Journal Of Harmonized Research (JOHR)

Journal Of Harmonized Research in Applied Sciences
4(2), 2016, 63 -73

ISSN 2321 – 7456

Original Research Article

DETERMINANTS OF INCOME DIVERSIFICATION AND INTENSITY AMONG RURAL HOUSEHOLDS IN SINANA DISTRICT, SOUTH EASTERN ETHIOPIA

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Abstract: This study treats income diversification as a differentiated form of agricultural development and recognizes its role to spur sustainable growth in the rural sector. To this end the objective of the study was to analyze the determinants of income diversification and intensity among rural households in Sinana District, South Eastern Ethiopia. Multi stage sampling techniques were used to achieve the objective of the study. 400 rural households were included during the study and responses of these households were also considered both in Multinomial and Tobit model econometric analysis. Both primary and secondary sources of data were used to come up with sound conclusion. The result of multinomial Logit which was identifying determinants of rural household income diversification indicated that Sex of household head and Age of household head had a negative relationship with income diversification whereas Educational level of household head , Family size , Land size owned , Membership to cooperatives, and access to market center had positive impact on income diversification vertically. However, Tobit model analysis indicates that educational level, family size, asset ownership and access to credit had positively and significantly affect the amount of income obtained from different income generating activities. From policy perspective, the presence of agricultural development institutions in rural areas that would promote access to credit facilities and ultimately increase income should be considered. To enhance income diversification, it is important to improve rural infrastructure in terms of provision of electricity, road, and improving loan and to markets.

Keywords: Diversification, Sinana, Diversifier, Non-Diversifier and Multinomial logit

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Received on: March 2016
Accepted after revision: May 2016
Downloaded from: www.johronline.com

Introduction: Income diversification refers to an increase in the number of sources of income or the balance among the different sources. Thus, a household with two sources of income would be more diversified than a household with just one source, and a household with two

income sources, each contributing half of the total, would be more diversified than a household with two sources, with one that accounts for 90% of the total (Joshi, *et al.*, 2003). Also income diversification is defined as the process of switching from conventional crop production to a higher value crop, livestock and off/ non-farm activities.

In Ethiopia, the policy focus is to increase agricultural productivity and farm income so as to attain food self-sufficiency at national, regional and household levels. While substantial resources have been spent on agricultural research and extension to alleviate food shortage in the nation, research and extension activities have not been done adequately on the issues related to income diversification (Amare and Belaineh, 2013). The same holds true in the study area because the attention of the government is totally geared towards improving and modernizing agricultural sector especially wheat production in Sinana District.

Income growth in an agricultural economy can come from various resources. Distinctions have been made between growth in crop income, non-crop agricultural income (livestock and forestry) and non-agricultural income which includes both off-farm wage labour and nonfarm self-employment (Escobal, 2001). Rural households in many different countries have been found to diversify their income sources allowing them to spread risk and smoothen consumption (Davis, 2010). This is often necessary in agricultural based peasant economies because of risks such as variability in soil quality, crop diseases, price shock, unpredictable rainfall and other weather related events. In these regard income diversification can be achieved by producing a variety of crops and/or pursuing non/off-farm employment.

In addition to the high incidence of crop failures due to disease outbreak and pest infestation, most rural areas of Ethiopia in general and study area in particulars are characterized by poor infrastructure, low level of urbanization and high population density. As a consequence, a sustained and widespread growth in household income through diversification is a necessary condition for any developmental strategy (Minot *et al.*, 2006). Therefore the aim of this study is to provide concrete information that will assist governmental organization, nongovernmental organization and local level planners in designing rural development interventions that will help rural households raise their income through different income generating activities.

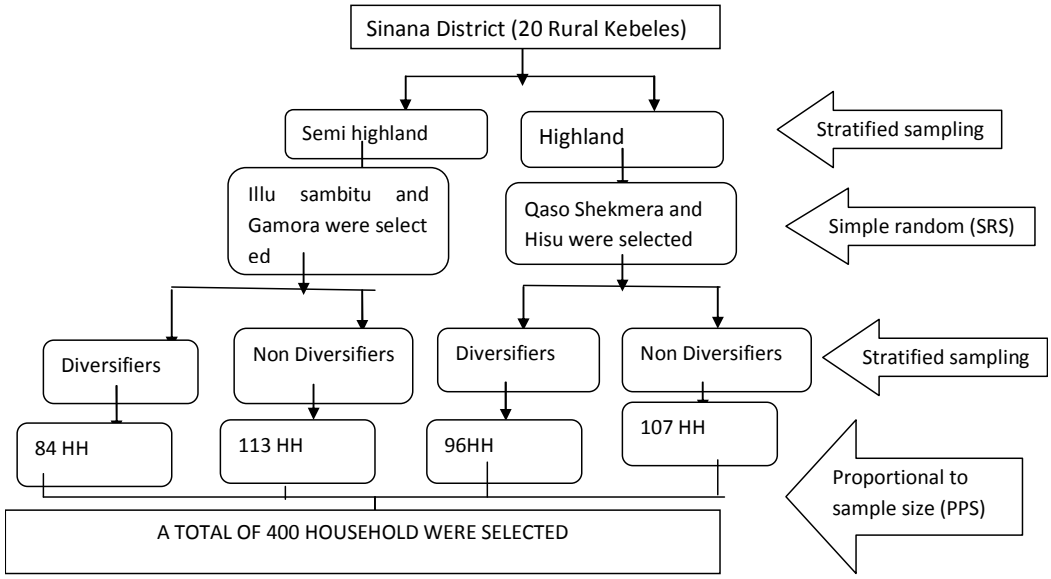
Methodology

Description of the Study Area: Sinana district is located in the north western part of Bale zone. It is bounded with Goro and Ginir in East, Dinsho in West, Agarfa and Gasera in North and Goba and Barbare district in the south. The total area of the districts are about 163554 hactar which ranked as the third smallest district in the zone and their area account about 1.67 % out of the total area of the zone (6966km^2).The administrative center of the district is Robe town and has 22 kebeles from which two of them are urban and 20 are rural kebeles. Out the total area of the district, highland accounts about 10% and semi- high lands are about 90 % (Source: Sinana District office of Agriculture, 2014).

Study Design: For the successful accomplishment of the study, Cross-Sectional Research Design was implemented. Therefore, data's were collected from the respondents to achieve the study objectives

Sampling technique

Figure 1 Diagrammatic Representation of Sampling Techniques



Data Collection Methods: Both primary and secondary data were gathered and used for this study. Primary data were collected from the sampled respondents on different issues using structured interview schedule that was pre tested before the formal survey begins. Secondary data were obtained from various sources such as reports, woreda agriculture office, pervious findings, internet and other published and unpublished materials, which were found to be relevant to the study.

Data Analysis: In analyzing the determinants and intensity of income diversification portfolios, a multinomial Logit and Tobit models were used (Greene, 2003).The multinomial logit model were used to express a household's choice of income activities as a function of some explanatory variables. According to the model, each individual would fall into one of the categories with certain probability. To analyze factors assumed to influence the intensity of income portfolios, Tobit model were used.

Specification of the models

Multi -nominal model specification

$$p_{ij} = \frac{\exp(X_i\gamma_j)}{\sum_{j=1}^{s}(\exp(X_i\gamma_j))} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$p_{ij} = \frac{\exp(X'_i\gamma^*_j)}{1+\sum_{j=1}^{s}(\exp(X'_i\gamma'_j))} (j=1, 2) \ldots\ldots\ldots\ldots (2)$$

and

$$p_{i0} = \frac{1}{1+\sum_{j=1}^{s}(\exp(X'_i\gamma'_j))} \quad \ldots\ldots\ldots\ldots\ldots\ldots..(3)$$

Where (j=0, 1, 2) = the probability associated with the income activities choices of a household I with j=0 if the household participates only in farm P_{ij}activities; j=1 if the household participates in non-farm wage employment activities; and, j=2 if the household participates in non-farm self-employment activities. X_i= the explanatory variables, which remains constant across alternatives.

Tobit model specification: Following Amemiya (1985), Maddala (1992) and Johnston and Dinardo (1997), the Tobit

Model can be defined as:

Yi* =bXi+ i u i = 1, 2 ….n

Yi = Yi* if Yi

* > 0 (1) = 0 if * £ 0 i Y

Where, Yi = the observed dependent variable, in our case income diversification

Yi* = the latent variable which is not observable

Xi = vector of factors affecting intensity of income, i b = vector of unknown parameters

i u = residuals that are independently and normally distributed with mean zero and a common variance s ^{2}.

Table 1: Hypothesized Explanatory Variables of the Study

Explanatory variables	Measurement level	signs	Explanation of the relation ship
Age	Nominal	-ve	When the age of the HH head increases it would be less likely to diversify their income sources
Education level	Interval	+ve	Increase in educational level of the head increase their income diversification activities
Proximity to urban centers	Nominal	+ve	Households near to urban areas would more likely to diversify their income sources
Farm size	Interval	+ve	The larger the farm size, the higher would be the probability of participating in income diversification activities
Access to credit service	Nominal	+ve	access to credit service would increases households participation in different income generating activities
Sex	Nominal	-ve	women's would diversify their income sources less likely than their male counterpart
Membership in cooperative	Nominal	+ve	being member in cooperatives would enable the household access information and in turn increase participation in income generating activities
Frequency of extension contact	Nominal	+ve	Frequency of extension contact by development agents would enable the households to diversify their income sources
average farm income	Ratio/interval	+ve	the higher the farm output, the higher their participation in income diversification activities will be
household size	Interval/ratio	+ve	the higher the number of active family members, the higher the probability to participate in income diversification would be
Asset ownership	Interval/ratio	+ve	It was expected that asset possession positively affect income diversification
Time spent in farm activity	Interval	-ve	the higher the time spent on single farm activity, the lower would be the households participation in income diversification

Result and Discussion

Interpretation of econometric results of Multinomial Log it model

Sex of household head (SEX): Sex was hypothesized to affect choice of income diversification strategy since men and women have differentiated social roles in the community. Gender affects income diversification options, including the choice of income-generating activities (both farm and non-farm) due to culturally defined roles, social mobility limitations and differential ownership of/access to assets (Galab *et al*, 2002). In the study, as expected sex of household head was found to negatively and significantly (< 0.05) influences diversification into off farm activities. This means female-headed households (FEHHs), tend to participate less in off-farm activities. Keeping the influence of other factors constant; the likelihood of FEHHs choice of agriculture and off farm income diversification strategy decreases by 0.2 %. The opposite is true for the male counterparts. This implies that female headed households have difficulty of participation in off farm activities because of cultural barriers.

Age of household head (AGE): As expected, this variable was found significant. At 1% significance level which is negatively influence farmers decision to diversify to off-farm activities while performing the livelihood domain agriculture, which implies that farmers participate in off-farm activities at a decreasing rate as they age. From Table - 2, it can be seen that the likelihood of a HH simultaneous choice of agriculture and nonfarm activities decreases by 1.2% with increasing age. The possible reason is that farmers, whose age is relatively younger, leaving other factors constant, could be pushed to engage more in non-farm activities than agriculture alone. This is because, younger farm households cannot get enough land to support their livelihood compared to the older farm households. Therefore the younger households have to rely more on non-farm income than the older ones to support their livelihood.

Educational level of household head (Edulev): Education increases farmers' ability to get involved in more remunerable income diversification activities. Educational attainment proves one of the most important determinants of nonfarm earnings, especially in more remunerative salaried and skilled employment in rural Africa (Barrett *et al*, 2001). Education is critical since the better-paid local jobs require formal schooling, usually to completion of secondary school or beyond. This variable has a positive and significant ($p<0.05$) influence on the decision of the household head participation on nonfarm activities. In other words, participation in non-farm activities and higher levels of education among sample HH heads were found to be positively associated, suggesting that household heads with more years of education may have realized the high return and decided to diversify their income sources. The possible explanation is that the average education achieved (which is above primary level) by the sample households is sufficient to be formally employed and educated farmers would find skill demanding income diversification option in the study area. The finding of the study revealed that when the educational status of the household increased by one grades level, their participation in nonfarm activities were found to increase by 20%. This indicates the paramount importance of education for income diversification.

Table 2: Multinomial logit regression of household income diversification strategies

Variable	**On+offfarm**				**On + non-farm**				**On+off+non-farm**			
	Coef.	T ratio	P value	Marginal effect	Coef.	T ratio	P value	Marginal effect	Coef	T ratio	P value	Marginal effect
Age	-0.012	2.945**	0.0032	-0.012	0.02	1.66	0.96	.016	0.158	0.939	0.347	0.054
Sex	-0076	2.38	.017**	0.002	0.08	2.13	0.032	0.014	0.901	0.995	0.319	0.108
Edulev	0.10	0.122	0.902	0.106	0.02	2.24	0.02**	.020	0.021	2.57	0.01	0.018
Accirr	0.0106	.844	0.39	0.0106	.0222	0.594	0.552	0.022	0.0005	0.05	0.95	0.0005
Netfarin	0.2646	3.73	.0002*	0.264	0.83	2.47	0.013**	0.11	0.694	0.928	0.353	0.061
Destmar	.079	1.544	0.1226	0.079	0.02	2.06	0.04*	0.026	-0.01	2.94**	0.0032	-0.012
Famsze	0.145	3.79	0.00	0.038	0.010	.844	0.3988	0.0106	0.04	2.45***	0.01	0.31
Mrcrtv	0.096	0.730	0.4652	0.33	0.03	2.14**	0.03	0.003	0.145	3.79***	0.000	0.038
Extens	0.116	2.09	0.036**	0.078	2.15	1.68	0.092***	0.550	.0401	.0712	0.563	.5732
Assown	0.0106	.844	0.3988	0.010	0.09	2.06	0.04**	0.07	.0114	1.043	.2971	0.0156
Timspfarac	0.037	1.004	0.315	0.156	0.145	3.797	0.0001*	0.17	.2752	6.558*	.0000	0.550
Acccre	0.007	0.232	0.8166	0.256	.1361	.097	1.394	0.005	0.0388	0.858	0.3911	0.021
Landsze	0.864	0.756	0.449	0.042	1.180	0.888	0.374	0.046	0.081	2.137**	0.032	0.014

***, **,* Significant at 1%, 5% and 10% probability level

Source: Own calculation based on household responses

Family size (Famsze): In line with expectation, family size was found to have positive and significant relation to diversification of income diversification strategies into agriculture plus off farm and agriculture plus nonfarm at 1% probability level. The positive correlation between family size and diversification might be due to the relation between larger family size and household labour or corresponding higher demand for food in the household which implies that while an additional member to the household increases the odds to participate in agriculture plus off farm plus non- farm activities in order to meet basic needs to the family. This means, one extra person in the household increases the likelihood of diversifying income by 31 %. In other words, additional family member decreases the participation only on farming.

Land size owned (Landsze):- As hypothesized, the area of land owned by the household has a significant ($p< 0.05$) and positive correlation with the likelihood of choosing AG+OFF+NF respectively. The results of this study suggest that rural households with more land tend to follow agricultural extensification and diversification since they draw incentives from land productivity. This implies the chances of choosing agriculture in the context of having large land size increases the probability of diversifying to off farm and nonfarm activities by 38 %. On the other hand the probability of diversifying livelihoods decreases by increasing land size as farmers with more land supposed to stay on farm since land stimulates farming. The implication is that farmers just switch away from off-farm activities when the farm activity is promising; and hence, this supports the necessity argument as opposed to the choice argument. Farmers consider off farm activities as a last resort income source if crop production fails.

Frequency of extension contact (EXTENS): This variable has a positive and significant ($p<0.05$) and ($p <0.10$) correlation with the likelihood of choosing agriculture and off farm and agriculture and non-farm income diversification strategy instead of sustaining on agriculture alone. Keeping other factors constant, the likelihood of participation in agriculture and off farm activities as well as agriculture and nonfarm income generating activities was increased by 7.8% and 5.5% respectively for those who have gained frequent extension contact than the counterparts. The objectives of extension is to change farmers outlook towards their difficulties which assists them adapt better solution to their livelihoods (Samuel, 2001).Thus, the information obtained and the knowledge and skill gained from extension organization may influence farmers' skill and decision making on seeking diversification. The frequent extension contact received will increase the tendency of household to participate in off farm and nonfarm activities. This may be also explained by the factors that the message/contents that farmer gain from extension agents help them to initiate to use risk aversion strategies that seek diversification of income within and out agriculture.

Membership to cooperatives (Mrcrtv): This variable as hypothesized, was found significant ($p<0.01$) to positively determine choice of income diversification strategy towards agriculture plus off farm plus nonfarm activities by 3.8%. That means the household who participated in cooperatives would diversify their income into off and nonfarm since cooperatives promote access to social capital in which off/ nonfarm options are gained. Culturally appropriate forms of social capital also appear to have the potential to aid rural income generation and reduce vulnerability to income shocks. As group discussants revealed, cooperation in the form of credit unions,

producer organizations, women credit association for milk and better, and churches have positive effects on the income generating capacity of their members and, through production linkages, on the wider local economy in the study area.

Another constraint ahead that can affect smallholder farmers' engagement into off-farm and non-farm income generating activities is determined by the existing infrastructural facilities to link the urban and rural people like access to market centre. The interpretation of the odds-ratio for the distance from market centre indicates that, other things being constant, the probability of the respondents to choose on-farm and non-farm income diversification strategies together decreases by 1.2%, as the distance increases by 1 km. This is because HHs nearby to market centre gets several key advantages, such as access to different information, terms of exchange for assets, save their substantial time, much lower transport costs and better and more remunerative non-farm and off-farm activities.

Determinants intensity of Income among rural households: The estimated results of the Tobit model is shown in Table 3 11 a total of 13 explanatory variables were considered in the econometric model. Four Variables were found to significantly influence the amount of income from income diversification activities among rural households. These were education of the respondents, family size, household assets, access to credit and land size. The remaining seven variables were found to have insignificant effect on the dependent variable (net income of the rural households).

The econometric model result revealed that level of education (Edulev) positively influences the probability of income gain at less than 5% significance level. As a household grade level of education increases by one, the probability of income gain increases by 4.4%. This implies that as the household ability/skill increases through formal education, a household can easily gain income. This indicates that education attainment is proved to be one of the most important determinants of intensity of income obtained from different diversification activities like in non-farm activities. The skilled and educated farmers have a positive interest in the involvement of non-farm employment in the study area. This may be because non-farm activities require some skill and training. Hence, households with some skill and educational background tend to engage in non-farm activities than others. Education tends to improve rationality and stimulate diversified use of resources.

As hypothesized, family **size (Famsze)** was positively related with the dependent variable (significant at less than 5%). As family size increases by one person, the probability of income gain increases by 3.2%.

As expected, a household **asset (Assown)** is another important economic factor, which was positively associated with rural household income (significance at 10% level). Household assets increase by one Birr, the probability of gain of income increases by 6.6%.

Availability of credit service **(credacc)** is another factor, which was positively related to the dependent variable (significant at 1% level). As there is an access to credit, the probability of income gain increases by 0.04%. The implication is that as the availability of credit increases by a single unit, the household could enlarge or diversify their business and earned high income. Availability of credit minimizes liquidity constraint and thereby enhances the probability of income gain. This is because the availing of credit (liquidity) enables the household to finance purchase of equipments, skills acquire, capital for initial investment and purchase of inputs. The study conducted by Reardon (1997) and Tassew (2001) supports the finding of this study.

Table 3: Maximum likelihood estimate of tobit model

Variables	Estimated coefficient	Standard error	T ratio	Change in income $\partial F(z)/\partial Xi = fz\ \beta i/\sigma$
Age	0.240	0.710	0.337	0.0009
Sex	0 .0799915	0 .0518142	1.544	0.1226
Edulev	1.734	0.177	4.073	0.044**
Accirr	0.0055834	0.0163390	0.342	0.7326
Netfarinc	4.131	14.221	0.290	0.0148
Destmar	-0.019	0.981	-0.274	0.600
Famsze	-1.588	0.741	4.592	0.032**
Mmrcrtv	.624	0.451	1.915	0.66
Extens	.074	.298	.063	.803
Assown	0.573	0.311	3.381	0.066*
timspfarac	0.151	.190	.634	.426
Acccre	0.018	0.065	1.66	0.0004*

**, * Significant at 5% and 10% probability level

Source: Own calculation based on household responses

Recommendations

As per the result of the study, the researchers forwarded the following recommendations:

- The access to credit is frequently a major constraint for farmers wanting to venture into new lines of production. Micro-finance options and the provision of credit lines for rural inhabitants have been shown to be effective means of overcoming this problem. Credit service is significant in tobit model, the coefficient indicates its positive relationship with different income diversification strategies of the household. Therefore All GOs and NGOs providing credit in the area or who are willing to provide the service should have to reach the marginalized groups by constantly expanding the availability and accessibility of credit through promoting and strengthening cooperatives.
- The substantial effect of education on household income diversification strategy choice for each type of diversification strategies confirms the significant role of the variable in consideration for betterment of living condition. The fact that, the average years of education achieved by sample HH heads is below primary level it has no more incentives to involve the household head in more remunerative activities since better jobs demand more than this level. The more household head educated, the higher will be the probability of participating in more improvement in agriculture and less deemed to diversify income which in turn improves the welfare of that household. therefore, Strengthening both formal and informal education and vocational training should have to be promoted to increase rural household's participation in more viable income generating activities and offer better prospects for improving their livelihood;
- The role of government in acquiring and sharing information and making assets as well as improved infrastructure (like expansion of rural road, electrification, etc) available to poor households is still essential in promoting different income diversification strategies. Therefore, development of infrastructure is most essential to link the rural dwellers with market.
- The research focus of the government on the study district should be on the improvement of the genetic potential of both crops and livestock so as to motivate and enable the

rural household to participate in high earning income generating activities in agriculture.

Acknowledgement: The authors would like to extend their gratitude to research and community service of Madawalabu University for funding this research work. Also the authors would like to appreciate their wives for their tolerance while they were entirely occupied with their research work without bearing in mind their interest.

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