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Impact Assessment of Ri-Lajong FPO on the Livelihood of Farmers in Ribhoi District, Meghalaya

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ABSTRACT

The study was carried out on Ri-Lajong Farmer Producer Organisation (FPO), Nongpoh, Ribhoi district, Meghalaya with the objective of examining the factors' influence on the annual income of member farmers of FPO during the year 2021-22 and primary data consisted of 65 members collected from Ri-Lajong FPO. The Heckman two-stage selection model was applied. Results showed that FPO significantly influenced the income of farmers by providing various facilities to conduct activities crop production, forest products, piggeries, and fish farming. All farming activities except piggeries showed a positive response to increase the income of members of the FPO. The factors such as farmers' education and training provided by FPO showed positive influence while hired labour had influenced negatively to the income of farmers. Therefore, the study concluded that educated youth of the state should join the FPO and attend the training program organised by the FPO as it will be helpful in income enhancement and reduce the unemployment level of the state.

INTRODUCTION

Farmer producer organisations (FPOs) are established to organised the marginal and small famers at different levels in state to improve the livelihood of its member (Singh & Vatta, 2019; Kumar et al., 2021; Srikar et al., 2021). FPOs are most convenient institute which mobilized the producers towards the capacity building and enhance the collective production and bargaining power of factors as well as farm's products (Manaswi et al., 2018; SFAC, 2022). The FPOs are usually worked as a legal organisation performed by primary producers such as farmers, fishermen, milkmen at production level. It can be worked as a cooperative organisation, Producer Company or any legal entity which provides incentive of profits to the members' organization (NABARD, 2015; Mukherjee et al., 2018). In India, numerous central level agencies and state departments are working in mobilizing the farmers into producer organisations under various central schemes like *Rashtriya Krishi Vikas Yojana* (RKVY), *Paramaparagat Krishi Vikas Yojana* (PKVY), *Vegetable Initiative for Urban Cluster* (VIUC), *etc.* The SFAC and NABARD are the major among central level institutions in working with the objective of promoting FPOs in the country (Manaswi et al., 2020; Kumari et al., 2022). Presently, total number of FPOs around 6000 are working in India as registered producer companies and around 3200 FPOs as cooperative societies (NABARD, 2021). The SFAC and NABARD have promoted total number 2961 FPOs out of which the Karnataka contributed maximum number *i.e.*, 284 FPOs, whereas, Nagaland having minimum merely 2 FPOs. Under the State of Meghalaya total number of 25 FPOs was functional till March, 2022 (GoI, 2022).

The present study had been carried out on Ri-Lajong Farmer Producer Organisation, Nongpoh, Ribhoi, Meghalaya which was started by College of Post Graduate Studies in Agricultural Sciences, Central Agricultural University, Imphal, Umiam, Meghalaya. The

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FPO was started with 50 farmers during the year 2013 but now it is working with more than 500 farmers. The FPO is providing numerous facilities to its member farmers like hybrid seeds and saplings, improve breed of piglets, scientific method of cultivation, implements for hoeing and cultivation *etc*. with this backdrop the study has been carried out by considering of objectives *viz.,* (a) to compare the farmers' income earned before and after participation of FPO (b) to examine the effect of various facilities provided by FPO on the income of farmers.

METHODOLOGY

The FPO is working with capacity of more than 500 member farmers of the locality area. Purposive sampling method was adopted for selection of respondents. The Ri-Lajong FPO was selected because it works with maximum number of farmers in the district. A total sample of 65 members were collected during the year 2021-22. In order to avoid the selection biasedness problem of variables, the Heckman selection two state model was applied to examine the influence of factors on the income of farmers (Heckman, 1979). In first stage of the model, the probit model was run with following equation:

$$P(0,1) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \mu_{2i} \quad ...(1)$$

Where, P(0,1) = indicating Probit estimates, β_0 = intercept, β_1 to β_{10}= slope coefficients, X_1 = gender, X_2 = education, X_3 = age of respondents, X_4 = dependency ratio, X_5 = farm size, X_6 = high yielding varieties (HYVs), X_7 = hired labour, X_8 = credit through KCC, X_9 = implements and machinery X_{10} = provision of inputs by FPO and μ_{2i} =indicates the disturbance terms of model.

$$E_i = \beta_1 + \Sigma\beta_2X_{1i} + \mu_{1i} \quad ... (2)$$

Where, E_i= latent variable that indicates dichotomy (denoted by 1, otherwise 0), β_1 = intercept, β_2 = slope coefficient, X_{1i} = exogenous variables that affect the income of farmers and u_{1i} = indicating disturbance term, and $\mu_{1i} \sim N(0, 1)$ means disturbance term is normally distrusted.

In second stage of Heckman selection model, the ordinal least square (OLS) was run by adding value of Inverse Mill's Ratio (λi) as an additional exogenous variable of the model.

$$Y_i = \alpha_0 + \alpha_1X_1 + \alpha_2X_2 + \alpha_3X_3 + \alpha_4X_4 + \alpha_5X_5 + \alpha_6X_6 + \alpha_7X_7 + \alpha_8X_8 + \alpha_9X_9 + \alpha_\lambda\lambda_i + \mu_{3i} \quad ... (3)$$

Where, Y_i = denotes income of respondents, α_0 = intercept, α_1 to α_9 = slope coefficients, X_1 = gender, X_2 = education, X_3 = age of respondents, X_4 = dependency ratio, X_5 = farm size, X_6 = high yielding varieties (HYVs), X_7 = hired labour, X_8 = credit through KCC, X_9 = implements and machinery, λi = Inverse Mill's Ratio and μ_{3i} = disturbance terms.

RESULTS AND DISCUSSION

The member farmers of FPO were engaged in various agricultural enterprises like crop production, forest products, piggery, fisheries and non-agriculture sources which are presented in Table 1. Earning from all sources was observed to increase after joining of the FPO where maximum increment was encountered by fish farming. The result was in conformity with the Parthiban et al., (2015); Sahu et al., (2017); Boskova et al., (2020). Other earning sources such as crop production and forest farming show significant increment in income. The gross income was measured by average income of 65 member of FPO. The income earned before November 2020 and up to November 2021 was considered before joining and after joining the FPO, respectively. In piggery enterprise the increment in income was lowest. It was reported that most of farmers sold their pigs during COVID-19 lockdown to earn instant income. At the same time farmers were not allowed to go out for work on daily wage basis, so could not earn income for daily consumption, hence need to sell out of compulsion.

Characteristics of member farmers of FPO

The exogenous variables used in the Heckman selection model have been presented in Table 1. Out of total respondent, 73.80 per cent member of FPO were found to be male. In case of educational status of farmers, around 50 per cent of total respondents were literate. The average age was recorded to be 43.61 years. The dependency ratio of members was observed at 0.54 indicating that on an average 54 per cent member of a household were under non-working category which may be due to under age or over age. The average landholding size of farmer was observed to be of 0.28 ha and out of total respondents, 21.53 per cent farmers adopted High Yielding Variety (HYV) of seeds and scientific method of cultivation. On an average, 81.53 per cent of total member farmers could be trained by FPO for scientific method of cultivation. Total 23.07 per cent of the member were sanctioned credit through *Kisan Credit Card (KCC)* for expansion of farming like establishment new fisheries pond, orchard and purchasing the power tiller *etc.* Out of total respondents, 30.76 per cent farmers adopted the implements and machinery for agricultural production. Total 73.84 per cent of farmers received input materials like improved varieties of pulses, oilseed, harrows and small iron plough from the FPO.

Testing assumptions of probit model

The study was analyzed by using Heckman two stages selection model including, estimation of probit model to determine the variables that influencing the income of the farmers. An assumption of probit model is that the data should be distributed normally which was tested by Jarque-Bera (JB) normality test. The value of JB statistics was estimated to be of 8.89 which was greater than 0.05 (p-value) indicated that data were distributed

Table 1. Sources of income of member farmers of FPO

Activities	Before (₹)	After (₹)	t-stat
Crop production	3000.97	6680.49	7.29***
Forest products	3332.93	7978.05	7.41***
Piggery	9787.80	7487.81	1.31
Fisheries	1369.76	5738.78	3.25***
Non-agriculture	120695.10	155941.50	5.47***

Source: Authors' calculation, Before = before joining of FPO, After = after joining of FPO, *** indicates the level of significance at 1%

Table 2. Descriptive statistics (exogenous variables) of member farmers employed under Heckman Selection Model (n = 65)

Exogenous Variable	Type	Parameters	Mean value	Parameter's Sign
Gender	Dummy	Gender of member of households (male=1, female=0)	48(73.80)	±
Education	Dummy	Education of member of household (Educated=1, Uneducated=0)	50(76.92)	+
Age	Continuous	Age of member of households	43.61	±
Dependency ratio	Continuous	No. of non-worker/Family size	0.54	±
Farm size	Continuous	Land under operation by household (ha)	0.28	±
HYVs	Dummy	Use of HYV (Yes=1, No=0)	14(21.53)	+
Training by FPOs	Dummy	Attended training programmeorganised by FPOs (Yes=1, No=0)	53(81.53)	+
Hired labour	Dummy	Hired labour employed under agricultural activities (Yes=1, No=0)	11(16.92)	+
Credit through KCC	Dummy	Suctioned loan from KCC (Yes=1, No=0)	15(23.07)	+
Implements & machinery	Dummy	Use of Implements and machinery in agricultural activities (Yes=1, No=0)	20(30.76)	+
Provision of inputs by FPOs	Dummy	Procurement of inputs from FPOs (Yes=1, No=0)	48(73.84)	+

Source: Field survey, 2021-22, Figure in parenthesis represents percentage of total respondents

normally. Moreover, another assumption is that exogeneous variables should not be correlated with each other or with the disturbance term (U_i) of the equation *i.e.,* no multicollinearity which tested by using Variance Inflection Factor (VIF) test. Value of VIF statistics was estimated to be less than 10, indicates no sever multicollinearity existed in the data. The selection biasedness of the variables was tested by using Inverse Mills Ratio (IMR) test found that the positive and significant value of 0.051, indicating unobserved factors were also influenced the income of the farmers which more likely to be associated with higher score on the dependent variable.

Determination of factor's influence on the income of member farmers

The factors influencing the income of member farmers were estimated by applying probit model presented in Table 3. The education was one of the significant factors influencing the income. As the farmers become more educated, they are not much willing to involve in farming but seeking towards other activities. The educated farmers were ahead and aware to take the advantage of facilities and subsidies provided by FPO. Similar finding reported by Verma et al., (2019); Singh et al., (2022). Moreover, the age of member was also observed to be positively influencing the income indicating that age is not a limiting factor in joining FPO. Similar finding reported by Mukherjee et al., (2019). The marginal effect of 0.164 signifies that with the increase in the age by one year it will increase in the income by 16 percent. As the age of farmers increases, they have more farming experiences which help them in enhancing the income. They have more power to reduce the extent of loss or getting minimum loss even in huge loss of situation. Generally, the young farmers once they undergo losses in farming it demotivated them to carry out the same operation but old age farmers have more patience than new age.

Extent of factors' influence the income of member

The result of OLS showed that the male head of households had significant influenced by 13 per cent to the income of farmers, although the variable had not identified as influencing factor in stage-I of Heckman selection model. The educational factor was observed to have negative extent by 16 per cent as the literate farmers were responsible for decreased in the farmer's income that comes from agriculture enterprises. The illiterate farmers were fully engaged in

Table 3. Probit model estimates of the income influencing factors (n=65)

Variables	Coefficient	Std. error	p-value	Marginal effect
Const	0.19	0.051	00***	0.094
Gender	0.01	0.058	0.77	-0.098
Education	0.01	0.001	00***	0.009
Age	0.35	0.098	00***	0.164
Dependency ratio	0.16	0.176	0.34	-0.178
Farm size	-0.02	0.054	0.64	-0.131
HYVs	-0.01	0.069	0.81	-0.151
Hired labour	-0.07	0.062	0.21	-0.200
Credit through KCC	-0.02	0.053	0.62	-0.131
Implements and machinery	0.04	0.044	0.36	-0.047
Provision of inputs by FPOs	-0.00	0.043	0.91	-0.089
Censored: 11				
Uncensored: 54				

Source: Authors' calculation, *** indicate the level of significance at 1%

Table 4. OLS estimates of factors applied in Heckman model (n= 65)

Variables	Coefficient	Std. error	p-value
Gender	0.13	0.62	0.027**
Education	-0.16	0.80	0.038**
Age	0.003	0.02	0.209
Dependency ratio	0.10	1.37	0.462
Farm size	0.20	2.30	0.383
HYVs	-0.69	0.55	0.207
Training by FPOs	0.72	1.74	000***
Hired labour	-0.15	0.79	0.054*
Credit through KCC	0.11	0.85	0.179
Implements and machinery	-0.54	0.52	0.305
Inverse Mills Ratio (λ)	0.20	0.10	0.051*
rho	1.37		
sigma	0.15		
lambda	0.20		

Source: Authors' calculation, ***, ** and * are indicates the level of significance at 1%, 5% and 10%

agricultural operations and also seeking to earned more income from agricultural enterprises. The FPO should be organised youth motivation program towards agriculture and awareness about the extent of earning profit from agricultural business.

However, in stage-I, it was identified as positive factor influencing to increase the income of farmers. The farmers who had trained by FPO indicate positive and significant and it was observed to be 72 per cent responsible to increase the income of member. Moreover, those farmers who had hired the labour for agricultural operation observed as negative and significant influence on the income. Labour hiring factor decreased the income of member farmers by 15 per cent. Inverse mills ratio (λ) was an additional explanatory variable which was also observed to be significant at 10 per cent level, indicates that the income of member was also influenced by unobserved factors like self-motivation towards agriculture, getting innovation from other working farmers, availability of more own agricultural resources at farm and unavailability of other government and private jobs.

CONCLUSION

Farmer Producer Organisation has positive and significant impact on the livelihood of the farmers by providing various support like training, scientific method of farming and input material for farming. Moreover, various agricultural farming was operated by member of the FPO and has achieved positive growth except piggeries farming. The negative impact experienced may be due to COVID-19 lockdown. The training programs organised by FPO had positive influence on the income of farmers due to intervention of new crop and scientific method of cultivation. The education level had occurred negative impact on the extent on the income of farmers from the agriculture enterprises as most of the educated members were engaged in businesses other than agriculture. Overall, Ri-Lajong FPO was successful in enhancement of livelihood of farmers in Ri-bhoi, Meghalaya. From the above results it can be concluded that more FPO can be established in other districts of Meghalaya which will be helpful in agricultural growth ultimately enhancing the livelihood of the farmers.

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