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An Analysis of the Pattern of Farmer's Income in Gopalganj District: An Empirical Investigation

Md. Abdul Gani Mina [aφ], Zubaidur Rahman [b*], Sayda Mahmuda [c], Md. Johurul Islam [d#], Md. Nobi Alam Bhuiyan [b#] and Bayejid Hossain [b#]

[a] Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD), Kotalipara, Gopalganj, Bangladesh.
[b] Department of Economics, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj, Bangladesh.
[c] Department of Sociology, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj, Bangladesh.
[d] Department of Statistics, Mawlana Bhashani Science and Technology University, Santash, Tangail, Bangladesh.

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

Aims: Although the income of the people of other sectors in the economy is relatively stable but the income of farmers are comparatively unstable. In addition, most of the previous studies analyzed partially the determinants of farmer's income.Thus, the aim of the current study is to investigate the pattern of farmers' income in Gopalganj district of Bangladesh.
Place and Duration of Study: The present study was conducted in Gopalganj district of Bangladesh where 10 unions, 20 villages and 400 respondents were selected randomly. Data were collected during the period from January to May in 2022.
Methodology: A multistage sampling technique was applied for the study where district and upazilas were selected purposively while unions, villages and respondents were selected using

[φ] Deputy Director (Admin and Finance);
[#] Graduate Student;
**Corresponding author: E-mail: zubaidureco@gmail.com;*

simple random sampling techniques. Primary data were collected from 400 farmers using a well-structured questionnaire. Descriptive statistics and the log linear regression model were used as the analytical tools.

Results: Result found from the descriptive statistics indicates that mean age of the respondents was 49.02 years whereas average educational attainment of the farmers in the study area was 5.72. In regards to the farming experience, it is found that average farming experience of the farmer was 5.07 years with maximum and minimum values were 25 years and 3 years, respectively. Regarding the household size of the respondents, the study showed that the mean family member was 4.82 with a standard deviation of 1.02. The study also indicates that 35.12% average income of the farmer obtained from non-farm sources while 64.88% average income obtained from farm sources.In regards to the farm income, it is found from the regression analysis that farm income is positively related with age, household size, education, farm size, agricultural training, access to credit facilities, membership of agricultural cooperative and distance to nearest market whereas the same is influenced by non-farm income. The findings suggest that variables like household size, education, household expenditure, access to internet and access to technical and vocational training has positive impact on non-farm income. In contrast, variables like age, farm size, distance from town, farm income have negative impact on non-farm income of the respondents in the study area. Finally, some policy recommendations are made based on the findings obtained from the study.

Keywords: Farm income; non-farm income; Gopalganj district; Bangladesh.

1. BACKGROUND OF THE STUDY

Income obtained from farm sources and non-farm sources constitute the income of a farmer [1]. Any earnings obtained from crop, forestry, fishery and livestock are the components of farm income whereas income obtained from non-farm economic activities like driving, teaching, nursing, domestic servant etc. are regarded as the elements of non-farm income [2]. Presently, farming has been considered as the principal source of income for a significant portion of rural people in Bangladesh and they also have involvement with other non-farm income generating activities [3]. Although the income of the people of other sectors in an economy is comparatively stable but it is seen that the income of farmers are relatively volatile by nature. Various factors including the fluctuation of the price of agricultural products, the influence of middleman on the price of agricultural products, weak bargaining power of farmers, imperfect market information, and natural calamities are responsible for the volatility status of the price of agricultural goods. Price of agricultural goods is found to lower at the time of harvesting because there is abundance of supply in comparison to demand. Majority of the small and marginal farmers operate their cultivation by taking loan from informal sources and for this reason they bound to sale their product immediate after harvesting for paying the loan. Though the government of Bangladesh has introduced several policies like buffer stock, buffer fund, price support and input subsidy to stabilize the price of agricultural goods as well as the income of the farmer but farmers do not get the fair market price declared by government in many cases due to the intervention of middleman. When farmers observe that they get lower price by selling agricultural product, they sometimes bound to change their production decision from crops with lower price to crops with higher price. Even in many cases, crop production may be hampered and government has to import agricultural product which again reduces the reserve of foreign currency. Many of them also go for non-farming professions to increase their income. As a result, rural people especially farmers have taken non-farm activities as their alternative means of profession in Bangladesh [4,5]. Due the volatility status of farmer's income, they often found to lead miserable life and sometimes their purchasing power becomes lower compared with the other people in the society. For alleviating poverty from the economy of Bangladesh, the Government has declared agriculture and rural sector as the thrust sector in Bangladesh. The contribution of rural economy to GDP is more than 56% whereas the contribution of rural non-farm sector is 36.71% [6].

Besides, it is an issue of concern among policy makers and development practitioners that whether farmers' income comes from farm sources or non-farm sources. Some researchers found that the income of farmer comes only from the farm sources while others reported that farmer's income comes from both farm as well as

non-farm sources. In addition, debate also associated with the question that which factors are responsible for determining farmer's income. The present study has tried to provide new insights regarding this issue. Thus, there are several research questions that arise regarding the pattern of farmer income which are as follows:

i. What are the sources of income of the farmer (both farm and non-farm) in the study area?
ii. What are the factors that influence the income of the farmer in the study area?

1.1 Objectives and Aims of the Study

The aim of the study is to identify the overall status of farmers' income in GopalganjDistrict of Bangladesh.To achieve this aim, the study sets the following specific objectives which are:

i. To describe the socio-economic profiles of the farmers' in Gopalganj district.
ii. To identify the pattern of farmer's income in terms of the proportion of farm income and non-farm income.
iii. To investigate the determinants of farm income and non-farm income in Gopalganj District of Bangladesh.

1.2 Importance of the Study

The government of Bangladesh is operating several plans like eight five year plan, perspective plan, delta plan, sustainable development goals (SDG) etc. Under these plans, the government has taken several long-term goals such as alleviating extreme poverty by 2030, achieving the status of upper middle-income country within 2030 and being a prosperous nation by 2041.Keeping all aspects of goals in mind, the government of Bangladesh has to pay special attention to the security of farmers' income. The issue of sustainable agriculture has been focused in majority of public paper both in domestic and abroad. For instance, goal two of SDG has direct linked with the issues of sustainability of farmers' income. The idea of transforming the economy of Bangladesh from a lower middle income country to upper middle income country by 2031 and a high income country by 2041 has explained in the perspective plan (2020-2041) of Bangladesh which again has close linked with the issue of farmer's income. Analyzing the delta plan as declared by the government of Bangladesh, it is found that there are three levels of strategies to achieve the long-term goals. In cross-cutting level strategy under delta plan, the fact of agriculture, food security and livelihood has been stated which again has linked with the pricing pattern of agricultural goods and farmer's income.

1.3 Operational Definitions

Farm Income: Farm income is the combination of income which is obtained from the four sub-sectors of agriculture like crop, forestry, fishery and livestock.

Non-farm income: Any earning which is obtained from non-farm economic activities is known as of non-farm income.

Marginal farmer: A farmer with farm size ranges between 0.05 to 0.49 acres is known as marginal farmer.

Small Farmer: A farmer is called small farmer if he/she holds land size from 0.50 to 2.49 acres.

Medium Farmer: A farmer with farm size ranges between 2.50 to 7.49 acres is considered as medium farmer.

Large farmer: A farmer with farm size ranges between 7.50 acres and above is called large farmer.

2. DISCUSSION OF PREVIOUS LITERATURES

There is an extended body of literatures which dealt with the issues related to the composition and determinants of farmers' income both in domestic and abroad. The findings of these studies differed widely from each other. Bongole [7] conducted a study on the determinants of farm and non-farm activities as sources of household income in Kahama District in Tanzania using Tobit model. A total of 207 farmers were selected randomly from two villages of Kahama district. Results obtained from the study indicate that farm size and the share of farm income positively related with farm income. Male-headed households derive a large share of their income from farming activities as compared to female-headed households where the marginal effects are about 3.5 percentages. Rahman [4] conducted a study on the socio-economic determinants of off-farm activity participation in Bangladesh. A total of 150 farmers were selected for the study using simple

random sampling technique. Findings of the study showed that farm size and education have negative relationship with participation in off-farm labour activities. In addition, low income from agriculture was the prime causes for participating in non-farm activities.A research study conducted by Khan *et al.* [8] analyzed the effect of farmers' characteristics, farm characteristics, institutional factors, and perceived climate risk on income sources diversification adopted by farm households in Uttar Pradesh, India. Data were collected from 220 respondents through structured questionnaires. A logistic regression model was developed and tested based on responses collected from survey data. The findings revealed that education, family size, land size, proper infrastructure for livestock, adequate production technology, information sources, access to market, and climatic risk are significant variables affecting farmer's income. Agyeman[9] assessed the determinants of income diversification of farm households in the Western Region of Ghana. Tobit regression model was used to find the determinants of the degree of income diversification measured by the Simpsons Index of Diversity (SID). Simpsons index of diversity and Tobit model were used to calculate the determinants of farm income. Findings of the study indicate that a total of 65% of households engage in non-farm income sources. Age, number of years of education, female headed households, household income per capita, number of extension visits, productive assets owned and nature of road were found to be significant in determining income diversification of farm households in the Western Region. Odoh andNwibo[10]analyzed the socioeconomic determinants of rural non-farm households' income diversification in South-East Nigeria. A combination of purposive and multistage random sampling techniques was adopted in the collection of data from 360 rural farm households. Results obtained from the study indicate that 82.5% of the farm households diversified their income and 17.5% solely depended on income from farming activities. Nwaru[11] analyzed the determinants farm and off-farm incomes and saving of food crop farmers in Nigeria. Data were collected from 75 food crop farmers. Findings of the study indicate that farm size, household labour, education and training, savings were directly related to farm income while off-farm income and hired labour were inversely related to farm income. Vasco and Tamayo [12] conducted a study on the determinants of both participation in non-farm employment and non-farm earnings in Ecuador. They used Durbin-McFadden two-step estimation method for analyzing the collected data. Result obtained from the study indicates that women are more likely than men in non-farm self-employment but earn significantly less than men employed in the non-farm sector. The research study operated by Parvin and Akteruzzaman[13] examined the factors influencing farm and non-farm income of Haor economy in Bangladesh. A total of 60 farmers were taken randomly. The log linear form of Cobb-Douglas production function was used to capture the effects of socioeconomic variables on farm income and non-farm income. Results found from the empirical analysis show that family size and farm size had a significant positive effect on farm income while the same is influenced negatively by non-farm income. In contrast, family size had a positive and significant effect on non-farm income and farm income had a negative and significant effect on non-farm income. Negl*oet al.*[14]examined the determinants of participation in non-farm activities and effect on household income. They used Heckman two-step procedure to analyze a three-wave survey data set collected from 3866 households. Results obtained from the study revealed that crop failures, insufficient intake of food, household consumption expenditure, gender, family size, literacy, health status, farm animals holding, access to credit, total hired labor, cooperative membership and agricultural extension services were the determinants for household involvement in non-farm work.

2.1 Gaps in Previous Literatures

Majority of the previous studies explained either the determinants of farm income or non-farm income. But there are few studies that analyzed both the determinants of farm and non-farm income. In addition, some of the previous studies explore the effects of socio-economic variables on non-farm income ignoring some important variables like access to technical and vocational training, household expenditure, access to internet, access to credit which may carry more policy implication than farm size, education, training, and household size. The present study is an improvement over the past studies in this sense that the current study considered all of those excluded variables. Furthermore, most of the existing studies on the determinants of farmer's income are conducted in abroad and there are few studies that looked into farmer's income in Bangladesh especially in *Gopalganj* district. Moreover, complexities may be found regarding the past studies in case of unified

assumptions among the nations that sometimes may be unrealistic due to the variation in existing socio-economic situations. In this context, formulating appropriate policies require region-oriented research. In order to include the previous gaps, the present study aims to explore the issues of farmers' income with special reference to Gopalganj district in Bangladesh.

3. METHODOLOGY OF THE STUDY

3.1 Selection of the Study Area and the Rationale

Gopalganj, a district in southern Bangladesh, was chosen for the study. In Gopalgnaj, 61.75% people live on agricultural activities. Total population of Gopalganj district is 1,295,053 and literacy rate is 79.76% [15]. The present study has been conducted in *Gopalganj* district which is located under the 14th agro ecological zone of Bangladesh. *Gopalganj* district was selected purposively and then data were collected from five *upazilas* under this district. Two unions were chosen from each upazila using simple random sampling. In addition, two villages from each union were selected and a total of 20 villages were chosen for analyzing the pattern of farmer's income. Finally, 400 respondents were selected randomly from the 20 villages. In addition, both farm and non-farm economic activities are extensively found in the study area.

3.2 Source of Data and Sampling

The present study applied multistage random sampling technique for collecting the data where district and upazilas were selected purposively and unions, villages and respondents were selected using simple random sampling techniques.In this study, 40 farmers were chosen from each union using simple random sampling technique and a total of 400 farmers were interviewed. In addition, three focus group discussions (FGD) were conducted to collect data from the farmer. In contrast, some secondary data were also collected and used for the study. Some important secondary sources were agricultural sample survey, Bangladesh Bureau of statistics (BBS), Ministry of agriculture (MoA), Bangladesh Economic Review (BER), union parishad office, numerous journals, and newspapers.In this study, farm income and non-farm income are considered as the dependent variable while age, household size, education, farm size, non-farm income, agricultural training access to credit facilities, membership of agricultural cooperative, distance to nearest market are considered as the explanatory variables. All these variables are transformed in their natural logarithms to avoid the problem of heteroscedasticity. The survey was conducted from January to May, 2022 in five upazilas under Gopalganj district.

Table 1. Selected Upazilas, Union and Respondents

District	Upazila	Unions	Villages	Sample Farmers
Gopalganj	Gopalganj Sadar	Gobra	Chargobra	20
			Vatiapara	20
		Kathi	Khelna	20
			Khanar Par	20
	Tungipara	Gopalpur	Rakhilabari	20
			Patharghata	20
		Bonni	Bonni	20
			Bashuria	20
	Kotalipara	Pinjuri	Kakdanga	20
			Dauypura	20
		Hiran	Majhbari	20
			Tarashi	20
	Kashiani	Orakandi	Orakandi	20
			Tilchara	20
		Singa	Nisinga	20
			Andarkota	20
	Muksudpur	Lohair Madrasa	Lohair	20
			Srinkbaskathi	20
		Poshargati	Kawaldia	20
			Goptorgagi	20
Total	**05**	**10**	**20**	**400**

Table 2. Definition of Variables used in the model

Symbols	Variables	Type of variable	Unit of Measurement
Dependent Variables			
FI	Farm income of the respondent	Continuous	Income obtained from the farm sources
NFI	Non-farm income of the respondent	Continuous	Income obtained from the non-farm sources
Explanatory Variables			
AGE	Age	Continuous	Age of the household head in years
HS	Household size	Continuous	Number of household members
SEX	Sex	Dummy	Dummy (1=male, 0=female)
EDU	Education	Continuous	Year of schooling of the household head
FS	Farm size	Continuous	Area of land owned by an individual
HE	Household Expenditure	Continuous	Per capita expenditure in Bangladesh Taka
DM	Distance to nearest market	Continuous	Distance from the village to the nearest market place (km)
AT	Agricultural Training	Dummy	(1=Received agricultural training, 0=otherwise)
DT	Distance from town	Continuous	Distance from the village to the town (km)
AC	Access to credit facilities	Dummy	(1=access to credit, 0=otherwise)
AI	Access to internet	Dummy	(1=access to internet, 0=otherwise)
MAC	Membership of agricultural cooperative	Dummy	(1=having membership in agricultural cooperative, 0=otherwise)
ATV	Access to Technical and vocational Training	Dummy	(1=having access, 0=otherwise)

3.3 Empirical Model used in the Study

Following the empirical work of [16-23] the present study decided to construct and use multiple log linear regression model. To determine the impact of the selected explanatory variables on farm income, the following specification of the model is applied:

$$\ln FI = \alpha_0 + \alpha_1 \ln AGE + \alpha_2 \ln HS + \alpha_3 \ln EDU + \alpha_4 \ln FS + \alpha_5 \ln NFI + \alpha_6 \ln AT + \alpha_7 \ln AC + \alpha_8 \ln MAC + \alpha_9 \ln DM + u_t$$

where,

FI= Income of the farmer obtained from farm sources, $AGE =$ Age; $HS =$ household size; $EDU =$ education; $FS =$ farm size; $NFI =$ non-farm income; $AT =$ agricultural training $AC =$ access to credit facilities; $MAC =$ membership of agricultural cooperative; $DM =$ distance to nearest market and $u_t =$ the disturbance term.

The equation for estimating the impact of explanatory variables on non-farm income of the farmer can be specified as follows:

$$\ln NFI = \beta_0 + \beta_1 \ln AGE + \beta_2 \ln HS + \beta_3 \ln EDU + \beta_4 \ln FS + \beta_5 \ln FI + .\beta_6 \ln DT + \beta_7 \ln HE + \beta_8 \ln AI + \beta_9 \ln ATV + e_t$$

where,

NFI= Income of the farmer obtained from non-farm sources, $AGE =$ age; $HS =$ household size; $EDU =$ education; $FS =$ farm size; $FI =$ farm income; $DT =$ distance from town $HE =$ household expenditure; $AI =$ access to internet; $ATV =$ Access to Technical and vocational Training and $e_t =$ the disturbance term.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics of the Selected Variables

Descriptive statistics of the selected explanatory variables are described in Table 3. It is found from Table 3 that the mean and standard deviation of the education level of the respondent are 5.72 years and 6.05 years, respectively.

The data indicates that 1.58 kilometers is the average distance to nearest market whereas the average farming experience is found as 5.07 years and average farm size is 51.08 decimals. The average farm income and non-farm income are Tk.1, 55,000 and Tk.83, 900, respectively. In case of mean household expenditure, it is found that the value for expenditure is Tk. 3705.35 per month with standard deviation 2305.07. The maximum and minimum value for access to internet is 1 and 0, respectively.

4.2 Factors Affecting the Farm Income of the Respondents

The findings show that there is a positive relationship between farm income and age, household size, education, farm size, agricultural training, access to credit facilities, membership of agricultural cooperative and distance to nearest market (Table 4). It means that one percent increase in age, household size, education, farm size, agricultural training, access to credit facilities, membership of agricultural cooperative and distance to nearest market, keeping all other factors constant, would result an increase in farm income by 0.085, 0.253, 0.103, 0.239, 0.005, 0.003, 0.124 and 0.108 percent, respectively.

Table 3. Descriptive Statistics of the Explanatory Variables

Variable	Mean	Standard deviation	Maximum	Minimum
Age (in years)	49.02	11.08	59	17
Household size (in numbers)	4.82	1.02	9	2
Sex (Dummy)	0.56	0.03	1	0
Education level (Year of schooling)	5.72	6.05	16	0
Farm size (in decimal)	51.08	27.08	257.08	5.07
Farm income (in Tk.)	155000	97760	350000	20,000
Non-farm income (in Tk.)	83900	5922	250000	0
Household Expenditure (in Tk./month)	3705.35	2305.07	7512.74	832.04
Agricultural training (Dummy)	0.58	0.23	1	0
Distance from Town (km)	12.04	7.06	13.04	25.71
Distance to nearest market (km)	1.58	11.08	6	0.5
Access to credit facilities (Dummy)	0.54	0.39	1	0
Access to internet (Dummy)	0.74	0.03	1	0
Membership of agricultural cooperative (Dummy)	0.63	0.19	1	0
Access to Technical and vocational Training (Dummy)	0.94	0.05	1	0
Farming experience (in years)	5.07	11.07	25	3

Source: Field Survey, 2022

Table 4. Effects of Explanatory Variables on Farm-income

Explanatory Variables	Coefficient	Standard error	t-value
C	157.035	19.56	8.029
lnAGE	0.085	0.072	1.183
lnHS	0.253***	0.080	3.153
lnEDU	0.103***	0.024	4.281
lnFS	0.239***	0.046	5.204
lnNFI	-0.028**	0.011	-2.596
lnAT	0.005**	0.002	2.192
lnAC	0.003**	0.001	2.471
lnMAC	0.124	0.101	1.224
lnDM	0.108***	0.021	5.027

*R^2 : 0.701, F-value:87.05; Note: *, **, and *** indicate the significant level at 10, 5 and 1 percent, respectively; Source: Authors' Own Calculation.*

On the other hand, farm income is influenced negatively by non-farm income which shows that, keeping other factors constant, one percent increase in non-farm income would decrease the farm income by 0.028 percent. This may be due to the fact that individuals having higher non-farm income may induce them not to participate in farm activities. The coefficient of determination (R^2) of the model is 0.701 which indicates that about 70.1 percent of the variations in farm income have been explained by the selected explanatory variables which are included in the model. Considering the F-value as obtained from Table 4 indicates that all the explanatory variables are important for explaining the variations in farm income of the respondents in the study area because the F-value for farm-income is 87.05.

4.3 Factors Affecting Non-Farm Income of the Farmer

It is found from Table 5 that there is positive relationship between non-farm income and household size, education, household expenditure, access to internet and access to technical and vocational training with regression coefficient of 0.042, 0.216, 0.874, 0.187 and 0.248. It implies that holding all other factors constant, one percent increase in household size, education, household expenditure, access to internet and access to technical and vocational training would lead to an increase in the non-farm farm income by 0.042, 0.216, 0.874, 0.187 and 0.248 percent, respectively.

Table 5. Effects of explanatory variables on non-farm income

Explanatory Variables	Coefficient	Standard error	t-value
C	59.035	20.69	2.853
lnAGE	-0.479**	0.198	-2.421
lnHS	0.042**	0.018	2.295
lnEDU	0.216***	0.084	2.571
lnFS	-0.107*	0.055	-1.942
lnDT	-0.091**	0.037	-2.487
lnHE	0.874	0.644	1.358
lnFI	-0.008*	0.004	-1.962
lnAI	0.187	0.157	1.193
lnATV	0.248***	0.064	3.891
R^2 : 0.598F-value:189.28			

*Note: *, **, and *** indicate the significant level at 10, 5, and 1 percent, respectively; Source: Authors' Own Calculation*

In contrast, variables like age, farm size, distance from town, farm income have negative impact on non-farm income of the respondent. Findings also suggest that among the nine explanatory variables, seven variables were found to significant which are age, household size, education, farm size, distance from town, farm income, access to technical and vocational training. Among seven explanatory variables, four variables such as age, farm size, distance from town, farm income are negatively related with non-farm income while other three variables including household size, education, and access to technical and vocational training are positivity related with non-farm income. It can be interpreted by saying that non-farm income can be increased through increasing the educational attainment of the respondents as well as their access in technical and vocational training.

The value for R^2 for non-farm income model is found as 0.598 which means that about 59.8 percent of the variations in non-farm income have been explained by the explanatory variables which are included in the model.

5. CONCLUSION AND POLICY RECOMMENDATION

The purpose of the article was to identify the pattern of farmers' income in Gopalganj district in Bangladesh. Five upazilas and ten unions were selected randomly for the present study. A total of 400 farmers were interviewed using well-structured questionnaire. In this paper a multiple regression model was employed to explain the determinants of farm income and non-farm income in Bangladesh. Result found from the descriptive statistics indicates that mean age of the respondents was 49.02 years whereas average educational attainment of the farmers was 5.72. In regards to the farming experience, it is found that average farming experience of the farmer was 5.07 years with maximum and minimum values were 25 years and 3 years, respectively. Regarding the household size of the respondents, the study showed that the mean family member was 4.82 with a standard deviation of 1.02. The study also indicates that 35.12% average income of the farmer obtained from non-farm sources while 64.88% average income obtained from farm sources. Results obtained from farm income model indicate that variables- age, household size, education, farm size, agricultural training, access to credit facilities, membership of agricultural cooperative and distance to nearest market are positively related with the farm income of the respondents while the same is influenced negatively by non-farm income. With regards to the non-farm equation model, findings show that there is positive relationship between non-farm income and household size, education, household expenditure, access to internet and technical and vocational training. In contrast, variables like age, farm size, distance from town, and farm income have negative impact on non-farm income of the respondent. Based on the findings of the study, the following recommendation can be made:

i. Observing the determinants of farm income, is found that there is a positiv relationship between farm income and age, household size, education, farm size, agricultural training, access to credit facilities, membership of agricultural cooperative and distance to nearest market. Thus, farm income could be increased through increasing the educational attainment, their easy access to loan facilities from formal institutions,

expanding theiragricultural training facilities.

ii. Since access to technical and vocational training is positively related with non-farm income, therefore non-farm income of the farmer can be increased by providing them training from technical and vocational institutions. In addition, access to internet can be made easy so that farmers can collect their necessary information.

iii. Since the proportion of farm income and non-farm income in the study area were 35.12% and 64.88%, respectively. Thus, farmers in the study area should be motivated to participate in non-farm economic activities to sustain their income level.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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