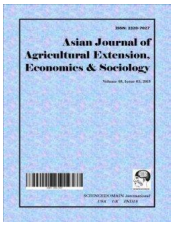

Asian Journal of Agricultural Extension, Economics & Sociology

22(4): 1-17, 2018; Article no.AJAEES.39355
ISSN: 2320-7027

Nexus between Household Asset Base and Agrarian Livelihood Strategies' Diversification: Using Multidimensional Approach

Tagesse Abo[1*], Sandra Rajan[1] and Endrias Geta[2]

[1]Department of Rural Development & Agricultural Extension, Wolaita Sodo University, Ethiopia.
[2]Southern Agricultural Research Institute, Hawassa, Ethiopia.

Authors' contributions

This work was carried out in collaboration between all authors. Author TA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author TA managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2018/39355
Editor(s):
(1) Zhao Chen, Department of Biological Sciences, College of Agriculture, Forestry and Life Sciences, Clemson University, USA.
Reviewers:
(1) Joseph A. Awuni, University for Development Studies, Ghana.
(2) Patricia Kefilwe Madigele, University of Botswana, Botswana.
Complete Peer review History: http://www.sciencedomain.org/review-history/23164

Original Research Article

Received 13th November 2017
Accepted 8th February 2018
Published 13th February 2018

ABSTRACT

Diversification of livelihoods is a commonly applied strategy for coping with economic and environmental shocks and instrumental in poverty reduction. The purpose of this study was to identify farm household's livelihood asset base and its effect on the extent of livelihood diversification among smallholder farmers of Kembata Tembaro zone, southern Ethiopia. The study employed a cross-sectional survey design where the mixes of qualitative and quantitative data were gathered using participatory rural appraisal and questionnaire as the main data collection tools. Employing the data produced from household surveys, we developed a composite household livelihood asset index incorporating five components and 17 indicators and measured the effect of asset dimensions on livelihood diversification status. The multivariate analysis showed that four out of the five household asset latent dimensions: social capital, human capital, physical facilities, and agricultural resource endowments were significantly predicting the farmers' livelihood diversification status. Thus, to enhance and contribute to the overall agrarian welfare, livelihood diversification strategies have to be supported by the appropriate household asset inputs.

**Corresponding author: E-mail: tageabo@gmail.com;*

Keywords: Livelihood asset; diversification; principal component analysis; Southern Ethiopia.

1. INTRODUCTION

Livelihood strategy diversification and people's asset endowment are intimately connected, yet the relationship between them is complex and bi-directional [1]. On the one hand, high diversity of production and economic activities of the people, which would result into income flows from diverse sources, may be triggered by the use of resources for the production of goods and services from available alternative choices [2]. Often the process of alternative choices also takes into account the opportunity and efficiency of resource use. On the other hand, resource allocation itself may get triggered, generally by economic forces, though sometimes there may be non-economic reasons, compelling the people to undertake alternative activities [3]. In this paper, however, it was hypothesized that household livelihood diversification status is triggered by household asset holdings.

Livelihood literature often suggests that strong household asset basis as an important factor in diversification choices [4,5]. In particular, members of better-off rural households can undertake innovative activities or engage in highly remunerative off/non-farm activities with the specific aim of accumulating savings needed to expand the landholding, offer better educational opportunities to their children, or ensure themselves against illness and vulnerability. In addition, diversification may also occur as a means to consolidate household natural capital (i.e. to enhance the environmental sustainability of a particular livelihood strategy) [6].

Availability of key-assets such as savings, land, labor, education, employment opportunities, access to common property natural resources and other public goods is an evident requisite in making rural households and individuals more or less capable to diversify [7,8]. Opportunities to livelihood diversity vary among households with differences in physical infrastructures (transport, energy, sanitation, water supply, communication, tools and technology) and natural resource endowments (land, water access, environmental safety) and access to markets and institutions [9]. The extent of diversification of the household portfolio of activities is determined also by it having the human capital including education, knowledge, skills, and capacity to work and adopt [10]. Investment in a proper mix of the asset endowments is the starting move of any independent activity. Moreover, labor capability and education determine the capability of finding a job and savings are often needed to migrate [11].

There has been relatively very little research [12, 13] on the association between household asset base and livelihood diversification in Ethiopia. Most of these researches have been practitioner-oriented survey researchers or conjuncture, and none has rigorously studied underlying dimensions of the household asset which have a significant association with livelihood diversification in smallholder farmers' context. On the basis, this study, therefore, posed a normative economic statement and attempted to prove or disprove it. It uses multidimensional measures to examine the nexus between household's access to various dimensions of livelihood assets and household livelihood diversification status among small-holder farmers in an agrarian setting of Ethiopia.

2. CONCEPTUAL FRAMEWORK OF THE STUDY

The fundamental characteristic of rural households in Ethiopia, as in most contemporary developing countries, is the ability to adapt, through the rural livelihoods diversification, in order to survive. Rural livelihoods diversification is a socio-economic process or a survival strategy in which factors of both threat and opportunity cause the rural household to adopt intricate and diverse livelihood strategies in order to survive [5]. Emphasizing on the reality and benefits of livelihood diversification, this paper takes the view, supported by a considerable literature and much empirical evidence [1,3,13], of course, and wants to test the hypothesis that livelihood diversification is generally fostered by access to household assets. Household resources are fundamental assets in rural livelihoods, but access to them needs to be viewed through the same lens of widening options and opportunity as livelihood diversification itself.

In the contemporary approach to livelihood analysis, resources are referred to as 'assets' or 'capitals' and are often categorized between five or more different asset types owned or accessed by family members: human capital (skills, education, health), physical capital (transport,

infrastructure, tools, technology), financial capital (money, savings, loan access), natural capital (land, water, trees etc.), and social capital (networks and associations). The theoretical literature, in fact, suggests a number of alternative conceptual and analytical frameworks to analyze rural livelihoods in general and livelihood diversification strategies as a part constituting sustainable rural livelihoods. Nevertheless, none of the available frameworks is free from limitations. For instance, though the sustainable livelihood framework [5,9,5] provides a better option, it has its own shortcomings. It is often criticized for its static feature [1,6] and the aforementioned asset categories are admittedly a little contrived and not all resources that people draw upon in constructing livelihoods fit neatly within them. For example, livestock keeping plays multiple roles that crossover at least three of these asset categories. Nevertheless, they serve a useful purpose in distinguishing asset types that tend to have different connections to the policy environment. For example, human capital connects to social policies (education and health), while natural capital connects to land use, agricultural and environmental policies.

Livelihood diversification has been defined in various ways. Among the prominent definitions, this study considered diversification as an increase in the number of income sources or the balance among different sources [14]. The household that has a higher number of income sources and generates an equal amount of share from each source is more diversified than a household with the same number of income sources but an unequal income share from each income source. The study focused on the assets base of rural households and the access of these assets that are accounted for the welfare of the household. While estimating the household income, the study considered the net income from different sources. The sources of household income were categorized as livestock rearing, subsistence crop production, commercial crop production, wage employment including salaried job and services, rural enterprises including small businesses and cast occupation, and occupational migration.

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted in Kembata Tembaro Zone of the Southern Nations, Nationalities and Peoples' Regional State (SNNPRS), Ethiopia. The administrative zone is located in southwestern Ethiopia about 350 kilometres to the south of the national capital, Addis Ababa. It bordered in the north by Hadiya administrative zone and the Alaba Special *woreda*; in the south by Walayta zone; in the east by the Billate River which separates it from the Arisi zone of Oromiya Regional State [15].

Kembata Tambaro zone comprises seven *woreda*s, namely Kadida-Gamela, Damboya, Angecha, Doyo-Gena, Kacha-Bira, Hadero-Tunto and Tembaro, and two town administrations with a total area of 1,356 sq. km. The zone is one of the most densely populated areas in the country and region with a crude population density of 588.5 people per sq. km, considerably higher than the estimated regional average of 164 [16]. Astronomically, the zone lies between 7°.10" to 7°.50" latitudes and 37°.34" to 38°.07"longitudes. The capital of the zone, Durame, is located 352 kilometres away from Addis Ababa. Concerning the land feature of the zone, of the total land, 75.23% is cultivated land; 6.19% is grazing the land, 6.73% is covered by bush and forest; 3.41% is arable but unutilized; 3.11% uncultivable land, and the remaining 5.31% is covered by others [17].

The administrative zone has three agrological (traditional) zones, comprising 13.7% wet (*dega*), and 71.17% mid-temperate (*weyna-dega*) and 11.14% is hot (*kolla*). The annual average temperature of the zone ranges from 126 to 27.5° Celsius and the annual average rainfall ranges from 1001 to 1400 mm [17]. Topographically, it lies between elevations ranging from 501 to 3000 meters above sea level. The total population of the zone is 841,663 with its population density of 504.3 inhabitants per square kilometres [18].

The economy of the zone is predominantly agriculture-based, which is the major source of employment and livelihood. The zone is suitable for crops such as *enset*, root crops, maize, wheat, fruits and vegetables. Around 90% of the zone population depends on agriculture, with crop production constituting the basic economic activity and primary source of livelihood for the rural population, followed by livestock rearing. According to Girma [19] and Mulgeta [20], Kembata Tembaro zone is a better representative to the general biophysical and socio-economic features that characterize the livelihood attributes of the "*enset*-belt" areas of southern Ethiopia.

3.2 Sample Size Determination

Since this study was mainly quantitative in its design, one of the appropriate criteria to determine the representative sample size- degree of variability in the attributes (livelihood strategies' diversification, in our case) being measured (or prevalence) was used. The proportion of 50%- the maximum variability in terms of diversifying livelihood strategies- was assumed helpful in determining the more conservative sample size. Accordingly, among the several mathematical sampling formulas, the one presented by Cochran [21] (Equation 1) was employed to determine the study sample size.

$$n_{0=\frac{Z^2PQ}{e^2}} \quad (1)$$

Where, n_0 is the sample size, $Z^2$is the abscissa of the normal curve that cuts off an area α at the tails, (1- α) equals the desired confidence level (95%, in our case), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z is found in the statistical tables which contain the area in the normal curve (Z=1.96, in our case).

3.3 Sampling Procedures

Multistage sampling technique was used to select the research districts and the sample respondents. First, three districts (or *woredas*) were selected using cluster sampling method. Out of the 7 *woredas* comprising the administrative zone, three *woredas,* namely Kedida-Gamela, Kacha-Bira and Angecha were selected to capture different livelihood clusters. According to the zonal Agricultural Office records, following the cropping attributes the zone is classified into three: cereal and *enset* livelihood cluster*,* the ginger cluster, and the coffee livelihood clusters. On this basis, the three *woredas* (one from each cluster) were included in the study as they represent the three clusters, respectively.

Second, out of the districts, six *kebeles* were selected using stratified random sampling technique. The *kebeles* in each *woreda* were listed based on their agro-ecological characteristic and stratified into three ecological zones namely, highland (*dega*), midland (*woine dega*) and low land (*qola*). Based on this, 2 *kebeles* from each agro-ecology (totalling 6) were included in the study. A total of 384 farm households were then selected using random sampling technique from the list of households by respective Peasant Associations (PAs) in each of the selected *kebeles*. The sample size from each kebele was then made proportional to the sample size (i.e. the number of households in the *kebele*).

3.4 Instruments and the Data

A cross-sectional field survey was carried out using a mix of various instruments including the interview- schedule and participatory rural appraisal methods to acquire the necessary primary data. The first step in the data collection was PRA which involve identifying household asset endowments and ranking household economic status. The ranking exercise using focus group discussion resulted in the identification of local indicators of basic rural household asset endowments, while the key informants' interviews define the economic position of households as per the indicators. Focus Group Discussion (FGDs) had been conducted in each *kebele* (two FGDs per a *kebele*) to gather perception of the farmers about the household economic status indicators and their estimates in the study area. Each focus group consists of six participants involving members from local administration, community elders, leaders of 1 to 5 arrangements (or farmer groups) and leaders of religious organizations. The discussion in each FGD took about an hour. This had, in fact, been done before the designing of questions for household survey.

Following the economic ranking practice, a detailed survey schedule prepared to collect quantitative data on the indicators already identified in the qualitative methods and other background characteristics of households. Trained enumerators administered the survey and field work was supervised on a day-to-day basis by the research team to ensure enumerators' compliance with established survey procedures. The field survey took place within three months ranging from April to July, 2016.

3.5 Analytical Procedures and Econometric Models

3.5.1 Constructing household asset dimensions

Economists have long relied on money-metric measures of income or consumption expenditures as indicators of living standards.

These money metric measures are used as proxies for economic status. One of the most common criticisms of these measures is that they at best capture temporal dimensions of asset as they measure consumption or income at only one point in time [19,22]. For this reason, they may not reflect long-term economic status. At the same time, collecting the information necessary to construct such a money metric measure and metric construction is often constrained by measurement problems [22].

Several empirical studies [22-26] have advanced an asset-based index as an alternative measure of economic status. They used a weighted sum of a defined set of household assets (including housing characteristics and durables) that is used to rank households and construct quintiles of economic status. Against this background, this paper employed a mixed method and multi-dimensional asset measurement using cross-sectional data. Despite the apparent advantage of employing mixed approaches, it is often argued [26] that asset indices must be approached cautiously. Specifically, in any one setting, the assets to be included in the index must be selected carefully and the technique used to compile it must be applied with caution. The challenge, then, is to define the assets relevant to the construction of locally relevant proxies. To alleviate such a challenge, participatory rural appraisal (PRA) approach was employed before conducting the household survey to obtain data for measures of asset-based variables. Focus Group Discussion (FGDs) had been conducted in each *kebele* (two FGDs per a *kebele*) to gather perceptions of the farmers about the asset indicators and their estimates in the study area. After this process, those proxies which were repeatedly addressed across the focus group discussions held in each *kebeles* were identified and thematically categorized so that predictor variables were set and defined for the household survey interview-schedules.

3.5.2 The principal component analysis

Principal Component Analysis (PCA) is a useful technique for transforming a large number of variables in a dataset into a smaller and more coherent set of uncorrelated (orthogonal) factors, the principal components [27]. It is assumed that economic status is the common factor behind the ownership of the assets, such that household economic status explains the maximum variance and covariance in the asset variables. Such factors can be extracted from a set of variables by creating a set of mutually uncorrelated components or factors of the data using principal component analysis. The first linear component is that linear index of the underlying variables that captures most common variation among them. Each item, in our case asset, gets a different weight reflecting the contribution of this asset to the common factor. The principal component analysis only uses the variation in the variables that they have in common with other variables (communality in a variable to extract the factors and also allows for a unique contribution of each of the assets (often referred to as uniqueness).

In mathematical terms, from an initial set of *n* correlated variables, PCA creates uncorrelated indices or components, where each component is a linear weighted combination of the initial variables. Let us consider the variables $X_1, X_2, \ldots, X_n$. A principal component analysis of this set of variables can generate *p* new variables, known as the principal components, $PC_1, PC_2, \ldots, PC_m$, which can be expressed as follows:

$$PC_{m=} a_{m1}X_1 + a_{m2}X_2 + \cdots a_{mn}X_n \quad (2)$$

Where a_{mn} represents the weight for m^{th} principal component and the n^{th} variable. Following equation (1), the principal components were computed using 17 multidimensional variables identified as possible indicators of household asset base.

3.5.2.1 Variable selection

Various sets of variables describing assets such as household characteristics, durable consumption goods, and housing features were included to ensure a multidimensional approach in understanding socioeconomic differentiation, inequality in distribution of resources, and access for assets among households in the population. Based on the identified asset indicators with respect to the locally perceived asset base of households in the community (see Appendix A), 17 theoretically important, contextually appropriate and policy-relevant variables were chosen for the present study and computed on PCA (Table 1).

In fact, in many studies, the asset-based asset index is constructed with a standard list of assets as proxies for asset-based analysis at a national

level, but when the analysis is confined to a lower level of aggregation, especially when covering only one village or socio-culturally confined community, the standard list may not be sufficient [28]. In such a case, the researcher should construct a locally relevant list of assets, for example, by taking the relevant items from the standard list and extend it to include location-specific assets. To move away from the composition of the fixed asset-based asset index *per se*, and following existing literature [20, 23] and researcher's successive piloting, the following indicator variables were constructed to measure multidimensional asset base of households.

3.5.2.2 Calculating aggregated indices of latent asset dimensions

The construction of an asset-based index is based on the assumption that household economic status is a latent variable. A composite index was developed by using PCA of 17 variables, compiled and/or computed. PCA retained five principal components (PCs) out the 17 variables introduced and computed. Algebraically, the asset index for a household i is expressed as follows:

$$W_i = f(PC_1, PC_2, PC_3, PC_4, PC_5) \quad (3)$$

Where *W* is the asset index, PC_{1-5} refer the five algorithms (principal component factor scores) of the household *i*. But, calculating the general asset index of households is not the intention of this study.

Following the method used by previous researchers [28,29,30] who used multidimensional approach to human poverty and welfare measurement, aggregated indices of household asset dimensions are determined as follows: As a first step in the computation of a single index, factor score coefficients, also called. Component scores were estimated using principal component analysis method. Factor scores are the scores of each sample household, on each factor. To compute the factor scores for a given case for a given factor, the case's standardized score on each variable is multiplied by the corresponding factor loading of the variable for the given latent factor.

Table 1. List and definition of variables originally entered in PCA analysis

Variables	Description
Family education	The number of household members graduated grade 10 and above.
Dependency ratio	The ratio of the dependent age groups (below 15 and above 65) to the working-age groups (15 to 65 years) in the family
Education status	Educational status of household head (years of schooling).
Roofing	The type of material which the roof of the house is made from (corrugated sheets, grass, or others)
Dwelling size	Number of houses that the household owns.
Enset Crop diversity share	Crop diversity index (share) of *Enset.*
Eucalyptus tree value	Annual income from sales of eucalyptus tree (produce or wood)
Coffee value	Total annual income from coffee sales
Land size	Total farmland size (in ha) that a household owns.
Ox ownership	Number of oxen (traction) that a household owns.
Exotic breed cows	The number of exotic breeds cows that a household owns.
Livestock ownership	Livestock ownership (with exclusion of ox/oxen as it is measured separately as traction power, and exotic cow/s owned by a household) is measured in tropical livestock unit (TLU).
Investments on farm inputs	The annual cost of a household for agricultural inputs (seed, fertilizer, pest sides, etc).
Investments in durable assets	Total market price of durable assets owned by household
Institutional Membership	Number of social institutions (self-help groups, cooperatives, village committee, etc) that a household head is a member
Urban linkage	The number of family members living in urban areas (both local and abroad).
Transfer value	Annual government transfer payments that a household has received during the year 2016.

3.5.3 Determining livelihood diversification status

The outcome variable, activity diversification on livelihood, is commonly measured in the literature using indices such as Simpson Index, Herfindahl Index or Shannon Index, which takes account of both the number of sources and the balance among them [31, 32, 33]. We use the Simpson Index of diversity (SID) to construct diversification index because of its comparative computational simplicity, robustness and wider applicability [34].

$$SID = 1-\sum_{i=1}^{n}\left[\frac{Mi}{Mt}\right]^2 \quad ; \quad i= 1, 2, 3,\ldots, n \qquad (4)$$

Where, n = number of income sources; $Mi =$ income from each activity, and $Mt =$household's total income. The value of SID always falls between zero and one. If there is just one source of income, P_i = 1, so SID = 0. As the number of sources increases, the shares (Pi) decline, as does the sum of the squared shares, so that SID approaches 1.

3.5.4 Analysis of nexus between livelihood diversification and household asset base

The nexus between livelihood diversification and household asset bases was analyzed using multivariate regression models. Among the five reported dimensions household asset(agricultural resource endowments, values of crop endowments, housing conditions, human resource and social networks), it was analyzed to identify which of the asset dimensions scored statistically significant correlation coefficients with household livelihood diversification status. To identify the best asset dimensions in predicting household livelihood diversification; we entered them into stepwise regression models. The stepwise regression model, according to Green [35], is expressed as:

$$Y = a + b_1 x_1 + b_2 x_2 + \cdots + b_i x_i \qquad (5)$$

Where a is the intercept, b_i is the coefficients, and x_i is the predictor variables (or latent dimensions of household asset).

4. RESULTS AND DISCUSSION

4.1 Descriptive Results

The PRA exercise in the study area revealed that household asset is understood as multidimensional as and broader than the conventional money-metric measures of income or consumption expenditures which have so far been relied on by economists as indicators of living standards. The proxies identified as indicators of economic status among the rural community in the study area are broader enough and include assets comprising household ownership of consumer durables, the household socioeconomic characteristics, household's dwelling and land ownership.

The discussants define (see Appendix A) as household asset involves material, intellectual, social, and living standard quality aspects of human welfare. The material aspects of asset identified by the focus group discussants encompass flows and stocks. The flows aspects capture income and liquid assets recurring periodically while the stock comprises assets accumulation and buffer such as livestock, house, land, savings etc. The asset also associated to outcome of intellectual ability, social position, and individual competence such as hardworking attitudes.

4.2 Statistical Test Results of Appropriateness of PCA

Before being submitted to a principal component analysis, the correlations among the identified variables were checked for multicollinearity problems. The Kaiser-Meyer-Olkin (KMO), a Measure of Sampling Adequacy (MSA) was used to detect multicollinearity in the data so that the appropriateness of carrying out a PCA can be detected. Table 2 describes the statistical test results.

The results of the present study showed that the value of KMO is 0.739 and is relatively high, that means that the data are suitable for the Principal Components Analysis and the appropriateness of

Table 2. KMO measure of sampling adequacy and Bartlett's test of sphericity

KMO measure of sampling adequacy	Bartlett's test of sphericity		
	Chi-square	df	Sig
0.739	1406.169	136	0.000

the model which is within an acceptable range for a well-specified model and which is good to warrant interpretation of results [36].

Another test of the strength of the relationship among variables was done using the Bartlett's (1954) Test of Sphericity. The Bartlett's Test of Sphericity tests the null hypothesis that the variables in the population correlation matrix are uncorrelated. The results of our analysis showed a significance level of 0.00, a value that is small enough to reject the hypothesis. It can be concluded that the strength of the relationship among variables is strong or the correlation matrix is not an identity matrix as is required by PCA to be valid. These diagnostic procedures indicate that principal component analysis is appropriate for the data.

4.3 Interpretation of Results from PCA

Among the 17 variables included in the principal component analysis, the correlation matrix was used as an input to PCA to extract the five factors. The number of factors extracted was defined and determined by following one of the most commonly used techniques- Kaiser's criterion, or the Eigenvalue rule. Under this rule, only those factors with an Eigenvalue (the variances extracted by the factors) of 1.0 or more are retained. Using this criterion, our data revealed 5 factors (see Appendix B). The results revealed that five factors accounted for 56.623% of the total variance in the data. The first principal component accounts for the largest portion of the variation in the data (22.738%), the second principal component accounts for the second largest variation in the data (11.079%); the third, the fourth and the fifth account for 8.303%, 7.559% and 6.944%, respectively.

The question about "What are these five latent factors (extracted principal components) and how the separate indicator variables were merged to make up the aggregate component factors so as to formulate a composite index of household asset base?" needs further elaboration. To solve this challenge, the results of PCA using varimax rotation are estimated using the largest factor loading values of the separate variables included in the principal component analysis. The varimax is a variance maximizing strategy where the goal of rotation is to maximize the variance (variability) of the factor (component), or put another way, to obtain a pattern of loadings on each factor that is as diverse as possible [37].

The results (see Appendix C) indicated that PCA transforms a large number of variables in a dataset (17 variables) into a smaller and more coherent set of five uncorrelated (orthogonal) factors, the principal components. The first factor involves five variables including farmland size, ox ownership, exotic breed cow's ownership, livestock ownership and investments on farm equipment which are related to *Agricultural Resource Endowments (ARE)*. For the first factor, all the variables showed markedly higher positive loadings. The higher value of the variables land size, oxen, exotic breed cows, livestock and farm equipment in the original data indicate better agricultural resource endowments of a household. And the positive sign on these variables means a strong positive relationship between the latent factor and the indicator variables. This factor which accounted for 22.738% of the total variation is a reasonable representation of the asset situation or status of household. It means that better asset base is associated with large land size, the number of oxen and exotic breed cows, livestock size and size of investment on farm equipment in the community.

For the second factor, this is related to value of crop endowments (or *Financial Capital*) at household level, value of eucalyptus tree and coffee value showed strong and positive loadings whereas share of *enset* crop diversity showed negative loading with relatively smaller magnitude of relationship as compared to the other two variables in the original data. The third factor accounts for 8.303% of the variance. We may interpret this factor as a measure of *Physical Facilities* (PF). Four variables are relating to this factor. These include roofing, dwelling size, investments in household durable goods and household transfer value. The fourth factor can be interpreted as *Human Capital* (HC) at household level, and three variables: family education, dependency ratio and educational status of household head are related to it. Except for dependency ratio, the other two variables showed positive loading and high magnitude relation with the factor. Two variables are related with the fifth component, which can be interpreted as *Social Capital* (SC) as both institutional membership and urban linkage of household have positive and high loading value which tells the strength of relationship between the explaining variables and the latent factor.

4.4 Household Asset Dimensions and Livelihood Diversification

To identify the best asset latent dimension in predicting the household livelihood diversification status, we entered the factor scores (or indices) of the five dimensions of asset in the stepwise regression analysis. Here, the livelihood diversification index computed through Simpson Diversification Index (SDI) was the dependent variable, whereas the five composite indices of the asset dimensions were used as independent variables. The regression results indicated that the coefficients of determinant (R^2) consistently increased with the addition of the first to the fourth independent variables from 0.041 in Model 1 to 0.0.088 in Model 4 (Table 3). The final model (Model 4) is statistically significant ($F4$, 379 = 5.104, R^2 = 0.098, p < 0.05) and loaded four asset dimensions that significantly explained household livelihood diversification: social capital, human capital, physical facilities, and agricultural resource endowments.

The footnote under the model summary box indicates that the above four out of the five dimensions entered into the regression model were included as they are significant predictors of household livelihood diversification status. Depending on the method of the regression used, the rest dimension (that is, financial capital) is excluded for failing to meet the criteria predetermined. That means, it is not a significant predictor variable for household livelihood diversification status.

The model summary explains the overall fitness of the model. R is the correlation between the variables, and the Adjusted R Square value indicates the amount of variance in the dependent variable by each of the predictor variables, with respective values ranging from 0.041 for the lowest to 0.088 for the highest degree of variance. We use the Adjusted R Square value since we have more than one predictor variable [38]. In this case, the maximum degree to which the amount of variance in the dependent variable is explained by the predictor variables accounts for 8.8% of the variance in the number of offences.

Table 4 shows the results of regression estimates predicting the effects of different asset dimensions on household livelihood diversification status. Among the independent variables put into the stepwise regression analysis, two of them (social capital and agricultural resource endowments) were found that they positively explained household livelihood diversification level; while the rest two (human capital and physical facilities) were influencing negatively. These are the priority dimensions of household asset which were found to put significant impact on household livelihood diversification status, and a discussion of them follows.

The results of this study indicate that the most instrumental of all of the predictors of household livelihood strategy diversification was social capital. Holding all other asset dimensions constant, social capital increased household livelihood diversification by 0.032 units (p < 0.001). This finding suggests the need to promote rural social networks as a strategy for raising standards of living of the rural households. The analyses provide important insights into the nature of the strategy (in terms of assets and activities) pursued by the households in their livelihood diversification.

Table 3. Summary of asset dimension models (derived by stepwise regression)

Model	R	R^2	Adjusted R^2	Std. error	Change statistics				
					R^2 Change	F Change	df1	df2	sig.
1	.210[a]	.044	.041	.14841	.044	17.573	1	382	.000
2	.258[b]	.067	.062	.14684	.023	9.204	1	381	.003
3	.292[c]	.085	.078	.14554	.019	7.821	1	380	.005
4	.312[d]	.098	.088	.14476	.012	5.104	1	379	.024

a. Predictors: (Constant), Social Capital
b. Predictors: (Constant), Social Capital , Human Capital
c. Predictors: (Constant), Social Capital , Human Capital , Physical Facilities
d. Predictors: (Constant), Social Capital, Human Capital, Physical Facilities, Agricultural Resource Endowments

Table 4. Coefficients of predictor variables included in regression model

Dimensions	Un-standardized coefficients		Standardized coefficients	t	Collinearity statistics	
	β	Std. error	β		Tolerance	VIF
(Constant)	.592***	.008		78.116		
Social Capital	.032***	.008	.210	4.192	1.000	1.000
Human Capital	-.023**	.008	-.150	-3.034	1.000	1.000
Physical Facilities	-.021**	.007	-.137	-2.797	1.000	1.000
Agri. Resource Endowments	.017*	.007	.110	2.259	1.000	1.000

****P< 0.001, ** P< 0.01, * P< 0.05*

The aggregate latent vector 'social capital' has important attributes that distinguish it as true capital among the society in the study area. Membership to *Iddir,* religious meetings, self-help groups like *Debo*, and various associations and political arrangements of women, youth and adult farmers are found to be the most important social assets in the study area. According to the key informants' interview responses, membership to *Iddir* enables the members to help each other, solve internal conflicts, and thus, reducing powerlessness. Empirical evidence shows that social capital results in direct income gains and more widespread and efficient services delivery; affects the provision of services in both urban and rural areas; transforms the prospects for agricultural development; influences the expansion of private enterprises; improves the management of common resources; helps improve education; and can prevent conflict [39, 40].

According to the respondents, the informal social ties like friendships, relationships and neighborhood activities (like coffee ceremony) are found as the other social capitals in the study area. Key informants stated that livestock shares, cropland sharing, credit services and other benefits are shared based on social ties, friendship, relatives and membership to local institutions. The landless and smallholder farmers who need additional unit of land for crop production makes agreement with those households who have land but lack inputs, traction power and labor are mediated through local institutions and local elders. With regard to urban linkage, the majority (57.2%) of the respondents confirmed that they have friends and/or relatives in urban area, and they use them for accessing information on the non/off-farm employment opportunities.

This finding agrees with previous literature which underlines as social capital is important in improving the livelihood diversification strategies of rural people directly and indirectly through increase in access to goods and services. Ellis [5,41], for instance, shows the significance of social capital in underpinning the livelihood diversification strategies of the individual and household. The access attribute of a livelihood, which includes rules and social relations subsumed under the asset-type, is important in determining the ability of people in the rural areas to own, control, claims, and make use of a resource as well as the ability to participate in and derive benefits from social and public services that are provided by the state such as education, health services, roads, water supplies, and so on. Social capital is essential for facilitating and sustaining diverse income portfolios and access to opportunities and resources to individual households [42,43,44].

After social capital, human capital was found to be the most promising asset dimension. Holding other dimensions for constant, the increase of human capital made a 0.023 unit contribution on household livelihood diversification ($p < 0.01$). The main indicators of human capital in this study are age of household head, education level of the household head, family education and dependency ratio of the households. Human capital is the knowledge and capacity of the people. It can be measured in terms of people's education, health, skills and knowledge.

These results go in line with existing empirical literature. Human capital comprising of labor, health, education, and skills is an important asset that enables the household to pursue different livelihood strategies [45, 46]. Regarding education level of the household head, the more educated household heads are engaged in non-farm and off-farm diversification strategies. The effectiveness of labor as an asset depends on good health and education. When enhanced through training and other skills, labor becomes a

powerfully effective tool for households to gain diversified livelihoods. This also can be justified by the fact that the better-educated households are capable of calculating the costs and benefits of income generating activities and hence, enable them to engage in non/off-farm activities.

It is evident in the findings (Table 4) that adoption of physical facilities would mark a 0.021 unit moderation in household livelihood diversification status (P < 0.01). These include the basic infrastructure and producer goods which are prerequisites to sustain livelihood [47]. The infrastructural base comprises of changes to the physical environment which assist people to attain their basic necessities and enhance their productivity whereas producer goods consist the equipment and tools employed by people to function efficiently for a more productivity.

During the field survey, it was observed that majority of the rural households subsist in a minimalist semi-traditional house made of wood and straw roofs, but very few live in galvanized iron roof with a mud wall. In concomitant to this, about 95% of the total households do not have electricity service at all whereas the remaining revealed that they have access to electricity through line extensions made to nearby churches and other organizations. With regard to tap water service, only 22% household from all the three study districts was found to have access to a tap water. Furthermore, it was observed that majority of the health posts were not functional, because, according to the respondents, they lack human and material facilities. It was also found that the major illness in the district including malaria, diabetics, HIV/AIDS, diarrhea, kidney related problems and eye problems.

The last, but statistically significant predictor of household livelihood diversification status among the asset dimensions was agricultural resource endowment which is an aggregate of variables like land, livestock ownership, ox ownership, and agricultural investment inputs. It uniquely explained that an increase in a unit of agricultural resources would create 0.017 unit increase in diversification status of livelihood activities for a household, and it was statistically significant (P< 0.05). The finding is inconsistent with empirical evidence. It was evident in [48,49] that households with more land develop more supplementary activities. They illustrate the same pattern for a rice-producing area in Ivory Coast. Households with relatively much land appear to generate income either by full-time farming or by a mix of farming and skilled supplementary work. Households with meager endowments generate limited supplementary income.

5. CONCLUSION AND POLICY PRIORITIES

The analysis in the previous sections shows that smallholder farmers' livelihood diversification is dependent on a range of household asset bases and endowments. The results indicate that greater diversification is associated with possession of better livelihood capitals. We identified four main sets of asset dimensions determining livelihood diversification, namely factors related to social capital, the human capital, the physical capital and agricultural resource endowments. The most instrumental of all of the asset dimensions of the smallholders is their social ties like friendships, memberships to local institutions, linkages, neighborhood activities, and self-help groups. Social capital results in both direct and indirect income gains access to information, employment opportunities, goods and services for the agrarian communities. This finding suggests the need to promote rural social networks as a strategy to enhance livelihood strategies' diversification.

The second set of asset dimensions determining livelihood diversification relates to human capital comprising of labor, health, education, and skills. Capacitating the agrarian households through educating more household members and enhancing access to good education and health is essential in facilitating and sustaining diverse income portfolios to the farmers. Equipping them with training and skills would help them gain effective and diversified livelihoods. Third, we found strong evidence that physical facilities including rural infrastructures like electrification, pure water access, functional health posts, and furnished housing conditions with basic facilities producer goods are likely to foster diversification into both on-farm and non/off-farm businesses. Finally, the results have shown that basic endowments of smallholder like land, livestock, oxen (as traction power) and inputs for agricultural investment have significant influence on the household livelihood diversification status.

Policy-makers should keep in mind that enhancing the asset-base of rural farm households merits special attention, and a strong

focus in development policy should be placed on those household asset dimensions to facilitate smallholder livelihood diversification. These are policies aimed at building up the smallholder households' assets, to develop the physical and natural environment so that smallholders get independent ownership rights over land and other resources, and participate in social processes. Active intervention of GOs and NGOs is needed to assist communities and households, particularly in building up rural livelihood assets.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bebbington A. Capitals and capabilities: A framework for analyzing peasant viability, rural livelihoods and poverty. World Development. 1999;27(12):2021–2044.
2. Dacron S. Growth and shocks: Evidence from rural Ethiopia. Journal of Development Economics. 2004;74(2): 309–329.
3. Su S, Shang HY. Relationship analysis between livelihood assets and livelihood strategies: A Heihe River Basin example. Sciences in Cold and Arid Regions. 2012; 4(3):0265–0274.
4. Ellis F. Peasant economics: Farm households in agrarian development. Cambridge: Cambridge University Press; 1993.
5. Ellis F. The determinants of rural livelihood diversification in developing countries. Journal of Agricultural Economics. 2000b; 51(2):289–302.
6. Hussein K, Nelson J. Sustainable livelihoods and diversification. IDS Working Paper 69. London: Institute of Development Studies; 1999.
7. Dercon S, Krishnan P. Income portfolios in rural Ethiopia and Tanzania: Choices and constraints. Journal of Development Studies. 1996;32(6):850–875.
8. Abdulai A, Rees A. Determinants of income diversification amongst rural households in Southern Mali. Food Policy. 2001;26(4):437–452.
9. Mutenje MJ, Ortmann GF, Ferrer SRD, Darroch MAG. Rural livelihood diversity to manage economic shocks: Evidence from South East Zimbabwe. Agricultural Economics Research. Policy and Practice in Southern Africa. 2010;49(3).
10. Barrett C, Bezuneh M, Abdillahi A. Income diversification, poverty traps and policy shocks in Cote d'Ivoire and Kenya. Food Policy. 2001a;26(4):367–384.
11. Warren P. Livelihoods diversification and enterprise development. An Initial Exploration of Concepts and Issues. LSP Working Paper 4. Food and Agriculture Organization (FAO), Rome; 2002.
12. Ncube A. Impact of livelihood diversification on household food security: The case of Hurungwe district, Zimbabwe (Unpublished MA thesis); University of South Africa. 2010;180.
13. Sisay BB. Review on rural livelihood diversification among the smallholder farmers in some Africa countries. International Journal of Agricultural Economics, Extension and Rural Development. 2013;1(1):010-016.
14. Ellis F, Freeman HA. Rural livelihoods and poverty reduction strategies in four African countries. Journal of Development Studies. 2004;40(4):1–30.
15. DPPC (Disaster Prevention and Preparedness Commission). SNNPR Livelihood Profile: Hadiya-Kambata Cereal and Enset Zone Report, Addis Ababa: LIU; 2005b.
16. CSA (Central Statistics Agency). Ministry of Finance and Economic Development. Agricultural Sample Survey Study Documentation.CSA: Addis Ababa; 2012.
17. SNNPR (Southern Nations, Nationalities and People's Region). The Socio-Economic Profile of the Southern Nations, Nationalities, and Peoples' Region, Ethiopia: Awassa; 2008.
18. CSA (Central Statistics Agency). Central Statistical Authority population estimates. CSA: Addis Ababa; 2007.
19. Girma A. The challenges and policies of poverty reduction in Ethiopia. The Challenges and Policies of Poverty Reduction in Ethiopia. Addis Ababa; 2013.
20. Mulugeta H. 'Green Famine' in Ethiopia: Understanding the causes of increasing vulnerability to food insecurity and policy responses in the Southern Ethiopian Highlands. A PhD dissertation submitted to University of Sussex. 2014;280.

Available:http://sro.sussex.ac.uk/

21. Cochran WG. Sampling techniques. (2nd Ed.), New York: John Wiley and Sons, Inc.; 1963.
22. Sahn DE, Stifel David C. Poverty comparisons over time and across countries in Africa: World development. Elsevier. 2000;28(12):2123-2155. Available:https://ideas.repec.org/s/eee/wdevel.html

(Accessed on: December 2, 2017)
23. Exploring alternative measures of welfare in the absence of expenditure data. The review of income and wealth. 2003;49(4): 463-489.
24. Filmer D, Pritchett LH. The effect of household wealth on educational attainment: Evidence from 35 countries. Population and Development Review. 1999a;25(1):135-164.
25. Estimating Wealth Effects without expenditure data- or tears: An application to educational enrolments in States of India: Demography. 2001;38(1):115-132.
26. Morris P, Huston A, Duncan G, Crosby D, Bos J. How welfare and work policies affect children: A synthesis of research. New York: MDRC; 2001.
27. Griffin J. Well-being: Its meaning, measurement and moral importance. Clarendon Press, Oxford; 1986.
28. Krishnan V. Early child development: A conceptual model. Presented at the Early Childhood Council Annual Conference 2010. Christchurch: New Zealand; 2010.
29. Scoones I. Livelihoods perspectives and rural development. The Journal of Peasant Studies. 2009;36(1):171–196.
30. Van Den Berg M, Kumbi GE. Poverty and the rural nonfarm economy in Oromia, Ethiopia. Agricultural Economics. 2006;35: 469–475.
31. Ellis F. Household strategies and rural livelihood diversification. Journal of Development Studies. 1998;35(1):1–38.
32. Minot N, Epprecht M, Anh T, Trung LQ. Income diversification and poverty in the Northern Uplands of Vietnam. Washington, DC: International Food Policy Research Institute; 2006.
33. Babatunde RO, Qaim M. Impact of off-farm income on food security and nutrition in Nigeria. Food Policy. 2010;35(4):303-311.
34. Shiyani RL, Pandya HR. Diversification of agriculture in Gujrat: A spatio-temporal analysis. Indian Journal Agricultural Economics. 1998;53(4):627-39.
35. Greene WH. Econometric analysis. (7th ed.). Prentice Hall, New Jersey; 2012.
36. Tewodros T, Bedru B, Teshale W, Solomon T, Black H. Measuring multidimensional rural poverty using combination of methods: A case study from Southern Ethiopia. Journal of Poverty, Investment and Development. 2016;29(1): 31-40.
37. Antony GM, Rao KV. A composite index to explain variations in poverty, health, nutritional status and standard of living: Use of multivariate statistical methods. Public Health. 2007;121:578-587.
38. Greene WH. Econometric analysis. (5th ed.). Prentice Hall, New Jersey; 2003.
39. Grootaert C, Bastelaer T. (Eds.). The role of social capital in development: An empirical assessment, New York: Cambridge University Press; 2002a.
40. Grootaert C, Bastelaer T. (Eds.) Understanding and measuring social capital: A synthesis of findings and recommendations from the social capital initiative. The World Bank: Washington, DC; 2002b.
41. Grootaert C, Narayan D, Jones V, Woolcock M. Measuring social capital: An integrated questionnaire. World Bank Working Paper No.18, The World Bank. Washington, DC; 2004.
42. Ellis F. Small-farms, livelihood diversification and rural-urban transitions: Strategic issues in Sub-Saharan Africa. Presented at the future of small farms, Withersdane Conference Centre, Wye, Kent, UK; 2005.
43. Berry S. No condition is permanent: The social dynamics of Agrarian Change in Sub-Saharan Africa, Madison, Wisconsin: University of Wisconsin Press; 1993.
44. Hart G. Gender and household dynamics: Recent theories and their implications, in Ellis, F (Ed.), Rural Livelihoods and Diversity in Developing Countries. Oxford: Oxford University Press. 1995;9.
45. Bryceson DF. The scramble in Africa: Reorienting rural livelihoods. World Development. 2002;30(5):725–739.

46. Carney D. (Ed.), Sustainable Rural Livelihoods: What Contribution can we Make? London: DFID; 1998.

47. Boli R. Livelihood assets of rural Kenyans. Final seminar paper in International Development Studies (IDS), University of Winnipeg; 2005.

48. Reardon T, Berdegué J, Barrett CB, Stamoulis K. Household income diversification into rural nonfarm activities. In S. Haggblade, P. Hazell, & T. Reardon (Eds.), Transforming the rural nonfarm economy. Baltimore, MD: John Hopkins University Press. 2006;115–140.
Available:http://papers.ssrn.com/abstract=184682

49. Reardon T, Taylor K, Stamoulis P, Lanjouw, Balisacan A. Effects of non-farm employment on rural income inequality in developing countries: An investment perspective. Journal of Agricultural Economics. 2000;51(2):266-288.

Appendix A. Summary of asset indicators and categories set by FGDs

Economic group	Local term	Indicators and estimates
Rich (or Better-off)	*Duuballua/qabaaxaamua*	Livestock size (3 or more milking cows, pair/s of oxen,) At least 1 cross breed cow Land size (up 8 *timad*), 1 or more *timad* rented in1–2 *timad enset* in his/her backyard (more mature ones) Coffee and eucalyptus tree (up to 1 *timad*) Educated family members. Having additional house in nearby town. Has a family member in South Africa or elsewhere. Modern residence (corrugated roofed) Known in qualities like hard work by the community
Middle	*Mereeraanchua*	1-2 milking cows, an ox, sheep/goat, chicken Up 4 *timad* land; Up 250 trees of *enset*; some coffee and eucalyptus trees Able to send his/her children to school and higher education Better housing condition
Poor	*Buxxichchua*	Up to 2 *timad* land, but half of it rented out One or more livestock raised on shared arrangement Small *enset* coverage (up 100, only immature) 1–2 chicken; works as daily labourer; PSNP beneficiary
Destitute	*Wee'nnaa buxxichchu*	No livestock, no *enset* (except very few and immature at his/her backyard, 1 *timad* and often rented out PSNP beneficiaries, socio-economically vulnerable groups such as low caste clan members, displaced and returnee households,

**Note: Timad is a local unit used to measure the size of farmlands. One timad is approximately 0.25 ha and 1 ha is approximately 4 timad. Source: Survey data (2016)*

Appendix B. The principal components and variance explained

Components	Initial Eigenvalues			Extraction Sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.865	**22.738**	22.738	3.865	22.738	22.738	3.127	18.396	18.396
2	1.883	**11.079**	33.817	1.883	11.079	33.817	2.163	12.726	31.122
3	1.411	**8.303**	42.120	1.411	8.303	42.120	1.688	9.928	41.051
4	1.285	**7.559**	49.679	1.285	7.559	49.679	1.408	8.282	49.333
5	1.181	**6.944**	**56.623**	1.181	6.944	56.623	1.239	7.290	**56.623**
6	.993	5.842	62.465						
7	.882	5.190	67.654						
8	.834	4.908	72.562						
9	.767	4.514	77.076						
10	.689	4.056	81.132						
11	.636	3.739	84.870						
12	.622	3.661	88.531						
13	.527	3.099	91.630						
14	.501	2.947	94.577						
15	.443	2.606	97.184						
16	.271	1.595	98.779						
17	.208	1.221	100.000						

Extraction Method: Principal Component Analysis.

Appendix C. Results of PCA: Varimax rotation factor matrix

	Components/factors				
	1	**2**	**3**	**4**	**5**
Family education	.211	.060	.016	**.574**	.041
Dependency ratio	-.220	-.274	-.183	**-.575**	-.110
Education status	-.078	.128	.122	**.811**	.051
Roofing	.114	-.409	**-.546**	.069	-.150
Dwelling size	.443	-.339	**.446**	.001	-.019
Enset crop diversity share	.114	**-.346**	-.049	.197	-.314
Eucalyptus tree value	.416	**.701**	.010	.057	-.113
Coffee value	.003	**.802**	.069	.070	-.162
Land size	**.610**	.525	.078	.000	.074
Ox ownership	**.807**	.053	.019	-.044	.000
Cross breed cows	**.628**	-.103	.065	.031	.059
Livestock ownership	**.839**	.176	.110	-.056	.021
Investments on farm inputs	**.588**	.113	.235	.106	-.005
Investments on durable assets	.225	.390	**.628**	.127	-.027
Institutional Membership	.147	-.152	-.367	.066	**.714**
Urban linkage	.025	-.058	.279	.035	**.737**
Transfer value	.304	-.139	**.371**	-.017	.003

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 9 iterations.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/23164