



Assessment of farm management methods for sustainable yam production in Nigeria

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Abstract

Farm management strategies are of substantial significance in agriculture, with the inherent values of the farmers' adaptive knowledge in achieving sustainable yam production. This study focused on assessment of farm management practices in Akungba-Akoko, Ondo State, Nigeria. Twelve farm settlements, where bulk of yam production is produced, were selected by purposive sampling method. However, simple random sampling was used to select ten yam farmers in each of the sampled settlements. In all, 120 farmers were sampled and administered with copies of structured questionnaire. Simple percentages and Likert Scale were adopted to examine farmers' notions on farm management methods. Results reveal that; (i) majority of farmers fall within the age group of active labour, highest composition of male farmers indicates categories of gender with enabling strength for yam farming, low educational status could point to prevalence of crude mode of production (ii) out of the 9 farming methods adopted by farmers; mixed cropping, regular weeding and burning of farm waste to add potash to soil ranked 1st, 2nd, and 3rd respectively (iii) inadequate access to capital (2.78), Low/late Rainfall (2.45), and soil degradation (2.53) are the limiting factors on yam production. It was concluded that farm management methods in the study are considered important to yam cropping at varying degrees. It was, however, recommended that the limiting factors should be improved upon by the farmers for sustainable farming practice and in achieving food security .

Keywords: Farm management; food security; soil degradation; yam production.

1. Introduction

As food security potential, yam is a major staple in West Africa. Nweke (1999) submitted that yam provides food for over 60 million people in West Africa. As noted by Food Agriculture Organization (FAO, 1998), Nigeria is a global leader in yam production, which accounts for 75% of the world total yam production. Yam is produced primarily in the savannah region of West Africa, which contributes 92% (66.8 million tons) of the world yam production of 72.6 million tons (Food and Agriculture Organization of the United Nations (FAOSTAT,

2020). According to Babaleye (2003), yam contributes over 200 dietary calories per capita per day for over 150 million people in West Africa with over 21% dietary fibre and are rich in carbohydrates, vitamin C, potassium, manganese and other essential minerals. Maikasuwa and Ala (2013) noted that many yam belt areas in Nigeria continuously proclaimed "yam is food and food is yam". Yam plays a vital role in enhancing food security and alleviating hunger in many parts of West Africa (Asiedu and Sartie, 2010). It is also a source of pharmaceutical compounds, such as saponins and sapogenins (Obidiegwu, Lyons and Chilaka, 2010), and its peels can be used as feed for livestock (Adegun, 2020).

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In tropical farming systems, yams are grown in raised beds, particularly mounds and with any other companion crop such as maize as inter crops. In Nigeria, yam production is viable among farmers based on the proportion of its returnable income from sales and its consumption. Despite the increase in yam production in Nigeria, prevalent food scarcity is becoming common problem because farmers still depends largely on the use of crude farming tools that include hoes and cutlass.

The observed trend in yam production in the country calls for research into the identification of effective production methods that could guarantee high yield of yam in the study area; although various researches have established the dominance and importance of traditional manual knowledge in developing cropping system. In developmental studies, the value of indigenous knowledge system cannot be overemphasized among the peasant farmers in the developing countries like Nigeria.

In order to understand the farm management that dominates farming system among the yam farmers, the study of farm management ranking system based on the nature of existing resources towards improving farm management and crop yields is essential. This is the focus of this current study.

Thus, farm management strategies are of substantial significance in agriculture, with the inherent values of the farmers' adaptive knowledge in achieving sustainable yam production. It is in this direction, this study considers the examination of farmers farm management methods and impacts on sustainable yam production in Akungba-Akoko, Ondo State, Nigeria.

2. LITERATURE REVIEW

2.1. Yam production in Nigeria

Yams are grown in tropical regions and mostly produced in the Savannah region of West Africa, where rainfalls are divided into wet and dry seasons (FAO, 2013). This crop is also grown in

Latin American and Caribbean countries like Colombia, Brazil, Haiti, Cuba and Jamaica (FAO, 2013).

Nigeria is the largest producer of yams in the world, followed by Ghana, Cote D'Ivoire, Benin, Togo, and Cameroon (FAO, 2013). Yams are mostly marketed as fresh tubers and prepared for consumption. Transportation and marketing are carried out both by farmers and traders (Ike and Inoni, 2006).

Yams are the most harvested crops in Nigeria, follow by cassava, maize, guinea corn, and beans/cowpeas. More so, cassava, yams are the most commonly harvested tuber crops in the country (National Bureau of Statistics, 2012). Yams do not only serve as the main source of earnings and food consumption, but also as a major employer of labour in Nigeria. Despite the importance of yams to people, the attention to its production is still questionable.

Some researchers have empirically investigated factors that determine the level of yam production in Nigeria and elsewhere in the world. For instance, Bamire and Amujoyegbe (2005) find a positive relationship between net returns (profitability) in yams output and land improvement techniques in Nigeria.

In the same direction, studies by Zaknayiba and Tanko (2013) reveal that lack of access to inputs, finance, poor producer prices, inadequate of storage facilities, incidences of pests and diseases have negatively affected yam production. Similarly, Ike and Inoni (2006); Maikasawa and Ala (2013) examine some determinants of yam production in particular regions in Nigeria. They find that the factors of production such as labour, finance and material inputs like fertilizer have influenced yam production in the region.

Etim, Thompson and Onyenweaku (2013) investigate the relationship between farm level and output-oriented technical efficiency indices. Their results suggest that farmers 'education, family labour, extension contact and experience

of farmers have a positive effect on the farm level technical efficiency and yam output.

Published empirical works within the context yam production in Nigeria were mainly field research used annual time series data to determine the factors that are influencing yam production in Nigeria during specified period of the year. He found out that Yam production has undergone some dramatic changes in many parts of Nigeria. He finally suggested that special attention should be given to the dynamics of production and potential constraints that hinder higher efficiency and sustainability of yam production in Nigeria.

2.2. Socio-economic importance of yam production in Nigeria

Yams are among major cash and most consumed food crops West African countries like Nigeria (Babaleye, 2003; National Bureau of Statistics, 2012). Its cultivation is very profitable despite high costs of production and price fluctuations in the markets (IITA, 2013). An average profit per yam seed, harvest and storage in Nigeria was calculated at over US\$13, 000 per hectare harvested (IITA, 2013).

Households demand for yam consumption is very high in Sub-Saharan Africa. Nutritionally, yam is major staple food consumption, providing food for millions of people in the West Africa. It is eaten in different forms such as fufu (the so-called pondo yam and Amala in Nigeria), boiled, fried and roasted (Aidoo, 2009).

This root and tuber place in the diet of smallholder farmers cannot be ignored. It contributes over 200 dietary calories per capita per day for over 150 million people in West Africa (Babaleye, 2003). Yams have over 21% dietary fibre and are rich in carbohydrates, vitamin C, potassium, manganese and other essential minerals. Many yam belt areas in Nigeria continuously proclaimed “yam is food

and food is yam” (Maikasuwa and Ala, 2013). Some family rural dwellers, where yams are grown, eat it all day round because yams are the only available food, especially during the harvesting season.

However, the primary research carried by LSMS-ISA (Living Standards Measurement Study- Integrated Surveys on Agriculture) in Nigeria showed that the consumption patterns of yams differ from the poor and rich people. Relatively, richer households were found to be consuming more yams, but selling less harvested than poorer households. Poorer households consumed fewer yams, arguably because they heavily depended on yam for income than their richer counterparts who have other sources of earning (National Bureau of Statistics, 2012).

Thus, yam plays significant roles in the social-cultural activities in Sub-Saharan Africa such as Nigeria and Ghana. For instance, some households used it during marriage and fertility ceremonies. More so, the festival takes place yearly to celebrate its harvest, and other social ceremonies (IITA, 2013; Bamire and Amujoyegbe, 2005; Aidoo, 2009).

In Nigeria just like in many sub-Saharan African countries, agriculture is the largest employer of labour. According to the National Bureau of Statistics, about 60% of the Nigeria labour forces were in agriculture, and they had contributed over 40% to the country’s annual average of real GDP (National Bureau of Statistics, 2012).

3. Materials and methods

3.1. Study Area

The study area is Akungba - Akoko of Ondo State, Nigeria. It is located on Latitude 7°24' and 7°28' North and Longitude 5°44' and 5°45' East (Figure 1).

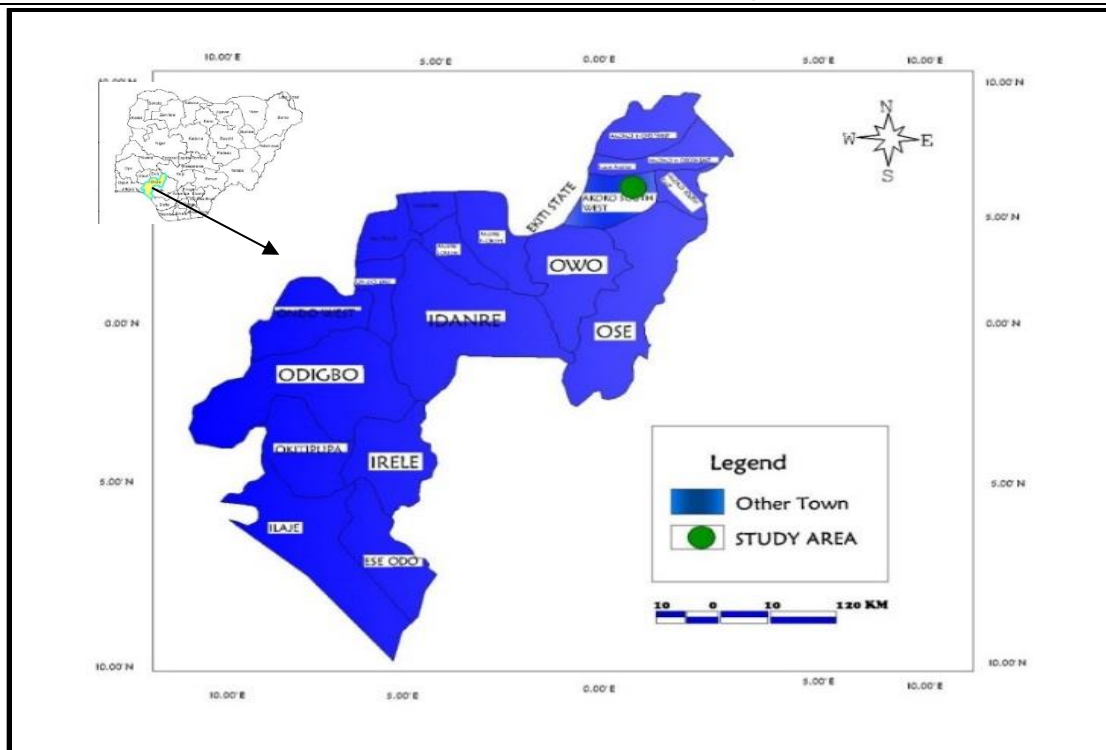


Figure 1. Ondo State showing Akoko South West. (Inset: Ondo in Nigeria) Source: Ondo State Ministry of Lands and Housing, 2018.

According to the Ondo State Ministry of Agriculture (2005), the topography varies between 400 meters to 500 meter above the sea level and consists of hills made of granite. Notable hills in Akungba-Akoko are Oke-Irigbo, Akunmeren and Oke Oko among other. At the beginning of rainy season is marked by great heat and destructive storm accompanied by lightning and thunder, crops and houses are destroyed because of thunder storm.

As noted by Olabode (2014), this study falls in the deciduous rainforest in the south western Nigeria. There are wide range of crops being grown in the area such as cassava, yam, vegetation and cash crop like cocoa and kola nuts among others. The trees in the area are fairly tall and are properly disseminated, which encourage timber business in the area due to fertile and rich soil. Aside farming, people were as well engaged in industrial activities that involved health services, traditional craft, mechanical engineering, trading, soap making,

palm oil production, educational and religion activities.

3.2. Methods

Population for the study was the rural settlers, while the sample frame involved farmers who cultivate yams. The multi-stage sampling method adopted involved purposive sampling method for the selection of twelve farm locations alongside simple random sampling method for the selection of ten yam farmers in each of the farm locations. Total number of one hundred and twenty farmers were sampled and used in this study.

4. Results and discussions

4.1. Socio-Economic Characteristics of Respondents

The observed age distribution among the yam farmers shows that ages between 31 and 40 are 50 percent (Table 1). It was revealed that male farmers are more than female counterpart following the highest recorded 90 percent of the

male farmers. This implies that highest composition of male farmers indicates categories of gender with enabling strength for yam farming. However, most farmers have low education status with 42% primary, 33% secondary, 16.7% tertiary, and 8.3% informal educations. This low educational status could point to how best yam production be practiced, especially as it relates to soil management. In

respect to the observed occupation of the respondents, the study established that 75 percent of the farmers are into full time farming activities. The result established that farming activities is the mainstay of farmers daily living. This study corroborate the previous findings by the National Bureau of Statistics (2012) that about 60% of the Nigeria labour forces were in agriculture.

Table 1. Characteristics of the respondents

| Age Distribution (year) | | | Gender Description | | | Educational Status | | | Occupation | | |
|-------------------------|------|------|--------------------|------|-----|--------------------|------|------|---------------|------|-----|
| Age Group | freq | % | Sex | freq | % | Status | freq | % | Status | freq | % |
| 20-30 | 15 | 12.5 | Male | 90 | 75 | Primary | 50 | 42 | Farmer | 90 | 75 |
| 31-40 | 60 | 50 | Female | 30 | 25 | Secondary | 40 | 33 | Trader | 12 | 10 |
| 41-50 | 30 | 25 | Total | 120 | 100 | Tertiary | 20 | 16.7 | Artisan | 10 | 08 |
| <50 | 15 | 12.5 | | | | Informal | 10 | 8.3 | Civil servant | 08 | 07 |
| Total | 120 | 100 | | | | Total | 120 | 100 | Total | 120 | 100 |

4.2. Types and ranking of farm management strategies for yam production in the study area

Table 2 indicates the summary of farmers' responses in relation to various types of farm management strategies adopted for improving yam production in the study area. The calculated Mean Weight Value (MWV) and the Ranking of the Mean Weight Value (RMWV) of respondents' notions is as shown in Table 2.

Mixed cropping was ranked first with the calculated Mean Weight Value of 2.51. Other farm management methods considered in the study were grouped and ranked in this order; regular weeding of farm plot (MWV =2.48), slashing and burning of farm plot to add ashes (Potash) to soil (MWV =2.36) ranked second and third respectively. Stacking of poles (MWV =2.28) ranks fourth, while mulching of yam farm to prevent sun burn (MWV =2.18) and avoidance of tree shades (MWV= 2.16) rank fifth and sixth. Moreover, bush fallow/ shifting cultivation (MWV= 2.05) crop rotation (MWV=1.91) and stripe contour farming (MWV = 1.88) rank 7th, 8th and 9th respectively. It is

apparent that farmers' knowledge in yam cropping comes with different farm management methods and with different level of farming processes. This study has shown the predominant practice of mix cropping, which tends towards planting other crops on the same farmland where yam is being grown. This tradition among the farmers aims at retaining soil fertility with different crop species. Also, mix cropping helps in working with available piece of land due to shortage of suitable land for farming. However, all the farm management methods are, however, considered important to yam cropping.

Regular weeding has 2.48 Mean Weight Value and was rated as 2nd ranked farm management method, which determines the effectiveness of yam production in the study area. This result shows that timely removal of weeds from farms is a regular practice among the farmers. The common method is by manual removal of weeds, why alternate method, which occasionally practiced is by applying chemicals on farmland. It was noted that an act of regular weeding usually reduces unwarranted

competition between the crop and weeds. Slash and burn of farm plot to add ashes (Potash) to soil is one of the three leading farm management methods for yam production in this study. The practice of stacking of poles is another process that is essential for yam cropping. Yam farmers

have found this process as part of live-wire for effective yam production. Yam plant is not a straight tall plant, it curls and look for a support in order to stand. This study ranked stacking of poles to number four.

Table 2. Types and ranking of farmers responses on farm management methods in the study area.

| Statement | Items | Responses | | | | | Likerts Conversion | | | | TWV | MWV | Ranking |
|----------------------------------------------------------|-------|-----------|----|----|----|-----|--------------------|----|----|----|-----|------|-----------------|
| | | SA | A | D | SD | T | 4 | 3 | 2 | 1 | | | |
| Mixed cropping | | 34 | 32 | 15 | 39 | 120 | 136 | 96 | 30 | 39 | 301 | 2.51 | 1 st |
| Regular weeding | | 34 | 27 | 22 | 37 | 120 | 136 | 81 | 44 | 37 | 298 | 2.48 | 2 nd |
| Slash and burn of farm plot to add ashes(Potash) to soil | | 25 | 33 | 22 | 40 | 120 | 100 | 99 | 44 | 40 | 283 | 2.36 | 3 rd |
| Stacking of poles | | 19 | 33 | 31 | 37 | 120 | 76 | 99 | 62 | 37 | 274 | 2.28 | 4 th |
| Mulching of yam to prevent sun burn | | 28 | 15 | 27 | 50 | 120 | 112 | 45 | 54 | 50 | 261 | 2.18 | 5 th |
| Avoidance of tree shades | | 22 | 23 | 27 | 48 | 120 | 88 | 69 | 54 | 48 | 259 | 2.16 | 6 th |
| Bushfallow/Shifting cultivation | | 21 | 20 | 23 | 56 | 120 | 84 | 60 | 46 | 56 | 246 | 2.05 | 7 th |
| Crop rotation | | 15 | 21 | 22 | 62 | 120 | 60 | 63 | 44 | 62 | 229 | 1.91 | 8 th |
| Stripe/Contour farming | | 10 | 22 | 32 | 56 | 120 | 40 | 66 | 64 | 56 | 226 | 1.88 | 9 th |

The early growing stage of yam needs much protection from the effect of surface-sun heat activities. Mulching of yam to prevent sun burn is rated 5 and much practiced by farmers. This farm management practice has been in practice for a very long time and has helped in preserving yam crops at the early planting period. Covering of the planted crops with grasses and plant leaves will last until rainfall period and when the crops begin to germinate. Table 5 also indicates that the percentage of shifting cultivation is low, which ranked number eight. This simply explains that most of the farmers in the study area are of the opinion that they cope on the existing farmland without shifting from one land to another. These farmers are maximizing their possible quantity and quality of the desired crop produce on a unit of land without the practice of shifting cultivation.

Stripe/Contour farming is another form of farm management practice by farmers in this study. This has to do with drainage system, which is

patterned in such a way that excess water that could damage the growth of the yam seed is diverted and drained away. It is however observed that the ranking system analysis in Table 4 placed stripe/contouring in number 9. This is because farmers have overtime developed a method of high ridges, much higher above surface level, for yam cropping in order to avoid interference of essence water that could damage crops while growing up. In a related study, Adas (1974) observed that canal also served the crucial purpose of providing places for homesteads, flood regulation to control flood-based agriculture.

Based on the existing types and ranking of farm management strategies for yam production in the study area, there are, However, militating factors that usually lead to low production of yam. Combatting the limiting factors would in a long way increase yam production, enhance food security and reduce hunger.

4.3. Perceived factors of low yield in yam cropping in the Study Area

This study has examined eight factors, which are capable of affecting production of yam in the study area. Table 3 presents farmers' responses on their notions for each of the identified factors. The farmers' perceptions were illustrated using Likert scale by measuring the calculated Mean Weight Value (MWV) and the General Mean Weight Value (GMWV) on the respondents' notions. Thus, it was established that factors, which are above the cut-off point at GMWV = 2.41 are accepted as key limiting factors; while other factors that fall below the cut-off are rejected and may not be considered important to affect yam production in the study area.

Results of the analysis for the current study identified inadequate access to capital (2.78), Low/late Rainfall (2.45), and soil degradation (2.53) as limiting factors on yam production. However, low labour (2.12), insufficient farm-

land (2.10), lack of viable specie (1.94), excessive rainfall (2.32) and Sun burns (2.29) were identified as minor factors with reduced impacts on yam production in the study area. The studies of Zaknayiba and Tanko (2013) equally revealed that lack of access to inputs, finance, poor producer prices, inadequate of storage facilities, incidences of pests and diseases have negatively affected yam production. Similarly, Ike and Inoni (2006); Maikasuwa and Ala (2013) examined labour, finance and material inputs like fertilizer as some determinants of yam production in particular regions in Nigeria.

This current study established that not all factors identified and examined have equal effects on yam production in the study area. The study would therefore enable specific ways of tackling the limiting factors in order to increase productivity and food production.

Table 3. Factors affecting yam production in the study area

| Factors | Responses | | | | | Likerts Conversion | | | | TWV | MWV | Decision |
|-------------------------------|-----------|----|----|----|-----|--------------------|-----|----|----|-----|------|----------|
| | SA | A | D | SD | T | 4 | 3 | 2 | 1 | | | |
| Insufficient take-off capital | 40 | 33 | 27 | 20 | 120 | 160 | 99 | 54 | 20 | 333 | 2.78 | Accepted |
| low labour | 28 | 15 | 20 | 57 | 120 | 112 | 45 | 40 | 57 | 254 | 2.12 | Rejected |
| insufficient farm-land | 12 | 26 | 44 | 38 | 120 | 48 | 78 | 88 | 38 | 252 | 2.10 | Rejected |
| Lack of viable specie | 7 | 32 | 28 | 53 | 120 | 28 | 96 | 56 | 53 | 233 | 1.94 | Rejected |
| Yam Pest and diseases | 69 | 17 | 15 | 19 | 120 | 276 | 51 | 30 | 19 | 376 | 3.13 | Rejected |
| Low/late Rainfall | 32 | 25 | 28 | 35 | 120 | 128 | 75 | 56 | 35 | 294 | 2.45 | Accepted |
| Excessive rainfall | 16 | 38 | 34 | 32 | 120 | 64 | 114 | 68 | 32 | 278 | 2.32 | Rejected |
| Sun burns | 18 | 34 | 33 | 35 | 120 | 72 | 102 | 66 | 35 | 275 | 2.29 | Rejected |
| Soil degradation | 36 | 33 | 10 | 41 | 120 | 144 | 99 | 20 | 41 | 304 | 2.53 | Accepted |
| General Mean Weight Value | | | | | | | | | | | 2.41 | |

SA: Strongly Agreed, A: Agreed, D: Disagreed, SD: Strongly Disagreed

T: Total, TWV: Total Weight Value, MWV: Mean Weight Value.

5. Conclusions

This study has examined the farm management methods adopted by the farmers in the study area. The observed age and gender distributions, education and occupation status of the yam farmers show that; majority of farmers fall within the age group of active labour, highest composition of male farmers indicates categories of the gender with enabling strength for yam farming, low educational status could point to prevalence of crude mode of production, and farmers depend on farming activities for their daily living. However, yam productions in the study area were affected by varied factors that emanated from the farmers adopted farming methods. This study identified mixed cropping, regular weeding, slashing and burning of farm residue as the leading practices among the farmers based on the ranking system adopted in the study. However, all other farm management methods in the study are as well considered important to yam cropping at varying degrees. It is therefore apparent to note that farm management strategies are essential components of sustainable farming practice in achieving food security.

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Institutional Review Board Statement

All Institutional Review Board Statement are confirmed and approved.

Data Availability Statement

Data presented in this study are available on fair request from the respective author.

Ethics Approval and Consent to Participate

This work carried out at Geography and Planning Sciences department and followed all the department instructions.

Consent for Publication

Not applicable.

Conflicts of Interest

Author declare no conflict of interest.

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