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SUSTAINABLE AGRICULTURE FOR SMALL SCALE FARMERS IN NIGER STATE, NIGERIA

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ABSTRACT

This research examined sustainable Agriculture for small-scale farmers in Niger State. The specific objectives of the study include; examining the socio-economic characteristics of the small-scale farmers in the study area; identify the system of farming they practiced; examine their level of adoption of improved technology; and, identify the constraints to achieving sustainable agriculture. Primary Data were collected from 120 respondents using a simple random sampling procedure. Six Local Government Areas of Niger State were studied during the 2010 cropping season. Data was generated using well structured questionnaire; frequency distribution, percentages, and ordinary least square (OLS), multiple regression was used to analyze the data. The results show that majority of the small scale farmers were within the economically active age and that crop rotation as an agriculture system was widely practiced in the study area. Results from the regression analysis confirm that variables, such as family size and farm size were statistically significant at 1% level and 5% level respectively. However, inadequate credit facility was identified as a major problem.

Keywords: Sustainable; Agriculture; Subsistence Farmer; Technology; Adoption

INTRODUCTION

Agricultural systems are so diverse, based on farm size, location, crops being grown, socio-economic background, among many other factors and because the movement has become so widespread globally, sustainable agriculture has come to represent different things to different people (Ogundare & Ojo, 2007). Nevertheless, Durno, (1992) opined that there exists some common trends, concepts and beliefs. In the most general term, sustainable agriculture describes systems in which the farmers reach the goals of producing adequate yield and good profit following production practices that minimize any negative short-and long-term side effect on the environment and the well-being of the community. The major goal of this approach is to develop economically viable agro system and to enhance the quality of the environment, so farm lands will remain productive indefinitely.

The future goal of the farming community is to strive to use current sustainable practices and to the latest production techniques to remain competitive in the global agricultural market. For this to take place, a close communication link has to be maintained between rural communities, researchers, and society at large. This link gives urban communities a better understanding of issues affecting farmers' roles as stewards of the environment, and of the economic realities of providing the public with a consistently healthy and safer food supply (Ogundare & Ojo, 2007).

An important aspect of sustainable agriculture is that it does represent a specific set of agricultural practices that farmers need to follow step by step; one would be a recipe, to reach a specific goal. Instead, the concept represent more of a paradigm shift that encourages farmers to seek their own path, one that best fits the farm's particular conditions, and lead towards a more environmentally friendly approach without sacrificing yield or profit. Similarly, sustainable agriculture is not a specific target, but instead is more of a process that every farmer pursues as part of the daily farm operation. Thus because agricultural systems are so diverse, farmers may choose among myriad numbers of agricultural practices and techniques available to produce crops more effectively (Kang 2003).

Small-scale farmers in Nigeria are classified as resource poor due to the poor resource-base available to them especially, capital resources. This causes low productivity due to the fact that they produce purely for subsistence consumption and little marketable surplus (Adeniyi, 1999). Food production in Nigeria, as in many developing countries is linked with small scale agriculture. The small holders in this system are responsible for a large share of the total agricultural output, cultivated land and the farming population. However, a conglomeration of complex endogenous and exogenous factors have precipitated, as well sustained what essentially amounts to productivity problems facing these producers. The productivity problems have been observed under two (2) facets. The first is low productivity per unit of total aggregate output of farm product Brown, L.R., & Wolf, E.C., (2005). Even if small scale farmers income maximizes, the high degree of uncertainty attending to agricultural production makes it impossible for them to identify and implement optimal resource allocation-except by chance.

Majority of farmers in Africa are subsistence farmers, who have small farm holdings ranging from 0.5 hectare to about 4 hectares. They produce food for their household plus little for sale in the neighborhood markets (Aina, 2007). Over the years, ineffective efforts have been made by donors and African countries to bring about agricultural development without much to show for it. Much of the failures can be attributed to the adapted transformation approach of agriculture which is characterized by the introduction of a wide variety of large scale farming and processing technologies. It is however gratifying to note that there is now a shift in emphasis from big scale transformation approach to small scale improvement strategy which is characterized by the introduction of a wide variety of large scale farming and processing technologies. It is however there is now a shift in emphasis from big scale transformation approach to small scale improvement strategy which is attuned to African age-long practice. Ozowa, (2002) stated that Nigerian farmers are classified into small scale, medium scale, and large scale. About 94.37 per cent of all farm holdings in Nigeria are classified as small holdings while the remaining 5.63 percent are medium scale holdings.

According to World Bank (1996), small scale farmers depend on their efficiency in the utilization of basic production resources available to them. They make a significant and important contribution to the national product that is 99 per cent of the crop output. The small scale farmers are the main producers of 98 per cent of most crops consumed in Nigeria.

The broad objective of this study was to assess sustainable agriculture for small scale farmers in six Local Government Areas of Niger State. Specifically, the study sought to examine the socio-economic characteristics of the small scale farmers in the study area; identify the system of farming practiced by the small scale farmers; identify the constraints to achieving sustainable agriculture for small-scale farmers and examine the level of adoption of improved technology by the small scale farmers in the study area.

MATERIALS AND METHODS

The Study Area

Niger State lies between latitude 3^{o} and 7^{o} east and longitude 8^{o} and 14^{o} north. It is bordered to the north by Sokoto State, west by Kebbi State, south by Kogi State, and south-west by Kwara State. Kaduna and federal capital territory border the State both to the north and the east, respectively.

The State has a common boundary with the republic of Benin along New Bussa, Agwara, and Wushishi local government areas. This has given rise to common inter-border trade between Nigeria and Benin Republic. The State comprises 25 local Government areas grouped into 3 administrative zones. A, B, C with each zone having 8, 9, and 8 local government areas, respectively. About 85% of Niger State's population is farmers while the remaining 15% engage in other vocations such as business, white collar jobs etc.

Niger State Agriculture Development Programme, (1999), Niger State experiences distinct dry and wet seasons with annual rainfall varying from 1100mm in the Northern part to 1600mm in the southern part of the State respectively. The maximum temperature (usually not more than $37.5^{o}C$) is recorded between March and June, while the minimum temperature is usually between December and January ($3^{0}.2^{o}c$). The rainy season lasts approximately 80 days in the Northern part and about 120 days in the Southern parts of the State. The average sunshine hour is about 8.9 hours generally, the climate soil and hydrology of the state permits the cultivation of most Nigeria's staple crops and still allows sufficient opportunities for grazing fresh water fish and forestry development.

The state covers a total land area of 85,733,17 km or about 8.6 million hectares which represent 9.3% of the total land area of Nigeria (Ministry of Agriculture and Natural Resources 1993), the State is also blessed with three hydroelectric power stations at Kainji, Shiroro, and Jebba. The river Niger forms the southern boundary of the State and its flood plain as well as the availability of extensive fadama land for dry season farming.

Data Collection

A total of one hundred and twenty farmers were selected using multistage random sampling method and drawn from six local government areas (LGAs) of Niger State. Structured questionnaire was used for the generation of primary data. Information collected included those on demography, farming experience, cost of variable inputs, improved technology adoption, and awareness, sources of farm labor, availability of credit and uses among the farmers. Both descriptive and inferential statistics were employed for data analysis.

Model Specification

In analyzing the determinant of profit making from farming activities by the small scale farmers in the study area, it was believed that the level of profit was influenced by some small scale farmer's specific variables. Conveniently the Ordinary Least Square (OLS) multiple regression analysis was used to analyze the data.

The model is specified as follows:

$Y= b_O+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+e$----------i

Cobb-Douglas; (double-logarithm)

$\ln Y = \ln b_o+b_1 \ln X_1+b_2 \ln X_2+b_3 \ln X_3+b_4 \ln X_4+b_5 \ln X_5+e$-----ii

Semi-logarithm;

$Y= \ln b_o=_{bi} X_1+b_2X_2+b_3X_3+b_4X_4+b_5 \ln X_5+e$----------iii

Exponential;

$\ln Y=b_o+b_iX_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+e$----------iv

Where $b_{o=}$intercept or constant term.

b = coefficient

e = error term

Y = farm income by yield (naira)

$X_{1=}$ age (years)

$X_{2=}$family size in no.

X_3=farm size in hectare

X_4=years of farming experience.

X_5=cost of variable input in naira

e=error term

Results and Discussion

The socio-economic characteristic of the respondent famers in Niger State is highlighted.

Table 1: Socio-economic characteristics of Respondent Farmers Based on Age, Sex, Marital status, Family size, and Level of Education

INDEX	FREQUENCY	PERCENTAGE
(i) Age		
30 and below	8	8.0
31 – 40	35	35.0
41 – 50	30	30.0
51-60	17	17.0
Above 60	10	10.0
Total	100	100.0
(ii) Sex		
Male	84	84.0
Female	16	16.0
Total	100	100.0
(iii) Marital Status		
Single	23	23.0
Married	49	49.0
Divorced	10	10.0
widowed	8	8.0
Total	100	100.0
(iv) Family Size		
1-5	15	15.0
6-10	34	34.0
Above 10	51	51.0
Total	100	100.0
(v) Level of Education		
No formal education	10	10.0
Adult education	7	7.0
Arabic education	18	18.0
Primary education	35	35.0
Secondary education	21	21.0
Post-secondary education	9	9.0
Total	100	100.0

Source: Field Survey, 2010.

The socio-economic characteristics of the respondents as contained in table 1` were 35% of the respondents are between the age range of 31 to 40 years which implies that majority of the respondents fell within the economically active age. Age factor is significant in the achievement of sustainable agriculture for small-scale farmers. Young people (farmers) are more responsive to new ideas and practices while older ones are conservative and less responsive to the adoption of new ideas and practices. It also shows that majority of the respondents 84% were male, 49% were married at the time of the study. The study also reveals that majority of the respondents, 51% have above 10 members of household. It is believed that the higher the number of people in the household the more labor availability for the farming. It also shows that 90% of the respondents have formal education to some extent. An individual's level of education can affect his/her access to comprehension and adoption of modern agricultural practices. The low level of education of small scale farmers, especially women who form the bulk of the agricultural labor force has remained a major constraint to the adoption of modern farming techniques and the ability to access other inputs necessary for increased productivity in the sector.

Further findings from the study reveal that 61% of the farmers practiced crop rotation farming system, while 28% of the respondents practiced shifting cultivation system and 11% of the respondents practiced bush fallowing system respectively. This result indicates that bush fallowing is not popular as a result of inadequate farm land for cultivation. However, majority of the respondents practiced crop rotation to minimize pest and disease infestation, loss of soil nutrient and conservation time of the soil. It is believed that this practice could aid the achievement of sustainable agriculture.

Table 2. Distribution of respondents based on years of adoption of improved technology.

Index	Frequency	Percentage
Years of Adoption		
This year	4	4.0
Last year	7	7.0
2 years ago	10	10.0
More than 3 years age	35	35.0
Never Adopted	44	44.0
Total	100	100.0

Source: Field Survey, 2010.

Data in table 2 shows that 4.0% of the respondents adopted improved technology recently (this year), majority of the respondents 44.0% have never adopted improved technology, while about 35.0% of the respondents have been adopting improved technology for more than 3 years. Reasons given for non-adoption was, input not available, input available but costly, technology is inappropriate and does not lead to higher yield. It then implies that more enlightenment on improved technology still needs to be put in place. The reduction and outright elimination of subsidies on all agricultural machinery like tractors, harvesters, harrowers, and planters following deregulation has

reduced the use of machines in agricultural activities. The post-harvest technology available in Nigeria is poor and grossly inadequate to cope with vibrant, market-oriented food production efforts of Nigeria's small holders. Apart from the damage which the crops are exposed to in the field as a result of pests and disease attacks, a considerable proportion of the harvest is lost due to poor processing and storage techniques. Crop losses have been estimated to be as high as 20 per cent of harvest in some cases.

The twin problem of inadequate extension services and the low morale of the available extension staff need to be addressed. More emphasis should be placed on having well trained extension agents and consideration should be given to female extension workers to address the problem of gender access to new innovations. Effort should be made as a matter of priority to ensure that the salaries and allowances of this important group of workers are paid regularly.

Table 3. Distribution of respondents based on source(s) of credit facilities

Index	Frequency	Percentage
Source of Credit		
Personal Savings	20	20.0
Traditional Savings	17	17.0
Isusu\Adashe	19	19.0
Friends and relatives	13	13.0
Co-operative Society	31	31.0
Total	100	100

Source: Field Survey, 2010.

Data in table 3 reveals that 20% of the respondents acquired credit through personal savings, 17% through traditional savings, 19% acquired through Isusu/Adashe, 13% acquired their credit from friends and relatives, while majority of the respondents (31%) acquired credit through their various cooperative societies. Small scale farmers do not have adequate capital to expand their scale of operations and /or take advantage of profitable packages of technology to boost productivity. The bulk of capital injections by this category of farmers come from owner's equity and informal credit sources. The price and exchange rate reforms that accompanied the Structural Adjustment Program of 1986 has increased the costs of production and significantly increased the working capital needs of agricultural activities. The long and cumbersome bureaucratic processes have prevented the flow of official credit through the government established credit schemes to the farmers.

This problem is more pronounced for the female headed household who has nothing to offer as collateral. If the objective of food security is to be attained, the issues of women empowerment should be taken seriously. There is also

the need for effective support for the formation and growth of farmers' cooperatives to assist in accessing credit, using the group for the mobilization and guarantee.

The volume of capital allocation to agriculture and the quality spending over the years has been low and poor. The share of agriculture in total capital expenditures averaging about 2.5 per cent need to be increased. The adequacy of capital and effective implementation of projects will ensure the effective provision of infrastructure and encourage research into crop production.

Table 4. Distribution of Respondents Based on Problems Encountered in Farming.

Problems	Frequency	Percentage
Lack of farm inputs	66	24.72
Lack of credit	75	28.09
High cost of inputs	41	15.36
Diseases and pest	57	21.35
Unfavorable weather	28	10.49
Total	267	100.0

Multiple responses recorded, Source: Field Survey Data, 2010

Data in table 4 shows that majority, 28.09% of the small-scale farmers sampled have the problem of inadequate credit, 24.72% identified high cost of inputs as a problem, 21.35% said they have the problems of disease and pest, while only 10.49% of the respondents identified with the problem of unfavorable weather condition. Results show that almost all the farmers have encountered one or more problems in farming.

Ikpi, A., & Mordi, C., (2006) opined that, although appreciable real output growth rates have been achieved in the agricultural sector in the last five years, a significant break-through in productivity to effectively guarantee domestic self-sufficiency is still constrained by a number of problems. These problems are the inadequacies in the supply and delivery of farm inputs; shortages of working capital; low rate of technology adoption; diseases and pests infestations; poor post-harvest, processing, and storage technology; environmental hazards; constraints; and land constraint. The unavailability of major farm inputs critical for agricultural production (fertilizers, seeds, agro-chemicals, machineries, etc) at the appropriate time and at the right prices has remained a source of worry and frustration.

Government efforts to develop efficient and effective input procurement and distribution systems that will ensure timely delivery of adequate quantity and quality of farm inputs to farmers have not been successful. Kallisa, (1999) observed that, despite the large sums of money that had been spent on procurement and subsidization of farm inputs, the problems of availability, accessibility, stability, and sustainability still remains. The adoption of many promised improved packages of technology has been compromised by the unavailability of the complimentary farm inputs. The persistence of the problem has been attributed largely to the issue of subsidy and its administration, as evidenced in the

procurement and distribution of fertilizer by the Government. This is an activity the private sector is believed to be better equipped technically to handle. The price regulating mechanism of a commodity whose supply could not match the demand at the stipulated prices create rent seeking thus there are more unintended beneficiaries, who are the fertilizer contractors, and haulers.

Table 5.Results of Regression Analysis

VARIABLE	LINEAR	COBB-DOUGLASS	SEMI-LOG	EXPONENTIAL
Constant	-22577.831 (-0.366)	8.513(4.677) xxx	-246520.696 (0.522)	9.494(38.157)xxx
Age (X_1)	-73.417(-0.027)	0.083(0.178)	33.929.923 (0.280)	0.007 (0.602)
Family size (X_2)	22912.676(2.657) Xxx	0.419 (2.197)xx	58868.844 (1.192)	0.083 (2.378)xx
Farm size (X_3)	-10155.277 (-1.051)	0.516 (3.125)xxx	-4594.260 (-0.107)	0.087 (2.241) xx
Year of farming Experience (X_4)	358.358 (0.210)	-0.033 (-0.261)	449.839 (0.014)	-0.001 (-0.197)
Cost of variable input (X_5)	-1.079 (-0.756)	0.053 (0.385)	9981.425 (0.278)	-2.594E-6 (-0.450)
R^2	0.175	0.547	0.114	0.538
R^2 Adjusted	0.131	0.523	0.067	0.514
F – ratio	3.987xxx	22.682xxx	2.411xx	21.903xxx

Source: Field Survey,2010

Note: xxx implies statistically significant at 1%

xx implies statistically significant at 5%

x implies statistically significant at 10%

Figures in parentheses are respective t – ratios.

Results found in table 5 indicated that the double log functional form was chosen as the lead equation. Based on the normal economic, econometric, and statistical criteria of the magnitude of R^2 (coefficient of multiple determination which shows that the explanatory power of a given model) statistical significance of estimate regression coefficients with a prior expectation as well as the f-statistic, the model has an R^2 (coefficients of multiple determination value) of 0.547 and 22.682 which is statistically significant at 1% level. It shows that 54.70% of variation in farm income proxies by total value of income of small scale farmers is explained by the variables included in the model while the remaining 45.3% is as a result of other important variables that were not included in the model. The coefficient for family size, X_2 (0.419) is positively significant at 5% level. This implies that increase in numbers of the small scale

farmers increases their farm income. It also implies that, increase in family size provides more family labor which could substitute for hired labor and could also lead to increases in output and subsequently the farmer's income. The coefficient for farm size X_3 (0.516) is positively significant at a 1% level. This is an indication that increases in farm size of the small scale farmers increase their farm income.

CONCLUSION

Based on the findings of the study, it was concluded that most of the respondents fell within the economically active age. The study further established that crop rotation as a system of farming is widely practiced in the study area compared to bush fallowing and shifting cultivation. Majority of the respondents were aware of improved technology and adopted many new farming practices.

The study discovered that lack of or inadequate credit facility is the major problem amidst others to sustainable agriculture for small scale farmers in the study area. Further, this study pointed out that the goals of sustainable agriculture in Niger State should include allocative- productive efficiency, maximum consumer welfare, enhancement of rural incomes, elimination of rural-urban migration, equalization of opportunities and optimization of access to income-employment generating opportunities of the small-scale farmers. Niger State government should improve heavily on agricultural programmes that seek to maximize the socio-political and economic welfare of the rural sector of the State's economy. Put differently, improved health, agricultural, infrastructural and other technological innovations relevant to sustainable agriculture should be injected in an integrated manner in order to provide a solid sustainable agriculture base for increased agricultural output.

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