



## Assessment of Cropping Systems and Soil Amendment Strategies Used By Farmers in Etche L.G.A of Rivers State

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### Abstract

Research was undertaken to assess the cropping system and soil amendment strategies used by farmers in Etche L.G.A of Rivers State. Data was collected for the study using a structured questionnaire. Multi-stage sampling technique was used to select crop farmers in the study area. The findings revealed that the majority of the respondents were female with no formal education. The average age of farmers was 35-45 years. The majority of the respondents cultivate less than one hectare of land. A greater number of farmers (72%) use inorganic fertilizer (NPK), and 15% use organic fertilizer such as poultry manure. Eighteen percent of the farmers do not apply any soil amendment. However, none of the farmers interviewed neither used agricultural lime or agrolzyer micronutrient fertilizer. Twenty percent of the farmers declined to use, and knowledge of biofertilizers and lime. On the choice of cropping system practice by farmers, the majority (87%) of the farmers in Etche L.G.A practice mixed intercropping with a higher percentage of farmers intercropping vegetables, and maize with root and tuber crops. In line with the findings, it was observed that farming operation in Etche L.G.A is subsistence and characterized by poor use of soil amendment which is a result of unavailability of such amendment and information gap. Therefore the research suggests the need to carry out a comprehensive capacity building of farmers on the best nutrient management options suitable for mixed intercropping system for the zone.

**Keywords:** *Cropping system, soil amendment, fertilizer, and organic manure*

### Introduction

The provision of adequate food supply to satisfy the needs of the whole population has always been one of the pressing needs of every country's government (FAO, 2001). In Nigeria, one of the reasons for the failure of agricultural plans is underestimating the importance of soil status and, therefore, mismanagement of the nation's soil (Teminski, 2012, Arokoyo, 2003). In addition, the lack of soil knowledge has led to a lot of soil damage and abuses. Soils represent 98% of the entire medium for plant growth. It provides anchorage for plants and also serves as a rich reservoir of nutrients for crop healthy growth and development (World Bank, 2022). Unfortunately, the later significance of soil has become a mirage as a result of the intense removal of nutrients in harvest produce without corresponding addition in both organic and inorganic forms. Factors such as an increase in population, soil erosion, soil degradation, overgrazing etc have been indicted as culprits (Daudu *et al.* 2016). These factors have already been recognized as reflected in the increased distribution of fertilizers to rural farmers through various schemes by the government at all levels. Despite interventions by government and private sectors to increase fertilizer used by farmers, average fertilizer use

by farmers in Nigeria is still very low (19.74 kg/ha) relative to Seychelles (515.67 kg/ha) (World Bank, 2022). In principle, soil amendment is any material (organic or inorganic) added to the soil to improve its physical properties such as water retention, permeability, water infiltration and drainage (CSU extension fact sheet, 2021). More so, they are used in agriculture to support plant growth and development (Clemente and Bihn, 2019). Soil amendment (especially organic) has been found to facilitate the establishment of plants in degraded and contaminated soils (Pardo and Clemente, 2017). Irrespective of the type of amendment to apply, factors such as soil texture, salinity, pH and duration of amendment should be considered in selecting an amendment. The use of organic amendments has been reported to improve soil ecology under varying cropping systems. Intensive agricultural practices and cropping systems without appropriate soil amendment schemes have been reported to impact negatively on soil health thereby resulting in overall yield decline (Ittyamkandath *et al.* 2022).

An attractive strategy for increasing productivity and labour utilization per unit area of available land is to intensify land use. A cropping system can be defined as

the kind and sequence of crops grown over some time in a given area. It includes all aspects of the spatial and temporal arrangement of crops in a given area with the sole aim of maximizing yield and enhancing environmental sustainability (Blanco, 2010). An understanding of the cropping system is necessary to identify constraints and develop appropriate techniques for increasing the quantity, quality and availability of food resources while assuring that subsistence needs are still met (Powell, 2014). Farmers cropping schemes on the other hand provide an insight into the overall nutrient status of the soil in a given locality. This is because a relationship exists between the influence of sole or mixed cropping on soil fertility status. For instance, previous work by Yun (2006) established that crop mixtures take up a higher amount of nutrients per unit of land area than their sole crop counterpart. Yun (2006) further estimated this uptake by mixed cropping to be at the range of 40 – 60% per hectare more nutrients uptake than 2 ½ hectares of corresponding sole crop. This observation was also confirmed by Can (2007). However, this does not negate the potential benefits of mixed intercropping as reviewed by Seran and Brintha (2010). In recognition of the problem associated with low yield prompted by imbalance nutrient management; vis-a-vis improper cropping scheme; there is an urgent need to assess the cropping scheme and soil amendment methods utilized by smallholder farmers that account for over 85% of the total output of crops produce in the country. The broad objective of the study therefore is to assess the cropping system/and soil amendment strategies used by farmers in Etche L.G.A of Rivers State. The specific objectives of the study are to: describe the socio-economic characteristics of farmers in the study area; identify the cropping system of farmers in the study area; identify the type of soil amendment methods utilized by farmers in the study area and identify factors responsible for the non-usage of soil amendment in the study area.

### **Methodology**

**Study area:** The study was carried out in Etche local government area of Rivers state. As of 2006, Rivers State has a population of 5,198,716 with a projected population of 7,303,900 as of 2016 with Etche local government area accounting for 351,200 of the total population (NPC, 2006). Etche is an agrarian community and represents one of the 22 local government areas of Rivers State which is located in the South-South geo-political zone of Nigeria. Etche's headquarters is in Ukehi.

**Population/Sample Size:** The population of the study area consists of all crop farmers in the local government area.

**Sampling Techniques/Model:** A multi-stage sampling technique was employed to select the respondent. In the first stage, three communities out of seven that make up the local government were selected. These communities are Isu-liohe, Ibgodo and Ukehi. In the second stage, there was a random selection of twenty respondents from each community making a total of 60 farmers. Primary data collected were analyzed using simple

descriptive statistics such as frequency, mean and percentages

## **Result and Discussion**

### ***Socio-Economic Characteristics of Farmers***

The socioeconomic characteristic of farmers in the study area is shown in Table 1. The result of the findings reveals that the majority (75%) of the farmers in Etche L.G.A of Rivers state were women within the middle age bracket of 36-45 years. This entails that the farming population in Etche were within their active and productive ages. The greater percentage of women farmers over their male counterparts is in sharp contrast to the report obtained by most researchers in other agroecological zones of the country; whereby males form a larger population of the active farm workforce. The result however agreed with those reported by Ajayi, (2002) in Southwest Nigeria. Furthermore, available data from the United Nations National Geographic Centre (2014) revealed that female farmers are 8 percent of the world's population, and men 11 percent. Women make up 20 percent of the agricultural labour force in Latin America and nearly 50 percent in East Asia and sub-Saharan Africa. The higher proportion of women in agriculture as depicted by our figure could be because women play a significant role in society, in food security; they are the backbone of the rural economy. Similarly, the current effort of local and international donor agencies aimed at placing more emphasis on women in agro-empowerment programs could be responsible for the considerable in the women farming population. He reported that women formed the majority of those engaged in the farming business, especially in rural areas. This stage represents the period where farmers are capable and energetic to perform assigned work more efficiently and effectively (Tambari et al. 2014). Sixty-six percent of the farmers cultivate less than one hectare. The majority (54%) of the respondents had primary education while about 8% did not have education of any kind. Sixty-six percent representing the majority of the respondents own less than one hectare of land whereas only 4% of the total number of farmers interviewed cultivate above two hectare of land.

### ***Cropping System Used by Farmers in Etche***

The result of the cropping system used by farmers in Etche is presented in Table 2. The result indicates that the predominance (94%) cropping system practice in Etche L.G.A was mixed intercropping with 86% of the farmers growing a mixture of vegetable, root and tubers and cereal crops. This confirmed the earlier work of Powell (2014) who observed that intercropping is popular within the sub-humid zone of Nigeria. The predominant cereal crop that is cultivated in Etche is fresh maize (*Zea may*). Hence, cereal represents 6% of the overall crops cultivated in Etche.

### ***Soil amendment used by farmers in Etche***

The result of the soil amendment used by farmers in Etche is shown in Table 3. The finding revealed that 74% of the farmers know the various soil amendment types

currently in use. Similarly, 74% also used inorganic fertilizer while 10% used organic manure. Sixteen percent of farmers in Etche do not use any form of soil amendment in their farms. The majority of the farmers do not use soil amendment due to high costs (42%). Fourteen percent do not find it necessary to use any soil amendment. During our interaction in the focal group discussions, many of the farmers revealed that their soil was already fertile due to the seasonal deposit of alluvium resulting from overflow from rivers. Other factors that strongly hindered farmers from adopting any form of soil amendment were unavailability (24%), and information gap (20%).

### Conclusion

Key observation from the findings revealed that farmers in Etche are peasants, and cultivate mixtures of crops with greater emphasis on root and tubers with minimal inclusion of vegetables and fresh maize. Many of the farmers are aware of the significance of soil amendment with its usage being limited by high cost. Other factors that were reported to hinder the use of soil amendment were unavailability and information gaps. Many farmers however believed that their soil was fertile; hence there was no need to apply any form of amendment. It was discovered that all farmers in Etche do not know agrolyzer micronutrient fertilizers. On this note, the following recommendation is in advance;

- (1) Extension efforts should be channelled to the general improvement of soil health by exploiting different soil amendment strategies to boost the outputs of crops in the study area
- (2) Capacity building of farmers on improved cropping system management should be encouraged since the predominant cropping scheme of the study area is mixed cropping.

### References

Arokoyo, T. (2003). ICTs in the Transformation of Agricultural Extension: The Case of Nigeria. Proceedings of *ICTS - Transforming Agricultural Extension? The 6<sup>th</sup> Consultative Expert Meeting of CTA's Observatory on ICTs*, 23-25 September Wageningen, The Netherlands.

- Can, F.K.N. (2007). Studies on the Effects of Cassava-Based Intercropping Systems on Soil Fertility in the Humid Tropics. *Soil Fertility Research*, 6(6): 801-807
- Daudu, C.K., Aliyu, J.A., Yakubu, A.A and I.Y.Amapu. (2016). Soil Fertility Management Practices for Irrigated Vegetable Crops. In: *Irrigation Extension handbook (IBCA-NAERLS project)*. NAERLS press, Pp.92-96
- FAO (2001). Soil Fertility Management in Support of Food security in Sub-Saharan Africa. Available on <ftp://ftp.fao.org/agl/agll/docs/foodsec.pdf>
- Powell, J.M. (2014). Cropping Systems in the Sub-Humid Zone of Nigeria
- National Geographic Centre (2014). International Women's Day 2014: Revealing the Gap Between Men and Women Farmers. <https://www.nationalgeographic.com/history/article/140308-international-female-farmers>
- Tambari, I.W., Abubakar, B.Z., Attahiru, M. and Moyi, S.S. (2014). Strengthening the Capacity Building of Extension Workers of Sokoto Agricultural Development Project towards Enhancing Agricultural Transformation Agenda in Nigeria. Proceedings of the 48<sup>th</sup> annual conference of the Agricultural Society of Nigeria, Abuja. Pp. 577-579.
- Seran, T.H. and Brintha, I. (2010). Review on maize based intercropping. *Journal of Agronomy*, 9:135-145
- Yun, E.A. (2006). Effects of Mixed Cropping on Soil Fertility. *Soil Fertility Management*, 8(5):543-548
- Terminski, B. (2012). Current Dynamics of Land Degradation in Africa: Facts and Statistics. *The Nigerian Voice*. Available Online, <https://www.thenigerianvoice.com/nvnews/89836/1/current-dynamics-of-land-degradation-in-africa-fac.html>
- Ittyamkandath Rashmi, Anita Kumawat., Athifa Munawery., Kavukattu Sreekumar Karthika., Gulshan Kumar Sharma., Samadharmam Kala., and Rama Pal. (2022). Soil Amendments: An Ecofriendly Approach for Soil Health Improvement and Sustainable Oil Seed Production .doi:10.5772/intechopen.106606.

**Table 1: Socio-economic characteristics of respondents**

Characteristics	Frequency	Percentage
<b>Age</b>		
25-35	6	12
35-45	39	78
above 45	5	10
<b>Gender</b>		
Male	15	30
Female	35	70
<b>Farm size</b>		
<1Ha	33	66
1-2Ha	15	30
above 2Ha	2	4
<b>Educational level</b>		
None	4	8
Primary	27	54
Secondary	12	24
Tertiary	7	14

*Source: Field survey*

**Table 2: Cropping system used by farmers in Etche**

	Frequency	Percentage
<b>Type of cropping system</b>		
Monoculture	3	6
Mixed	45	94
<b>Type of crop grown</b>		
Legumes	1	2
Cereals	3	6
Vegetables	1	2
Root/tubers	2	4
Tree crops	0	0
Vegetables/roots/cereals	43	86

*Source: Field survey*

**Table 3: Soil amendment used by farmers in Etche**

	Frequency	Percentage (%)
<b>Knowledge of soil amendment</b>		
Yes	37	74
No	13	26
<b>Type of amendment</b>		
inorganic fertilizer	37	74
organic manure	5	10
bio-fertilizer	0	0
Lime	0	0
Micronutrient agrolyser	0	0
None	8	16
<b>Reason(s) for non-usage</b>		
Unavailability	12	24
High cost	21	42
information gap	10	20
Just not necessary	7	14

*Source: Field survey*