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Sweet Potato Processing Capabilities among Households in Delta Central Agricultural Zone of Delta State, Nigeria

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Abstract

The study examined the sweet potato processing capabilities among households in the Delta central agricultural zone in Delta State, Nigeria. A multistage sampling procedure was used to select 120 households for the study. Data were collected through a structured questionnaire and analyzed using percentages. Results show that the majority of the households were capable of: sorting sweet potato based on size, shape, and quality (94.2%), peeling sweet potato using hands and knives (94.2%), and processing sweet potatoes into confectionaries (94.2%). However, the households had low capabilities in the processing of sweet potatoes into starch (34.2%), peeling sweet potatoes using machines (18.3%), and processing sweet potatoes into sparr (15%). The major factors limiting the sweet potato processing capabilities of households were: poor monitoring of government structural programmes (65%), inadequate access to the market chain (59.2%), poor sensitization of farmers on the appropriate methods of processing sweet potato (58.3%). The study concluded that households had low capabilities on some sweet potato processing techniques and recommended that stakeholders in the sweet potato value chain should empower households, especially youths on sweet potato value additions and types of machinery used in sweet potato processing while linking them with available markets to sell their processed products.

Introduction

In sub-Saharan Africa, Nigeria is one of the biggest producers of sweet potatoes, with an estimated annual production of 3.69 million metric tonnes per year (Aneneokeakwa et al., 2021). The crop is a good source of β -carotene (pro-vitamin A) which helps to eradicate the problem of vitamin A deficiency prevalent in sub-Saharan Africa (Alam, 2021). Sweet potato is a drought-tolerant crop and a nutritional security crop that can serve as an alternative source when highly dependable food crops such as maize, rice, and cassava fail in high yield due to drought (Laurie, et al., 2022). Despite the nutritional importance of sweet potatoes over most root crops, it has not been fully utilized domestically and industrially (Okereke et al, 2021). Based on this, attempts are being made to develop appropriate processing technologies in sweet potato production (Gbigbi, 2019).

Most sweet potato farmers in Nigeria depend on indigenous and personal experience in production rather than the use of improved technologies and innovation (Okeke et al., 2020). Many farmers are ignorant and lack awareness as regards the benefits of the new technologies in sweet potato production. This has caused underutilization of resourceful technology and its efficiency in sweet potato production in developing countries such as Nigeria. Similarly, Sulaiman et al. (2020) reported that perceived technological capabilities significantly influenced households' decisions to cultivate sweet potato. Despite the importance of sweet potato in agricultural-led economic growth, there has been few studies on the processing and use of sweet potatoes at the household level in Nigeria. Most studies and reports on sweet potatoes in the country has focused on increasing sweet potato production (Okeke et al., 2020). According to Clark (2019), sweet potatoes can be processed to create a variety of snack and dessert foods, as well as sweet potato juices drinks, soups, baby food, and ice cream. Also, Alalade (2019) reported that a range of items, including flour, crisps, canned sweet potatoes, starch, and sweet potato beer, can be made from sweet potatoes, including *sparri* (sweet potato garri). Additionally, processing sweet potatoes into non-perishable goods helps farmers overcome storage and preservation issues while maintaining food supply during times of scarcity (Caicedo Solano et al., 2020). However, are farm households capable of carrying out the techniques involved in sweet potato processing? Therefore, to promote value addition to sweet potatoes after harvest, households must be capable of carrying out all the processing activities involved in sweet potato processing.

Based on this backdrop, there is need to increase the processing capabilities of farmers in sweet potato processing to improve value addition, reduce hunger and food insecurity amongst households, and encourage viable growth and advancement in Nigeria's agricultural sector. Therefore, the study calls for the need to ascertain the processing capabilities of households in sweet potato processing in the Delta Central agricultural zone of Delta State, Nigeria. Specifically, the objectives of the study: (i) identified the households' level of awareness of sweet potato processing and its effects on households' consumption behaviour; (ii) examined the sweet potato processing capabilities among households; and (iii) identified the factors limiting the sweet potato processing capabilities of households.

Methodology

The study was carried out in the Delta Central agricultural zone of Delta State, Nigeria. The Delta State is divided into three agricultural zones by the Delta State Agricultural Development Programme (DTADP). These zones are Delta North, Central, and Delta South agricultural zones, with Agbor, Effurun, and Warri as the zone headquarters respectively. Delta Central consists of 10 blocks, while Delta North and South consist of 9 and 6 blocks, respectively, making a total of 25 blocks in the State. It lies roughly between longitudes 5°00' and 6°45'E and latitudes 5°00' and 6°30'N. It has a total land area of 16,842 sq. km. Delta State has a projected population of 5,663,362 (National Bureau of Statistics [NBS], 2017). The main cash crops grown in the area include oil palm and rubber, while the food crops include cassava, sweet potato, plantain, banana, maize, yam, and cocoyam. Livestock such as birds, goats, and sheep are also reared. The population of the study consisted of households involved in sweet potato farming in the Delta Central agricultural zone.

A multistage sampling procedure was used to select households for the study area. In the first stage, the Delta Central agricultural zone was purposively selected from the three agricultural zones (Delta Central, Delta North, and Delta South zones) because it had the largest concentration of crop farmers in the study area. Secondly, two (2) blocks (Ughelli South and Ughelli North) were selected from the ten (10) blocks in the Delta Central agricultural zone. These blocks were chosen due to the predominance of sweet potato farming in the zone. The third stage involved a random selection of three (3) cells from each of the selected (2) blocks. A total of six (6) cells were selected. Finally, 20 households were randomly selected from each of the cells with the help of enumerators. Thus, a total of 120 households were selected for the study.

Results and Discussion

Households' Level of Awareness on Sweet Potato Processing and its Effects on Household's Consumption Behaviour

Table 1 indicates that a majority (64.2%) of the households were aware of some sweet potato processing technologies. The majority (56.7%) of the households affirmed that a lack of awareness of the different processing techniques of sweet potatoes affects the household's consumption of sweet potatoes.

The majority of households were aware of some sweet potato processing technologies, which means that a significant proportion of the households are knowledgeable about sweet potato value additions. However, most of the households still need to be well informed about the various value additions carried out on sweet potatoes.

The majority of households' affirmation that lack of awareness of the different sweet potato processing techniques affected household consumption of sweet potatoes gives a clear indication that creating awareness and training households on the multiple methods of sweet potato processing will tend to increase household demand for sweet potato consumption. This result supports Egwuonwu (2024), which reported that inadequate knowledge of the value additions of sweet potatoes and lack of proper storage are the challenges in the consumption of sweet potatoes.

Table 1: Households level of awareness on sweet potato processing and its effects on household consumption behaviour

Level of awareness of sweet potato processing and its effects on household's consumption behaviour	% Yes
Are you aware of some sweet potato processing technologies?	64.2
Does lack of awareness of the different processing techniques of sweet potato affect your consumption of sweet potato?	56.7

Source: Field Survey, 2023.

Sweet Potato Processing Capabilities among Households

Results in Table 2 show that the majority of sweet potato farm households were capable of sorting sweet potatoes based on size, shape, and quality (94.2%), peeling sweet potatoes using hands and knives (94.2%), processing sweet potatoes into confectionaries, including flour, chips, buns, etc. (94.2%), using adequate storage facilities, such as a cool, dry, and well-ventilated warehouse in other to maintain the quality and shelf life of sweet potato (77.5%), packaging of peeled sweet potato in vacuum-sealed bags or containers to protect the product from browning or damage and extending its shelf life (52.5%), processing sweet potatoes into animal feeds using sweet potato peels (48.3%), sun drying of sweet potato chips to extend its shelf life (47.5%).

This result indicates that the households were capable of carrying out sweet potato processing, which is easy to perform (in a subsistence manner) in order to quickly prepare sweet potato meals for their household use and consumption. These results support Egwuonwu (2024), who reported that consumption of sweet potato products was mainly chips, soup, baked, and boiled, which involved the aforementioned sweet potato capabilities of the farm households.

However, the households had low capabilities in the processing of sweet potatoes into starch (34.2%), peeling sweet potatoes using machines (18.3%), and processing sweet potatoes into *Sparri* (garri made from potato) (15%). These low capabilities could be an indication that the households do not have machinery used in sweet potato processing and need training on how to handle sweet potato processing machines, which can be used in the peeling of sweet potato, converting sweet potato to starch, as well as *Sparri* (garri made from potato) production. Also, the cost implication of purchasing a machine could also result in low capabilities in machine usage. This is in consonance with Egwuonwu (2024), who reported that the majority of the households never consumed sweet potato products such as starch and alcohol. Thus, this could be responsible for the low capabilities in processing sweet potatoes into starch, peeling sweet potatoes using machines and processing sweet potatoes into *Sparri*.

Table 2: Sweet potato processing capabilities among households

Sweet potato processing capabilities	% Yes
Sort sweet potatoes based on size, shape, and quality to improve product quality and reduce waste	94.2
Peel sweet potato using hands and knives	94.2
Peel sweet potatoes using the machine, which increases efficiency and reduces labour costs compared to manual peeling.	18.3
Process sweet potatoes into <i>sparri</i> (garri made from potato)	15.0
Process sweet potatoes into confectionaries, including flour, chips, buns	94.2
Process sweet potatoes into animal feeds using sweet potato peels	48.3
Process sweet potatoes into starch	34.2
Always package sweet potatoes in vacuum-sealed bags or containers to protect the product from damage and extend its shelf life	52.5
Sun-dry sweet potato	47.5
Use adequate storage facilities, such as a cool, dry, and well-ventilated warehouse to maintain the quality and shelf life of sweet potato	77.5

Source: Field Survey, 2023.

Factors Limiting the Sweet Potato Processing Capabilities of Households.

The factors limiting sweet potato processing capabilities of households as presented in Table 3 were analysed under three main categories: institutional, sociocultural, and political and economic factors. The households agreed that the major institutional factors limiting their sweet potato processing capabilities were: inadequate access to a market chain on sweet potato (59.2%), poor extension and research service supporting sweet potato processing among households (51.7%), inadequate agricultural programmes and policies supporting sweet potato processing (50.0%), and inadequate access to agricultural credit and loans limits household processing capabilities (50.0%).

The households agreed that inadequate access to the market chain for sweet potatoes limits their sweet potato processing capabilities could indicate that the household's capabilities of processing sweet potatoes tend to reduce when they lack information on the available markets to sell their processed sweet potato. The households agreed that poor extension and research services supporting sweet potatoes and inadequate agricultural programmes and policies supporting sweet potato processing limit sweet potato processing capabilities. This could indicate that extension services for sweet potato processing have not been addressed in the study area. This result aligns with Adewale and Abdulazeez (2021), who reported that inadequate extension services to help improve the level of sweet processing are constraints to sweet potato processing.

The households agreed that inadequate access to agricultural credit and loans limits their sweet potato processing capabilities. This could indicate that the households are

operating the sweet potato processing on a small scale due to their inability to access agricultural finance from stakeholders in their locality. Also, the households agreed that poor youth empowerment and participation in sweet potato processing (52.5%) was the major sociocultural factor limiting their sweet potato processing capabilities.

The households agreed that poor youth empowerment and participation in sweet potato processing limits sweet potato processing capabilities. This implies that the Government is not empowering youths in sweet potato processing, and the youths are not motivated to perceive sweet potato processing as a lucrative enterprise. This result supports Obayelu and Fadele (2019), who reported that youths are repulsive to picking agriculture as an occupation, notwithstanding the fact that agriculture is a very lucrative profession. Furthermore, the households agreed that the major political and economic factors limiting capabilities in sweet potato processing were: poor monitoring of government structural programmes (65%), poor sensitization of farmers by extension agents on appropriate methods of processing sweet potato (58.3%), poor government sensitization to enlighten its citizens of the usefulness of sweet potato to industries like flour mills, bakeries, textiles industries among others (55.8%), poor improvement in sweet potato plant nutrition and post-harvest management (54.1%).

The households agreed that poor monitoring of government structural programmes limits capabilities in sweet potato processing. This could be an indication that agricultural programmes in the study area were not well implemented and monitored, hence could discourage the households in participating in government programmes geared towards sweet potato processing. The households agreed that poor government sensitization to enlighten its citizens of the usefulness of sweet potatoes to industries like flour mills, bakeries, textiles industries among others limits their capabilities in sweet potato processing, which could be an indication that the majority of the households perceived sweet potato processing to be geared towards household consumption with low or no intention of processing sweet potatoes as raw material for industries.

The households agreed that poor sensitization of farmers by extension agents on appropriate methods of processing sweet potatoes limits capabilities in sweet potato processing. This could be an indication that there was poor extension service delivery, especially in the area of sweet potato processing. The households agreed that poor improvement in sweet potato plant nutrition and post-harvest management limits could be an indication that the households have not been trained on sweet potato value additions as well as post-harvest management of sweet potato tubers. These results are similar to the constraints to the adoption of agronomic practices of sweet potato production which included inadequate access to input, lack of capital, poor access to the market, inadequate access to credit facilities, poor extension service delivery, high cost of labour as reported by Ajayi (2022). Also, it was reported that the major constraints found in potato production and processing were majorly poor access to information from extension agents, inadequate government commitment in providing appropriate agricultural policies to encourage youth involvement, inadequate finance or loans for potato farming and processing and poor access to training on sweet potato production and processing (Alalade et al., 2019; Onu et al 2024).

Table 3: Factors limiting the sweet potato processing capabilities of households.

Factors	Strongly Agree %	Agree %	Disagree %	Strongly Disagree %
Factor 1: Financial/institutional factor				
Inadequate access to market chain on sweet potato	31.7	59.2	9.2	-
Inadequate access to agricultural credit and loans limits household processing capabilities	16.7	50.0	33.3	-
Inadequate agricultural programmes and policies supporting sweet potato processing	19.2	50.0	30.0	0.8
Poor extension and research service supporting sweet potato processing among households	18.3	51.7	30.0	-
Lack of equipment and machinery used in sweet potato processing	14.2	32.5	52.5	0.8
Factor 2: Sociocultural factor				
Poor youth empowerment and participation in sweet potato processing.	52.5	46.7	0.8	-
Low attainment of higher education by households which helps to propel easy understanding of new technologies and techniques in sweet potato processing.	35.8	41.7	22.5	-
Poor availability of funds to afford the initial investments required to start a sweet potato processing business.	33.3	34.2	30.8	1.7
Low empowerment of women financially to obtain funds for potato processing.	20.0	21.7	55.8	2.5
Poor empowerment of members of marginalized or disadvantaged households in starting sweet potato processing business	10.8	13.3	60.8	15.0
Factor 3: Political and economic factor				
Poor monitoring of government structural programmes affect transfer of sweet potato technology among households	30.8	65.0	4.2	-
Poor Government sensitization to enlighten its citizens of the usefulness of sweet potato to industries like flour mills, bakeries, textiles industries among others.	43.3	55.8	0.8	-
Poor sensitization of farmers by extension agents on appropriate methods of processing sweet potato	40.8	58.3	0.8	-
Poor improvement in sweet potato plant nutrition and post-harvest management	30.8	54.1	15.1	-

Source: Field Survey 2023

Conclusions and Recommendations

The study revealed that the sweet potato processing capabilities of households were majorly hand peeling of sweet potatoes with knives, processing sweet potato peels for animal feeds, processing sweet potatoes to confectionaries (flour, chips, buns), and preserving and packaging of sweet potatoes in cool, dry, well-ventilated stores. However, the households had low capabilities in processing sweet potatoes into starch, peeling sweet potatoes using machines, and processing sweet potatoes into *Sparri* (garri made from potato).

It was therefore recommended that stakeholders in the sweet potato value chain, such as the government, agricultural extension workers, policymakers, and agricultural

cooperatives should empower farm households especially youths with types of machinery used in sweet potato processing while linking them with available markets to sell their processed products. Also, agricultural stakeholders should empower households with funds and carry out extension service delivery targeted on creating awareness and training households on the value additions carried out on sweet potatoes and how to use types of machinery in the processing of sweet potatoes.

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