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Can Diversification of Livelihood Sources Increase Income of Farm Households? — A Case Study in Uttar Pradesh

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Abstract

This paper has examined the question 'Can diversification of livelihood sources increase the income of farmers?' through a case study conducted on 151 farm households in the districts of Moradabad and Aligarh in Uttar Pradesh in the first quarter of 2017. The study has considered three sources of income, viz. crops, animal husbandry and non-farm sector. The analytical tools used in the study are Simpson index of diversification, chi-square test and censored Tobit regression model. The study has observed a significant difference between the incomes of diversified and undiversified farm households. The determinants of income sources of farm households identified in the study are age, education level, use of ICT, access to credit, input supply and market. The study has suggested that to increase farmers' income, policies should focus on the development of livestock sector to motivate them for rearing of animals for commercial purposes. Also, the delivery of formal and informal education and extension services should be strengthened to enable the farmers to utilize their full capacity and consequently earn more. Information centres should be opened at the block level to provide information on less time-consuming farming techniques, marketing and opportunities in the non-farm sector.

Key words: Farmers' income, livelihood diversification, non-farm sector**,** Uttar Pradesh.

JEL Classification: Q12, D31, R33, C24

Introduction

A plethora of studies from developing countries have underscored the importance of diversification strategies from farm to non-farm activities which have immense potential to enhance farmers' income and mitigate conditions of poverty and inequality (Adams and He, 1995; Reardon *et al*., 2007; Lanjouw , 1999; de Janvry *et al*., 2005; de Janvry and Sadoulet, 2001). Evidence has been reported regarding a substantial increase in the share of off-farm and/or non-farm income in rural households' total income in several developing countries (Gecho, 2017). It becomes imperative to target the farmers' distress by mitigating the risks and uncertainties that suddenly culminated after 2011-12. Therefore, this study has identified the determinants of sources of diversification of farmers' income so that it could provide a sustainable growth in farmers' income.

Several factors are known to affect income diversification in one or the other way. Factors such as education, leadership, livestock ownership, oxen ownership, farm size, gender, annual cash income and market distance are the key determinants that affect farmers' participation in income diversification, as reported by Gecho (2017). Some other empirical researches [de Janvry and Sadoulet, 2001; Barrett *et al*.,2005; Escobal, 2001; Canagarajah *et al*., 2001; Abdulai and CroleRees, 2001] have included household asset endowments like financial, physical, human and

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social factors, local advantages, agro-climate and relative prices, access to infrastructure and risks. Babatunde and Qaim (2009) have reported mixed results as far as the significance of few of these variables are concerned, especially land and agricultural assets.

Livelihood diversification can address many constraints to income growth, conditions like crop failures and builds capacity for investment (see Birthal *et al*., 2014). It is reported to be associated with providing growth and stability in income and consumption in a period of time (Dercon and Krishnan, 1996; Reardon *et al*., 1998; Barrett *et al*., 2001; Canagarajah *et al.*, 2001; Block and Web, 2001). Brithal *et al*. (2014) have stated that fostering farm-nonfarm linkages, absorption of surplus labour, reduction in rural-urban disparities and migration can be all addressed by growth of rural non-farm sector. Therefore, mostly in the developing countries, researchers have probed into the factors that affect non-farm income diversification (Ellis, 2000; de Janvry and Sadoulet, 2001; Barrett *et al*., 2001; Abdulai and CroleRees, 2001) which has been grouped into barriers to income diversification, individual and household characteristics, farm characteristics, location factors and risk factors (Olale and Nazli, 2010). While inaccessibility to credit and market information may demotivate farmers to non-farm diversification, risk factors are found to take control of the variability of returns from several non-farm activities (Winters *et al*., 2002; Schwarze and Zeller, 2005; Abdulai and CroleRees, 2001).

Data and Methodology

This study is based on a survey conducted using a structured questionnaire in the first quarter of 2017 in Moradabad and Aligarh cities of Uttar Pradesh. A total of 151 farm households selected randomly were interviewed personally to collect data regarding their socio-demographic profile, farming characteristics and institutional availability. In the study simple statistical analyses including descriptive analysis and chi-square test have been used. The level of diversification was analysed using Simpson's index of diversity (SID), which is computed on the basis of distribution of income among the different sources (Agyeman *et al*., 2014; Minot *et al*., 2006). Joshi *et al*. (2004) and Ali (2015) used Simpson index for crop diversification. The general form of Simpson Index of Diversification (SID) is given by Equation (1):

$$SID = 1 - \sum_{i=1}^{n} P_i^2 \qquad \ldots(1)$$

where, n is the number of income sources, and P_i is the share of income from the source i.

Further, an empirical model was developed to identify factors affecting the diversification of income sources in farm households. The diversification index of income sources was considered as a dependent variable and age, education, social category were taken as independent variables. Other independent variables included availability of income generating asstes (IGA), use of information and communication technology (ICT), access to financial services (AFS), size of operational holdings (OH), access to organized input supply (AOIS), and access to market to sell produce (ACCMRKT). Based on these variables, the empirical model was specified and estimated to predict the probability of factors influencing diversification for sources of income in farm household using Equation (2):

$$SID = \beta_0 + \beta_1 AGE + \beta_2 EDU + \beta_3 SC + \beta_4 OH + \beta_5 IGA + \beta_6 ICT + \beta_7 AFS + \beta_8 AOIS + \beta_9 ACCMRKT + \varepsilon \qquad \ldots(2)$$

To analyse the factors affecting diversification of income sources in farm household, Censored Tobit regression model was applied using Stata, ver13. A Censored Tobit regression model is specified as:

$$y_i^* = x_i\beta + \varepsilon_i$$

$$y_i = \begin{cases} 0 & if \ y_i^* \le 0 \\ y_i^* & if \ y_i^* > 0 \end{cases} \qquad \ldots(3)$$

where, y_i^* is a censored variable of Simpson diversity Index or the variable of primary interest, x denotes the matrix of explanatory variables, and $\varepsilon_i \sim (0, \sigma^2)$.

Results and Discussion

Level of Diversification across Major States of India

The principle source of income of agricultural households during the past 365 days for major states of India is presented in Table 1 and the Simpson Index of Diversification was calculated. The results reveal that few states like Assam, Chhattisgarh, Jharkhand

Table1. Principal source of income of agricultural households in major states of India and Simpson Diversification Index

(No. /1000 households)

State	Income sources of households						
	Cultivation	Livestock	Other agri. activity	Non agri. enterprises	Wage/salaried employment	Others	SID*
Andhra Pradesh	592	46	16	35	280	31	0.57
Assam	767	42	16	23	128	24	0.39
Bihar	697	30	2	50	163	58	0.48
Chhattisgarh	805	0	6	15	168	7	0.32
Gujarat	584	90	7	37	267	14	0.58
Haryana	600	91	0	47	236	26	0.57
Jharkhand	725	1	8	46	186	35	0.44
Karnataka	694	40	31	24	193	17	0.48
Kerala	161	60	169	134	299	176	0.80
Madhya Pradesh	753	25	1	6	204	11	0.39
Maharashtra	717	27	5	49	180	22	0.45
Odisha	602	10	12	73	259	43	0.56
Punjab	456	92	8	51	319	74	0.67
Rajasthan	456	64	8	55	334	82	0.67
Tamil Nadu	548	102	11	23	293	23	0.60
Uttar Pradesh	652	31	2	51	187	76	0.53
West Bengal	558	12	17	83	268	63	0.61
All India	635	37	11	47	220	51	0.54

* Author calculations based on NSSO data, 70th round

and Madhya Pradesh edge more towards specialization and Chhattisgarh being the most specialized state in this category (0.32). Kerala, Punjab, Rajasthan and West Bengal have more diversified income sources with higher index values ranging from 0.61 to 0.80. Kerala has depicted the highest diversification among income sources (SID=0.80), followed by Punjab and Rajasthan (each 0.67), and West Bengal (0.61).

Level of Diversification across Income Sources

The study revealed that there are three major sources of income in the area surveyed: (1) Cultivation of crops, (2) Animal husbandry, and (3) Non-farm sector. Table 2 shows that cultivation is the major income source. About 40 per cent of the farmers' income is from cultivation, followed by non-farm income sources (~ 35 %). On average, farmers earn about 25 per cent of their income from animal husbandry. The average value of Simpson diversification index is 0.40, which shows low diversification of income sources in the study area. In other words, farmers are more likely to concentrate on one income source.

Table 2. Average Percentage of income from different sources and SID

Income Sources	Mean	S.D
Cultivation	39.93	29.89
Animal husbandry	24.97	25.42
Non-farm income sources	34.81	33.02
Simpson Index of Diversification	0.40	0.19

Characteristics of Diversified and Undiversified Farm Households

Table 3, presents the characteristics of diversified and undiversified farm households about age, education, social category, annual household income, type of farmer, type of family and family size. Of the

Table 3. Characteristics of diversified and undiversified farm household

Characteristics	Undiversified		Diversified		χ^2	P-value
	N	%	N	%		
Age category						
<25 year	2	2.1	5	9.3	16.945*	0.001
26-40 year	31	32.0	30	55.6		
41-60	55	56.7	19	35.2		
> 60 year	9	9.3	0	0.0		
Education level						
Illiterate	21	21.6	8	14.8	6.609***	0.085
Junior High School and below	36	37.1	12	22.2		
Secondary/higher secondary	25	25.8	21	38.9		
Graduate/ Post Graduate	15	15.5	13	24.1		
Social category						
General	25	26.0	7	13.0	3.646	0.162
OBC	62	64.6	40	74.1		
SC/ST	9	9.4	7	13.0		
Annual household income (₹)						
< 50000	38	39.2	12	22.2	8.248**	0.041
50000-100000	29	29.9	13	24.1		
100000-200000	18	18.6	19	35.2		
>200000	12	12.4	10	18.5		
Type of farmers						
Landless farmers	19	19.6	2	3.7	8.219**	0.042
Marginal farmers	45	46.4	28	51.9		
Small farmers	24	24.7	15	27.8		
Medium & large farmers	9	9.3	9	16.7		
Family size (No.)						
1-4 Members	37	38.9	15	28.3	8.860**	0.031
5-6 Members	22	23.2	6	11.3		
7-10 Members	22	23.2	15	28.3		
> 10 Members	14	14.7	17	32.1		
Type of family						
Nuclear	61	62.9	23	43.4	5.284**	0.022
Joint	36	37.1	30	56.6		

Source: Authors' calculations based on collected data

* Significant at 1 per cent, ** Significant at 5 per cent %, *** Significant at 10 per cent %

total 151 sample farm households, 54 have diversified income sources. The majority of respondents were from the mature age group. A significant difference (χ^2 =16.945; p 0.001) has been found between the age of respondents from diversified and undiversified households. The diversified farmers are younger as compared to undiversified farmers. In terms of education, the diversified farmers had more years of schooling; 63 per cent had education above secondary school. The results of chi-square test revealed a significant difference in the education levels of diversified and undiversified farmers (χ^2 = 6.609; p 0.085). As far as social category is concerned, the majority of respondents were from other backward

class (OBC) category and the caste of diversified and undiversified farmers was found to be statistically same (χ^2 = 3.646; p 0.162). On the perspective of economic dimension, most of the farmers of diversified income sources belonged to the income group of ₹ 1 lakh to ₹ 2 lakh per annum. However, most of the undiversified farmer belonged to the income group of less than ₹ 50,000 per annum. The farmers of diversified income sources had a higher annual income as compared to the undiversified group, and a statistically significant difference was found (χ^2 =8.248; p 0.041). Thus, we may say that diversification of livelihoods increases farmers' income.

Table 3 reveals that most of the farmers belonged to the marginal and small categories of farmers. The medium and large farmers were more likely to have diversified income sources. Chi-square test (χ^2 =8.219; p 0.042) indicated a significant difference in landholding size between diversified and undiversified farmers. The family size also depicted a significant difference between the two groups (χ2 =8.860; p 0.031). The diversified farmers had a bigger family size as compared to the undiversified farmers. It was observed that the diversified farmers belonged to the joint family and undiversified farmers were from the nuclear family. The results of chi-square test also revealed a significant difference in the family type of the diversified and undiversified farmers' income sources (χ^2 =5.284; p 0.022).

Factors Affecting the Diversification of Income Sources

Several studies have identified the determinants of income diversification across rural households (Birthal *et al*., 2014; Agyeman *et al*., 2014; Jetté-Nantel, 2011; McNamara and Weiss, 2005; Reardon *et al*., 1992; Pieniadz - 2009; Jongeneel *et al*., 2008). Farm size, education, access to credit, age, possession of productive assets, work experience and social category were the important determinants of livelihood diversification of farm households. The present study has included socio-demographics, farm characteristics, and institutional factors to determine the livelihood diversification of farm households. From the estimates of Tobit regression model, it is found that age has an inverse relationship with Simpson diversification index of income sources, which indicates that younger farmers have more diversified income sources. The young farmers have more working capacity as compared to the older farmers, and they look for employment opportunities in the nonfarm sector too.

The level of education showed a positive significant impact (β=0.0857, P=0.01) on sources of income diversification index. Higher was the education level of the farmers, higher was the chance to have diversified livelihood sources. Educated farmers understand the risk of one income sources, viz. cultivation, and therefore to diversify the risk, they

Table 4. Determinates of farm households income diversification

Variables		β	SE	t-value	P-value
AGE	Age in years	-0.0031	0.0015	-2.0600**	0.0410
EDU	(Secondary & above=1,Otherwise=0)	0.0857	0.0326	2.6200*	0.0100
IGA	(Yes=1, No=0)	-0.0168	0.0322	-0.5200	0.6040
ICT user	(Yes=1, No=0)	0.1355	0.0314	4.3100*	0.0000
AFS	(Yes=1, No=0)	0.0685	0.0372	1.8400***	0.0670
SC	(Gen=1,Otherwise =0)	-0.0563	0.0376	-1.5000	0.1360
OH		0.0088	0.0148	0.5900	0.5540
AOIS	(Yes=1, No=0)	0.0809	0.0373	2.1700**	0.0320
ACCMRKT	(Yes=1, No=0)	0.1411	0.0330	4.2800*	0.0000
Constant		0.3299	0.0985	3.3500*	0.0010
LR chi-square (9)		56.1*			0.000
Pseudo R-square		1.4068			
log likelihood		8.11049			

* Significant at 1 per cent, ** Significant at 5 per cent, *** Significant at 10 per cent

opted for diversified livelihoods. Having income generating assets do not make any significant impact on SID.

In the present era, ICT has a remarkable importance in transforming knowledge to people. The ICT enabled the farmers to be a better decision-maker (Ali and Kumar, 2011). More knowledge about employment opportunities leads farmers to engage in more than one livelihood. The Tobit model revealed that ICT users were more likely to have diversified income sources as compared to non-users of ICTs. The access to financial services had a statistically significant (at 10 % level) impact on the level of diversification of livelihoods. The availability of resources led to investment in other income generating sources such as animal husbandry and other off-farm activities.

The social category and farm size had no significant impact on diversification index of income source. The estimates of organized input supply (β=0.0809, P=0.0320) showed that if the farmers have access to organized input supply, then there is a higher chance of having diversified income sources. The impact of access to market revealed that if access to market is increased by 1 point, it will lead to 0.1411 point increase in income diversification sources. Farmers having better market access to output selling market had diversified income sources. A good physical access to market leads to a good remunerative price and low marketing transaction cost, that make farmers financially sound, which in turn increases strength to take risk in doing business and engaging in other non-farm sector. The model produced a reasonably good fit as indicated by the likelihood ratio (LR) chi-square test. This is statistically significant at 1 per cent level of significance.

Conclusions and Policy Implications

In a country like India, where 63.5 per cent of the rural workforce is engaged in agriculture (NSSO, 70th round), farmers' well being should be a major issue of concern as they are in debt from formal and informal sources. According to National Sample Survey Organization (NSSO, 70th round), about 52 per cent of the agricultural households were indebted. Chand *et al.* (2015) have reported that the growth of farm income has plummeted to around 1 per cent after 2011-12. The empirical studies have argued that diversification from farm to non-farm sector has immense potential to income growth and poverty reduction of farm households (Chand *et al.,*2011).This study has empirically analyzed the determinants of diversification of income sources through censored Tobit regression model. It has clearly indicated that diversification of farm households is determined by sociodemographic, farm and market related variables. The extent of livelihood diversification is significantly influenced by the factors like age of farmers, education level, use of ICTs, access to financial services, availability of organized input supply, and access to market.

Policy Implications

- Develop policies that encourage farmers to diversify their income sources, particularly for marginal and small farmers.
- Policies should focus on the development of animal husbandry sector that motivates farmers to undertake livestock-rearing on commercial level.
- Delivery of formal and informal education and extension services should be strengthened.
- There is a need to develop institutions of financial services and marketing infrastructure for better accessibility for farmers.
- Access to soft finance will facilitate the farmers to invest in non-farm business activities leading to increase in family income and food security.
- The government should ensure organized input supply to the farm sector.

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