Journal of Agricultural Sciences https://doi.org/10.2298/JAS1902203S
Vol. 64, No. 2, 2019 UDC: 631.15(669)
Pages 203-214 Original scientific paper

THE EFFECT OF SUSTAINABLE LAND MANAGEMENT TECHNOLOGIES ON FARMING HOUSEHOLD FOOD SECURITY IN KWARA STATE, NIGERIA

Shehu A. Salau[*], Robiu O. Aliu and Nofiu B. Nofiu

Department of Agricultural Economics and Extension Services,
College of Agriculture, Kwara State University, Malete, Nigeria

Abstract: Nigeria is among countries of the world confronted with the food insecurity problem. The agricultural production systems that produce food for the teeming population are not sustainable. Consequently, the use of Sustainable Land Management (SLM) technologies becomes a viable option. This study assessed the effect of SLM technologies on farming households' food security in Kwara State, Nigeria. A random sampling technique was used to pick 200 farming households for this study. The analytical tools included descriptive statistics, Shriar index, Likert scale, food security index and logistic regression analysis. The results indicated that the average age of the respondents was 51.8 years. The food security index showed that the proportions of food secure and insecure households were 35% and 65% respectively. The binary logistic regression revealed that SLM technologies were one of the critical determinants of food security. An increase in the usage of SLM technologies by 0.106% raised food security by 1%. Other important factors that were estimated included farm income, family size, gender and age of the household head. To reduce the effects of food insecurity, the effective coping strategies adopted by the respondents were reduction in quantity and quality of food consumed, engaging in off-farm jobs to increase household income and using of money proposed for other purposes to buy foods. Governments at all levels should encourage the adoption and use of SLM technologies through both print and electronic media. Policies and strategies towards reducing the household size should be vigorously pursued to reduce food insecurity.

Key words: agricultural practices, coping strategies, farming households, food security, SLM technologies and logistic regression.

[*]Corresponding author: e-mail: talk2salaushehu@yahoo.com

Introduction

Food is the key to life. It represents a large part of typical Nigerian household expenses. Thus, food security is critical to any country of the world. Food security occurs when all people, at all times, have physical, civic and financial means to provide adequate, safe and nourishing food that satisfies their dietary requirements and food choices for an energetic and beneficial life (FAO, 2005). Food insecure and secure households are those whose food intake falls below and above their minimum calorie requirements respectively.

In spite of the available resources and the efforts made by governments at different times, food insecurity remained one of the most significant challenges to Nigeria's economic development (Ifeoma and Agwu, 2014). The cost of food insecurity is substantially high. The poor performance of the agricultural sector deepens the food security problem of the country. Thus, it becomes more pertinent to increase the productivity of the sector. The agricultural sector is expected to create foods for the people. The agricultural production technologies and practices adopted to a greater extent determine whether a farmer will be food secure or not. Knowing the best technologies and practices to achieve this goal is significant (Branca et al., 2013). The disadvantages of the dominant model of agricultural intensification include the increased use of capital inputs and problems of economic feasibility (IAASTD, 2009). Consequently, concern is given to the alternative method of intensification such as the use of SLM technologies. SLM technologies refer to practices and technologies that relate to the management of land, water, biodiversity, and other resources to meet human needs without endangering the ecosystems. The adoption of SLM technologies can lead to improved soil texture and structure as well as it can raise the activity of soil flora and fauna (World Bank, 2006; Pretty, 2011). It can also make farmers less vulnerable to climatic risks. Many studies (Ahmed et al., 2016; Amaza et al., 2008; Omonona et al., 2007; Babatunde et al., 2007) have been carried out to investigate factors influencing food security of households. However, none of these studies have assessed the effect of SLM technologies on household food security. Thus, this study measured food security status, assessed the effect of SLM technologies on food security and described the reliable coping strategies used by the respondents to reduce the effect of food insecurity.

Materials and Methods

Area of study

The study area was Kwara state. The latitude and longitude of the state are: 8º and 10º north and 3º and 6º east respectively. The state has an area of 35,705 sq kilometers with a population of 193,392,500 people (NPC, 2016). To the west, Kwara state shares the international boundary with the Republic of Benin and to the north, the interstate boundaries with Niger state. It also shares boundaries with Oyo, Osun and Kogi states to the southwest, southeast and east respectively (Figure 1).

The climate consists of both wet and dry seasons each lasting for nearly six months. The raining season starts in April and ends in October while the dry season commences in November and stops in March. Temperatures range from 33°C to 34°C, with the total annual rainfall of about 1,318mm. The main occupation of the people is agriculture. The common crops grown are cassava, millet, maize, okra, sorghum, beniseed, cowpea, yam, sweet potatoes, and palm tree. The state has about 1,258 rural communities and the rural dwellers are the majority. Based on ecological characteristics, cultural practices and project administrative convenience, the state is categorized into four zones by Kwara state Agricultural Development Project (KWADP). These are: Zone A: Baruteen and Kaima Local Government Areas (LGAs); Zone B: Edu and Patigi LGAs; Zone C: Asa, Ilorin East, Ilorin South, Ilorin West and Moro LGAs and Zone D: Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke-Ero LGAs (KWADPs, 2010).

Figure 1. Map of Kwara state, Nigeria.
Source: Adapted from Ibiremo et al. (2010).

Results and Discussion

Method of data collection and sampling

Primary data were gathered using a structured interview schedule. A three-stage random sampling procedure was adopted for this study. Two out of the four

ADP zones were randomly selected in the first stage. This was followed by a proportionate selection of 20 villages from the two selected zones. Lastly, ten farming households each were picked randomly from the chosen villages to make a total of 200 farming households as shown in Table 1. The state has about 185,000 farm families (KWADPs, 2010).

Table 1. Village distribution in the zones.

Zones	Village distribution	Sampled villages	Sampled households
Zone B	237	7	70
Zone C	483	13	130
Total	720	20	200

Analytical framework

The tool of analysis comprised: descriptive statistics, Likert scale, food security index and logistic regression. The socio-economic features as well as the effective critical strategies adopted by respondents were explained using descriptive statistics. The respondents were further grouped into food secure and food insecure households using food security index. The index is stated as follows:

Fi = Per capita food expenditure for the i^{th} household divided by 2/3 mean per capita food expenditure (MPCFE) of all households;

where Fi = Food security index,

when Fi > 1 = Household is food secure, and

Fi < 1 = Household is food insecure.

A situation where the per capita monthly food expenditure (PCMFE) of a household is larger or equal to two-thirds of MPCFE the household is food secure. On the other hand, a food insecure household is a situation where the PCMFE is smaller than two-thirds of MPCFE (Omonona et al., 2007). The proportion of food secure/insecure households was estimated using the headcount ratio (H) as follows:

$$H = \frac{M}{N} \quad (1)$$

Headcount ratio $(H) = \frac{M}{N}$,

where M = Proportion of food secure/insecure households, N = Proportion of households in the sample.

To ascertain the effect of SLM technologies on household food security, a binary logistic regression model was employed.

The model is stated as:

$$Z = m_o + m_1X_1 + m_2X_2 + \ldots + m_kX_k + u, \quad (2)$$

where Z = Explained variable,

mo = Constant,
$m_1, m_2, \ldots, m_k$ = Coefficients,
X = Explanatory variables,
K = Number of explanatory factors,
P = Probability,
u = Error term.
The explanatory factors are:
X_1 = SLM technologies which were measured using Shriar index (2005),
X_2 = Estimated farm income (₦),
X_3 = Number of years of schooling (years),
X_4 = Household size (adult equivalent),
X_5 = Co-operative membership; (COOP) (Yes=1; No=0 for COOP),
X_6 = Sex of household head (D=1 for male; D=0 for female),
X_7 = Age of the respondents (years).

Estimation of Shriar index

Table 2 shows the different SLM technologies, the scale ranges and their associated weights.

Table 2. SLM technologies employed.

SLM technologies	Scale range	Weight	Max. points
Agronomy			
Cover crops	0–3	3.5	10.5
Intercropping	0–3	3.0	9
Organic fertilizer			
Compost	0–1	3.0	3
Animal and green manure	0–1	3.0	3
Min. soil disturbance			
Minimum tillage	0–3	2.5	7.5
Mulching	0–1	3.0	3
Water management			
Terraces	0–1	3.0	3
Water harvesting	0–1	3.0	3
Agroforestry			
Trees on crop land	0–1	2.0	2
Fallowing	0–1	2.0	2
Total			46

Adapted from Salau et al. (2011).

Table 2 shows that not all the farming activities could justify 0–3 scaling. From all the activities, the maximum attainable point was 46. The SLM index is given as:

$$SLM = \sum_{j=1}^{10} S_J W_J \qquad i=1 \ldots N \ldots\ldots\ldots\ldots\ldots (3)$$

where:

SLM = Sustainable Land Management technology index for the i^{th} household,
S = Scale range for the activities employed by the i^{th} household, and
W = Weight of the activities used by the i^{th} household.

If a household is engaged in any activity, it gets point 1 and 0 otherwise. The scale range of 0–3 suggests that if the household is engaged in the activity and if so, it does so at low (1 point), medium (2 points), or high (3 points) scale. This classification was based on the percentage of the total area cultivated on which the strategy was employed. Production practices like the use of legumes are more endurable and so attracted the highest weighting of 3.5 (Salau et al., 2011). Intercropping with other crops besides legumes takes the value of 0, for no, and 1 (low), 2 (medium) and 3 (high) levels of activity respectively. The scale range of organic fertilizer application, water management, agroforestry and mulching starts from 0 to 1 – zero for no activity, and 1 if used. The scale of minimum tillage takes the value of 0 for no activity, and 1, 2 and 3 for the use of tractor, animal traction and hoes/cutlass respectively.

To identify the effective coping strategies, a three-point Likert scale was employed. The response options and values assigned were as follows: very effective = 3; effective = 2; and not effective = 1. These values were added and divided by 3 to obtain the mean (2.0). Strategies with mean scores greater and lower than 2.0 will be regarded as effective and not effective respectively.

Socioeconomic characteristics of respondents

The majority (94.5%) of the respondents were males. Based on the culture and tradition of the people, the male respondents usually had more access to farmland when compared with the female respondents. The mean age of the respondents was 51.8 years. This implies that most of the respondents were aged. Age is a critical variable which can affect the ability and agility with which the head meets the food needs of the household. An old household head is more likely to have a larger family size and may lack the energy required to work for the upkeep and sustenance of the family (Table 3).

About 35% of the household heads had access to credit facilities from cooperative societies. Access to credit facilities may affect the type of food eaten and expenses of households. A large (62.5%) proportion of the household heads were literate. Hence, the respondents are supposed to be able to take good decisions which will likely enhance their food security status (Babatunde et al., 2007). The respondents operated at a subsistence level with a mean farm size of 1.5 hectares. The size of farmland cultivated may affect production and food security of the respondents (Akinsanmi and Doppler, 2005). Furthermore, the study revealed that most (62.5%) respondents received between ₦50, 000 and ₦100, 000 monthly from agricultural and non-agricultural related jobs respectively.

Table 3. Socioeconomic characteristics of the respondents.

Variable	Frequency	Percentage	Mean
Age			
1–30	27	13.5	
31–60	104	52.0	
61–90	69	34.5	51.8
Gender			
Male	189	94.5	
Female	11	5.5	
Level of education			
No formal education	75	37.5	
Primary	55	27.5	
Secondary	50	25.0	
Tertiary	18	9.0	
Postgraduate	2	1.0	
Marital status			
Single	25	12.5	
Married	174	87.0	
Divorced	1	0.5	
Household size			
1–5	71	35.5	
6–10	79	39.5	6.84
11–15	43	21.5	
16–20	7	3.5	
Primary source of income			
Agriculture	119	59.5	
Salary	61	30.5	
Trading	20	10.0	
Cooperative participation			
Yes	69	34.5	
No	131	65.5	
Estimated monthly income			
50,000–100,000	125	62.5	
101,000–150,000	49	24.5	
151,000–200,000	21	10.5	64,000
201,000–250,000	5	2.5	
Farm size (hectares)			
1–5	113	56.5	
6–10	68	34.0	1.59
11–15	11	5.5	
16–20	6	3.0	
21–25	2	1.0	

Source: Field survey, 2018.

Food security status of farming households

The calculated MPCFE was ₦4219.787. Households whose per capita food expenditure fell below and above ₦4219.787 were designated food insecure and food secure households respectively. Hence, 35% and 65% of the farming households were food secure and food insecure respectively (Table 4).

Table 4. Household food security status.

Variables	Mean		
	Food secure	Food insecure	All
2/3 mean per capita food expenditure was ₦4219.787			
Proportion of households	35.0	65.0	100
Number of households	70	130	200
Head count ratio (H)	0.35	0.65	

Source: Field survey, 2018.

Factors influencing food security of households

The result indicated an R^2 value of 48.1%. This suggests that about 50% of the total variation in the explained variable was accounted for by the explanatory variables. Factors influencing food security were the adoption of SLM technologies, estimated farm income, family size, gender and age of the household head (Table 5).

Table 5. Effects of SLM technologies on food security.

Food security	Coefficient	Std. Error	Sig.
SLM technologies	.106	.018	.000***
Estimated farm income	.000	.000	.003***
Level of education	-.001	.031	.982
Household size	-.310	.092	.001***
Cooperative participation	-.007	.466	.987
Gender	-.961	.523	.066*
Age	-.048	.023	.032**
Constant	-2.877	1.330	.030**

Source: Field survey, 2018; *, **, *** significant at the 1%, 5% and 10% levels respectively.

The coefficient of SLM technologies used was positive and critical at the 1% level. This suggests that the adoption of SLM technologies was an important factor influencing food security in the study area. An increase in the usage of SLM technologies by 0.106% raised food security by 1%. The higher the percentage of SLM technologies adopted, the larger the chance of being food secure. Estimated income is also significant at the 1% level. This implies that the higher the income of the households, the more secure the household is. These findings agree with those of Amaza et al. (2008) and Ifeoma and Agwu (2014). Household size was negative and it was also important at the 1% level of probability. This suggests that larger households may be food insecure. This finding agrees with those of Tilksew and Beyene (2012) and Ifeoma and Agwu (2014). Age of respondents was important at the 5% level, but it had a negative relationship with food security. This indicates that the young respondents were more food secure when compared with the aged ones. An old household head was more likely to have larger household size and may lack the energy required to work for the upkeep and sustenance of the households. Sex of the household head was also negative and important at the 5% level of probability. This suggests that female-headed households may be more food secure than their male counterparts. Surprisingly, education and cooperative participation were not the factors that influenced food security in the area.

Coping strategies employed by households

The most effective coping strategies adopted by respondents to reduce food insecurity included: reduction in quality of food eaten (M=2.06), consuming less preferred foods (M=2.09), using money budgeted for other uses to purchase foods (M= 2.14), doing off-farm jobs to raise income (M=2.12) (Table 6).

Table 6. Coping strategies adopted by the respondents.

Coping strategy	Mean	Std. deviation
Eating less preferred foods	2.09*	0.602
Lowering the quality of food intake	2.06*	0.696
Lowering the quantity of food intake	1.76	0.752
Borrowing food from friends and relatives	1.76	1.049
Borrowing money to purchase food	1.81	0.748
Mothers lowering their food intake for their children to eat enough	1.65	0.591
Avoiding one or two meals per day	1.60	0.666
Avoiding consuming food for one day	1.45	0.640
Engaging in prostitution and theft	1.51	0.626
Leaving children to cater for themselves	1.59	0.595
Lowering the number of people consuming food in the household	1.40	0.576
Consuming wild food	1.46	0.625
Income diversification	1.67	0.585
Asking for food on streets	1.58	0.613
Disposing assets	1.51	0.610
Distress migration	1.40	0.625
Consuming less expensive foods out of home	1.74	0.636
Doing off-farm jobs to raise income	2.12*	0.689
Purchasing meals on credit	1.72	0.778
Using funds budgeted for other uses to purchase food	2.14*	0.735
Depletion of stores	1.55	0.632

Source: Field survey, 2018; * effective coping strategies.

This finding agrees with the results of Haile et al. (2005), who have opined that engaging in off-farm and non-farm jobs is necessary for diversification of household income. Other strategies are borrowing food from friends and relatives (M=1.76), borrowing money to purchase food (M=1.81), purchasing food on credit (M=1.72), and lowering the number of people eating in the household (M=1.40). According to Ifeoma and Agwu (2014), household assets could be disposed to purchase food in times of adversity, crop failure and other eventualities.

Conclusion

This study assessed the influence of SLM technologies on household food security in Kwara state, Nigeria. The study indicated that 35% and 65% of the respondents were food secure and food insecure respectively, with an average age of 51.8 years. Furthermore, the adoption of SLM technologies was found to be significant in explaining food security of households in the state. An increase in the usage of SLM technologies by 0.106% increased food security by 1%. Other important determinants estimated were farm income, household size, gender and age of the household head. Moreover, reduction in quality of food consumed, engaging in off-farm jobs to raise income and diversion of funds budgeted for other uses to purchase foods were some of the effective coping strategies used by the respondents in reducing the effects of food insecurity. Consequently, it is recommended that the adoption and use of SLM technologies should be encouraged at local, state and federal levels by sensitizing farmers on the significance of SLM technologies through print and electronic media. Policies and strategies aimed at reducing household size should be formulated and implemented to reduce food insecurity.

References

Ahmed F.F., Eugene, C.E., & Abah, P.O. (2016). Analysis of food security among farming households in Borno State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences, 1* (1), 130-141.

Akinsanmi, A. & Doppler, W., (2005). Socio-economic and food security of farming families in Southeast Nigeria. Paper presented at Tropentary, 2005, Conference on international agricultural research and development. University of Honhentiem, Stuttgart, Germany.

Amaza, P.S., Adejobi, A.O., & Fregene, T., (2008). Measurement and determinants of food insecurity Northeast Nigeria: Some empirical policy guidelines. *Journal of Food, Agriculture and Environment, 6* (2), 92-96.

Babatunde, R.O. Omotesho, O., & Sholotan, O.S., (2007). Socio-economic characteristics and food security status of farming households in Kwara State, North-Central Nigeria. *Pakistan Journal of Nutrition, 6,* 49-58.

Branca G., McCarthy N., Lipper L., & Jolejole, M.C. (2013). Food security, climate change and sustainable land management. A review. *Agronomy for sustainable development, 33*, 635-650.

FAO, (2005). Food and agricultural organization. The state of food insecurity in the world, 2005, Rome, 2.

Haile, H.K., & Alemu, Z.G., (2005). Causes of household food insecurity in Koredegaga peasant association, Oromiya zone. Ethiopia working paper. Department of Agric Extension, Faculty of Natural and Agricultural Sciences at the University of Free State, Africa, 2-8.

IAASTD, (2009). Agriculture at the crossroads. Island Press, International Assessment of Agricultural Knowledge, Science and Technology for Development, Washington, DC.

Ibiremo, O.S., Ipinmoroti, R. R., Ogunlade, M.O., Daniel, M.A., & Iremiren, G.O. (2010). Assessment of Soil Fertility for Cocoa Production in Kwara State: Southern Guinea Savanna Zone of Nigeria. *Journal Agricultural Science, 1* (1), 11-18.

Ifeoma, J.I., & Agwu, E.A. (2014). Assessment of Food Security Situation among Farming Households in Rural Areas of Kano State, Nigeria. *Journal of Central European Agriculture, 15* (1), 94-107.

Kwara State Agricultural Development Projects (KWADPs) Progress Report 2000. From<Kwaraadp.com> (Retrieved on 4 June 2018).

Muhammed-Lawal Abdulazeez (2008). Analysis of food insecurity situation in rural households in Kwara State, Nigeria, unpublished Ph.D. Thesis, Department of Agricultural Economics and Farm Management, Faculty of Agriculture, University of Ilorin, Ilorin, Nigeria.

National Population Commission, (2016). *National population of Nigeria,* (2016).

Omonona, B., Agoi, T., & Adetokunbo, G. (2007). An analysis of food security situation among Nigerian urban households: Evidence from Lagos State, Nigeria. *Journal of Central of European Agriculture, 8* (3), 399-406.

Pretty, J.N. (2011). Editorial: sustainable intensification in Africa. International Journal of Agricultural Sustainability *9* (1), 3-4.

Salau, S.A.**,** Adewumi, M.O., Omotesho, O.A., & Ayinde, O.E. (2011). A Comparative Analysis of Crop Production Intensification and its Determinants among Kwara and Niger States Maize Based Farming Households**.** *Journal of Agricultural Sciences, 3* (2), 97-105.

Tilman, D., Cassman, K.G., Matson, P.A., Naylor, R., & Polasky, S. (2002). Agricultural sustainability and intensive production practices. *Nature, 418,* 671-677.

Tilksew, G.B., & Fekadu, B. (2013). Factors influencing Rural Household Food Insecurity: The case of Babile district East Hararghe zone, *Ethiopia Journal of Development and Agricultural Economics, 6* (4), 149-158.

World Bank (2006). *Sustainable land management: challenges, opportunities, and trade-offs*. The World Bank, Washington, DC.

Received: May 2, 2018
Accepted: February 28, 2019

UTICAJ TEHNOLOGIJA ZA ODRŽIVO UPRAVLJANJE ZEMLJIŠTEM NA PREHRAMBENU SIGURNOST POLJOPRIVREDNIH DOMAĆINSTAVA U DRŽAVI KVARA, NIGERIJA

Shehu A. Salau*, Robiu O. Aliu i Nofiu B. Nofiu

Odsek za agroekonomiju i savetodavne usluge, Poljoprivredni koledž,
Državni univerzitet u Kvari, Malete, Nigerija

R e z i m e

Nigerija je među zemljama koje se suočavaju sa problemom prehrambene nesigurnosti. Sistemi poljoprivredne proizvodnje koji proizvode hranu za rastuću populaciju nisu održivi. Shodno tome, upotreba tehnologija za održivo upravljanje zemljištem (engl. *Sustainable Land Management* – SLM) postaje održiva opcija. Ovim istraživanjem se procenjuje uticaj tehnologija za održivo upravljanje zemljištem na prehrambenu sigurnost poljoprivrednih domaćinstava u državi Kvara u Nigeriji. Za ovo istraživanje korišćena je tehnika slučajnog uzorkovanja za odabir 200 poljoprivrednih domaćinstava. Analitički alati uključivali su deskriptivnu statistiku, Šriarov indeks, Likertovu skalu, indeks prehrambene sigurnosti i logističku regresionu analizu. Rezultati su pokazali da je prosečna starost ispitanika bila 51,8 godina. Indeks prehrambene sigurnosti pokazao je da su proporcije prehrambeno sigurnih i nesigurnih domaćinstava bile 35% odnosno 65%. Binarna logistička regresija pokazala je da SLM tehnologije predstavljaju jednu od važnih determinanti za prehrambenu sigurnost. Povećanje upotrebe ovih tehnologija za 0,106% povećalo je prehrambenu sigurnost za 1%. Ostali važni faktori koji su procenjivani uključivali su prihod domaćinstva, veličinu porodice, pol i starost nosioca domaćinstva. Da bi se smanjili uticaji prehrambene nesigurnosti, efikasne strategije suočavanja koje su ispitanici usvojili obuhvatale su smanjenje kvantiteta i kvaliteta hrane koja se konzumira, angažovanje na poslovima van gazdinstva kako bi se povećao prihod domaćinstva i korišćenje novca namenjenog za druge svrhe za kupovinu hrane. Vlade na svim nivoima bi trebalo da ohrabre usvajanje i upotrebu tehnologija za održivo upravljanje zemljištem kako putem štampanih tako i putem elektronskih medija. Politike i strategije u pravcu smanjenja veličine domaćinstva trebalo bi odlučno slediti kako bi se smanjila prehrambena nesigurnost.

Ključne reči: poljoprivredne prakse, strategije suočavanja, poljoprivredna domaćinstva, prehrambena sigurnost, SLM tehnologije i logistička regresija.

Primljeno: 2. maja 2018.
Odobreno: 28. februara 2019.

*Autor za kontakt: e-mail: talk2salaushehu@yahoo.com