Econometric analysis of income diversification, savings and investment among smallholder vegetable farmers in dry land of northern Nigeria

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Abstract: The study was conducted to analyse the income diversification, savings and investment among small-scale vegetable farmers in dry land of northern Nigeria. A sample of 180 small-holder vegetable farmers were selected using multi-stage sampling technique. A structured questionnaire was adopted. Descriptive statistics, Regression analysis, and factor analysis were used for analysis. The results show that 97.2% of the farmers were males with a mean age of 48 years and mean household size is 12. The main livelihood is vegetable farming. Average propensity to save was found to be 18%. Logistic regression analysis revealed that educational status, income and membership of association of the farmers had significant (p<5%) influence on farmers' saving capacity. The results of poison regressions analysis on the income diversification revealed that farm sizes, farming experience, off-farm income as well as household size were positive and statistically significant at 1%, 5% 1% and 10 % respectively. The adjusted R^2 value and F-ratio for income diversification model was 81.5% and 88.8% respectively Major constraints to saving and investment capacity include risk of capital loss, high expenditure on consumption and social obligation, poor access to credit, lack of banks, and high administrative cost of saving institutions. Therefore, it is wise to encourage farmers to diversify their economic activities to earn more income enabling savings so as to cover their expenditure on consumption and social obligation. There is need to mitigate farmers through insurance scheme so as to cover the risk of capital loss.
Keywords: Income diversification, Savings, Investment, Expenditure, and Economy

INTRODUCTION

Income diversification with respect to agrarian livelihood is the process of switching from low value crop to higher value crop, livestock and other non-farm activities (Halliru, 2018). Diversification is seen as a source of income growth and thus a potential means of wealth creation and poverty reduction. The small holder farmers' motives for diversification as well as the opportunity available to them differs significantly across settings and income group (Abdulaziz and Nura, 2015). The income diversification, saving and investment of small holders farming sector is of utmost importance to the Nigerian economy. This is because of the income generated and the employment potential, instructive in them which set limits of the sector to the growth of the other sectors of the economy. Over the years many small holders farmers in Nigeria have increasingly became unable to finance their farming activities. These farmers according to Babatunde et al. (2007) are characterized by their engulfment in vicious cycle of poverty due to low productivity, low income, low savings, and low investment. It was further observed that this vicious cycle in the rural areas has been identified as one of the major factors impeding rapid economic development. Past effort at overcoming these problems were traced to lack of substantial income diversification, savings and easy access to credit facilities by farmers due to inadequate and inappropriate choice of a savings and investment plan. Odemenem et al. (2013) reported that one of the basic problems confronting the development of Agricultural sector in Nigeria could be attributed to inadequate savings and investment by the small-scale farmers. Despite this problem, policy makers have not really drawn up adequate and comprehensive rural saving scheme that will progressively encourage the farmers to diversified and invest their capital efficiently (Ogwanighie, 1997). A lot of research has been carried out on Income diversification, saving and investment potentials of small holders farmers in Nigeria but despite the quantum of researches in this area of study, there seems to exist dearth of empirical knowledge of the study in dry land of northern Nigeria.

The tendency for small holders farmers to engage in multiple occupations is often remarked, but also few attempts have been made to link this behaviour in a systematic way to Savings and investment. Therefore, this study attempts to contribute to knowledge by empirically analysing income diversification to saving and investment in dry land of northern Nigeria with reference to small holders farming household. Specifically, the study described the socioeconomic characteristics of small-holders farming households; described the income, saving and investment level of the farmers, estimate the determinants of small-holder's income diversification, analysed the factors that influenced savings behaviour among small-holders farmers and analysed constraints to savings and investment among the farming households.

METHODOLOGY

The study was carried out in dry land of northern Nigeria. The dry land of northern Nigeria falls within the coverage of north-west, north-east and north central region. The dry region of Nigeria lies between latitude 13^0 E, covering a land mass of 342,158km^2 or 85% of the total land area of Nigeria (FAO, 2001). The region has a population of about 42.6 million (FAO, 2001) and generally has a lower

precipitation with an annual rainfall of about 400-1140mm. This area is largely characterised by informal sector activities with agriculture as the major economic activity. Agricultural production is an important economic activity in the study area consisting of both crop and livestock production.

Multi-stage sampling techniques was used in selection of sample for the study with careful consideration of areas associated with security problems as well as accessibility. Firstly, three regions (i.e., north-west and north east and north central) that cover the dry land of northern Nigeria were considered and this forms the basis for stratification component of the study area. North-west covers seven states; north-east covers six states while north central also covers six states. The second stage also involved purposive selection of one State within each zone based on careful consideration of areas associated with security problems as well as accessibility. Jigawa, Gombe and Nasarawa were identified. Third Stage involved random selection of two Local government from each of the selected States. The local government selected were Hadejia and Dutse in Jigawa, Funnakaye and Billiri in Gombe and Nasarawa and Keffi in Nasarawa State The final stage was a random sampling of 30 Small-holders farmers from each of the selected LGAs to make up a total sample size of one hundred and eighty (180) respondents.

Descriptive statistic including frequency, means and percentage was used to describe the socioeconomic characteristic of the famers. Logistic regression was used to determine the socioeconomic factors that influence farmer's attitudes to save in the study area, poison regression models to analyse factors influencing household income diversification and also factor analysis was used to determine the factors that militate against saving and investment of small-holders vegetable farmers in the study area.

Logit Regression Model

$$Sav = \beta_0 + \beta_1 Age + \beta_2 Edu + \beta_3 HHZ + \beta_4 Income + \beta_5 Mberass + U \dots (2)$$

Where:
Sav = (sav =1 if farmer saved, 0 if other wise)
β_0 = Constant
β_1. β_5 = the coefficient of explanatory variables
Age = (Years)
Edu = Education Status (Years)
HHZ = Household size (Number)
Income = Income level (Naira)
Mbrass = Membership of association (Member =1, 0 otherwise)
U = Error terms

Poisson Regression Model

Application of poison regression model has been popular especially for continues count dependent variables.

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 \dots + \beta_k X_k + U$$

where:
Y = Number of income generating activities by the household
X_1 = Age of the Farmer (years)
X_2 = Access to credit (1= access and 0 = No access)
X_3 = Education (years)
X_4 = Farm Size (ha)
X_5 = Household size (Number)
X_6 = Farming experience (years)
X_7 = Savings pattern (1= formal and 0 informal)
X_8 = Off- farm income
β_o = Slop or intercept
$\beta_1 - \beta_{10}$ = parameters to be estimated,

Factor analysis

Factor analysis is a generic name used to describe a number of techniques that are used to decompose a correlation matrix when strong assumptions are made about the nature of variation in the variables of the data set (Farinde and Alabi, 2015). Factor analysis is applicable when there is a systematic interdependence among a set of observed variables (Kothari, 2003). This technique allows the researcher to group variables into factors (based on correlation between variables), the meaning and name of such new variable is subjectively determined by the researcher. The principal factoring with iterations and the orthogonal rotation method with Varimax solution adopted by Nwibo and Mbam (2013) were used. The Kaiser rule of thumb of 0.4 as a minimum point factor can be accepted as used by Ashly and Anthony (2006), Nwibo and Mbam (2013). This rule according to Vincent (1997), as cited by Oloruntoba (2002) state that the number of factors retained should be equal to the number of Egenvalues which are equal to or greater than one. However, all factors having an Egenvalues of one or more will be retained as used by Olurontoba (2002), Nwimbo and Mbam (2013). The model is generally specified as follows

$$X_{1, i} = \ell_1 F_1 + \ell_{1,2} F_2 + \ell_{1,3} F_3 + \dots + \ell_{1,m} F_m + e_1 \dots (3)$$
$$X_{2, i} = \ell_2 F_1 + \ell_{2,2} F_2 + \ell_{2,3} F_3 + \dots + \ell_{2,m} F_m + e_2$$
$$X_{n, i} = \ell n F_1 + \ell_{n2} F_2 + \ell_{n,3} F_3 + \dots + \ell_{nm} F_m + e_n$$

Were
F = unobserved variable (factors)
X = Observed variable
ℓ = factor loading
e = error terms

RESULT AND DISCUSSION

Socioeconomic characteristics

A socioeconomic characteristic result in Table 1 indicated that 97.2% of the farmers were males with a mean age of 48 years. This result implies that majority of the farmers falls within their active age. It could therefore be assumed that they would be rational in making decisions and choices regarding their farm responsibilities. Age classification is relevant to this study in that physical ability and productivity depend on age and this is expected to

influence savings and income diversification positively or negatively. Mean household size was 12 persons. Classification of family size is relevant to this study because income and expenditure depends on the number and type of people in the family who are economically active. With respect to saving this finding could mean that there was less saving and because the Average dependency ratio is high and positive (0.67). It can be assumed that food expenditure and non-food expenditure increase with increase in household size, and this could reduce the saving and Investment capacity of the farmers. This is supported by Haruna, (2011) who reported that high dependency ratios or so many dependents indicate more consumption expenditure and hence lesser saving. This result also is in line with findings of Yinusa, (1991) who found an inverse relationship between Savings and the Household size in a study of housed hold size in Kaduna State. The average farm size was 2 hectares. Farming alone (46.1%) was the major occupation for the farmers with most of them having a farming experience of 24 years on the average. However, 91.7% of the farmers acquired land by inheritance this supported by Mamman *et.al.,* (2017) who reported that land acquisition by inheritance serve as a major source of land ownership in rural farming community.

Table 1a: Socioeconomic characteristic of the smallholder farmers, n=180

Variables	Frequency	Percentage	Mean
Gender			
Male	175	97.2	
Female	5	2.8	
Educational Status			
Qur'anic	73	40.6	
Primary	56	31.1	
Secondary	45	25.0	
Tertiary	3	1.7	
Adult Education	3	1.7	
Age (Yrs)			
25-37	23	12.8	48
38-49	86	47.8	
50-61	57	31.7	
62-73	9	5.0	
74-85	5	2.8	
Household size (no.)			
02-10	81	45.0	12
11-18	89	49.4	
19-26	7	3.9	
27-34	2	1.1	
35-42	1	0.6	
Number of Dependent(no.)			
01-05	59	32.8	8
6-10	100	55.6	
11-15	16	8.9	
16-20	2	1.0	
21-25	3	1.7	
3.26-4.00	3	1.7	
Farm Size (Ha.)			
0.25-1.00	60	33.3	2
1.01 -1.75	1	0.6	
1.76-2.50	97	53.9	
2.51-3.25	19	10.6	
3.26-4.00	3	1.7	

Table 1b: Socioeconomic characteristic of the smallholder farmers

Main Occupation		
Farming/ public servant	32	17.8
Farming alone	83	46.1
Farming/ Trading	13	7.2
Farming/ Fishing	23	12.8
Farming/ Livestock rearing	14	7.8
Farming/ Artisanship	7	3.9
Farming/Agro processing	8	4.4
Land Tenure System		
Inherited	165	91.7
Purchased	9	5.0
Hired	2	1.1
Family land	4	2.2
Total	**180**	**100**

Source: Survey Data, 2015

Saving, income and investment level of the Small-holder vegetable farmers

The result for income distribution of the smallholder vegetable farmers is presented in Table 2. The sum of average income of the farmers from both farm and off farm income were ₦254,971 and ₦54,141.92 respectively. Considering the categories of their source of income this result further showed that tomato farmers with vegetable/arable crop farming had higher average farm income (₦215518.19). The implication of this finding is that income from farm may likely affect their savings rate and investment in profitable ventures or farms if properly managed. This result is in conformity with the findings of Nayak (2013) who reported that rural families earn their livelihood from agriculture, petty trading and daily wage working. The average annual saving by the small-holders vegetable farmers was ₦55935.47. The result further showed the saving by various categories of the farmers. Vegetable farmers that involve themselves in vegetable farming/ fishing have the highest average saving (₦83819.49). The average saving of farmers is low if compared with the finding of Jalo (2015) who reported that average saving of cooperative farmers in Adamawa State is ₦210000.The result goes in line with finding of Osaka (2006) in his analysis of saving and investment behaviour of farmers in Kaduna State. The implication is that the saving capacity of the respondent in the study area is low. This may be due to the socioeconomic characteristic of the respondent among others. These agreed with report from Mora (1994) that the smallholder farmers are characterised by their engulfment in vicious cycle of poverty due to low productivity, low income, low savings, and low investment. The average propensity to save was 0.18 implying that 18% of the total income was saved while 82% of their income were either consumed or invested. This result shows that there is propensity to save in the study area.

Table2. Saving and Income Level of smallholder Vegetable farmers

Source of Income	Average Farm Income (₦)	Average off farm Income (₦)	Average Saving (₦)	Average Propensity to Save (APS)
Farming/ public servant	61927.27	129318.18	51584.25	0.27
Vegetable farming alone	168518.17	0	49518.23	0.29
Vegetable / Arable crop farming	215518.17	0	63811.32	0.30
Vegetable /fish farming	313515.17	90356.31	83819.41	0.38
Vegetable/ Livestock rearing	133561.50	42500.0	56915.31	0.32
Vegetable/ Commodity marketing	83519.60	56818.94	45318.56	0.32
Vegetable farming/Agro processing	803519.60	60000.00	40581.20	0.28
Total Average	1780079.48	378993.43	391548.28	0.18

Source: Survey Data, 2015

The analysis of the investment pattern of the smallholders' vegetable farmers as presented in Table 3 showed that about 68.3% and 48.3% of the farmers invested in livestock and supporting crop production respectively. Investment in non-agricultural sector was found to be 42.2% while investment in farm input is 8.9%. The reason given for the high proportion of investment in livestock production is the availability of space, Agricultural bye-products and proximity with Agricultural farmlands by the farmers which motivate them to keep livestock either as a means of hedging against unforeseen circumstances or a planned saving strategy of earning a lump sum income. Investment

in purchase of Agricultural land and farm equipment (water pump, hose and plough) are the only capital investment by these farmers. The low proportion of these investment may be attributed to their level of operation, which is very low, they are mostly cultivating in small area of land. Also, investment in those aspects is expensive and most of them cannot possibly afford the equipment and since they are not frequently purchase and their benefits are spread across different production season. The implication of this finding is that investment in this study area conforms to investment pattern of peasant farmers which is purchase of livestock and supporting production of other crop which would possibly increase their volume of saving and consequently their investment capacity.

Table 3: Investment pattern of small-holders' farmers, n=180

Areas of Investment	Frequency	Percentage
Livestock production	123	68.3
Farm equipment	43	23.8
Agricultural land	9	5.0
Farm Inputs	16	8.9
Non-agricultural sector	76	42.2
Growing other crops	87	48.3

Source: Survey Data, 2015
*Multiple responses recorded

Factors influencing small-holders income diversification among vegetables farmers

The output of the Income diversification model is presented in Table 4. The results indicated that the coefficient of determination (R^2 Adjusted) was 0.629 which signified that 62.9% of total variation observed in the dependent variable was explained by the explanatory variables (age, Access to credit, educational level, farm size, household size, farming experience, saving pattern and non-farm income) included in the model. The remaining 37.1% can be attributed to error in specification and other factors not included in the model. The fitness of the model was further confirmed by the low value of the standard error of estimate (Std. error = 0.10703). Again, the overall significance of the model was depicted by the F-statistics which was significant at 1% level. Age was significant at 10% ($p < 0.1$) and has a negative influence. This is in line with a priori expectation. As farmers grow old, there is tendency to reduce farm investment as their ability to cope with various farm operation diminish. This finding was not consistent with findings of Nwibo and Alimba (2013) who reported that age has a positive relationship with agribusiness investor decision to invest. However, the finding was in conformity with the findings of Bamire (2005) who found that age to be inversely related to the probability of one in farm investment. Farm size was found to be positively related to income diversification at 10% ($p < 0.1$) level of significant, this signified that the larger the farm size the more the value of output and the more the income source will be diversified. Farming experience was also positive and significantly related to income diversification of the farmers. This result agrees with a *priori expectation*, because farmers with good farming experience are expected to be conversant with appropriate timing and execution of farm operation, efficient resource utilisation which can increase income generation ability and diversified their income sources. Various authors (Babatunde *et al.,* 2007, Kibet *et al.,* 2009, and Osundare, 2013) have reported similar findings in related studies. Incomes from off-farm activities is positively signed and statistically significant at 5% ($p < 0.05$) level. The result implies that increase in off-farm incomes of the farmers will bring about increase in small-holders income diversification. Hence an increasing income will result to surplus that can be saved after expenditure has been made. This concurs with studies of Amanze, Ezeh and Okoronkwo (2015) who reported off-farm income as an important parameter that contribute substantially to rural livelihood.

Table 4: Poison Regression Estimates of factor influencing Small-holders Income Diversification

Variables	Coefficient	Standard Error	T-value	Tolerance	V.I.F
Constant	1.109	0.473	2.343 NS	-------	---------
Age	-0.289	0.152	-1.894 *	0.440	2.273
Access to credit	0.026	0.040	0.643 NS	0.884	1.185
Educational Level	0.009	0.081	0.107 NS	0.840	1.190
Farm size	0.093	0.052	1.784 *	0.963	1.038
Household size	0.098	0.076	1.290 NS	0.716	1.396
Farming experience	0.381	0.114	3.347 ***	0.475	2.107
Savings pattern	0.328	0.093	3.533***	0.976	1.024
Non-farm income	0.102	0.042	2.412 **	0.988	1.044
R^2	0.646				
R^2 Adjusted	0.629				
F- Statistic	38.974***				

Source: Survey Data, 2015
*Significant at 10%, **Significant at 5% level, ***Significant at 1% level, NS =Not Significant.

Socioeconomic factors influencing saving attitude among small-holders vegetable farmers

The logistic regression in Table5 established the link between small-holders vegetable farmers' socioeconomic characteristic and saving attitude in the study area. The variables included in the model were age, educational status, household size, farmer's monthly income and membership of association. The result of logistic regression as shown in Table 2indicatedthat the R^2 Cox and Snell and R^2 Nagelkere were 0.252 and 0.341 respectively which signified that 25.2% and 34.1% variance observed in the model is attributable to the independent variables. The fitness of the model was further confirmed by the chi-square (x^2) value of 52.2 with which was significant at 1% probability level. However, the result in Table 4 revealed that educational status, income and membership of association of the farmers were significant at 5% level of probability. The Educational level influenced saving practice implying that having any form of education accounts for ability to manage their finance, because an educated person is more enlightened, easily adopt new ideas, manage resource and hence could be a better producer. This is in conformity with view of Adeyomo and Bamire, (2000) who ascertained that educational status improved quality of labour and has positive influence on saving and investment decision for improve production and increased income.

The income of the farmers influenced saving practice decision thus showing that income has a direct and positive impact on saving practice decision. This positive relationship between income and saving attitude meant that availability of income enhanced farmers' ability to save and invest. This is in line with the view of Panickar (1992) that the ability to save depends on the level of income other things being the same. Membership of association also influenced saving attitude. This implies that being in any group or association will enhance farmer's attitude to save because one of the important economic obligations of members of association or cooperative society is saving. Most farmers join cooperative society or association in order to be able to Pool their resource together as savings and also to obtain needed inputs (Babatunde *et al.*, 2007).

Table 5 Socioeconomic Factors influencing saving behaviour

Independent variables	B	S.E	Wald	DF	Sig	Exp(B)
Age(years)	0.495	0.665	0.555	1	0.456	1.641
Educational Status	1.034	0.389	7.051	1	0.008s	2.812
Household size	0.483	0.752	0.412	1	0.521	1.620
Income	0.859	0.385	4.972	1	0.026s	2.361
Membership of association	1.240	0.406	9.332	1	0.002s	3.455
Constant	-2.015	0.736	7.497	1	0.006s	0.133

Source: Survey Data, 2015 n=180 s=Significant
X^2 = 52.191 df = 5 R^2 Cox and snell= 0.252 R^2 Nagelkere= 0.341

Constraints of saving and investment capacity

In order to determine the Constraint of saving and investment capacity of small-scale tomato farmers in the study area, factor analysis was used. The principal factoring with iterations and the orthogonal rotation method with varimax solution adopted by Oloruntoba (2012) and Nwibo (2013) was used. A saturation level or cut-off of 0.4 as used by Nwibo (2013) was set for the study. The Kaiser Rule- of- thumb for final factor identification was also used. This rule according to Vincent (1971) states that the number of factors retained should be equal to the number of Eigen values. This value must be equal to or greater than one. In Table 6, it

was observed that out of 13 variables (possible problems), 11 variables have loading of >0.4 while the remaining 2 variables failed to meet the cut-off level (0.4) set for the study. The underlying constraint militating against saving and investment capacity are grouped under four (4) factors. The factors are financial, administrative, specific personal and social Factor.

Based on the factor loading shown in Table 5 the following financial factors were extracted. Risk of capital lost (0.95), High consumption expenditure (0.93), High expenditure on social obligation (0.95) and poor access to credit (0.84) these are the major financial constraint that affect saving and investment capacity in the study area. This result implies that farmers in the study area still have the traditional old perception that, their money is not safe when saved in both formal and informal forms. The reason is the fear that people may abscond with the money saved, Thieves may enter their homes and steal their savings, Bank collapse, liquidation, and also the fear of generating low return from farm are other reasons. Farming was still not viewed as a business in the study area by farmers since farms operated as business should be capable of generating sufficient revenue for the farm and the farming family. The finding agree with the finding of Osaka (2006) who observed that due to the peasantry nature of the rural farmers of northern Nigeria the returns to farming was low thus, contributing to the low savings and investment habit. Again, Yarron *etal*. (2007) reported that low saving and low investment of farmers are as a result of high marginal propensity to consume. The result equally reveal that the administrative constraint to saving capacity of tomato farmers base on Kaser loading were lack of Banks branches (0.53) and high administrative cost by saving institutions has greatly been a bane for farmers to save. Non availability of banking institute in the study area made it difficult for farmers to have access to banks and also it will be difficult to farmer to travel far distances to save the money in organised financial institution. The other major constraint identified is specific personal status constraint, the saving and investment capacity of the farmers were constraint by low literacy level (0.601), poor market outlet (0.831) and lack of agent for collection. The low literacy level of the farmers as justified from this and the earlier findings on their socioeconomic status indicated that this education status has negatively shaped the saving and investment habit of the respondent. Social constraint, the saving and investment were constraint by inadequate information (0.93) and high input cost (0.480).

Table 6: Varimax Rotated Factors Matrix on Constraints to saving and investment capacity of small-scale tomato farmers in Jigawa State.

S/N	Variables	Factor 1 Financial constraint	Factor 2 Administrative constraint	Factor3 Specific personal status constraint	Factor4 Social constraint
1	Risk of capital lost	0.950	-0.109	0.108	-0.051
2	High consumption expenditure	0.933	-0.025	0.122	-0.003
3	High expenditure on social obligation	0.954	-0.023	0.088	0.008
4	Low literacy level	0.244	-0.007	0.601	0.079
5	Poor market outlet	0.028	-0.008	0.831	-0.102
6	Lack of Agent for collection	0.150	-0.059	0.875	-0.117
7	Lack of bank branches	0.584	0.698	0.094	0.131
8	High administrative cost	-0.136	0.926	-0.098	-0.099
9	Inadequate information	-0.162	-0.039	-0.059	0.932
10	Poor access to credit	0.808	-0.033	0.088	-0.230
11	High Input cost	-0.747	0.098	-0.108	0.480

Source: Survey Data, 2015

CONCLUSION AND RECOMMENDATIONS

The study revealed that most of the farmers had informal education, majority were male. vegetable farming alone is the main occupation. The educational status, monthly income and membership of association of the farmers positively influenced farmers' saving attitude. Also farm sizes, farming experience, off-farm income as well as household size positively influence income diversification. Major constraint militating against saving and investment capacity of the farmers include risk of capital lost, high expenditure on consumption and social obligation, poor access to credit and lack of banks branches. To overcome these observed constraints, farmers should be encouraged to diversify their economic activities to earn more income to be able to increase their saving, cover their expenditure on consumption and social obligation. This can be achieved through creation of enabling socioeconomic environment that will generate employment opportunity for farming household. There is need to mitigate farmers through insurance scheme so as to cover the fear of capital lost. Private lending institution should be encouraged to open in rural areas of the State or creating mobile banking programme so as to render

their mandate to farmers in order to break the problem of lack of bank branches and lack of agent for collection in the study area.

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