PRINT ISSN 1119-8362
Electronic ISSN 2659-1502

Full-text Available Online at
https://www.ajol.info/index.php/jasem
http://www.bioline.org.br/ja

J. Appl. Sci. Environ. Manage.
Vol. 27 (6) 1153-1157 June 2023

Environmentally Friendly Agricultural Practices amongst Farmers in Ogun and Oyo States, Southwestern Nigeria

***[1]OYEWOLE, SO; [2]OYEWOLE, AL; [3]OBADIMU, OO**

[1]Research Coordinating Unit, Forestry Research Institute of Nigeria, Ibadan, Nigeria
[2]Federal College of Forestry, Jericho, Ibadan, Nigeria
[3]Forest Economics and Extension, Forestry Research Institute of Nigeria, Ibadan, Nigeria

**Corresponding Author Email: shola4delord@yahoo.com; Tel: +2348066394848*
Co-Authors Email: akintolaadekemi@gmail.com; obadolusola@gmail.com

ABSTRACT: A good agro-environmental practice is necessary due to the recent resource constraint, poor soil fertility and nutrient depletion, degradation, low yield and poor resource extraction for short term gain. This study examined the preference of farmers for environmental friendly agricultural practices among farmers in Ogun and Oyo States of southwestern Nigeria using multistage sampling technique, structured questionnaire to collect data and analyzed using descriptive statistics, likert scale and random effect logit regression model. The results revealed that the use of crop rotation was ranked first which was followed by the use of cover cropping. Those that rarely use cover cropping and cover cropping constitute 11.76 and 50.0% respectively. The use of organic manure and mulching are not common among the farmers in the study area. The result of random parameter logit revealed that the Chi-square value (1326.76) was significant at 1%. This is associated with the log ratio (LR) that assessed whether the attributes of environmental friendly practices and socioeconomic factors of farmers provide a significant amount of information to explain farmers' decision to embrace environmental friendly practices. The coefficient ($\beta = 0.0004$, $p<0.01$) of bid is significantly positive. The estimated coefficient for pesticide reduction at 20, 30 and 40% were positive, underlining that farmers prefer to reduce the use of pesticide. The estimated coefficient of crop rotation with legume ($\beta = 0.8522$; $p<0.01$) was also positive and significant to farmers' decision to embrace environmental agricultural practices. The study recommends agricultural subsidy programme that will cover the use of eco-friendly agro-practice among farmers.

DOI: **https://dx.doi.org/10.4314/jasem.v27i6.14**

Cite this paper as: OYEWOLE, S. O; OYEWOLE, A. L; OBADIMU, O. O (2023). Environmentally Friendly Agricultural Practices amongst Farmers in Ogun and Oyo State, Southwestern Nigeria. *J. Appl. Sci. Environ. Manage.* 27 (6) 1153-1157

Dates: Received: 17 May 2023; Revised: 08 June 2023; Accepted: 16 June 2023 Published: 30 June2023

Keywords: Environmental friendly agro-practices; food production; hydrological conditions; land degradation

Poor agro- environmental practices requires some improvements to enhance productivity and sustain healthy environment. To improve these practices, there is need for adequate knowledge of all factors that play roles in farming activities. With increased environmental risk associated with agricultural production, the pressures of an increasing population will cause increasing food demands this will necessitate the expansion of areas of cultivation depending on the availability of land, reduced fallow intervals with a lack of inputs necessary to compensate for reduced soil fertility and consequently, land degradation. Increasing population pressures on the land has led to land shortages and continuous arable cultivation. Efforts to boost food production through direct expansion of cropland will have a negative impact on the capacity of the ecosystem to support food production and to provide other essential services. Food production will be affected by environmental problems such as land degradation, erosion, drought, climate change etc. Therefore, substantial contribution to improving agricultural productivity can only be made through continuous support to farm household to embrace sustainable food

**Corresponding Author Email: shola4delord@yahoo.com*

production method. This can be achieved if up to date information associated with their current level of farm activities is available.Over the years, increased agricultural production has not been achieved without negative impact on the environment and consequences on soil. Changes that occurred during the conversion of natural vegetation to agriculture has decreased the status of soil in terms of nutrient recycling leading to nutrient degradation, soil salinity and loss of soil structure. This is also affecting the hydrological conditions (Srinivasarao*et al.,* 2021). Small scale agricultural production is characterized by the removal of forest cover thereby exposing the soil surface to the impact of raindrops. This is causing depletion of soil layer and forming barrier that prevent infiltration of water to the soil (Chalise*et al*., 2019). Another ecological problem as a result of agricultural intensification with poor practices is flooding. This is more frequent and common due to excessive runoff. It tends to encourage erosion hence increasing load of sediment in water (Nda*et al.,* 2017). Agricultural production is faced with environmental problems. The worsening situation is posing fear to global food supply. This indicates that changes are required in the way agriculture is being practiced. There are many ways to farm taking into account the negative impact on the environment. These sustainable actions have seen the advent of good agricultural practices (Siebrecht, 2020). These are practices that cause less harm to the eco system and animal health. Environmental friendly agricultural technologies for food safety appropriate technologies, which do not assault the nature, would have key roles to play in ensuring food security, in improving human health and in rehabilitating and conserving the environment to safeguard the well-being of the posterity (Mishra, 2013) .There are many opportunities associated with good agricultural practices it offers adaptation to and climate change and other ecological problems mitigation is of immediate importance to people across sub-Saharan Africa. Adaptation to climate change and reduce environmental vulnerability to shocks can be achieved by adopting more versatile and resilient technologies through approaches which enhance flexibility and responsiveness to change. Some practices increase the amount of rainfall that infiltrates the soil (e.g. mulching, improved plant cover) as well as improving its capacity to store water (e.g. increased soil organic matter content) - while simultaneously protect the soil from extremes of temperature and more intense rainfall. Thus the most appropriate environmentalfriendly farm practices are characterised by tolerance to increased temperatures, to climate variability, and environmental degradation (Reytar, 2014).Objective of this study is to determine the rate of adoption of environmental friendly agro-practices and factors influencing willingness to embrace such practices among farmers.

MATERIALS AND METHODS

Study Area: The study was conducted among arable crop farmers in southwestern Nigeria particularly Ogun and Oyo State. These States were selected because of their peculiarity in terms of arable crop production such as maize, cassava, yam, vegetable, etc. Oyo State covers 27,107.93 square kilometers with latitudes 7^{o}N and 9^{o}N and longitudes 2.5^{o}E and 5^{o}E of the prime meridian (Oladejo*et al.,* 2011). The State exhibits the typical tropical climate of averagely high temperatures, high relative humidity and generally two rainfall maxima regimes during the rainfall period of March to October (Olaoye*et al.,*2013). Ogun State lies approximately between latitude 3^{o} 30 N and 4^{o} 30N and longitude 6^{o} 30 E and 7^{o} 30E (Ambali*et al*., 2013). The State is located within the humid tropical lowland region with two distinct seasons.

Sampling procedureand data collection: A multistage sampling procedure was employed to select the respondents for the study. The first stage involves purposive selection of two agricultural zones due to agrarian nature of the zones. The second stage involves random selection of one agricultural block from each of selected zones out of which four cells were selected. Proportional sampling was used to select the farmers after the determination of sample size using farmers cultivating maize as the major crop, 370 farmers were selected out of which 340 were used for the analysis based on the correctness of the responses. Primary data were used for the study. The data were collected through the use of structured questionnaire.

Analytical techniques and data analysis: Data collected were analyzed using descriptive statistics which were used to describe the socio-economic characteristics of the respondent. Likert Rating was used to examine the use of environmental friendly practices in the study area. This was based on 5-point Likert Rating Scale (LRS) and graded as never = 1; rarely =2; sometimes = 3, often =4 and regularly = 5. The mean score of respondent base on the 5- point LRS is computed as: 5+4+3+2+1=15; 15/5 =3 cut off point. Using the interval scale of 0.50, the upper cut-off point was determined as 3.00 + 0.50 =3.50; the lower limit as 3.00 – 0.50=2.50. On the basis of this, mean scores below 2.50 (i.e. MS < 2.50) was ranked Low. Those between 2.50 – 3.49 was considered as moderate while mean scores that was greater than or equal to 3.50 was considered to have High level of utilization of environmental friendly practice.

Random-effect logistic regression was used to identifyfactors influencing farmers' willingness to embrace environmental friendly agricultural practices in choice experiment. The choice experiment in its simplest design is a set of alternatives which describes a bundle of different attributes and bid. The bid is systemically varied such that the changes in probability of choosing an alternative and its cost changes can be estimated. According to Shittu (2018), attributes should be relevant to policy makers, meaningful and important to respondents. The choice experiment here had three attributes; number of trees per hectare, pesticides and improved fertility. The description of the attributes and levels are presented in Table 1.

Table 1: Attributes and levels of the choice experiment

Attribute	**Levels**		
Number of trees per hectare (Agroforestry)	10 trees	15 trees	20 trees
Pesticide	Decrease by 20%	Decrease by 30%	Decrease by 40%
Improved soil fertility	Organic fertilizer	Intercrop with legumes	Recommended Chemical fertilizer
Bid (₦)	10,000	15,000	20,000

The choice of attributes for this study was based on a review of existing relevant literature, current agricultural and environmental policies in Nigeria. Agricultural production practices among farmers in rural communities of Nigeria is characterized by slash and burn of vegetation cover, over use of agro-chemicals causing pollution, and continuous cultivation of same land, reducing nutrient recycling (Nwokoro and Chima, 2017). These practices accelerate degradation of agricultural ecosystem with negative impact on ecosystem services. The assumption is that farmers will accept to forego unsustainable current traditional farm practices if and only if they are convinced that the new bundle of practices will provide more benefits including increased productivity, income and improved agro-ecosystem condition.As farmers attempt to meet growing food demand and face with strong weed and pest pressure, they increasingly rely on synthetic pesticides. Farmers frequently misuse and overuse pesticides which have raised concerns about negative effects on both people and environment. In the absence of observable benefits to environment protection, and without efficient governmental control mechanisms, maize production in Nigeria has changed into an environmentally unfriendly state.A number of options were provided for farmers to choose from. These include the use of recommended inorganic/chemical fertilizer, the use of manure (organic fertilizer), as well as intercropping maize with legumes such as cowpea, groundnut and soybean. Intercropping is said to fix the nitrogen content of the soil and enhance organic soil matter. Manure, on the other hand, is cheaper compared to chemical fertilizer. Moreso, the bid which represents subsidy/incentive was selected based on the review of agricultural promotion and inputs subsidy policy such as growth enhancement support scheme, fertilizer reform etc. The attributes were varied with *status quo* scenario and blocked into three choice sets of A, B and C. A typical choice set consists of nine different cards having three alternatives and repeated nine times conferring multinomial and panel structure on the data set. A respondent was required to choose one out of the three alternatives in a card. With a total of nine cards presented, each respondent was required to make nine choices across number of trees per hectare, pesticide use and improved fertility.An example of a choice card with two alternatives and the *status quo* as another alternative is shown in Table 2. The status quo alternative (doing nothing different) was provided to minimize bias in the Willingness to Accept (WTA) estimates and enhance the reality of the choice situation, as respondents may exercise their right to do nothing if the alternatives presented to them are perceived not to improve their current level of utility.

Table 2: Example of a choice card

Attribute	**Option A**	**Option B**	**Option C**
Number of trees per hectare	20 trees	15 trees	Neither A nor B
Pesticide	Decrease by 20%	Decrease by 30%	
Improved soil fertility	Organic fertilizer	Intercrop with legume	
Bid (₦)	15,000	10,000	

Factors influencing willingness to embrace environmental friendly agricultural practices were examined using random effect logit models. This was used to describe the relationships of data generated from the choice experiment. The model is specified as a linear utility function of individual i associated with alternative j

$$V_{ij} = \alpha_{ij} + \beta_p X_{ip} + \beta_q S_{iq} + \varepsilon_{ij}$$

Where: V_{ij}= Alternative of a choice set. It takes a value of 1 when an alternative is chosen and 0 otherwise; α_{ij}= Alternative specific constant; β_q = Parameters of sustainable practices and bid; S_{iq} = Variables of

sustainable practices and bid; β_p = Parameters of respondents' socio-economic characteristics; X_{ip}= Socio-economic characteristics of respondents; S_1= number of trees on farmers farm; S_2= Use of organic fertilizer (dummy, Yes=1, 0 otherwise; S_3= 20% pesticide reduction (dummy); S_4 =30% pesticide reduction (dummy); S_5 = 40% pesticide reduction (dummy); S_6 = Legume intercrop (dummy); S_7=Bid (₦); X_{ip} Socio-economic characteristics of respondents; X_1 = Age (years); X_2 = Education (years); X_3 = Household size (number); X_4 = Farming experience (years); X_5 = Access to credit (dummy); X_6 = Membership of associations (years); X_7 = Extension contact (number); X_8 = Farm size (hectare); X_9 = Profit (naira); $\mathcal{E}_{ij}$=Random error of the regression

RESULT AND DISCUSSION

Adoption of environmental friendly agricultural practices among farmer: The result presented in Table 3 showed the use of environmental friendly agricultural practices among farmers in the study area. The use of crop rotation was ranked first which was followed by the use of cover cropping. The result indicates that farmers rarely use mulching. Those that rarely use cover cropping and cover cropping constitute 11.76 and 50.0% respectively. The use of organic manure and mulching are not common among the farmers in the study area. Crop rotation has been categorized as one of the sustainable farming practices that is capable of increasing nutrient uptake and improve soil health. It is also a method that could decrease pest and weed infection (Sahu*et al*., 2019). According to (Yoder *et al*., 2021) use of cover crops by farmers is win-win because it has potential of boosting long term crop yield.

Factors influencing willingness to embrace environmental friendly agricultural practices among the respondents: The result of random parameter logit presented in Table 4 was obtained through choice experiment and socioeconomic factors of farmers. It was revealed that the Chi-square value 1326.76 was significant at 1%. This is associated with the log ratio (LR) that assessed whether the attributes of environmental friendly practices and socioeconomic factors of farmers provide a significant amount of information to explain farmers' decision to embrace environmental friendly practices.

Table 3: Adoption of environmental friendly agricultural practices

Environmental friendly practices	Never	Rarely	Sometimes	Often	Regularly	Weighted average	Rank
Cover cropping	47(13.8)	40(11.8)	230(67.6)	23(6.7)	-	2.67	2
Crop rotation	31(9.1)	17(5.0)	262(77.1)	30(8.8)	-	2.85	1
Organic manure	119(35.0)	170(58.0)	12(3.5)	39(11.4)	-	1.91	4
Irrigation	135(39.7)	111(32.6)	73921.5)	5(1.4)	16(4.7)	1.98	3
Mulching	135(39.7)	150(44.1)	40(11.8)	40(11.7)	15(4.4)	1.80	5

Table 4: Factors influencing willingness to embrace environmental friendly practices

Variables	Coefficient	Z
Constant	-2.1617***	-14.62
Bid	0.00004****	8.36
Number of tree per hectare	0.0022	0.69
Chemical reduction (20%) dummy	0.8570***	9.42
Chemical reduction (30%) dummy	1.4274***	13.29
Chemical reduction (40%) dummy	0.7683***	9.14
Organic fertilizer (dummy)	-0.0087	-0.13
Legume intercrop (dummy)	0.8522***	14.53
Profit	-6.85e-10	-0.04
Age	0.0003	0.09
Education	-0.0001	-0.01
Household size	-0.0012	-0.09
Farming experience	0.0001	0.02
Access to credit	0.0033	0.05
Membership of association	-0.0005	-0.05
Extension contact	-0.0001	0.00
Farm size	0.0002	0.03
Loglikelihood	-5534.5943	
LR $chi^2(16)$	1326.76	
Prob> chi2	0.000	

The coefficient of bid is significantly positive. This implied that the more money farmers can receive, the more likely they are willing to embrace sustainable agricultural practices. This is not surprising because farmers would always prefer higher subsidy. This result support the assertion made by Piñeiro*et al*. (2020) that adoption of sustainable practices usually requires concrete incentives to the farmers. Bellmann (2019) opined that agricultural subsidy is a feature of Government policies that could be granted to farmers and influence the use of resource, change production pattern and land use practices. The estimated coefficient for pesticide reduction at 20, 30 and 40% were positive, underlining that farmers prefer to reduce the use of pesticide. The use of legume intercrop was also found influencing farmers willingness to embrace environmental friendly practices.

Conclusion: The attributes of good agricultural practices and socioeconomic factors of farmers provide a significant amount of information to explain farmers' decision to embrace environmental friendly agro-practices.Given the subsidy farmers are willing

to accept good agricultural practices. The study recommends policies and programmeswould be directed at increasing farmers' willingness to embrace eco-friendly agricultural practices as option to increase farm productivity and mitigate wide spread of ecological problems in the country.

REFERENCES

Ambali, OI; Adegbite, DA; Ayinde, IA; Awotide, DO; (2013). Analysis of production efficiencyof food crop farmers in Ogun State, Nigeria. *ARPN J.l of Agri. Bio. Sci.,* 7(9):680-688

Bellmann, C. (2019). Subsidies and sustainable agriculture: Mapping the policy landscape. Hoffmann centre for sustainable resource economy. The Royal Institute of International Affairs, Chatham House. 10 St James's Square, London. PP 72.

Chalise, D; Kumar, L; Kristiansen, P (2019). Land degradation by soil erosion in Nepal: A review. Soil Systems, 3(1), 12-30

Mishra, M (2013). Role of eco-friendly agricultural practices in Indian agriculture development. *Int. J. of Agri. and Food Sci. Tech.,* 4(2):11-15

Nda, M; Adnan, MS; Ahmad, KA; Jimoh, OD (2017). Erosion, sediment transport and sedimentation in Rivers and dams. Water and Environmental Issues, 1, ID: 216950758 119 –147.

Nwokoro, CV; Chima, FO (2017). Impact of environmental degradation on agricultural production and poverty in rural Nigeria. *A. Int. J. of Cont. Res.,* 7(2):6-14.

Oladejo, JA; Ajetomobi, JA; Fabiyi, YL (2011). Transactions costs and agricultural household supply response of maize farmers in Oyo State of Nigeria. *J. Agric.Soc. Sci.,* 7:69–74

Olaoye, OJ; Ashley-Dejo, SS; Fakoya, EO; Ikeweinwe, NB; Alegbeleye, WO; Ashaolu, FO; Adelaja, OA(2013). Assessment of socioeconomic analysis of fish farming in Oyo State, Nigeria. *Global J. Sci. Fron. Res. Agri. and Vet.,* 13(9):45-55

Pineiro, V.; Arias, J; Dürr, J; Elverdin, P; Ibanez, AM; Kinengyere, A; Opazo, CM; Owoo, N; Page, JR; Prager, SD; Torero, M(2020). A scoping review on incentives for adoption of sustainable agricultural practices and their outcomes. *Nature Sustainability*, 3:809-820.

Reytar, K; Hanson, C; Henninger, N (2014). Indicators of Sustainable Agriculture: A scoping analysis." Working paper, Installment 6 of creating a sustainable food future. Washington, DC: World Resources Institute. Available online at http://www.worldresourcesreport.org, 2014

Sahu, G; Kaur, S; Singh, G (2019). Knowledge Level of Farmers and Constraints Faced in Adoption of Crop Rotation System. *Curr. J. Appl. Sci. Technol.* http://dx.doi.org/10.9734/cjast/2019/v38i130349

Shittu, AM (2018). Willingness to accept incentives for a shift to climate smart agriculture among smallholder farmers in Southwest and North central Nigeria. International Conference of Agricultural Economists, July 28-August2, 2018.

Srinivasarao, C; Rakesh, S; Kumar, GR; Manasa, R; Somashekar, G; Lakshmi, CS; Kundu, S (2021). Soil degradation challenges for sustainable agriculture in tropical India. *Current Sci.*120(3), 492.

Yoder, L; Houser, M; Bruce, A; Sullivan, A; Famer, J (2021). Are climate risks encouraging cover crop adoption among farmers in the southern Wabash River Basin? *Land Use Policy*, 102:1-39