We are IntechOpen, the world’s leading publisher of Open Access books
Built by scientists, for scientists

6,600
Open access books available

177,000
International authors and editors

195M
Downloads

154
Countries delivered to

TOP 1%
Our authors are among the most cited scientists

12.2%
Contributors from top 500 universities

WEB OF SCIENCE™
Selection of our books indexed in the Book Citation Index in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com
Abstract

Agriculture is one of the prevalent economic activities in Nigeria with different crops cultivated in diverse regions of the country. The justification for this study is based on Egusi being a food item used by almost 50% of Nigerian households and eateries on a recurring basis in the country, yet it is not known if sustainable agricultural practices are adopted in the value chain. Most farmers are not aware of the harmful effects of intensive agricultural practices and therefore, may be exposed to the use of unsustainable agricultural methods. This research intends to investigate the common agricultural practices adopted by Egusi farmers in Nigeria with a view to suggesting better sustainable methods. The study adopted the qualitative method of research. Questionnaires were administered to the players in the Egusi value chain in Nasarawa state of Nigeria. The research findings suggest that sustainable agricultural practice is alien to some stakeholders in the value chain. Other findings suggest the existence of trust between the suppliers of the input materials and the farmers. The findings of this research call for greater awareness and education of stakeholders in the value chain, particularly as it affects the use of chemicals in agricultural practice.

Keywords: farmers, sustainability, value chain, cropping, environmental practices

1. Introduction

Agriculture has and will always play a crucial role in the survival of humanity and each nation’s economy. With the world population growing at an average of 1.06% for the past 5 years (data.worldbank.org), the need to emphasize sustainable agricultural practices has become pertinent. This is because sustainable agriculture concerns itself with improving human condition and the impact of human activities on the environment and other species [1]. In September 2015, the world leaders during the UN Summit recognized the immense importance of adopting sustainable agricultural practices, thus emphasizing ending hunger, achieving food security, improving nutrition, and promoting sustainable agriculture in second place of the Sustainable Development Goals (SDGs) agreement [2].

In 2019, the world population grew at the rate of 1.1% with the prevalence of severe food insecurity in the population at 10.5% [3]. As the events of 2022 keep
unfolding, it will be false to say that the situation has improved. The aftermath of the COVID-19 pandemic coupled with the Russia-Ukraine war has led to the fear of a looming food crisis in Europe and other parts of the world. The case of the arranged passage of Ukrainian wheat from the war-thorn zone is a current case in point. Combating food insecurity entails adopting sustainable agricultural practices. To appreciate the need for sustainable agricultural practices, the importance and composition of the soil need to be known. The soil is not just another component necessary for crop production but rather a complex, living, fragile medium that requires protection and nurturing to ensure sustained productivity, profitability, and stability [4]. Sustainable agricultural practices encompass numerous variants of nonconventional agricultural practices that are often referred to as organic, alternative, regenerative, or ecological. However, a farm practice using organic farming methods does not guarantee that it is sustainable. Sustainable agricultural practices when adopted imply that the farm cultivates high-quality food while safeguarding resources (human and ecological) and generating profit for everyone in the value chain contrary to the popular opinion that the promoters of sustainable agriculture do not put into consideration the economic profitability of players in the agricultural value chain [4].

To ensure a sustainable agricultural value chain, all the stakeholders in the value chain have to be put into consideration. Bammann [5] noted that the value chain concept has proven very useful for the identification and formulation of workable action plans for the improved development of agricultural practices. The agricultural value chain constitutes the range of activities and phases of cultivation, processing, consumption, and disposal. The major players in an agricultural value chain include farm input suppliers, farmers, processors, wholesalers, retailers, exporters, and consumers. Hence, this study seeks to investigate the prevailing agricultural practices of key players in the value chain of Egusi to suggest practices that will guarantee sustainability throughout the value chain.

2. Literature review

2.1 Sustainable agricultural practices

The green revolution as it was called brought with it increased productivity enabling the world to meet its food needs. As of the mid-1960s, Asia was faced with a food crisis that threatened millions. This situation was salvaged by the green revolution, which made Asia self-sufficient with essential food products within 20 years [6]. This self-sufficiency that was the trend during the green revolution can be said to be coming to an unfortunate end given the looming food crisis and the prediction by the World Bank that the world will need to feed 8.9 million persons by 2050 (which has been reiterated by many researchers). The agricultural practices that characterized the green revolution can be described as a quick fix that came at a very high cost. The positive effects of high yield were doused by negative impacts on the environment, such as erosion, water pollution, eutrophication of water bodies, water wastage, and the growth of resistant varieties of weeds and pests [7].

The transition from traditional agricultural practices to modern agricultural practices characterized by the use of machines, inorganic fertilizers, pesticides, and herbicides among others can be linked first to the Industrial Revolution in the eighteenth-century discovery of fossil fuels in the twentieth century, which made the industrial production of agrochemicals possible [8]. Consequent to the green revolution, crops
were cultivated with little or no consideration for the depleting nutrients and the destruction of the soil structure. This, however, has polluted the entire agricultural value chain [9]. The use of pesticides destroys both pest and useful soil organisms, inorganic fertilizers cause water pollution when washed into water bodies, monocropping depletes soil nutrients without replenishing them, and heavy ridging destroys the soil structure making it more susceptible to erosion among others remain the major non-sustainable agricultural practices. Consequently, the need for sustainable agricultural practices cannot be overstated.

One of the earliest definitions of sustainable agricultural practices states that it is a set of management strategies that address the concerns of society about the quality of food or the protection of the environment [10]. Later, the focus was on the ability of agricultural practices to productivity over a long period and the capacity to adapt to changes in future. Currently, the criteria for sustainable agricultural practices are economic viability, environmental protection, and social consideration.

Franklin King [11] in his publication titled Farmers of Forty Centuries: Permanent Agriculture in China, Korea, and Japan brought to light how farmers in some parts of East Asia cultivated their fields for four centuries without depleting the soil. It was around the same time that industrialization was emerging. With machines, more efficiency and effective use of resources could be guaranteed. This led to higher productivity and profitability; hence, the long-term effect was not considered.

By adopting sustainable agricultural practices, it is not implied that farmers should return to pre-Industrial Revolution practices. Sustainable agricultural practices involve adopting a system of crop cultivation with the use of fertilizers, pesticides, and herbicides among others. Emphasis is rather placed on combining traditional methods and modern innovations that are sustainability-centric. These practices include crop rotation, water and soil conservation, use of organic fertilization methods, little or zero tilling, cover cropping, and many other practices that put into consideration the long-term implication of their application.

The International Federation of Agricultural Movement (IFOMA) opined that organic agriculture, which is sometimes used as a synonym for sustainable agricultural practices, is a method of production that can preserve the soil nutrients, ecosystem, and health of the members of the value chain. Such practices could be said to be the best agricultural system to adopt given the challenges of the present day [12]. Sustainable agricultural practices have been promoted because of their ability to enrich environmental biodiversity through the use of animal manure, compost manure, organic waste materials, crop rotation, mixed cropping, and biological pests and weed control methods.

Sustainable agricultural practices have a positive impact on the environment as well as the farm. These practices help soil microorganisms thrive. Soil microorganisms such as rhizobacteria produce bioactive substances, which in turn enhance plant growth and offer protection against pathogens [13]. The presence of soil microorganisms also promotes the aeration of the soil. Another noteworthy action of soil microorganisms is the replenishing of soil nitrogen through their action on the roots of legumes. Given this myriad of benefits offered to the soil by microorganisms, it is in place to protect and promote their existence in the soil. The consequence of the neglect is the increasing use of harmful chemicals in farming systems. In the bid to safeguard and enhance the existence of soil microorganisms, the use of eco-friendly agricultural chemicals, which contains effective microorganisms, has proven to enhance plant growth and environmental sustainability [13].
In 2012, a research by Chhetry and Mangang, the French Bean Rust was studied for 3 years. During the course of the study, farmers who adopted sustainable agricultural practices and those who adopted intensive methods were understudied. Their research revealed that intercropping beans with maize lessened the occurrence of beans rust as the maize served as a sort of barrier between the spores that cause beans rust and the leaves of the beans plant. Indications were also made that maize plants could have a negative effect on rust pathogens. The application of plant extract was found to be beneficial as it reduces the severity of bean rust although it did not reduce the occurrence of the disease. These findings led to the conclusion that sustainable agricultural practices are more effective in reducing bean rust compared to inorganic methods.

2.2 Dimensions of sustainable agriculture

The misconception would be to think that sustainable agricultural practices are targeted just to conserve the environment while negating the advantages of machinery, pesticides, and herbicides to improve yield and profitability for the farmer. In some corners, it is discussed as an ineffectual method of food production [14]. Contrary to the foregoing, it is a blend of science, traditional agricultural methods, and innovation [15] while putting into consideration the relationship between the environment and quality of life. Agricultural practices can be described as sustainable if they maintain productivity and profitability over a long period of time without compromising the ability of future generations to do the same. Simply put, the farm has to be viable economically, ensure environmental protection, and be socially fair [7]. Sustainability in agriculture has dimensions that encompass all areas of concern to the stakeholders in the agricultural value chain. These dimensions are economic, social, and ecological.

2.3 Economic dimension

Considering the overall economic viability of a farm is key to promoting sustainable agricultural practices. A farm can be said to be sustainable if it can cater to the financial needs of the farm and create value and profit throughout the value chain among other criteria. This brings to light the fact that sustainable agriculture is not just about environmental protection. It is pertinent that the farm is profitable. To incur a loss on account of the use of sustainable agricultural practices would be a contradiction and a poor application of sustainable practices. Economic profitability is a key criterion in ascertaining a farm practice of sustainable agriculture [15]. Economic sustainability can be achieved through the use of fewer inputs without putting productivity at risk.

When a farm decides to adopt sustainable practices, its dependence on input relating to intensive agriculture is reduced if not eradicated completely. Consequently, the production cost is reduced [16]. The argument is that shifting to sustainable agricultural practices will result in poor yield. However, it has been brought to light in practice that relying on crop rotation, mixed cropping, minerals-carrying rocks, planting cover crops, and biological means of pest control among other methods could result in high yield while maintaining soil fertility and productivity [17]. It is common for farmers to adopt cropping systems that enhance output, profitability, and sustainability [18]. Therefore, bringing to light the benefits of sustainable agricultural
practices will serve to the advantage of ecological sustainability given the high level of ignorance among farmers in developing countries like Nigeria.

Intercropping has been considered a practice that is low input and energy-efficient [19]. Intercropping is an agricultural practice where two or more crops are grown together. These crops could be planted at different times and in most cases harvested at different times resulting in efficient use of resources, enhancing productivity and income as well as giving support to each other. Cultivating two or more crops simultaneously promotes the existence of insect pollinators, which in turn improves yield and also suppresses the growth of weeds because of plant population [19]. Leguminous plants have the ability to host predators, which results in a simpler pest management practice [20].

2.4 Social dimension

The social dimension of sustainable agriculture advocates for the welfare and safety of the players in the value chain. The prevailing practices in the past years have failed to meet the aspirations of a large part of society who seek good working conditions and dignified lives (www.ilo.org). This has led to the advocacy for practices that puts the welfare of people and the environment at the heart of its affairs. The employment relationship in the agricultural value chain has proved to be complicated. This is due to the nature of the contract, which is wage-based. This complicated relationship gives little or no room for proper benefits that ensures welfare. This is because the contract ends with the completion of each task with no guarantee of renewal.

This unclear relationship thrives because the employers hide the true legal status of engagement. The resulting effect denies the worker labor protection and other benefits. Sustainable agriculture promotes the proper treatment of employees and a better relationship among all members of the value chain, a relationship where trust and respect are evident. The adoption of sustainable agricultural practices results in increased labor demand, improved productivity, and higher reverse migration.

2.5 Ecological dimension

This dimension of sustainable agricultural practices stems from the rising cases of the pollution of both surface and groundwater, which is caused by the heavy application of chemical fertilizers, and pesticides and also the erosion of surface soil due to repeated tilling, which poses a great environmental challenge [21]. Agricultural practices and the environment are so closely linked in such a way that for agriculture to thrive, environmental processes need to be functioning properly, and the health of the environment depends on a balanced agricultural system [22]. From this closely knitted relationship, intensive agricultural practices can be referred to as self-sabotage.

The environmental degradation caused by intensive agricultural practices needs to be critically analyzed [23] and its long-term effect needs to be brought to the knowledge of the stakeholders in the agricultural value chain. Realizing that environmental pollution caused by intensive agricultural practices threatens the livelihood of millions could lead to the modification of agricultural systems that promotes both environmental sustainability and economic sustainability [24]. Putting the harmful effect of intensive agriculture in the open is not enough, innovative, and sustainable practices should be promoted. The importance of promoting sustainable agricultural practices goes without saying considering the harmful effect of chemicals on beneficial
microorganisms, which are responsible for fixing soil nitrogen and decomposition of organic wastes suppressing plant diseases among others. From the perspective of environmental protection and the vitality of soil microorganisms (which further impacts the overall health of the soil), intensive agricultural practices can be said to be a menace.

Such practices are mixed cropping, crop rotation, zero-till practice, use of compost, green manure and biopesticides, planting of cover crops, and effective water management among others. Intensive agricultural practices, such as mechanization use of chemicals, monoculture, and intensive tilling, led to the simplification of the different parts interacting in the agricultural systems. This has led to erosion, making the agricultural system prone to abiotic stress and thus, putting the agricultural system at risk of being unsustainable. In order to safeguard the sustainability of the cropping system, restoration of the biodiversity of farms is integral. This restoration can be achieved through the adoption of mixed cropping and other farming systems that guarantee sustainability [25].

The success of sustainable agricultural practices in promoting biodiversity and environmental production hinges on the effectiveness of the diversification of crops, the inclusion of leguminous crops in the cropping system, organic restoration of soil fertility, and the no-till practice. Notable among the benefits of mixed cropping to the environment is its ability to reduce runoff water because the crops tend to cover more ground. As insignificant as this may seem, less run-off water means less soil erosion and nutrient loss [26].

2.6 Strategies for sustainable agricultural practices

As earlier seen, the practice of sustainable agriculture has been heavily debated. Hence, in order to fully achieve sustainability, it is necessary for a workable framework to be followed. Mac Rea et al. [27] suggested substitution and agroecological and global strategies.

In substitution, the farming practices are not fundamentally altered but are slightly modified. The use of toxic pesticides, herbicides, and fertilizers is replaced with less toxic chemical compounds and the cultivation of genetically modified plants [7]. An agroecological strategy is a holistic approach. Here, ecological principles and concepts are applied to the planning and execution of all farm practices. Practices such as mixed cropping, crop rotation, and the use of compost manure are used to foster biodiversity [7].

The global strategy as the name implies seeks to find solutions to the adoption and application of sustainable agricultural practices at a global scale. In the global strategy, an interdisciplinary effort involving scientists, economists, politicians, and agriculturists is called for in order to fine-tune the current rough edges of sustainable agricultural practices, economic growth, and food security. The global strategy, therefore, implies that in order to achieve sustainability, the relationship between the players in the agricultural value chain has to be cemented as farm systems without the collaboration of the food systems cannot achieve sustainability [28].

3. Egusi value chain in Nigeria

The concept of the value chain has evolved over time with three main variants, namely the French Filiere approach, Michael Potter’s value chain approach, and
commodity chain and global capitalism [29]. In agriculture, the concept of a value chain is centralized on the differentiation of the entire agricultural system and the peculiarities of each player in the value chain with the aim of enhancing the performance of the entire system [30]. Value chains have been viewed as the driver of production, and organizational relations and networks are developed [31]. In recent times, there has been a push for a cyclical approach to the value chain as opposed to the linear approach.

Egusi seeds come from Egusi gourd, which looks very similar to watermelon. Unlike watermelon, the pulp is bitter and not edible, so this gourd is grown primarily for the Egusi seeds, which are similar in size to small pumpkin seeds. Shelled Egusi seeds are creamy in color. The seeds are cultivated mostly in the north-central part of Nigeria. The seeds are rich in unsaturated fatty acids, proteins, and vitamins. Egusi is used as a major condiment in preparing Egusi soup, which is a celebrated and regular dish in Nigeria. Due to its popularity, it has a household name in every region, such as Miyan Agushi of Miyan Gushi in the north, Efo ElEgusi in the western part of Nigeria, and Ofi Egusi among the Igbos of the southeast. Unconfirmed reports suggest that on average, over 50% of Nigerian households prepare Egusi soup every week. Recent development suggests that Egusi is now packaged and sold in supermarkets, but can also be found in open local markets where they are sold in different measures by weight and also in multiple cup sizes.

Based on the national acceptance of Egusi soup, its value chain cuts across various parts of the country. Stakeholders of the value chain range from the northern farmers, the southeastern retailers, and nationwide consumers. The stakeholders of the Egusi value chain include farm input sellers, traders of agricultural equipment and machines, farmers, farm hands, processors, wholesalers, retailers, and consumers.

In the cultivation of Egusi, certain agronomic practices are prevalent. Egusi is among the first crops cultivated at the beginning of the farming season, which begins around March and April. The first course of action is land clearing during which the farmer cuts grasses and stalks of previously cultivated crops, gathers them, and burns or bury in the soil during tilling. Ridges are made after land clearing and then, the seeds are planted. In order to control weeds, preemergence and postemergence herbicides are used although hand weeding is carried out in some cases. The harvesting process that starts after about 3 months of planting involves gourds collection into mounds for fermenting, seeds extraction and washing, drying, and shelling. Yet in spite of the widespread consumption of this product, not much work has been done on its agricultural sustainability. It is this gap that the current study is designed to fill.

4. Research questions

Agriculture is one of the prevalent economic activities in Nigeria with different crops predominantly cultivated in particular regions of the country. With the level of ignorance in Nigeria, most farmers are not aware of the harmful effects of intensive agricultural practices and are willing to make use of any chemical suggested to be effective.

This research, therefore, intends to investigate the common agricultural practices adopted by Egusi farmers in Nigeria and suggest more sustainable practices. Consequently, this research intends to answer the following questions:
i. What are the prevailing practices in Egusi value chain?

ii. What is the level of awareness of sustainable agricultural practices in the Egusi value chain in Nigeria?

5. Research design and methodology

In order to find answers to the research questions, open-ended questions were administered to some of the players in the Egusi value chain in Nasarawa state, Nigeria. Nasarawa state is located in the north-central part of Nigeria and about 900–1100 kilometers from Lagos and 50–100 kilometers from Abuja, the Federal Capital. The subsequent interviews were recorded and transcribed. The interview transcripts were analyzed using a thematic approach. The major themes are ecological, economic, and social sustainability.

5.1 Data gathering

The main sources of data for this study were interviews and field visits. The interview guide was constituted of open-ended questions, which gave the interviewees the opportunity to express themselves while providing information about the research questions. The interviewees included the following:

i. **Farm input seller:** A farm input seller is a trader. The role of this stakeholder is to make available farm inputs to the farmers.

ii. **Farmers:** The farmers perform most of the agronomic activities. They contribute to a great extent to the adoption of sustainable agricultural practices.

iii. **Farm hands:** These are hired workers. They assist the farmer in performing various activities on the farm. Farm hands are engaged to work for a day or for the duration of a certain activity.

iv. **Processor:** The processors in the Egusi value chain are responsible for removing the Egusi shells and packaging them for consumption.

v. **Wholesaler:** The wholesalers in the Egusi value chain buy Egusi from various farmers. They are responsible for pooling Egusi from various smallholder farmers.

vi. **Retailer:** The retailers sell both the Egusi seeds with and without the shells for consumption. Retailers may sell the seeds or the soup to final consumers. Some of the retailers are farmers, others buy from other players (not just retainers) in the value chain.

vii. **Consumer:** The consumers are those who buy the seeds and use them to prepare the soup for consumption on a regular basis.
The interviewees selected for this study are stakeholders from Obi and Kokona LGAs of Nasarawa state. This is because of their years of experience. Obi and Kokona LGAs are also known for their high cultivation of Egusi. This location is in the north central of the country and approximately one and a half hours of flight time or 900–1100 kilometers by road, which may take a whole day’s journey (Table 1).

5.2 Data analysis

In analyzing the data collected during the interview, thematic analysis was adopted. An inductive approach was used in coding the interview transcript. This allowed the author to begin with preset themes that are pertinent to the research questions and sustainable agriculture. These themes were then analyzed by deducing from the themes the information that pertains to the major aspects of sustainable agriculture. From the quotes, a comparative evaluation was carried out. This is illustrated as follows:

“After harvesting, we bury what is left of the pods when we make ridges” (Farmer A).

“The pods of the Egusi are left on the land so I bury them when I am making ridges for the next cultivation…” (Farmer B).

From the quotes above, it is visible that both farmers use the leftover pods as manure.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Type</th>
<th>Estimated years of experience</th>
<th>Year of interview</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Farm input seller</td>
<td>20</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>2.</td>
<td>Farmer A</td>
<td>25</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>3.</td>
<td>Farmer B</td>
<td>15</td>
<td>2022</td>
<td>Kokona LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>4.</td>
<td>Farm hand</td>
<td>10</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>5.</td>
<td>Processor</td>
<td>12</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>6.</td>
<td>Wholesaler</td>
<td>15</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>7.</td>
<td>Wholesaler</td>
<td>10</td>
<td>2022</td>
<td>Kokona LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>8.</td>
<td>Retailer</td>
<td>15</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>9.</td>
<td>Consumer A</td>
<td>23</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
<tr>
<td>10.</td>
<td>Consumer B</td>
<td>20</td>
<td>2022</td>
<td>Kokona LGA</td>
</tr>
<tr>
<td>11.</td>
<td>Egusi farmers coop. society</td>
<td>20</td>
<td>2022</td>
<td>Obi LGA, Nasarawa State, Nigeria</td>
</tr>
</tbody>
</table>

Source: Author, 2022.

Table 1. Interviewees' details.
6. Findings

After analyzing the interviews using a thematic approach, the results are presented in this section under the three basic themes of sustainable agricultural practices. These themes are ecological, economic, and social sustainability.

6.1 Ecological sustainability

Ecological sustainability in sustainable agricultural practices borders around the protection of the environment and ensuring that the soil remains viable and productive in the long term. The interviewees, while answering questions pertaining to ecological sustainability, made statements that had various indications. First, the statements indicated the use of chemicals within the value chain. Secondly, mixed cropping was a common phenomenon. Issues such as water management, cover cropping, shifting cultivation, and waste management were featured in the interviews. These are evident in various quotes from the interview transcripts.

In answering a question on the use of chemical substances, these were some of the responses:

"Before planting, the farmers buy chemicals which they apply to the seeds" (Inputs Seller).

"We buy the necessary pesticides to apply and when we finish planting, we spray preventive chemicals" (Farmer A).

While answering questions relating to what becomes of the Egusi pods after the seeds have been extracted, the farmers made the following statements.

"After harvesting, we bury what is left of the pods when we make ridges" (Farmer A).

"The pods of the Egusi are left on the land so I bury them when I am making ridges for the next cultivation..." (Farmer B).

In answering questions about the use of water, the interviewees responded thus:

"We scoop the contents of the pod and take it to the river for washing" (Farmer A).

"I extract the contents of the pod. Stir it in a container with holes then take it to the river for washing" (Farmer B).

"I do not need so much water so I buy from the borehole" (Processor).

With reference to cover cropping, the farmers and farmhands mentioned that the land is first cleared of grasses and stalks.

6.2 Economic sustainability

Economic sustainability emphasizes the profitability of the entire stakeholders in the value chain. The interview questions here referred to practices considered in this category that ensure the players in the value chain make a profit. The interviewees were of the opinion that the Egusi business was profitable. It must be emphasized that value chain members are quite reluctant to disclose the scale of profitability in the business for fear of competition, taxes, etc. Therefore, indicators were relied upon to discern the scale of profitability. The following quotes were extracted from the interview transcript.

"I would say that Egusi business is a profitable business" (Farmer A).

"I think it is profitable since it saves me more than I put into it. I plan to cultivate on a larger scale next year" (Farmer B). The response by the farmers suggests some
profitability in the business, which is manifested in the drive to expand the area of cultivation in the next season.

"We keep the Egusi for a while in the store. After some time, the Egusi becomes scarce, and the prices increase. That is the time we sell because we will make a profit" (Wholesaler). It is reasonable to infer that the cost of storage and the Egusi-carrying costs are covered by the final price sold to the retailers and consumers.

6.3 Social sustainability

Social sustainability covers the area of welfare and interpersonal relationships within the value chain. Subthemes include pricing, negotiations, staff welfare, and availability of credit. Some statements from the members of the value chain indicate a cordial relationship, which gives room for credit. This is evident in a statement by the sellers of input materials to the farmers.

"There is a very cordial relationship because you cannot drive your customers away. Sometimes, if they don’t have money, I do give them till when they have the money to settle their debts" (Inputs Supplier).

The interviews brought to light the prevailing conditions and practices in the Egusi value chain (Figures 1 and 2).

6.4 Discussions of findings

This study seeks to find out the prevailing practices in the Egusi value chain and to suggest more sustainable practices where necessary. The data was sourced from interviews. The interview transcripts were analyzed using thematic analysis.
The data suggest that the stakeholders use chemicals for input treatment, weed and pest control as well as for the preservation of Egusi after the harvest. It can also be deduced from the analysis that the land is not left bare after harvest. Another important discovery is the washing of melon seeds in water bodies. The data also show that the members of the value chain agree that Egusi business is a profitable venture. It also shows that farmers and wholesalers use artificial scarcity to affect the market forces. The data also indicate that there is a cordial relationship between the players in the value chain. The data were, however, analyzed under certain themes, which will guide the discussion of findings. An important development of the Egusi value chain is the fact that while it is grown and harvested within three to four months, its consumption is widespread over the year, thus suggesting the need to preserve and stock the seeds over time. The storage obviously leads to a reduction in the weight of the seeds due to moisture loss.

6.4.1 Ecological sustainability

Egusi is mostly cultivated in the north-central part of Nigeria but consumed all over the nation. Farmers who are found in this area are mostly without formal education. It is also common to have smallholder farmers, who cultivate Egusi for subsistence and small-scale sales. There are, however, few farmers that invest heavily in agriculture. The common agronomic practices to some extent have no disastrous effect on the environment save for a few. Promoters of sustainable agricultural practices have frowned on the use of chemicals in the agricultural value chain. More organic substitutes have always been proposed. However, it is shown from the interviews that players in the Egusi value chain have no qualms with the use of chemicals. In fact, due to their lack of formal education, they use chemicals whose constituents or
impact they do not know. This claim is supported by their inability to state the names of the chemicals they use. This indiscriminate use of chemicals in the agricultural value chain is seen in the 2018 report on the use of Sniper in preserving beans by the Vanguard Newspaper. The use of Sniper, which is harmful to insects and rodents to preserve beans, posed a threat to public health. In the case of water management, it is seen that the common practice is to wash melon seeds in water bodies. This action renders the water unsafe for other immediate use. However, this is of little consequence as most of these water bodies are in nonresidential areas and also for the organic nature of the pollutants. The contribution of these pollutants to the eutrophication of water bodies has not been established by this study; however, this could be a possibility.

On the positive side, the farmers are seen to use organic fertilizer. This is evident in the burying of Egusi pods in ridges made for the next cultivation. This indicates their agreement with the effectiveness of organic sources of nutrients in the soil. However, their effort can be said to be passive. This is because the farmers do not actively source and use organic sources of nutrients. They only make use of the crop leftovers, which cannot be used for other purposes. This action tends more toward effective waste management. Having the land covered with grasses and stalks that serve as cover crops is another interesting fact. Scholars have agreed with the immense importance of cover crops in the protection of the soil from erosion and harsh environmental factors.

6.4.2 Economic sustainability

Existing literature shows that economic sustainability plays a very important role in the practice of sustainable agriculture. The discussion with some players in the value chain shows that the value chain is economically sustainable. It can also be deduced from the data that using artificial scarcity to affect the price of Egusi is a common practice. Such a practice puts a question mark on the claim of sustainability of the value chain. The profitability may be a consequence of the scarcity created by players in the value chain. The absence of intense investment in Egusi cultivation also indicates that the farmers do not make as much profit as they claim.

6.4.3 Social sustainability

The social sustainability aspect of sustainable agriculture focuses on the relationship and welfare of the players in the value chain. It was discovered from the data that there exists a cordial relationship between the players of the value chain. The farmers are given items on credit, which is commendable. Given the poor standard of living of the interviewees, data pertaining to welfare could not be deduced.

The discussions of the findings under the ecological, economic, and social themes provide answers to research question 1 as to the prevailing practices in the chain. In an attempt to answer research question 2, it is obvious from the findings that some of the farmers were actually adopting some form of sustainability practices without really being aware of them. In a way, they often adopted some practices based on economics. For instance, the use of gourds as a supplement for manure is a case in point. Thus, their level of awareness of sustainability in the value chain is still very limited.
7. Implications of the findings and conclusion

This study set out to investigate the prevailing agricultural practices in the Egusi value chain in Nigeria. The author from the outset intended to evaluate the sustainability of the Egusi value chain and to recommend more sustainable practices. However, the findings of this research indicate that the concept of sustainable agriculture is alien to some stakeholders in the value chain. The research was carried out using a qualitative and thematic approach. In light of the findings, the following issues need to be addressed by the regulatory agencies as well as the farmers’ cooperative society.

The stakeholders in the Egusi value chain have poor knowledge of sustainable agriculture. The players in the value chain are mostly uneducated and unaware of the current trends in agriculture and are at best constitute small-scale farmers that rely on traditional methods for farming. However, there are traces of some unsustainable agricultural practices within the value chain. Some of these practices include indiscriminate use of chemicals in seed treatment, pest and weed control, and storage. It was also found that the market forces are being controlled using artificial scarcity to guarantee profitability. This practice by the stakeholders calls for the processing and packaging of Egusi as a retail stock item for sale at groceries stores rather than storing it in jute or polypropylene sacks. Some form of investment is called for to actualize this aspect of the value chain. A recent development suggests that some SMEs now process and package Egusi as a stock item and sold through supermarkets.

Finally, the findings of this research call for greater awareness and education of stakeholders in the value chain, particularly as it affects the use of chemicals in the value chain. This could be initiated through any of their associations.

A. Interview questions and some answers

A.1 Farm inputs trader

Tell me about the last time a farmer came to buy input materials for Egusi farming; what did he/she buy? *It is around March/April, which is the normal time farmers come to buy things for.*

Egusi preparation.

How did she/he bargain with you? *They buy chemicals that they apply to the seeds. It cost 3000.*

How do you source the things she/he bought? *Normally, I have some little savings in my account. I do go to the store or company to buy the chemicals.*

Did they buy in large or small or medium quantities? *It depends on how big their farm is. If the farmer has a very large farm, he buys a lot, depending on the size of the farm. They buy what will solve their problems on the farm.*

What period of the year did they come to buy? *Around March/April. That is the normal period when Egusi inputs are bought.*

How do you relate with your buyers—sell on credit, or cash and carry; there is a very cordial relationship because you cannot drive your customers away. Sometimes even if they do not have money, I do give them till when they have the money to settle their debts. *We help those who are running short of money we help them, but those who have the money pay immediately.*

Do you visit them at the farms to see how they apply the chemicals? *No*
A.2 Farmer A

Tell me about the last time you planted Egusi seeds; when was that? The way will cultivate Egusi is that when rain falls in April, we begin the cultivation process. By the end of April, we should have finished everything that pertains to planting.

Where did you plant? I plant on my farm.

How did you prepare the land? Before planting, we first prepare the land. If there are grasses or shrubs, we cut them, gather them, and then burn them.

Does the land belong to you or did you also plant in some other persons’ land on any arrangement? I rent a land.

Do you plant on the same land all the time? I do not get the same land every time.

Do you plant any other crop before the Egusi planting season on the same piece of land? We do not plant any other crop before planting Egusi.

Do you shift to other places? If we plant on one land this year, by next year, we will change to another piece of land.

Do you water the land? We do not plant until the rainy season begins.

Do you plant Egusi with other plants such as in between yams? No, we plant only Egusi, not together with any other crop.

What pest(s) are common in Egusi production and how are they controlled? We buy the necessary pesticide and apply.

How do you treat Egusi to guide you against damage from pests? How do you harvest Egusi? After harvesting, we bury what is left of the pods when we make ridges.

What do you do with the land after harvest? After harvesting, we bury what is left of the pods when we make ridges.

Do you sell or consume the Egusi after harvest? We do not sell the Egusi immediately. We store it until the price has gone up.

How do you relate with your customers, farm workers, and suppliers? For the workers who help me, I pay them. I also pay for my suppliers. Only with the harsh economic conditions, I do not get enough to pay my workers.

What do you think about the profitability of Egusi cultivation? I would say that Egusi farming is a profitable business.

A.3 Farmer B

Tell me about the last time you planted Egusi seeds; when was that? The last time I cultivated Egusi was during the last planting season this year. Around March and April.

Where did you plant?

I cultivated it in Nasarawa state.

How did you prepare the land?

The first thing I did was to cut the grass, after which we gathered the grass, we cut and then burn them. Then, I made ridges. But I first planted Maize before the Egusi.

Weed Control:

I do manual weeding.
Does the land belong to you or did you also plant in some other person’s land on any arrangement?

The land does not belong to me.

Do you plant on the same land all the time?

No

Do you plant any other crop before the Egusi planting season on the same piece of land?

No, but is done after.

Do you shift to other places?

Yes, when the owner of the farm decides I should go elsewhere.

Do you plant Egusi with other plants such as in between yams?

Yes, I plant between the maize.

What pest(s) are common in Egusi production and how are they controlled?

The pest is common with the pest that affects beans, beniseed... the affect Egusi during the flowering stage but fortunately, I have not encountered them.

How do you treat Egusi to guide you against damage from pests?

Do you harvest Egusi?

I gather the pods first. Then, they are sliced and left to rot. After a brief period, I extract the contents of the pod, stir it in a container with holes, then take it to the river for washing. Most farmers wash at the river, but some use boreholes to get water for washing.

What do you do with the land after harvest?

The pods of the Egusi are left on the land. So, I bury it when I am making ridges for the next cultivation. That is beans cultivation. It serves as a source of manure for the plant. With that, I do not need to buy fertilizer for my farm.

Do you sell or consume the Egusi after harvest?

I cultivate Egusi for family consumption.

What do you think about the profitability of Egusi cultivation?

I think it is profitable since it saves me more than I put into it.

A.4 Farm hand

Tell me about the last time you worked for an Egusi farmer; when was it?

It was in August.

What were you engaged to do?

We went to harvest Egusi.

How did you negotiate?

We are paid daily.

How do you go about the land preparation for Egusi?

We cleared the land and sprayed it with chemicals, after which we made ridges, prayed chemicals again, and then planted the Egusi.

What are the common weed control practices?

We normally spray chemicals first, then after a while, when the grasses start growing we do hand weeding.

What you engaged in harvesting before; what techniques did you use?

We gather the melons, then we slice them and cover them with grasses. After 3 days, we come back to scoop the contents of the melon pod. We then wash it in a stream or get other sources of water, after which we dry the melon seeds and bag.

What becomes of the piece of land after harvest?

After harvest, we cultivate soybeans on the same land.
A.5 Egusi processors

Tell me about the last time you processed Egusi after harvesting. How did you start the processing?

I processed Egusi just yesterday. I usually soak the Egusi before peeling it with the machine.

Do you do it for your Egusi, for other farmers, etc.?

I process for myself and for other customers.

How do you get water for the processing?

I do not require much water, so I buy from the borehole or fetch from the stream or the well.

How do you prepare the Egusi for transport/or storage after processing?

I bag them and store them.

A.6 Egusi traders (wholesalers)

Tell me about the last time you bought Egusi; How do you source for Egusi?

The last time I bought Egusi was 2 days ago. In order to get the quantity I need, I normally would go around seeking farmers and other traders who are willing to sell.

Do you engage farmers to farm for you?

I do not cultivate myself. I buy from farmers who cultivate.

Is there a particular period you buy Egusi and why?

I go around during the harvest period when the farmers are harvesting and drying the Egusi. That is the best time to buy. After buying, we bag and put a chemical to preserve the Egusi from insects.

Do you purchase Egusi before or after shelling?

Most times, we buy the Egusi unshelled nut, we also buy shelled Egusi but it is more expensive.

How do you store Egusi?

We bag them and preserve them with chemicals.

Do you sell immediately?

We keep it for a while till when it is more expensive. That is how we make our profit.

What value do you add to the Egusi after purchase?

We shell the Egusi for the unshelled ones before selling.

How do you prevent Egusi from a pest infestation?

We make use of chemicals.

Is it difficult to sell Egusi after a period of storage?

When it is scarce, it is not hard to sell.

How do you ensure you make a profit?

We keep the Egusi for a while in the store. After some time, the Egusi becomes scarce and the price increases. That is the time we sell because we will make a profit.

A.7 Wholesaler B

Tell me about the last time you bought Egusi; How do you source for Egusi?

I bought Egusi around June this year. I have a contact in the market to whom I give money to buy bags of Egusi for me.
Do you engage farmers to farm for you?
I do not farm. I buy from traders in the market.

Is there a particular period you buy Egusi and why?
I usually buy Egusi after the harvest. That is when it is cheap in the market.

Do you purchase Egusi before or after shelling?
I buy Egusi after shelling.

How do you store Egusi?
I store them in a store in my store.

Do you sell immediately?
I buy to keep for the period of scarcity. That is when I sell.

What value do you add to the Egusi after purchase?
I just store it and then sell it.

How do you prevent Egusi from a pest infestation?
There are chemicals that I use in preserving them.

Is it difficult to sell Egusi after a period of storage?
No. It is just that the prices fluctuate.

How do you ensure you make a profit?
I confirm the market trends and see when the price has appreciated.
References


