 ha the farmers' income increases by Rs 140648.9. The production area was significant at 1 per cent and positively related to farmers income. The area under crop sown increases marketable surplus increases which leads to higher income (Table 6). The results were similar to [3].

#### 4.5 Factors Influencing Farmers to Join as Members in Chandragudem Jasmine Collection Centre

To study the factors influencing the farmers to join as members in Chandragudem Jasmine Collection centre multinomial logit model was used, as the estimates cannot be interpreted directly their marginal effects were calculated to know the magnitude. The results were shown in the Table 7.

Education of the farmer was significant and positive at 5 per cent which showed that educated farmer was willing to join in farmer groups at a tendency of 21 per cent. As educated farmers were well known about the benefits accrued through the FPOs they were willing to join as members.

**Table 6. Impact of Mangaladri agri Producers Company on farmers' income**

**Dependant Variable: Farm Income**

Variable	Regression coefficient	Standard error
Group membership	7451.63**	3275.75
Age	1.49	148.38
Education	693.08	762.02
Family labour	21.81	942.23
Hired Labour	845.22	828.04
Production area	140648.9***	2205.085
Share of crop sold	1771.07***	95.26
Price of crop	17.48***	0.11
Inverse mills ratio	1192.37	891.07
Constant	268095.20***	17882.9
R <sup>2</sup> =0.99	P-value =0.00	F(10,29)=3474.27

\*\*\* = 1 % level of significance, \*\* = 5% level of significance

**Table 7. Factors influencing farmers to join as members in Chandragudem Jasmine collection centre**

**Dependant Variable: Group Membership**

Variable	Logit estimates	Marginal effects
Constant	7.11(8.11)	
Age	0.10(0.88)	0.25(0.21)
Education	0.86(0.44)	0.21(0.11)**
Family size	0.44(0.48)	0.11(0.12)
Land Ownership	0.52(0.67)	0.13(0.16)
Distance to market	0.61(0.29)	0.15(0.07)**
LR Chi <sup>2</sup> (5)= 35.18	p- value = 0.00	Pseudo R <sup>2</sup> = 0.63

\*\* = 5% Level of Significance, Values in the parenthesis show standard error

Distance to market was also significant at 5 percent but was positively related which showed that as the distance between the market and farm increases they tend to join in FPO because this leads to the reduction in the transportation costs.

From the Table 7 it was shown that LR Chi<sup>2</sup> value was 35.18 with a p- value of 0.00 which indicates that the model as a whole fits significantly better than a model with no prediction. The other variables age, family size and land ownership were positively related to group membership but insignificant.

**4.5.1 Impact of Chandragudem Jasmine Collection Centre on farmers’ income**

Ordinary least square regression was used to analyse the impact of FPO on farmers’ income by including Inverse Mills ratio to remove the selection bias. The results were shown in the Table 8.

The study showed that inverse mills ratio was positively related but insignificant which indicates that there was no selection bias. Group membership was significantly related to farmers’

income at 1 per cent and increases the income by Rs 769460.90. Hired labour was positively related to the farmers’ income and significant at 5 per cent which showed that the study area was labour intensive. Production area was significant at 5 per cent and positively showing that the area under cultivation of jasmine would increase the farm income by Rs 22650.89. The higher the area of cultivation under jasmine the higher would be the yield which lead to increase in income. As the price of the crop increases the income of the farmer increases. The price of the crop was significant at 10 per cent and positively related to the farmers’ income.

**4.6 Impact of FPOs on Farmers’ income in Rayalaseema region**

**4.6.1 Factors influencing farmers to join as members in Kissan Suvida FPO**

To analyse the willingness of farmers to join as members of Kissan Suvida FPO multinomial logit model was used. The estimates in the model cannot be interpreted directly so marginal effects were calculated to interpret the magnitude of estimates. The results were presented (Table 9).

**Table 8. Impact of Chandragudem Jasmine Collection Centre on farmers’ income**

**Dependant variable: Farm Income**

Variable	Regression Coefficient	Standard error
Group membership	769460.90***	226313.25
Age	1343.08	2456.87
Education	10567.56	10126.32
Family labour	1867.42	15403.77
Hired labour	32510.03**	16816.79
Production area	60895.34**	22650.89
Share of crop sold	2659.03	5402.92
Price of crop	7985.17*	4544.31
Distance to market	935057.31	8357.01
Inverse Mills Ratio	7251.23	9543.86
R2 = 0.85	p-value = 0.00	F(10,29)=17.72

\*\*\* = 1% level of significance, \*\* = 5% level of significance, \* = 10% level of significance



**Table 9. Factors influencing farmers to join as members in Kissan Suvida FPO**

**Dependant variable: Group Membership**

Variable	Logit estimates	Marginal effects
Constant	6.67(9.85)	
Age	0.22(0.15)	0.56(0.04)
Education	0.91(0.47)	0.22(0.12)*
Family size	0.69(0.83)	0.17(0.20)
Land ownership	0.03(0.72)	0.09(0.17)
Distance to market	1.89(1.01)	0.46(0.23)**
LR Chi <sup>2</sup> (5) = 39.85	p- value = 0.00	Pseudo R <sup>2</sup> = 0.71

\*\* = 5% level of significance, \* = 10% level of significance, Values in the parenthesis show standard error

Education of the respondent was positively related to group membership and significant at 10 per cent which showed the tendency of educated farmer to join in the farmer groups was 22 per cent. The educated farmers were well known about the situation prevailing in the FPOs which makes them to join in FPOs.

Distance to the market was significant at 5 per cent. As the distance to the market increases the cost of transportation increases which is difficult for the farmers to sell their produce. So, in the results obtained distance to market was positively related which showed the farther the market the higher the transportation cost, which makes the farmer to join in FPO which can be benefitted through FPO.

From the Table 9 it was showed that the likelihood chi square ratio was 39.85 with the p-value of 0.00 which indicates that the model was fit. The remaining variables such as age, land ownership and family size were positive but insignificant to group membership.

**4.6.2 Impact of Kissan Suvida FPO on farmers' income**

To analyse the impact of FPO on farmers' income ordinary least square regression was

used by including inverse mills ratio to remove selection bias.

From the Table 10 it was showed that group membership was significant at 1 per cent and increased the farmers income by Rs 119390.75 per cultivation. Hired labour was positively related to farmers income and significant at 1 per cent which showed that the study area was labour intensive. The labour availability was more and high usage of labour would help in increase in the yield of the crop and increase the income by Rs 112464.62.

As area under cultivation of mangoes increases the farmers' income also increases. As the production area increases by 1ha farmers' income increases by Rs 169928.00 and was significant at 1 per cent. Share of crop sold and price of the crop were proportional to each other and significant at 5 and 10 per cent respectively. They were positively related to the farmers' income. High access to the markets leads to the increase in the farmers' income by Rs 19141.86 and leads to increase percentage of crop sold by the farmers. The results were similar to [3].

**Table 10. Impact of Kissan Suvida FPO on farmers' income**

**Dependant variable: Farmers' income**

Variable	Regression coefficient	Standard error
Group membership	119390.75***	35689.06
Age	125.07	386.64
Education	2168.86	1809.53
Family labour	500.07	2187.54
Hired labour	112464.62***	26181.32
Production area	169928.00***	20392.12
Share of crop sold	1953.97**	712.47
Price of crop	19141.24***	3723.09
Inverse Mills ratio	1507.86	1463.65
R <sup>2</sup> = 0.96	p-value = 0.00	F(9, 30) = 107.31

\*\*\* = 1% level of significance, \*\* = 5% level of significance

#### 4.7 Factors Influencing Farmers to Join as Members in Sri Siddeswara FPO

Multinomial logit regression was used to analyse the factors influencing farmers to join as members in FPO. As the logit estimates cannot be interpreted directly marginal effects were calculated to study the magnitude of the estimates. The results were presented in Table 11.

Age was significant and positively related to group membership which showed that the older farmers were more willing to join as group members. The tendency of older farmers to join as group members was 6 per cent. The older farmers had more land resources than the younger farmers, who mainly rely on the inherited land. This means that young farmers are less likely to join and participate in farmer groups because they are forced to wait longer before they own ample production resources which could enable them to participate in farmer group activities.

Distance to market was significant at 10 per cent and positively related showing that if the distance between the market and farm increases the farmers tend to join farmers groups by 16 per cent. The farther the market the tendency of joining in the farmer groups increases because the FPO provides the transport facilities which reduces the transportation costs.

The likely hood chi square ratio was 33.95 with p – value 0.00 which indicated that the model was fit (Table 11). The remaining variables such as education, family size and land ownership were positively related to group membership but insignificant.

#### 4.7.1 Impact of Sri Siddeswara FPO on farmers' income

To analyse the impact of Sri Siddeswara FPO on farmers' income ordinary least square regression was used by including inverse mills ratio to remove selection bias. The results were presented in Table 12.

From Table 12 it was showed that group membership was positively related and significant at 10 per cent. By participating in farmers groups farmer could instantly increase the income by Rs 19069.89 per cultivation. Hired labour also had a significant and positive relation with farmers' income indicating that farmers who use more labour, may obtain higher incomes. The study area was labour intensive, labour availability and use may significantly contribute to farmers' income by Rs 3768.48.

An increase by one ha production of mango cultivated area, would lead to Rs 77885.82 increase in farm income. Effective utilization of farm land which may enhance production and consequently marketable surplus thereby increasing farmers' income. Another important factor that lead to increase in farm income was share of crop sold. The study showed that price of crop and share of crop sold are significant at 5 percent. Farmers who had access to higher market price secure higher income. As the price of the crop increases share of crop sold increases which lead to increase in the income of a farmer. Inverse mills ratio was positively related to the farmers' income but was insignificant which showed that there was no selection bias. The results were similar to [3].

**Table 11. Factors influencing farmers to join as members in Sri Siddeswara FPO**

**Dependant Variable: Group Membership**

Variable	Logit estimates	Marginal effects
Constant	19.87(8.79)**	
Age	0.30(0.12)**	0.06(0.02)**
Education	0.10(0.36)	0.02(0.08)
Family size	0.30(0.35)	0.06(0.07)
Land ownership	0.18(0.79)	0.04(0.18)
Farm size	0.25(0.93)	0.05(0.21)
Distance to market	0.71(0.41)*	0.16(0.08)*
LR Chi <sup>2</sup> (6) =33.95	p- value = 0.00	Pseudo R <sup>2</sup> = 0.61

\*\* = 5% level of significance, \* = 10% level of significance, Values in the parenthesis show standard errors

**Table 12. Impact of Sri Siddeswara FPO on farmers' income****Dependant variable: Farm income**

Variable	Regression coefficient	Standard error
Group membership	19069.89*	11157.95
Age	203.71	336.52
Education	634.56	721.11
Hired labour	3768.48*	1928.26
Production area	77885.82***	2523.99
Share of crop sold	867.31**	345.14
Price of crop	413.74**	1412.65
Inverse mills ratio	4148.07	1703.46
R2 = 0.97	p- value = 0.00	F(10, 29) = 184.58

\*\*\* = 1% level of significance, \*\* = 5% level of significance, \* = 10% level of significance

## 5. SUMMARY AND CONCLUSIONS

The findings of the results indicate that the coefficient of inverse mills ratio was insignificant showing that there was no selection bias. The distance to market was positively related to group membership from significant at 5percent level. Age and education were positively related to group membership at 10 percent and 5 percent level. The results also indicate that group membership, farm size, share of crop sold, price of crop and labour used were positively related to farmers income and significant at 5 percent level. The group membership as the potential benefit to farmers by increasing their income and the FPOs provide a good platform for marketing of output and this can immensely enhance farm productivity and increase income their by reducing poverty. The analysis revealed that group members were able to earn higher incomes than non-members. This study helps the small farmers to integrate into Farmer Producer Organisations and perform the marketing activity and take all the benefits accrued from FPOs which improves the income thereby improves better living of small farmers. FPOs were instrumental in reduction of transaction cost and number of intermediaries leading to the realization of a higher proportion of producer's share in consumers rupee [4]. FPOs had a tremendous possibility to become a model for enhancing sustainable livelihood of small and marginal farmers for income enhancement [5]. Maa Bamleswari Utpadak Sahkari Samiti was one and only FPO run by women in Chattisgarh had earned highest profits which improved the income of the members in Chattisgarh [6].

This is crucial since the integration of small farmers in the market oriented production

through Farmer Producer Organisation can transform rural economy through increased incomes. As doubling of farmers income is one of the agricultural policy priorities, farmer producer organisations can achieve this by adapting new technology in production and improve the better growth in the sector.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Nalini B, Rama R, Vaibhav B. FPOs as farmers collectives: A case study from India. "Development Policy review". 2017; 1:1-9.
2. Greene WH. Econometric Analysis. Prentice Hall. New Jersey. 2008;6:15-25.
3. Emmanuel T, Hajime K, Matsumura I, Esham Md, Siddhigi B. Economic analysis of the role of farmer organisations in enhancing smallholder Potato farmers income in middle Guinea. " Journal of Agriculture Science". 2015;7(3):123-127.

4. Manaswini BH, Pramod KP, Anbukkani P, Amit K, Jha GK, Rao DUM, Lenin V. Impact of Farmer Producer Organisations on organic chilli production in Telangana, India. "Indian Journal of Traditional Knowledge". 2020;19(1):33-43.
5. Anirban M, Singh PK, Mrinmoy R, Satya Priya. Enhancing farmers income through Farmer Producer companies in India: Status and roadmap. "Indian Journal of Agricultural Sciences". 2018;88(8):1151-1161.
6. Prishila K, Aryama B, Urmila. Farmer Producer Organisations as an opportunity to strengthen small and marginal farmers: a case study in Rajnandgaon district of Chattisgarh, India. "International Journal of Current microbiology and applied sciences". 2019;8(11):1832-1838.

---

© 2021 Vedasri and Mishra; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*  
<https://www.sdiarticle4.com/review-history/71904>