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Assessment of Supply Chain Management Practices and Sustainable Food Security in Nigeria

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Abstract

Supply chain flow is a major concern for food security, particularly to ensure that food is not lost between farmers and consumers. Food security has become a highly emotive issue, as chronic hunger, local food shortages, and sudden increases in food prices are strongly influencing public sentiment and reaction. This raises concern for the assessment of supply chain management and sustainable food security in Nigeria, using honesty among supply chain participants, effective storage facilities, and quality of seed as a determinant for sustainable food security. A survey research design was adopted for this study, using a structured questionnaire. Convenient and Purposive sampling techniques were used to select 80 farmers from the North-Western state of Nigeria. Descriptive statistics were used to analyse the data collected, which was presented using charts. The findings of this study show that honesty among supply chain participants, effective storage facilities for farm produce, and the quality of seeds to plant will enhance nutritional foods in society, promotes both affordability and high profits for all participants in the supply chain based on the response of the selected farmers. It was further revealed from the study that Government intervention in terms of subsidy and credit facilities to the farmers are not well harnessed by the real farmers that are actually in the business of farming. Therefore, it was recommended, among others, that there should be an effective feedback mechanism from the government to ensure the subsidy is actually addressing the purpose of its establishment.

Keywords: Supply Chain Management, Honesty among Supply Chain Participants, Quality of Seeds, and Sustainable Food Security.

INTRODUCTION

Supply chain flow is a major concern for food security, particularly to ensure that food is not lost between farmers and consumers. Seamless flow of information to all supply chain partners and development of sustainable financial flows that ensure food availability and access remain sacrosanct to the development of every country (Shakerod, Tapiwa, Aaron Rudzai, Charanga & Rumbid, 2022)

According to Ratikanta and Debashish (2018), ensuring food security is one of the main global challenges for a world-growing population. In creating a long-term sustainable development goal, food security must be considered an important concept of sustainable development. FAO (2019) stated that food production will need to grow by 70% to feed the world population, which will reach 9 billion by 2050. This concept requires a thorough understanding of agro-ecosystem functions to

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solve the persistent hunger problem, which could require developing new agricultural technologies and practices

Virva and David (2022) explained that food security had become a highly emotive issue, as chronic hunger, local food shortages, and sudden increases in food prices are strongly influencing public sentiment and reaction. This could also lead to nutritional security within an array of poor households to pursue survival. To some extent, the Federal government of Nigeria has tried to reform its agricultural policies, most especially on staple foods such as rice, grains, etc. but has been confronted with great difficulties, with the progress relatively slow and not yielding a desirable result.

Researchers such as Shakerod et al. (2022) and David (2022) conducted a similar study on the influence of supply chain flows on food security. These studies identified variables such as product flow and money flow on food security and further established the linkage l between supply chain management and availability of staple food production.

Despite the significant contribution of these authors, most of these problems still persist. This raises the concerns for this study to assess supply chain management practices and sustainable food security in Nigeria. Effective storage facilities, honesty among supply chain participants, and quality of seed for planting were used to measure supply chain management practices, while food accessibility and nutritional food were used to measure food security.

Literature Review

Long-term relationships between channels, management of lesser inventories, Inter-firm communication, lead time reduction, and process re-engineering involving customer orientation on products were highly emphasized in the supply chain (Joni-Murti,2020). Pujawan and Mahendrawathi (2010) described the supply chain as the linkage of upstream to downstream through the process that embeds the value creation of goods and services to be delivered to end-users. The nexus between the customers and the other participant in the chain process is referred to as the supply chain. This promotes the value of products and determines the effective services to customers, within and outside the company, if properly managed. (Cox, Blackston &Spencer,1995). Managing the supply chain plays a very vital role in producing value for the end-users, which consists of physical, financial, and information flows (Correia, Carvalho, Azevedo & Govindan,2017). Supply chain management could also be defined as “the management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole”. However, it was also suggested that “Network” could also be used instead of ‘chain’ because normally, there are several suppliers and customers involved in the process (Christopher, 2016). Furthermore, the conceptualization of supply chains as sequential relationships implies that the modern supply chain is a simple linear system that represents the realism of modern society (Hearnshaw & Wilson, 2013).

The links between the heterogeneous members that exist in the network are always taken into consideration. Therefore, a supply chain can be alternatively defined as "a network of a connected and interdependent organisation's mutually and cooperatively working together to control, manage and improve the flow of materials and information from suppliers to end users" (Carter, Rogers & Choi 2015). It was also observed that another product supply chain is different from the food supply chain because food, especially fresh farm produce and meat, are vulnerable to the continuous and significant change in quality and risk of contamination throughout the entire supply

chain. Therefore, additional care is needed for the food supply chain, which requires developing robust and resilient supply chains (Yu & Nagurney, 2013).

In order to improve the competitiveness of the supply chain, there must be an adequate improvement in the management of the supply chain process, which will involve all the supply chain participants. All strategic business units of the supply chain must embark on a process that will enable value-adding activities in their organisation process, which will eventually lead to the attainment of a competitive advantage for the supply chain (Joni-Murti,2020). Several participants were always connected in simple supply chain processing from the early stage of the supplier to the point of production at the manufacturing stage, distribution to both the wholesalers and retailers and finally to the end users (Crandal, Crandall &Chenl, 2010; Pujawan & Mahendrawathi, 2010)

LITERATURE REVIEW

Sustainable Food Security

In the study of Taslim and Zainuri (2020), food security was described as a condition of sufficient food availability, access, and utilization or consumption. Recent definitions of food security have focused more on individuals' access to food that is not only quantitatively adequate but also nutritionally adequate; in the study of Joni-Murt (2020), food security was described as a situation where all people meet their dietary needs for a healthy and productive life. Timmer (2005). Further defined food security as the ability to provide assurance that on a long-term basis food system can provide all people with access to a reliable, timely, and adequate supply of nutritious food

Food security was also described as the focus on delivering aggregate food requirements towards a broader framework of individual manners in the face of irreversibility, uncertainty, and binding constraints on food selection (Barret,2002). FAO (2019) defined food security as a situation in which all people have physical and economic access to adequate, safe, and nutritious food to always suit their dietary needs and food choices for an active and healthy life. Sustainability of food security was also viewed as a participatory concept of food security synergy that linked to sustainable drivers (Joni-Murti,2020)

Storage Facilities

After harvesting, crops are stored in a collecting center or area, either for short or long periods, before they are delivered to the market. This process of preserving the farm produce in a place for certain periods is known as storage. When the farm products have been harvested and processed, some may be used or consumed immediately. Some produce is stored in order to supply the needs of the farmer or may be preserved in case of famine. Some farm produce can be stored until a time when the market prices are favorable or even stored waiting for transportation or shipment abroad. There are various storage facilities such as Store building, Silos, Crib, drum, Bags, sacks, can, Pyramid stacking, Underground grain storage pit, and Hermetic method (Ministry of Agriculture,2014)

Storage losses of farm produce are high due to large variations in temperature and humidity between growing fields to the place of marketing, in case of distant marketing. The lowest temperature that does not cause chilling injury is the idle storage temperature for fresh fruits and vegetables. The optimum refrigerated storage requirement for different fruits have been worked out as 1.7-3.3^{o}C for apples, 12.8^{o}C for banana, 0-1.7^{o}C for grapes, 8.3-10^{o}C for guava, mango &

pineapple, and 5.5-7.2^{o}C for oranges. When combined with low temperature, controlled or modified atmospheres appreciably retards respiratory activity and delay softening senescence and changes in the quality of the stored product (Radikant &Debashis,2018).

Honesty among Supply Chains Participants

Honesty is a behavior that reflects the moral character that emphasizes virtuous and positive attributes such as integrity, truthfulness, and straightforwardness of conduct, along with the absence of lying, cheating, and theft (Oshungboye,2019). Supply Chain has demonstrated that honesty among supply chain participants could influence the integration of knowledge and processes in the supply chain (Manu, Ankrah, Chinyio, & Proverbs, 2015). In the work of Marly, Kaibara, Almei, Fernando, Andréia Maria, Fernando, and Sérgio (2017), honesty was described as a tool that promotes credibility, respect, and mutual understanding between the suppliers and customers. It has also been recognized that honesty plays a significant role as a governance mechanism of the supply chain rather than just a means of complementing an incomplete contract. However, honesty is seen as being benevolent among each participant involved in the supply chain process. Thus, it will be highly beneficial to contracting parties if honesty exists in their relational contract because this will ensure that none of the parties will be a victim of behavior., such as moral risk, adverse selection, hold-up, or any other types of hazards in contractual hazard. Basically, in the real world of business, suppliers and customers are always major concerns of a firm. Therefore, organisation mostly establish deliberate attempts to create enabling environment that promotes the customer-supplier cordial relationship. Also, for the purpose of cost minimization, quality improvement, efficient productivity, improving competitive advantage, and technological advantage, most organisation are forging closer to more collaborative ties with supply chain partners and shifting away from traditional “arm’s length” business relationships. (Masuku & Kirsten,2003).

Quality of Seeds

Conceptually, the quality of seeds is referred to as a standard established to which given seeds possess certain attributes that justify the expected quality status of seeds. The quality seed must be pure genetically with adequate moisture content and possess a high level of germination., It must also be free from the content of weed seeds and shows no form of any disease. Moreso, both the formal and the informal sectors must ensure the quality of seeds that possess the needed standard for their farming business. The formal sector encompasses specific activities were encompassed in the formal sector to maintain purity and make available in a new variety. There are always recognized seed channels that ensure adequate and prompt distribution to farmers. There are proper supervision conditions for the quality of seeds produced in the formal sector, which are categorized into various category class of seeds. The traditional or the farmer seeds system is referred to as the informal sector, which lacks adequate supervision with no proper public sector regulation. The seed is only exchanged and bartered among the farmers; only battered seeds and exchange within their-selves or marketed through a local channel. The informal system has five basic features that differentiate it from the formal sector, which is based on tradition, mostly deal with small quantities of seeds as widely requested by farmers they are semi-structured, and function at the individual community level. (ISTA,2019).

Supply Chain Management and Sustainable Food Security

Shakerod et al. (2022) examined the influence of supply chain flows on food security: A case study of maize supply chain in Zimbabwe. A survey research design was used for data collection of the study, while the data collected were analysed using SmartPLS-3. The findings show that there is a significant relationship between supply chain variables such as product flow and money flow on food security.

David (2022) explored supply chain issues on food access and security among the urban poor in South Africa. The field study for the research comprised of 59 semi-structured interviews, which were transcribed, translated, and analysed using NVivo software. The findings of this study identified the retail supply chain as a major constraint for food distribution, food accessibility, and food security.

Joni-Murti,2020) examined the linkage between supply chain management and food security: A concept of building sustainable competitive advantage of Agric business in developing economy, using a systematic literature review. The findings of the study show that there is a linkage between supply chain management and the availability of staple food production.

Conceptual Method

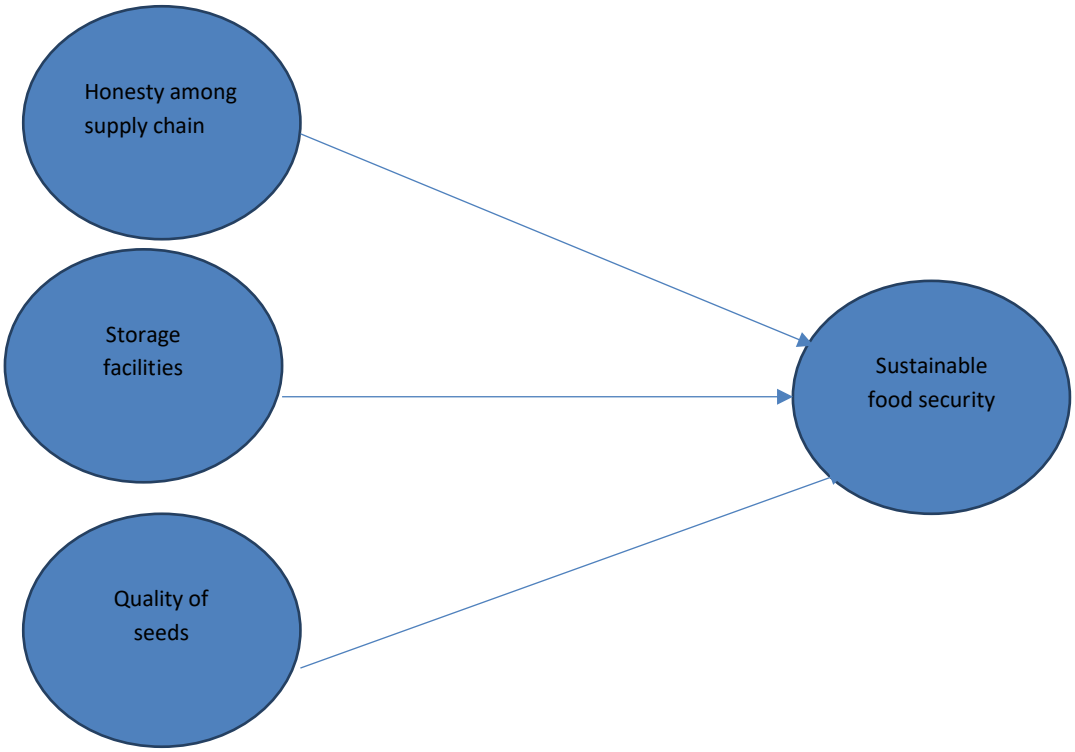


Figure 1. Supply Chain Modell for Sustainable Food Security

Based on an earlier literature review that emphasizes product flow, money flow, and retail supply chain as major constrain for effective food security. This study assessed the role of supply chain management on sustainable food security in Nigeria. The researcher used honesty among supply chain participants, effective storage facilities, and the quality of seeds to establish a conceptual

model for this study. This study asserted that the supply chain management constraint needed to attain sustainable food security are honesty among supply chain participants, effective storage facilities, and quality of seeds. The argument was that if these variables were properly managed, there would be sustainable food security in Nigeria.

RESEARCH METHOD

A survey research design was used for the purpose of this study. Following studies such as Abdul-Azeez, Olateju, and Aworemi (2009) and Ajemunigbbohun (2022) survey research approach was adopted for this study. The survey was done through the use of a questionnaire, which was developed using google Forms and distributed via the WhatsApp platform through the personal contact of individual farmers. The primary data was collected from commercial farmers in the North-Western States of Nigeria, which are mostly into mechanized farming. Convenient and purposeful sampling techniques were used to select 80 farmers that have knowledge of the identified variables of this research and who can respond appropriately to the survey questions. Out of the 80 questionnaires distributed, 55 usable questionnaires were retrieved; this represents a 69% response rate. The validity and reliability of this instrument were done using content and Cronbach alpha, respectively. The reliability was achieved at $\alpha = (0.86)$. Data collected for this research were analyzed using descriptive statistics, and the results were presented using charts with the aid of excel micro software.

FINDINGS

RQ1

What are the relationships between honesty among supply chain participants and sustainable food security in Nigeria?

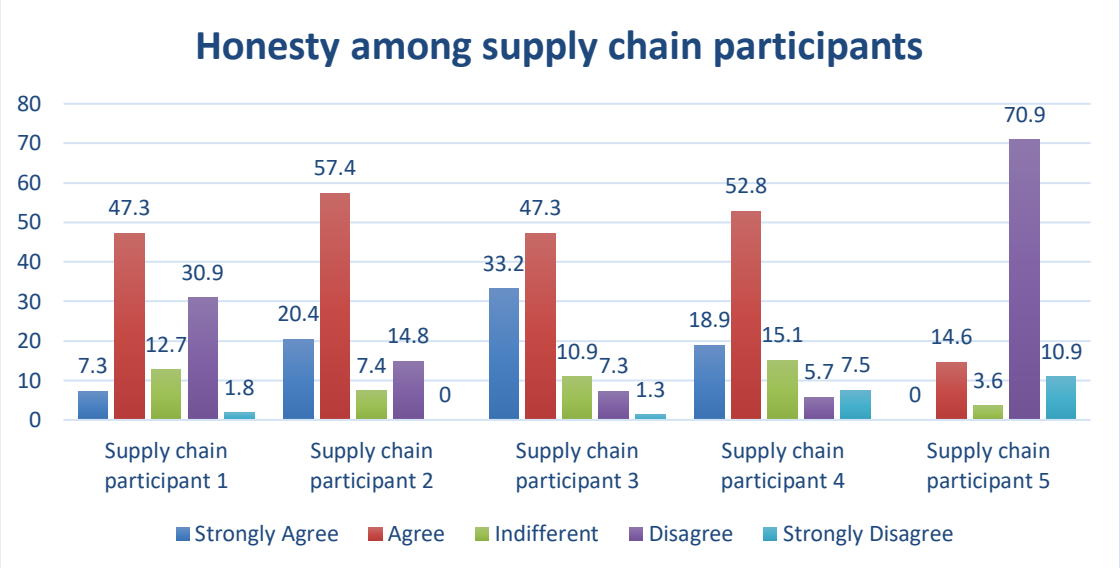
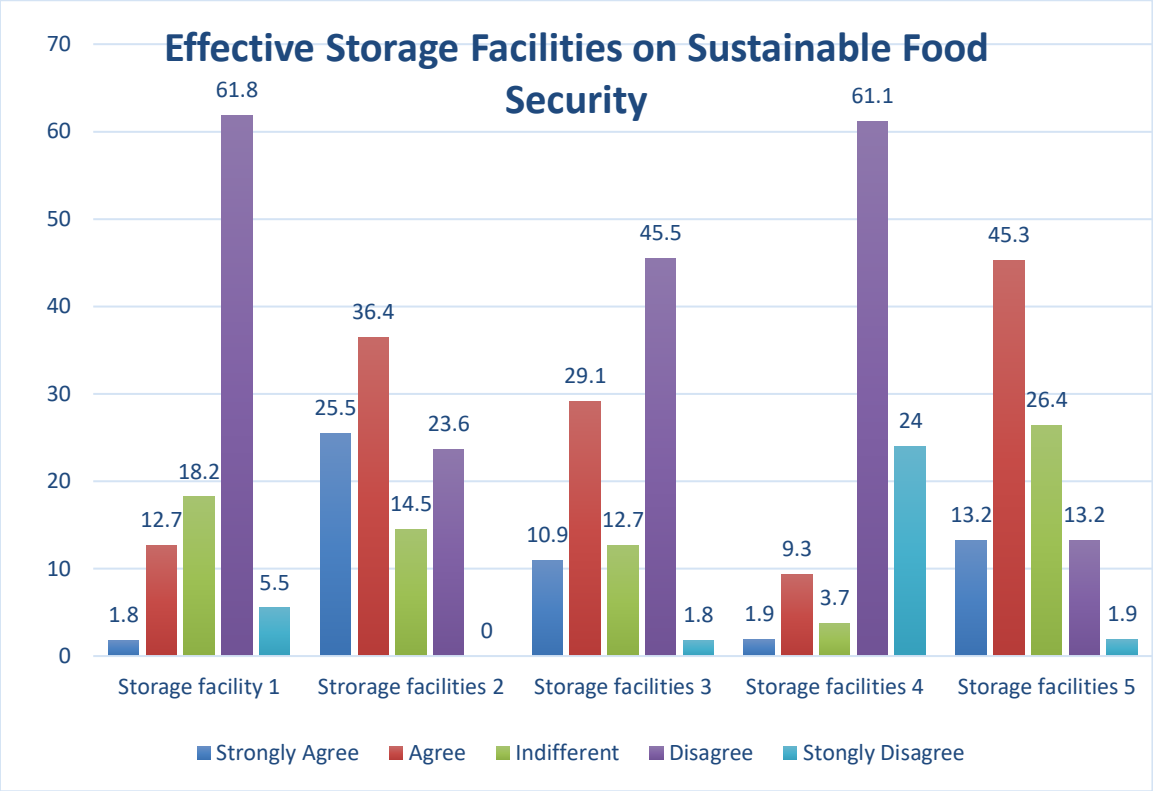


Figure 2. Respondents' perspective on honesty among supply chain participants on sustainable food security in Nigeria

Figure 2 above shows the respondents' perspective on honesty among supply chain participants on sustainable food security in Nigeria. Based on the items in the questionnaire, The chart above indicated that 7.3% of the respondents strongly agreed that prompt responsiveness among supply chain participants promotes sustainable food security, while 47.3% agreed, 12.7% of the respondents were indifferent, 30.9% disagreed and the remaining 1.8% of the respondents strongly disagree. This implies that the majority of the respondents agreed that prompt responsiveness among supply chain participants promotes sustainable food security. The chart also showed that 20.4% of respondents strongly agreed that a good image of individual supply chain participants promotes timely delivery of farm produce, 57.4% agreed, 7.4% of the respondent were indifferent, while the remaining 14.8% of the respondent disagreed. This implies that the respondents agreed that a good image of individual supply chain participants promotes the timely delivery of farm produce. Furthermore, 33.2% of the respondents strongly agreed that working collectively with other farmers to solve farming problems (production and marketing problems enhances sustainable food security, 47.3% of respondents agreed, 10.9% of the respondents' responses were indifferent, while 7.3% respondents disagreed, and the remaining 1.3% respondents strongly disagreed. This implies that the majority of the respondents agree that working collectively with other farmers to solve farming problems, production, and marketing problems enhances sustainable food security. The chart further showed that 18.9% of respondents strongly agreed that fair judgment on product quality among supply chain participants promotes the nutritional needs of farm produce, 52.8% of respondents agreed, 15.1% respondent responses were indifferent, 5.7% respondent disagreed, while the remaining 7.5% of respondents strongly disagreed. This implies that the respondents agreed that fair judgment on product quality among supply chain participants promotes the nutritional needs of farm produce. Furthermore, 14.6% of respondents agreed that they always have access to government subsidies for crop cultivation, 3.6% of respondents' responses were indifferent, 70.9% of respondents disagreed, while the remaining 10.9% of respondents strongly disagreed. This implies that the majority of the respondents disagreed that they always have access to government subsidies for crop cultivation.

RQ2
Is there any relationship between effective storage facilities and sustainable food security?



The figure 3. Respondents' perspective on effective storage facilities for sustainable food security in Nigeria

The figure 3 above shows the respondents' perspective on effective storage facilities for sustainable food security in Nigeria; based on the items on the questionnaire, the chart above indicated that1.8% of respondents strongly agreed that their access to credit facilities for post-harvest storage is very proactive, 12.7% respondents agreed to this statement, 18.2% responses were indifferent, 61.8% respondent disagreed, while the remaining 5.5% of respondents strongly disagreed. This implies that the majority of the respondents disagreed that their access to credit facilities for post-harvest storage is very proactive. The figure above further showed that 25.5% of respondents strongly agreed that their type of storage facilities always promotes the life span and residual value of the farm produce, 36.4% of respondents agree, 14.5% were indifferent, and the remaining 23.6% disagree. This implies that the majority of the respondents agreed that their type of storage facilities always promoted the life span and residual value of the farm produce. Furthermore, 10.9% of the respondent strongly agree that the storage facilities used for their farm produce are robust and resistant to fire, 29.1% agree, 12.7% are indifferent, 45.5% disagree, and 1.8% respondent strongly disagree. This implies that the majority of the respondents disagree that the storage facilities used for their farm produce are robust and resistant to fire. The chart also shows that 1.9% of the respondent strongly agree that the cost of storage for post-harvest are

always subsidies by the government, 9.3% of respondents agree, 3.7% are indifferent, 61.1% disagree, and the remaining 24% respondents strongly disagree. This implies that the respondents disagree that the cost of storage for post-harvest is always subsidies by the government. Furthermore, the figure shows that 13.2% of the respondents strongly agree that the use of multipurpose packaging was always used to monitor insect damage of their goods, 45.3% agree, 26.4% are indifferent, 13.2% disagree, and 1.9% of the respondent disagree. This implies that the majority of the respondents agree that the use of multipurpose packaging was always used to monitor insect damage to their goods.

RQ3. What are the relationships between the quality of seeds and sustainable food security?

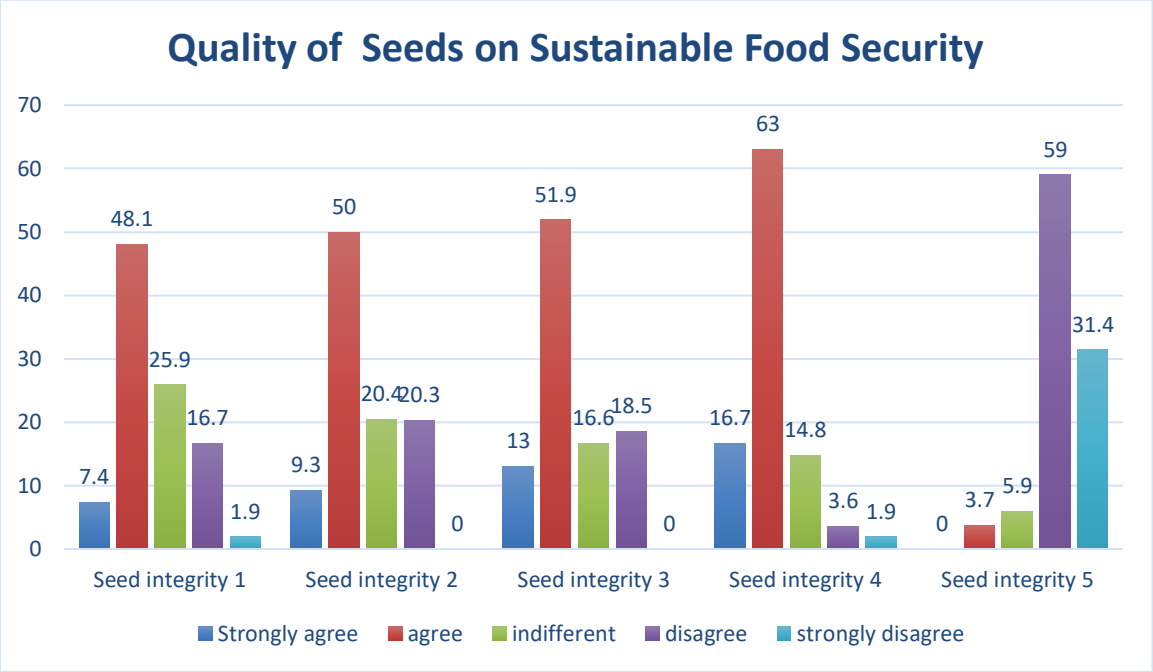


Figure. 4. Perspective of respondents on the quality of seeds and sustainable food security

Based on the items in the questionnaire, 7.4% of the respondents strongly agree that the quality of seeds used for plantation always satisfies minimum seed certification policy, 48.1% agree, 25.9% are indifferent, while 16.7% disagree with the statement, and the remaining 1.9% strongly disagree. This implies that the majority of the respondents agree that the quality of seeds used for plantation always satisfies the minimum seed certification policy. Furthermore, 9.3% of the respondent strongly agree that the seed used for their planting always have generic and physical purity, 50% of respondents agree, 20.4% are indifferent, and 20.3% disagree. This implies that the respondents agree that the seed used for their planting always has generic and physical purity. The chart above also shows that 13% of the respondents strongly agree that the seeds used for their planting are always free from designated diseases, 51.9% agree, 16.6% are indifferent, and the remaining 18.5% respondents disagree. This implies that the majority of the respondents agree that the seeds used for their planting are always free from designated diseases. The chart also shows that 16.7% of the

respondents strongly agree that planting seeds always promotes high germination and vigor of farm products, 63% agree, 14.8% are indifferent, 3.6% respondents disagree, and 1.9% strongly disagree. This implies that the respondents agree that their planting seeds always promotes high germination and vigor of farm products. The figure also shows that 3.7% agree that the seeds used for their farming are always supplied by the government, 5.9% are indifferent, 59% disagree, and the remaining 31.4% of the respondents strongly disagree. This implies that the majority of the respondents disagree that the seeds used for their farming are always supplied by the government.

DISCUSSION

RQ 1

Based on the findings of an analysis of respondents from figure 2, it was revealed that honesty among supply chain participant plays a vital role in sustainable food security. The findings show that majority of respondents agreed that honesty among supply chain participant promotes both affordability and high profits for all participants in the supply chain based on the response of the selected farmers. This is in line with the study of Masuku and Kirsten (2003), which stated that relationships established based on trust and honesty among supply chain participants are more likely to succeed than a relationship of convenience supported by legal contingencies. This implies that a good image of individual supply chain participants promotes sustainable food security.

RQ 2

The findings of this study show that effective storage facilities for farm produce could enhance nutritional foods in society. Based on the analysis of respondents in figure 3, it was revealed that the majority of the respondents disagreed that their access to credit facilities from the government for post-harvest storage is very proactive. This corroborated the study of Afolabi, Ajimati, Goshen, Juliet, Damilola, Falope, Agboola, Ojeokun, and Elohozino (2022); the study stated that high-tech storage facilities are needed as a springboard to increase food security in Nigeria The study of Kennedy and Gattis (2922) also stated that effective storage facility would ensure the availability of food stocks. Therefore, Government intervention in terms of subsidy on the cost of storage for post-harvest should be considered, so that could be an abundance and availability of food in Nigeria.

RQ 3

Lastly, the findings of this study revealed that the quality of seeds to plants would enhance nutritional foods in society. Based on the analysis of respondents in figure 4, it was revealed that adequate quality of seeds always promotes high germination and vigor of farm products. This is in line with the study of Hilman (2020), which stated that there is a linkage between the quality of seed and food security. This assertion was further corroborated by the study of Augna (2017), the study explained that the quality of seed for planting provided beneficiaries with access to improved food security.Therefore, from the findings of this study, it could be deduced that effective supply chain management practices will promote positive influence on food security

CONCLUSION

Findings from this study show that access to food by individuals could often be a greater constraint than the availability of the food itself. Food insecurity mostly affects the different groups of the population, e.g., low-income and senior citizens, who may be affected by limited food choices, financial aid food availability, location of restaurants, and food prices. It is therefore recommended that government intervention, in terms of a subsidy program, is critical for food security in Nigeria. There should also be an effective feedback mechanism from the government to ensure the subsidy is actually addressing the purpose of its establishment. Adequate information-sharing practices and a culture of honesty should be encouraged and promoted among the supply chain participants.

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