



Implementing green action, use of organic fertilizer in Rural Gambia: The case of The Upper River Region

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Abstract: The study was conducted to understand the use of organic fertilizer to enhance production in the subsistent farming system of the Gambia. The understanding of the use of organic fertilizer in rural Gambia, specifically in the Upper River Region of the Gambia, has not been studied for knowledge, policy, and advocacy direction. The use of organic fertilizer in the Gambia is not well defined, despite Agriculture, which is the mainstay of nearly 70 percent of Gambians, provides a livelihood for most Gambians. This study aimed to address the intention of farmers to integrate organic fertilizer into farming practices. Moreover, this study aimed to bolster the capacities of farmers to promote and engage in organic fertilizer use, which is crucial for sustainable agriculture and food security in The Gambia. Data was collected from 317 representatives of small-scale farmers in the Upper River Region (URR) of the Gambia. Findings revealed a low intention to use organic fertilizer, despite very low challenges, such as inadequate materials and inconsistent government support. There's a clear demand for consistent support and comprehensive training programs to enhance organic fertilizer production. There's a call for more consistent and accessible support to promote the widespread adoption and use of organic fertilizers and the reduction and eventual abandonment of chemical fertilizers by farmers in URR. Overall, the study highlights the importance of addressing gaps in knowledge, skill development, and the use of organic fertilizer to foster sustainable agricultural practices and improve farm productivity in The Gambia.

IndexTerms - Organic fertilizer, URR, Gambia, Sustainability, Agriculture.

I. 0 INTRODUCTION

Small farms are estimated to feed roughly half of the world's hungry people[1]. To combat global food insecurity, it is imperative to prioritize the needs of small-scale farmers in developing countries[2]. Many developing countries, particularly those in Africa, face a slew of issues that must be addressed to improve the sustainability of food production. To address all of these issues, many researchers have identified low-external input sustainable agriculture as a preferred development strategy for the problem of food security[2]. Integrated farming, agroecological practices, pest management, and, in particular, organic farming are the most important sustainable agriculture systems introduced in recent years[2].

Nonetheless, organic farming may vary by region. Many researchers, including [3], [4], [5], [6] have proposed organic farming as an environmentally friendly agricultural production system. Organic farming (using organic fertilizer) is thus a holistic production system that takes into account long-term environmental sustainability and primarily aims to produce food in an environmentally friendly manner[3], [6], [7], [8]. Organic fertilizer provides environmental benefits such as biodiversity conservation, improved soil quality, reduced evaporation and water harvesting, strengthened adaptation strategies, reduced greenhouse gas emissions, and increased energy efficiency. Using organic fertilizer aligns with the goals of environmentally friendly production, improving animal health and welfare, and promoting high-quality products[2]. The International Federation of Organic Agriculture Movements (IFOAM) defines organic farming as being based on four basic principles: health, ecology, fairness, and care for people and ecosystems.

There is compelling evidence to support the claim that organic farming can contribute to food security[5], particularly in certain regions such as Africa. On the other hand, in developing countries where the majority of farmers are small-

scale, the conventional agricultural system fails to meet the basic needs of resource-poor farmers[2]. This is due to their inability to afford costly synthetic inputs, demonstrating how poverty and food insecurity frequently coexist[2]. As about three-fourths (70%) of the poor in the world are living in sub-Saharan Africa and Asia, investing in agriculture is an effective strategy to improve their livelihood[5],[9].

This study is critically important as organic fertilizer production has received much attention in the literature. Organic amendments' impact on crop yield and soil fertility has been studied extensively around the world, and it has been identified as critical for sustainable agroecosystem management[10]. For example, Kwesiga et al. (2020)[11] investigated the effects of repeated applications of green and farmyard manures on rain-fed rice performance in East African rural floodplain environments and discovered that both amendments resulted in a significant increase in grain yield (18-62%), with a positive residual effect on non-amended rice yield in the third year, as well as increased soil fertility. Thus, there is enough evidence available even though researchers have paid little attention to these systems – to suggest that agroecological technologies promise to contribute to food security on many levels[12]. This is particularly important for The Gambia as an agriculture-based economy. The use of organic manure and compost has been shown to improve the soil organic matter content, water infiltration and retention, and the available water content of soils by 58–86%[13].

Some studies also contend that organic farming is not a viable option for smallholder farmers in many regions, including Africa, who are unable to produce adequate amounts of compost and green manures[2],[11], [13] Farmers typically need about 5 years to see the best return on their investment. Farmers who adopt certified agroecological practices must also deal with risk management issues during the three-year transition period[7]. As previously discussed, small-scale farmers who choose agroecological practices face a variety of opportunities and challenges. This study examined the use of organic fertilizers by small-scale farmers in the study area (URR) in the Gambia. Thus, this study is significant for the potential results and recommendations in providing possible and viable solutions for the production and use of organic fertilizer in the Gambia.

1.1 Purpose of Study

The study aimed to strengthen the capacities of small-scale subsistent farmers in The Gambia to engage in the production and use of organic fertilizer. The study's specific objectives were to strengthen the research, promotion, production, marketing, vulgarization/extension, and the use of organic fertilizers in the Gambia and to promote the consumption of food items produced using organic fertilizers. Thus, the study is significant for agroecology knowledge, and the production and use of organic fertilizer.

1.2 Study Areas: URR (Upper River Region)

Upper River Region, occupying about 2000 sq km is the second largest division in the Gambia[14]. The region has 4 districts, namely Fulladu East, Kantora, Wuli, and Sandu with the headquarters in Basse Mansajang Kunda. The largest and most populous district is Fulladu East. Occupying 39% of the total land area of the division, the district is home to 53% of the residents in the Division with a population density of 125 persons per sq. km about the national average. The second most populous district is Wuli, the larger of the two districts on the north bank of the Division, with 19% of the divisional population. Sandu district is the least populated in the Division with a population density of 31 persons per sq. km.

The population of Upper River Division in 2003 was 182,586 an increase of 18% from 1993. The distribution of population varies across the division with over 70% of the population living in the two south bank districts of Fulladu East and Kantora. Only one of the 10 largest settlements in the division is on the north bank of the river. The largest town Basse is also the commercial center of eastern Gambia. Over the years Basse has become an important transit point for goods going to eastern Senegal, the Republic of Guinea, and Mali[14].

Like the Central River Region, agriculture and livestock are the main livelihood in URD. Fulladu East is a major livestock production center. Extensive floodplains in the Division have led to the expansion of irrigation rice production in many areas. Groundnuts, millet, and maize are the dominant crops within the upland areas. In efforts to diversify agriculture, successive governments have promoted commercial cotton production although with limited success[14]. See Table 1 for the distribution of households by district in URR. Figure 1 depicts the map of URR.



Figure 1: source[14] The map of Upper River Region (and districts)

2.0 LITERATURE REVIEW

Organic fertilizers are materials with a specific chemical composition and high nutritional value that can provide sufficient nutrients for plant growth [15], [16], [17]. Organic fertilizers are primarily created by composting animal manure, human excrement, or plant matter (such as straw and garden waste) with microorganisms that are fermented at high temperatures [16]. Organic fertilizers improve soil structure, provide a variety of plant nutrients, and introduce beneficial microorganisms into the soil [18]. Organic fertilizers are widely used in agriculture due to their benefits for soil structure and crop yield [19]. Organic fertilizers can increase crop yields and soil quality, and combining organic and inorganic fertilizers is thought to be an effective solution for crop ecosystem sustainability [20]. Organic fertilizers can improve soil structure and fertility while also increasing organic carbon and other nutrients [19], [21]. Many studies have found that applying organic fertilizers to the soil surface can provide a rich food source for microorganisms while also significantly increasing microbial community composition and diversity when compared to no application [18], [22].

Furthermore, using organic fertilizers alters cation exchange capacity (CEC) and increases soil moisture content, resulting in changes in soil fauna community structure and composition in acidic soils [23], [24]. Organic fertilizers promote the formation and stability of earthworm communities due to the more stable nutrients in organic manure after aerobic fermentation [25]. Others, on the other hand, have discovered that long-term use of chemical fertilizers can reduce soil OM content and change the activity of soil biota, resulting in changes in soil microbial composition and decreased soil invertebrate abundance and diversity due to environmental constraints and pH reductions [20]. A study also found that short-term applications of inorganic fertilizers (urea) significantly increased soil fauna feeding activity after two days when compared to before the application. [26]. A separate study also demonstrated that soil organic matter (empty fruit bunch) improves soil ecosystem function by increasing soil fauna feeding activity [27].

3.0 RESEARCH METHODOLOGY

The present study adopted a mixed-methods approach, combining both quantitative and qualitative methods to gather a holistic understanding of the use of organic fertilizer by farmers in the URR of The Gambia. Studies of farming systems with similar objectives to the current study are typological mixed methods analyses to classify prevailing practices among farmers and identify farmer characteristics that determine their proclivity to engage in those sets of practices[28]. From the literature, we identified a universal set of observable organic fertilizer use decisions to support possible subsets of decisions by farmers in the URR. Since there is no prior information about how farmers make organic fertilizer decisions, we could not assume any number or nature of expected factors. Thus, based on the objectives of the study, the nature of the study was a survey design using a micro survey (questionnaires).

4.0 POPULATION & SAMPLING

The population of the present study represents the households in the respective districts of URR in the Gambia. Therefore, the study targeted households in the farming communities in URR. The population (No. of households) for the study consists of 7 districts with 34659 households. See Table 1 depicts the number of districts and households in URR.

Table 1. URR districts and number of households

URR (Basse)	District	Household No.	Percent (%)
1	Jimara	6267	18.0
2	Basse	9867	28.0
3	Tumana	5213	15.0
4	Kantora	4830	14.0
5	Wuli West	2611	8.0
6	Wuli East	3011	9.0
7	Sandu	2860	8.0
TOTAL		34659	100

4.1 Sampling

The population of this study was stratified first by regional population, followed by farming districts, followed by farming households, and finally active farmers male or female. The respondents were randomly selected in their respective districts. Stratification of the population was necessary to achieve the aim of the study's participant representation. Farming communities are found in all 7 seven districts URR. Therefore, stratified sampling was appropriately used to ensure that the study obtained an accurate representation of the regional population of which a significant number (approximately 70% of the population earn their living through agricultural engagement). Moreover, the stratified sampling approach was the most appropriate for the present study because of the availability of information (list of households in the regions/districts provided by Gambia Bureau of Statistics(GBoS)[29]. Thus, the present study conveniently selected three districts Jimara, Basse, And Wuli West to determine the sample size. Table 2 depicts the questionnaire distribution by district in the region.

Table 2: Number of questionnaires per districts of URR

URR Districts	No. of Household	Percentage Share (%)	No of Questionnaires
Jimara	6267	0.33	104
Basse	9867	0.53	168
Wuli West	2611	0.14	45
Total	18745	100	317

krejcie and Morgan formula was used to determine the sample size of the study-18745 population which equalled 317 participants.

5.0. RESULTS AND DISCUSSION

The findings showed the URR and exhibited the highest low use of organic fertilizer.

URR: Dominated by low engagement (65%) (Fig. 2 below).

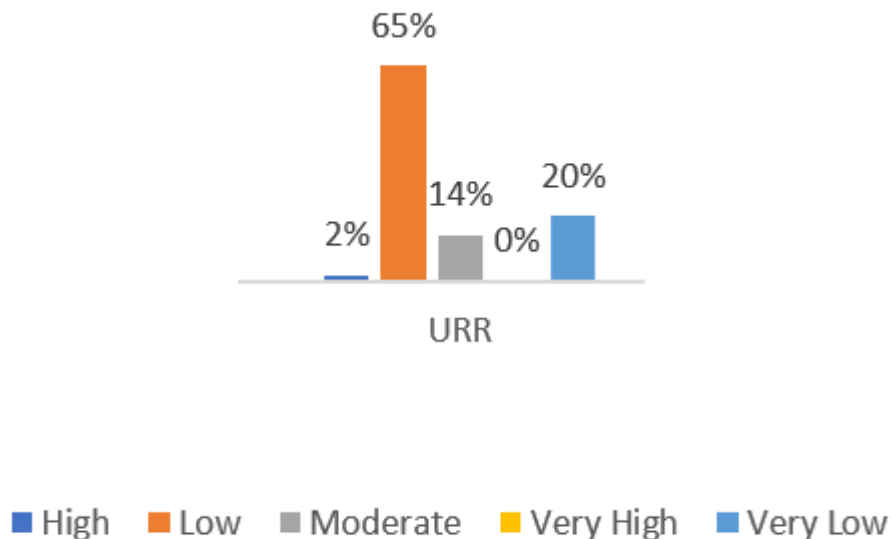


Figure 2. Use of organic fertilizer per percentage

a. Main social barriers that prevent wider adoption of organic fertilizers in the URR. We asked why a significant number of farmers do not use organic fertilizers, the respondents indicated the following:

- **Resistance to change:** 37% of respondents in URR identified resistance to change as the main barrier, the highest among all regions. This suggests that even if awareness is raised, overcoming resistance could be more difficult here.
- **Lack of awareness:** 21% of respondents cited a lack of awareness, which, while significant, is not as prominent as in other regions.
- **Cultural beliefs:** 29% identified cultural beliefs as a barrier, similar to other regions but not as significant as in CRR North or LRR.

6.0 CONCUITION

Organic farming is a knowledge-intensive rather than input-intensive system; knowledge and capacity building are critical components of this system. Although organic farming encourages the use of Indigenous knowledge, many believe that small-scale farmers in developing countries can learn organic farming more easily because it is so similar to their traditional knowledge; however, farmers must still be specifically educated about appropriate agroecological practices, the certification process, and critical marketing information. Thus, this challenge can be addressed with more education/training and information for the proper production and use of organic fertilizers. The education and training on agroecology and the production and use of organic fertilizers should be informed by more research and development efforts by the Ministry of Agriculture and other entities with similar interests. This study provides information that may help extension workers to better align their intervention efforts with needs of farmers in the URR.

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