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# Adoption of sustainable land management practices among farmers under the Third National Fadama Development Project in Imo State, Nigeria

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**This study assessed the adoption of Sustainable Land Management (SLM) practices among farmers participating in the Third National Fadama Development Project in Imo State, Nigeria. Data were collected through structured questionnaires administered to 128 randomly selected members of Fadama User Groups (FUGs) in Imo State. The analysis utilized simple descriptive statistical tools such as frequency distribution tables, percentages, mean, and mean score. The findings revealed that the major land management problems in the area were land fragmentation (97.42%), soil erosion (94.06%), flooding (91.41%), waterlogging (87.23%), and indiscriminate deforestation (76.02%). Additionally, the study highlighted SLM practices adopted by the farmers, including mulching (91.41%), cover cropping (85.21%), agroforestry (79.10%), and intercropping (78.11%). Farmers reported that the adoption of SLM practices had positive impacts on their farming activities, leading to an increase in crop yield (mean score = 3.68), improvement in soil organic matter content (mean score = 3.12), reduction in the risks of crop failure (mean score = 3.34), and decrease in the occurrence of flooding (mean score = 3.24). The study also identified important challenges faced by the farmers, including poor government support (95.31%), the nature of the land tenure system (62.50%), limited access to land for agroforestry (62.50%), and the destruction of farms by grazing cattle (62.44%). The study recommends that the Imo State government continues to provide support to the Fadama Project as a grassroots poverty intervention program in the state. Additionally, the project coordinating office should strengthen its supervision of the project community facilitators to prevent the diversion of inputs meant for the farmers.**

**Key words:** Sustainable land management, farmers, adoption, Fadama III Project.

## INTRODUCTION

The importance of land and other natural resources to agriculture cannot be overemphasized. Land is the basic natural resource that provides habitat and sustenance for living organisms. Nigeria is endowed with enough land resources to undertake small and large-scale agricultural activities to strengthen the national economy, boost household income generating activities and ensure food security for its citizenry. Unsustainable land management

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practices contribute significantly to the increasing incidence of land degradation especially in ecologically vulnerable areas of the country (Lal, 2000). Sustainable Land Management (SLM) practices were implemented through Fadama III Project in Southern Nigeria (Imo State inclusive) to address land management problems associated with farming. According to World Bank (2010), SLM is defined as knowledge-based procedure which helps to integrate land, water, biodiversity and environmental management to meet the rising demand for food and fiber, while sustaining ecosystem services and livelihoods.

Fadama III Project was a follow-up to the successful implementation of the First and Second National Fadama Development Projects in Nigeria. Fadama III, like the second phase was based on Community Driven Development (CDD) approach which has proven to be viable in the transformation of the rural communities in Nigeria. World Bank (2010) indicated that Fadama III and the partially blended Global Environment Facility (GEF) and Sustainable Land Management (SLM) Project were designed to contribute to the Nigerian government's strategy for poverty reduction by improving the welfare and living conditions of many poor and vulnerable communities in the participating states, and thereby contributing to food security.

The GEF grant provides incremental support to Fadama III components to improve the enabling environment for up scaling climate smart SLM, with emphasis on: knowledge fertilization; environmental and institutional monitoring tools; institutional capacity building; and outreach advocacy on SLM practices and policy.

This incremental support was intended to help Nigeria upscale improved land and water management and set the stage for expanding SLM practices beyond the life of the Project. The development and global environmental objective of the GEF incremental grant was to improve the enabling environment for sustainable land management in participating communities. It is hoped that adoption of the promoted SLM practices will allow communities participating in the project to reduce the threat of land degradation and climate risks facing their production lands. The on-going implementation of the GEF grant support, has led to the establishment of a number of SLM sub project activities in the participating communities. These SLM practices/subprojects included: mulching, mixed cropping, contour farming, agroforestry, crop rotation, zero tillage, liming and minimum tillage (FMARD, 2014).

In spite of the wide spread knowledge (some even indigenous) about land management practices such as fallowing and crop rotation known to have significantly contributed to land sustainability and other soil water and nutrient conservation measures which could help to remedy soil condition, land degradation seems to be on the increase. It is uncertain if farmers in Nigeria especially those in Imo State are taking full advantage of the opportunities offered by the sustainable land management practices for improved and sustainable agricultural production. It is also pertinent to note that the status of adoption of many of these land management solutions which have long been advocated in the natural resource literature (Lal, 2000; Odunze, 2002; Adekalu et al., 2006), is yet to be validated through empirical studies. Scarcity of reliable data had made it difficult for both policy makers and development planners to make informed decisions on the sustainability of SLM practices in Imo State. In an attempt to generate reliable data, and as part of the need for proper tracking of the progress made through this Project and appropriately quantifying the contribution of GEF to the greater adoption of SLM practices in the Project areas, this study was designed to analyze the level of adoption of Sustainable Land Management practices among farmers under the Third National Fadama Development Project in Imo State, Nigeria. Specifically, the study sought to:

1. Describe the socio economic characteristics of the FUG members who participated in the SLM sub-project of Fadama III Project in Imo State.
2. Identify the land management problems as perceived by famers in the study area.
3. Identify the SLM practices introduced to farmers under fadama III project in Imo State.
4. Ascertain the level of adoption of SLM practices in the study area.
5. Identify the effects of the SLM practices as perceived by the farmers, and
6. Ascertain the factors that militated against the adoption of SLM practices by the farmers.

## METHODOLOGY

This study was conducted in Imo State, Nigeria. Imo State is one of the five states that make up Southeast, Nigeria. It lies within latitude $4^{0}45^{1}$N and $7^{0}15^{1}$N and longitude $6^{0}50^{1}$E and $7^{0}25^{1}$E, and covers a total land area of about 5,100 square kilometers (www.imostate.gov.ng). Imo State has an estimated population of about 4.8 million people and an annual population growth rate of 3.35 percent (National Population Commission (NPC), 2010). Administratively, the state is divided into three Senatorial Zones (Okigwe, Orlu and Owerri), and twenty seven (27) Local Government Areas.

The population of this study comprised all the FUG members in Imo State. Two zones (Orlu and Owerri) were randomly selected out of the three zones in the state. Two local government areas were also randomly selected from each of the two zones, giving a total of four local government areas used for the study. Two Fadama Community Associations (FCAs) were randomly selected from a list of FCAs in the sampled areas, thus, a total of eight (8) FCAs were used for the study.

Two FUGs were randomly selected from a list of FUGs that made up the selected FCAs. Thus a total of sixteen (16) FUGs were sampled for the study. Lastly, eight (8) members of the selected FUGs including the Presidents and Secretaries were selected, thus giving a total of one hundred and twenty-eight (128) members of

**Table 1.** Distribution of respondents according to socio-economic variables (n = 128).

| Variable | Percentage | Mean (X) |
|---|---|---|
| Age (in years) (45 - 54) | 42.20 | 46.20 |
| Years spent in school (7 - 12) | 51.60 | 9 |
| Household size (5 - 8) | 54.00 | 7 persons |
| Farm size (hectares) (1.1 - 2.0) | 46.00 | 1.72 ha. |
| Income per month (in naira) (17,001 - 25,000) | 34.00 | N22,142.47 |
| Extension contact per month (twice) | 56.40 | |

Source: Field Survey Data (2022).

**Table 2.** Distribution of respondents according to perceived land management problems (n = 128).

| Land | Management problems | *Percentage |
|---|---|---|
| 1 | Land fragmentation | 97.42 |
| 2 | Soil erosion | 94.06 |
| 3 | Flooding | 91.41 |
| 4 | Water logging | 87.23 |
| 5 | Indiscriminate deforestation | 76.02 |
| 6 | Soil crusting and compaction | 68.00 |
| 7 | Slow nutrient recycling | 62.44 |
| 8 | Decline in ground water storage | 59.00 |
| 9 | Reduced infiltration | 55.03 |

Source: Field Survey Data (2022). * = Multiple responses.

Fadama User Groups interviewed for the study. The data collection exercise was conducted by five enumerators recruited from the sampled communities and trained and supervised by the researchers. Simple statistical tools such as mean, standard deviation, percentage distribution and mean score were used to analyze the data collected. However, a 4-point Likert-type rating scale was used to measure agreement or otherwise with the listed response items in objective five. The rating scale was operationalized thus: Strongly Agreed (4), Agreed (3), Disagreed (2) and Strongly Disagreed (1). The mean score was obtained by adding up the values of the scale (e.g. 4+3+2+1 =10) and divided by the number of scales (4) to give a mean score of 2.5, which was used as the discriminatory index, such that any mean score ≥ 2.5 was regarded as agreed while those < 2.5 was regarded as disagreed.

## RESULTS AND DISCUSSION

### Socio-economic characteristics of the farmers

The result in Table 1 shows that the largest proportion (42.20%) of the farmers was within the age bracket of 45 and 54 years. The mean age was 47.40 years. This implies that most of the farmers who participated in the SLM sub-project under Fadama III in Imo State were still in their active and productive ages. The result also shows that most of the farmers (51.60 %) spent about 9 years in school, indicating that they had at least basic education. The result is not surprising because, age and education are important factors in technology adoption. Several adoption studies have revealed that young and educated people adopt innovation faster than the old and illiterate ones (Agwu and Anyanwu, 2000; Pannell et al., 2006; Ifejika et al., 2008; Hill and Linehan, 2011). The data in Table 1 further show that the farmers had a mean household size of 7 persons, farm size of 1.72 hectares and a mean monthly income of N22,142.47. This implies that the beneficiaries were smallholders and low income farmers and who fell within the targeted beneficiaries of Fadama III Project. Also, the result revealed that the farmers had extension contact twice per month, which is encouraging but need to be strengthened, bearing in mind that increased frequency of extension contact with the farmers will help in facilitating adoption of the SLM practices in the area.

### Land management problems in the study area

The data in Table 2 indicate that the prevalent land management problems in the area were land fragmentation due to tenure system (97.42%) soil erosion (94.06%), Flooding (91.41%), water logging (87.23%)

**Table 3.** Distribution of respondents according to SLM practices introduced to the farmers.

| SLM practices introduced | *Percentage |
|---|---|
| Mulching | 92.19 |
| Cover Cropping | 77.34 |
| Agroforestry | 71.09 |
| Contour Farming | 68.28 |
| Mixed Cropping | 60.17 |
| Zero Tillage | 59.29 |
| Ridging across the slope | 57.03 |
| Crop Rotation | 57.01 |
| Intercropping | 56.28 |
| Liming | 53.13 |
| Minimum Tillage | 52.22 |

Source: Field survey data, 2022. * = Multiple responses.

**Table 4.** Distribution of respondents according to SLM practices adopted by the farmers.

| SLM practices introduced | *Percentage |
|---|---|
| Mulching | 91.41 |
| Cover cropping | 85.21 |
| Agroforestry | 79.10 |
| Inter cropping | 78.11 |
| Crop rotation | 72.68 |
| Mixed cropping | 61.71 |
| Ridging across the slope | 51.72 |
| Liming | 36.72 |
| Zero tillage | 28.12 |
| Minimum tillage | 26.34 |
| Contour farming | 22.24 |

Source: Field survey data, 2022. * = Multiple responses.

and indiscriminate deforestation (76.02%). Land fragmentation is an issue in the study area because it hinders commercial production and long term investment in soil conservation (Aja et al., 2017). Similarly, soil erosion, flooding and water logging have been an age long challenge to agricultural production vis a viz land management in most part of Southern Nigeria especially in Imo State (Odunze, 2002; Adekalu et al., 2006, Aja et al., 2015).

## Sustainable land management (SLM) practices introduced to the farmers

Table 3 shows that the SLM practices introduced to the farmers in the surveyed area were mostly agronomic soil conservation practices such as mulching (92.19%), cover cropping (77.34%), agro forestry (71.09%), and contour farming (68.28%). Others included mixed cropping (60.17%), zero tillage (59.29%), ridging across the slope (57.03%), and crop rotation (57.01%). From the result, it can be deduced that most of the SLM practices promoted through Fadama III Project were not entirely new to the farmers, which by implication would help to facilitate their adoption since the farmers were already familiar with some of those practices.

## Adoption of SLM practices introduced to the farmers

Result in Table 4 shows the distribution of respondents according to SLM practices they adopted measured as the percentage of the farmers using a particular practice. The result showed that all the SLM practices introduced to the FUGs were adopted in varying degrees by the farmers. The majority (91.41%), (85.21%), and (79.10%)

**Table 5.** Distribution of respondents according to level of adoption of the introduced SLM practices.

| SLM practices introduced | *% of field under SLM practices |
|---|---|
| Mulching | 68.41 |
| Cover cropping | 64.72 |
| Agroforestry | 61.83 |
| Inter cropping | 61.28 |
| Crop rotation | 50.84 |
| Mixed cropping | 50.02 |
| Ridging across the slope | 39.14 |
| Liming | 25.77 |
| Zero tillage | 24.59 |
| Minimum tillage | 24.28 |
| Contour farming | 18.58 |

Source: Field survey data, 2022. * = Multiple responses.

adopted mulching, cover cropping and agroforestry. The reason for this could be because the farmers in Imo State were already familiar with those practices before the introduction of SLM through Fadama III Project. The result is in line with the findings of Aja et al, (2015). However, only few of the farmers (36.72%), (26.34%) and (22.24%) adopted liming, minimum tillage and contour farming.

**Level of adoption of SLM practices**

Table 5 shows the distribution of respondents according to the level of adoption (extent of use) of the introduced SLM practices. It was expressed as the proportion of farmers' field under SLM practices. From the table, the practices that recorded high level of adoption were mulching (68.41%), cover cropping (64.72%), agroforestry (61.83%) and inter cropping (61.28%). The reason for the high level of adoption of the practices above could be due to their compatibility with the traditional farming practices of the people. From literature (Agwu and Anyanwu, 2000; Ifejika et al, 2008; Hill and Lineham, 2011), when a new technology is compatible with the culture of the people, its adoption is higher compared to when it is otherwise. However, the result in Table 5 indicates that contour farming (18.58%), minimum tillage (24.28%), zero tillage (24.59%) and liming (25.77%) recorded low level of adoption. The reason for the low adoption of these practices could be due to the alien nature of the practices.

**Perceived effects of SLM practices on agricultural production**

Table 6 shows the perceived effects of the SLM practices on agricultural production. From the table, the farmers were in agreement with all the listed possible effects of SLM practices on farming productivity. The most agreed perceived effect was increase in crop yield (mean score = 3.68). This is in line with Babatunde et al. (2009) who stated that maintenance of soil fertility is at present the most critical factor for increased sustainable crop production. Others effects that recorded high score included reduction of the risks of crop failure (Mean score = 3.34), protection of the land from direct sun impact (Mean score = 3.27), reduction of the incidence of flooding/water runoff (mean score = 3.24), and improves soil organic matter content (mean score = 3.12). Others effects included increased moisture retention (Mean score = 3.10), enhance soil microbial activities (Mean score = 2.93), and maintain healthy ecosystem (Mean score = 2.89). The above findings are in line with Al-kasi (2012), who noted that sustainable land management practices plays a significant role in soil quality and sustainability even in time of adverse human activities and climate change and this in turn increase productivity.

**Constraints that militated against the adoption of SLM practices**

The results in Table 7 show that the most important factors that hindered the adoption of the SLM practices included poor government support (95.31%), limited access to land for agro forestry (62.50%), destruction of farm by cattle (62.44%), and diversion of farm inputs by the Project community facilitators (52.34%). Others included inadequate land for agro forestry (54.69%) and poverty (43.75%). Removal of these constraint factors would definitely increase the level of adoption of SLM practices in Imo State, which will translate to better land management and improved agricultural productivity.

**Table 6.** Distribution of respondents according to perceived benefits of SLM practices.

| Benefits of SLM practices | SA | A | D | SD | Mean ($\bar{X}$) | Remark |
|---|---|---|---|---|---|---|
| Enhance nutrient recycling | 33(25.78) | 74(57.81) | 16(12.50) | 5(3.91) | 3.05 | Agreed |
| Help in soil moisture retention | 37(28.91) | 74(57.81) | 10(7.81) | 7(5.47) | 3.10 | Agreed |
| Aid soil aeration | 34(26.56) | 70(54.69) | 14(10.94) | 10(7.81) | 3.00 | Agreed |
| Reduce flooding/water runoff | 43(33.59) | 75(58.59) | 8(6.25) | 2(1.56) | 3.24 | Agreed |
| Protect the soil from sun impact | 42(32.81) | 81(63.28) | 3(2.34) | 2(1.56) | 3.27 | Agreed |
| Increase crop yield | 92(71.88) | 33(25.78) | 1(0.78) | 2(1.56) | 3.68 | Agreed |
| Maintain healthy ecosystem | 29(22.66) | 69(53.91) | 17(13.28) | 13(10.16) | 2.89 | Agreed |
| Enhance soil microbial activities | 42(32.81) | 52(40.63) | 17(13.28) | 17(13.28) | 2.93 | Agreed |
| Reduce risk of crop failure | 49(38.28) | 76(59.38) | 1(0.78) | 2(1.56) | 3.34 | Agreed |
| Reduce soil degradation | 10(7.81) | 73(57.03) | 19(14.84) | 26(20.31) | 2.52 | Agreed |
| Improve soil property/structure | 15(11.72) | 75(58.59) | 31(24.22) | 7(5.47) | 2.77 | Agreed |
| Improve soil organic matter content | 52(40.63) | 50(39.06) | 15(11.72) | 11(8.59) | 3 .12 | Agreed |

Source: Field survey data, 2022. Figures in parenthesis are percentages.

**Table 7.** Distribution of Respondents according to constraints that militated against adoption of SLM practices.

| Constraints to adoption of SLM practices | *Percentage |
|---|---|
| Poor government support | 95.31 |
| Limited access to land for agroforestry | 62.50 |
| Indiscriminate bush burning | 54.69 |
| Destruction of farm by grazing cattle | 62.44 |
| SLM Practices are capital intensive | 35.16 |
| Nature of land tenure system | 62.50 |
| Tedious nature of SLM practices | 42.19 |
| Difficulty in payment of counterpart funding by FUGs | 43.75 |
| Diversion of farm inputs by the Project community facilitators | 52.34 |
| Poor extension contact | 59.38 |

Source: Field Survey Data, 2022. * = Multiple response.

## Conclusion

Based on the findings of this study, it was concluded that sustainable land management practices such as mulching, cover cropping, agro forestry contour farming and minimum tillage were promoted among farmers under Fadama III Project in Imo State. The SLM practices recorded high adoption rate by farmers in Imo State. Despite the high level of adoption of the SLM practices in Imo State, some constraining factors were observed. They included poor government support, limited access to land, and destruction of farm by grazing cattle and poor extension contact. The farmers believed that adoption of the recommended SLM practices impacted positively on their farming productivity by helping to reduce the incidence of land degradation, flooding and water runoff on one hand while improving soil property, structures, organic matter contents, reduces risk of crop failure and increases yield on the other hand.

## Recommendations

Based on the findings of the study, the following recommendations were made:

1. The Imo State Government should continue to provide support to the Fadama Development Project as a grassroots poverty reduction intervention in the state.
2. The Imo State Fadama Development Coordinating Office should liaise with the IMO State Agricultural Development Programme (ADP) to ensure continuous training of farmers on sustainable land management practices. This will help in curbing the increasing incidence of land degradation problems on the one hand while boosting agricultural production on the other hand.
3. There is the need to strengthen supervision of the Project community facilitators to ensure that they carry out their task as required. This will help to reduce or if possible stop the diversion of inputs and other resources

meant for the farmers.
4. The Imo State Government should enact relevant laws to regulate the entries of herdsmen into these communities especially into the farms as this will help reduce the rate of cattle invasion and destruction of farms. Also, unsustainable practices such as bush burning and indiscriminate deforestation should be regulated, and
5. The Fadama III Development Project Coordinating Office should ensure that farm inputs such as fertilizers, agro chemicals, seedlings, etc. needed for SLM practices are delivered to the beneficiaries on time and in the required quality and quantity. Equipment like tractors should be made available to the farmers to reduce the level of drudgery involved in some of the SLM practices.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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