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Indigenous Food Yam Cultivation and Livelihood Practices in Cross River State, Nigeria

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Abstract: Yam production, processing, distribution, and marketing processes are underpinned by socio-cultural beliefs shaped by ritual practices and indigenous wisdom. We used semi-structured interviews, public meetings, keen observation, local informants, and a review of secondary materials to assess local indigenous understanding of interconnected perspectives of yam farming processes, socio-cultural perspectives, and livelihood practices in communities in southern Nigeria. Our findings revealed that over 90% of farmers depend on experiences of adjusting to seasonal challenges, storage practices, and fertility enhancement. Cultural beliefs and spiritual practices pervade farmers' social attitudes to improving farming operations. Almost 70% of yam producers are aged 60 years and above and depend on crude tools and traditional methods of land management and production process, even though the modern and innovative farming methods and practices are limited. Farmers respond to the poor public support system of extension services by informal networking and local associational relationships with diverse schemes to support and encourage members. Government and organizations should take advantage of these informal structures to empower farmers through micro-credits, education, information, training, supervision, and mechanization. Different groups of actors organized into formal social structures like cooperatives will take advantage of bulk buying, selling, transportation, access fundings, information, education, and training from public and non-governmental institutions. The study findings have demonstrated that the socio-economic structure of the Obudu community has developed extensively on account of decades of yam production and processing, supporting chains of a livelihood network, entrepreneurship, and relationships of mutual cooperation and co-existence.

Keywords: yam cultivation; native wisdom; social economy; Nigeria



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1. Introduction

The yam (*Dioscorea rotundata*) is a clonally propagated economic crop, cultivated for its underground edible tubers. Yams have been cultivated since 11,000 BC in West Africa [1], and more than 94% of the world's yams are produced in the “West African yam belt” including countries like Nigeria, Ghana, Côte d’Ivoire, Benin, and Togo [2]. Nigeria ranks as the leading producer of yams (*Dioscorea* spp.) in the world, accounting for 66% (about 50.1 million tons) of annual global production [3]. The yam is an important source of dietary calories and contributed on average more than 200 Kilocalories per person per day to over 300 million people between 2006 and 2010 [4,5]. The yam is a highly revered cultural crop and key festivities like marriage, chieftaincy ceremonies, conflict resolutions, peace accords, and sacrifices to the gods are tied to it [6]. As a testament to the economic impact

of the yam value chain, 31.8% of the Nigerian population depends on yams for food and income security [7].

Yam farming has led to the emergence of a range of livelihood options in local farming communities. Farmers participate in yam production for three main reasons: household food supply, income generation through marketing ware yams, and production and marketing of planting material (seed yam). Yams exhibit diverse agro-ecological adaptation, diverse maturity periods, and in-ground storage capability, thus permitting flexible harvesting times, which aids sustained food availability.

Yam production has led to the thriving of social and economic practices as well as enriched the cultural and political identities of farming communities. According to Appadurai [8], historical research on food production, consumption and distribution, cuisines, and gastronomy are symbolic representations of the nations and identity of a people. There is a consensus in the literature that food types, mode of preparation, and consumption habits are strong markers of regional, social, and cultural identities [9–11]. Our total selves—‘who we are and where we are from’—most likely bears much on the popularity of our individual food habits. Our dietary footprints and food habits are, to a large extent, ethnically, regionally, and culturally interconnected. Kittler et al. [11] noted this when they stated that eating is a daily reaffirmation of (one’s) cultural identity.

The interaction of yam and man is speculated to have developed in the humid tropics from West Africa at one end to New Guinea at the other end. Yams have been cultivated since 11,000 BC in West Africa [1]. Scientific evidence supports the fact that the center of domestication of the popular white yam is in the River Niger belt of Nigeria and parts of the Republic of Benin [12]. This region is speculated to have the most advanced yam culture in the world [13]. Coursey [14] argued that the survival imperatives of emerging human cultures enhanced the appreciation of certain food species in a given environment. The value of yam under such circumstances was not to be underestimated. Additionally, plants were probably more central to the survival needs of the inhabitants of the humid tropics than animal foods, compared with the inhabitants of other climes outside the tropical regions. This point was reinforced by Lee and de Vore [15] stating that ‘tropical hunter/gatherer societies that have survived until modern times derive three-quarters or more of their total diet from plant sources’ [14].

Not much is known about indigenous practices and sustainability impact as well as how the organization of yam farming has shaped local socio-cultural, economic, and livelihood practices. This paper draws on local indigenous understanding of interconnected perspectives of yam farming processes, socio-cultural perspectives, and livelihood practices in the Obudu community, northern Cross River State, southern Nigeria. Obudu represents a typical yam production community and the prowess of her production status in yam is celebrated within the yam production agro-ecologies of Nigeria. We organize our discussion in segments touching on the background of study communities, data collection, and the analysis approach, as well as the presentation and discussion of findings.

2. Research Methodology

The fieldwork process used interviews, public meetings, local informants, review of secondary and grey literature, and keen observation [6]. The study adopted a multistage sampling procedure. In the first stage, we targeted stakeholders (comprising 90 farmers, 60 middlemen and transporters) purposely chosen and interviewed from farms and yam loading and offloading points in Obudu.

Our interviews were segmented into two demographic categories (60 years and above and below 60 years) to understand generational differences and associated perceptions related to the topic of study [6]. We successfully conducted a total of 150 in-depth and semi-structured interviews. A total of 33% of the respondents were in the age group of 60 years and above while 77% were below 60 years of age. A total of 56% of the respondents were males and 44% were female participants. The above variance in the gender proportion

of respondents may have created a limited level of bias. However, this variance showed the availability and livelihood nomenclature of respondents who participated in the study.

A public meeting was organized at the point of yam loading and offloading. These informal yam stations signify a wider representation of yam farmers and distribution stakeholders from all demographic categories. These stakeholders were interviewed to discern their level of perception of yam farming and livelihood practices. A single interview lasted, on average, between 35 min and one hour. Four local informants were used to facilitate our community entry, interaction with interviewees, clarification of issues, and communication with the local elders and chiefs. Our respective individual experiences and familiarity with the local customs and traditions were equally useful.

2.1. Study Communities

Obudu is located at latitude 6°40' and longitude 9°10'. It has a total land size of 459.458 km² [16] and is bordered to the south by Boki, to the east by Obanliku, to the west by Ogoja and Bekwarra local government areas in Cross River State, and to the north by Vandeika local government area in Benue State. Obudu is home to the clans of Bette, Obanliku, Bendi, Utugwang, Ukpe-Alege, Utanga-Becheve, Bekwarra, and Mbube, who all lived as autonomous communities sharing kinship, being the sons of Agba [17].

The Obudu people, with an estimated population of 161,457 (81,537 males and 79,920 females), are found in Akim, Atikpe, Begiaba, Beniabe, Betukwe, Babwabie uya, Babwabie, Betukwe, Igalaba, Obudu, Obuabung, Okolo obudu, Ohong, and Okoshe settlements. They speak five different tribal languages. In Ubang, men speak a different language from women though they understand each other. Obudu parades some clusters of heterogeneous nationals and ethnic groups comprising the Cameroonians, Hausas, Igbos, Igedes, Yorubas, and the Tivs, among others, who have integrated into the various sub-communities on account of migration, marriages, and businesses.

Over 90% of the population are Christians, who co-exist with other religious groups including the Muslims and the traditional religious worshippers. There is, however, a tendency of syncretism among the various religious groups which manifests through ancestral worship, sacrifices, libation, and beliefs in witchcrafts, myths, taboos, charms, etc. Eko and Ekpenyong [18] explained that the prevalence of these beliefs has shaped the course of many practices, ceremonies, and festivals, for instance, the designation of special days during which no economic or related activities may be conducted. Saturdays are popularly reserved for major traditions and festivals during which all forms of farming activities are prohibited. Obudu is dominantly a rural settlement. Consequently, the larger proportion of the population (over 90%) is estimated to live in the rural areas and is involved in subsistent and semi-subsistent activities dominated by farming, trades, skill crafts, and commerce, among others.

2.2. Conceptual and Theoretical Framework

The socio-ecology theory is a conceptual model developed by Urie Bronfenbrenner in the 1970s and later formalized as a theory in the 1980s. It places its focus on the individual, their affiliations, and interrelationships with their environment via people, institutions, organizations, and policy. Moraine et al. [19], utilizing this framework, analyzed, designed, and performed integrated assessment of crop–livestock systems at the territory level. They defined the framework as a socio-ecological system called the territorial crop–livestock system (TCLS) and developed a generic typology of crop–livestock systems through interacting with stakeholders in participatory design approaches. They concluded that this framework shows great potential to support the development of sustainable farming systems at the territory level.

This work utilizes socio-ecology theory in simplifying the complex web of individuals' affiliations and interrelationships in food yam cultivation. Structured by the focus on the individual level, this work shows how the individual's skills, cultural knowledge, native wisdom, and information about yam farming and ecological interactions across

the environment are important in influencing the right attitudes and decision making in assessing sustainability and productivity.

The actor in yam cultivation utilizes all the necessary physical, economic, cultural, and social capital, be it land, labor, farming inputs, cultural wisdom, family, friends, and social groups, to mention but a few, available to achieve their aim by interacting with the diverse institutional organization to enhance profitability. These institutions also exist in the individual’s community and usually pull resources and ideas together to better productivity and sustainability outcomes.

Figure 1 shows Cross River State in the southern geopolitical zone of Nigeria. Obudu is located in the northern Cross River State and geographically characterized as derived savanna agro-ecology, which is suitable for yam cultivation.

CROSS RIVER STATE SHOWING OBU DU STUDY AREA: INSERT NIGERIA.

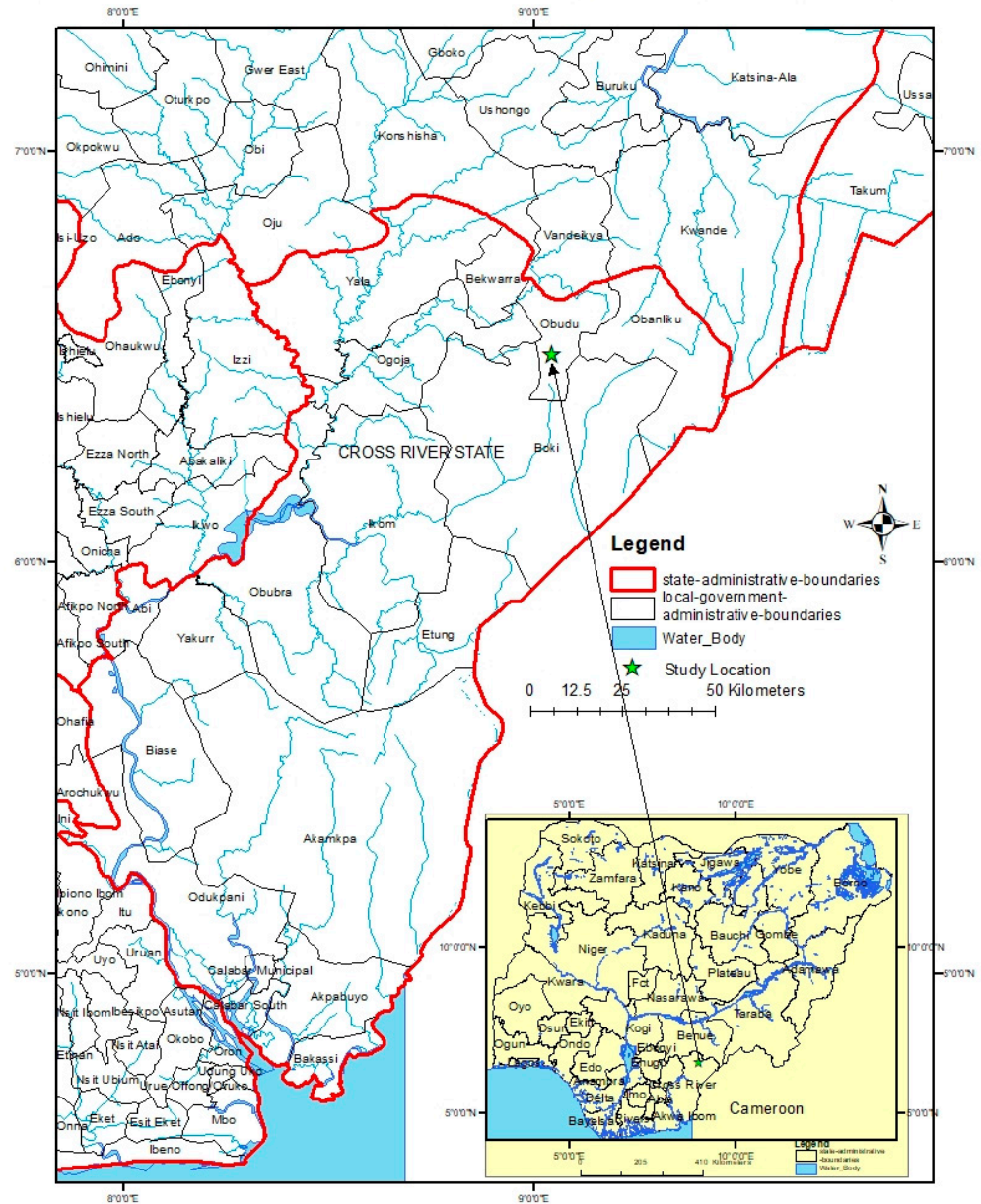


Figure 1. Cross River State showing Obudu, Nigeria.

3. Results

3.1. Indigenous Knowledge and Yam Cultivation

Yam cultivation involves series of interconnected processes shaped by seasons, local knowledge, and religious rituals. Every year, yam farming proceeds through land preparation, planting, weeding, staking, harvesting, storage, and marketing with huge financial and labor implications (Table 1).

Table 1. Activities carried out in yam production at different periods of the cropping seasons in Obudu, Nigeria.

| Months | Processes and Labor Demands |
|------------------|----------------------------------------------------------------------------------------------|
| January–March | Cutting, clearing, burning, tilling/mound making, planting, staking, weeding, mulching |
| April–June | Planting, vine trailing, staking, weeding, mulching |
| July–September | Weeding, mulching, harvesting, sales |
| October–December | Harvesting, tuber milking, sales, cutting, clearing, burning, tilling/mound making, planting |

The cutting process involves the removal of vegetative life such as grasses, trees, and any other obstacles that may limit yam cultivation in the farm. This process is usually carried out using knives and cutlasses and executed at any time of the day, but the mornings or late evenings are preferred by farmers. After the cutting process, the farm waste is allowed to dry for a day or two. This culminates in the clearing process, which refers to the gathering of all farm waste into diverse shapes and heaps. The burning stage is where the gathered farm waste is set on fire. The clearing stage continues, where the remaining waste is moved to the farm boundary, thus creating space for tilling/mound making. Tilling/mound making is carried out with special hoes and sometimes shovels. It is believed that the deeper the till depth and larger the mound, the better the yam yield.

Planting is carried out by inserting the seed yam into the mound. This is followed by staking when the yam stem has sprouted. Trailing and staking are carried out for better exposure of the foliage to sunlight. This can have an indirect effect on underground tuber growth resulting in a better yield. Weeding is carried out 2–3 weeks after planting. The uprooted weeds are kept strategically to dry and then applied upon the yam mound as mulching. This organic form of soil enhancement is extensively utilized, as it is believed to be a major boost for yam growth. Vine trailing occurs when the yam stem grows longer with different branches. This process involves guiding the stem in a way to enhance faster growth of the root.

Yam tuber milking is a pre-harvest activity often carried out between five and seven months after planting. The time for yam tuber milking is usually determined by the farmer as influenced by two main factors, these being his/her perception of yield output and household food need. In milking, the immature tuber is harvested carefully without destroying the roots and the corm, after which the tuber continues to grow from the corm. This process enables farmers to assess yams before the main harvest. Harvesting marks the end of yam cultivation as the farmers reap their rewards. During our survey, a local chief in his late 70s explained that ‘yam planting is possible and successful during the dry season (October–December) due to the cultural wisdom and norms of making till/mound under huge/large trees and applying intense mulching’. Cultural practices, such as mulching in the dry season, conserve the soil moisture and improve the nutrient status. It also reduces soil caking caused by high absorption of heat/solar radiation, thus preventing tuber rot. It also provides loose seedbeds for ease of tuber penetration, allows for the collection of fertile topsoil, controls water in areas with a high water table, and makes harvesting easy.

The chief further stated that the wisdom behind early planting is to take advantage of tree shade and protect the seedlings and sprouts from the heat of the dry season sun. As the rain begins in March and April, yam stems would have grown very appreciably, while the branches of shaded trees will serve the purpose of staking and trailing. The period

spanning July and September is reserved for harvesting. Furthermore, it is important to mention that a key aspect of yam production lies in the transfer from farms to preservation and distribution. Traditional “milking” of the yam provides seed yams for the next planting season and thus reduces the burden of buying seed yams from the market. The respondents highlighted four main traditional storage methods, which include straws and sticks, the use of mud, the raffia bag, and compact storage (Table 2).

Table 2. Yam storage methods and distribution across livelihoods.

| Yam Storage Technique | Farmers | | Collectors | | Transporters | |
|-----------------------|---------|----|------------|----|--------------|----|
| | No | % | No | % | No | % |
| Straws and sticks | 13 | 43 | 15 | 25 | 8 | 13 |
| Mud | 8 | 27 | 3 | 5 | 1 | 2 |
| Raffia bag | 7 | 23 | 28 | 47 | 19 | 32 |
| Compact storage | 2 | 7 | 14 | 23 | 32 | 53 |

The straw and sticks technique for yam storage utilized these components as preservatives during storage. We found that farmers make a careful choice of some categories of leaves and sticks in the storage process to further protect the harvested yams from pest attacks as well as to enhance their longevity: “. . . yams may be stored in any safe place but without the use of certain types of leaves/straws and sticks they may not last to the next planting season . . .”, noted a farmer in his late 70s.

The storage techniques used vary in relation to context and equally determine risk exposure levels of yams. For transporters, the compact method is the most suitable. Compact storage refers to the technique where yams are packed in an organized form in a vehicle, preventing spaces in between them as much as possible. A total of 53% of the transporters believed that the compact storage method, a relatively modern method of storage, reduces the risk of breakage upon encountering bad patches of road during transport, while 13% explained that straws and sticks help prevent disease, pests, and parasites from damaging the product. A total of 43% of farmers utilized the straws and sticks methods for similar reasons, while 27% of farmers utilized the traditional mud method. A total of 47% of collectors used raffia bags as the major material of storage and distribution. It was also observed that most of the respondents above 60 years of age adopted mud, straw, and stick techniques, which were the more traditional form of storage. This technique was mostly adopted by the farmers and 25% of the collectors.

3.2. Farmers’ Seed System Management

Seed yams are culturally perceived as the source of all life, wealth, and health. This belief holds that seed yam production is sacred and highly regarded in such a way that it is used as one of the marriage rites to test/screen for an optimal bride. An elderly chief in his late 70s recounts that after a man expresses his desire to marry his bride, the male’s family would give the bride a yam to process. The bride is screened from the first minute her blade touches the yam. If she starts to peel from the seed head down, then she has failed the marriage test. She is also tested on how she handles the yam. If she hurts the seedhead or consumes the head irrespective of the economic situation of the family, then she is definitely not a good bride and will not be able to manage the home. The right approved and good bride would be one who not only separates the seedhead but keeps it in an appropriate space that would encourage sprouting. The woman that keeps the head is a woman that will preserve the family’s future. This is because the woman is supposed to consider the next planting season by preserving the head for cultivation. This is the optimum bride desired by all families.

Another yam farmer in his early 60s explained that to be a successful yam farmer, one has to understand the spirituality and fertility difference between seeds. He revealed every seed yam is different in terms of fertility and reproductive capacity; as such, they have the ability to communicate to a listening farmer. This indigenous knowledge is mostly

transferred from father to son and gained through practical experiences of yam cultivation on each particular traditional farm plot. He revealed that in his traditional farmland plot, not all spaces have the same fertility outcome, as some are high, moderate, and low. This trend is observed in the seed yam due to variations in sprout time. He quipped that there is also a spiritual dimension to these, as he mutters his prayers while applying the seed yam with a slow stem sprout to the portion of farmland that he perceives to have a high fertility rate. The seed yam with fast sprout potential is thus planted at farm spaces perceived to be of moderate fertility, while a seed yam exhibiting fast sprout potential is planted in spaces of low fertility in the plot. He explained that he has never been disappointed, as his yield is appropriate to his expectations.

All farmers had diverse indigenous techniques for identifying what makes a good seed yam. The dominant indigenous techniques for identifying a good yam are the seed yam's appearance, the speed of germination, which translates to vigor potential, the seed yam's size, and the scratch technique. Respondents could only perceive and found it difficult to explain choosing a good seed yam based on its appearance. However, a male respondent in his late 40s came close in his explanation, saying that he would choose a seed yam which skin had limited wrinkles and no spots over the ones with lots of wrinkles and black spots. Respondents easily acknowledged that the seed yam exhibiting a vigorous dormancy break tends to be more vegetative in growth and thus results in a higher yield. They also explained their preference for the larger seed yam over others, as it is perceived that the larger the size, the more fertile the seed yam. The scratch technique is used to determine if there is still life in the seed yam. This technique involves scratching the seed yam's brown skin surface lightly. If a light greenish color is found, then the seed yam is alive. The deeper the light green color, the higher the fertility of the seed yam. These indigenous techniques were used to determine the degree of fertility of the seed yam.

All farmers acknowledge using at least one or more of the above identified indigenous technique in choosing a good seed yam, especially in their supplementary purchase to meet their cultivation demand. A total of 62% of yam farmers preferred seed yam exhibiting vigorous sprout potentials, while 48% revealed their main preference to be seed yam size. Different farming households produced seed yam for different purposes. Based on the respondents' reports, farmers engage in seed yam production with the following intent: (a) private use, (b) private use in combination with sales to make income, and (c) exclusively for sales to make income. (Table 3).

Table 3. Famers' seed yam production intent.

| Seed Yam Production Purpose | Respondents' Number | Respondents' Percentages % |
|-----------------------------------|---------------------|----------------------------|
| Produced for private use only | 48 | 53 |
| Produced for private use and sale | 41 | 46 |
| Produced for sale only | 1 | 1 |

It was observed that the one percent respondent had a land conflict issue and had to resort sales of his seed yam. Farmers who produced seed yam for private use and sale often had large farmlands and or several farmlands in diverse locations, thus enabling them to possess a large supply of seed yam stock for sale or barter for other farming and household commodities. Farmers who produce seed yams for private use often run short of their farm requirements and are required to purchase more seedlings from the market to augment their demand. The seed yam value often varies from NGN150 to NGN500 (USD0.32–1.1 (conversion rate of NGN460 to USD1)) depending on perceived fertility quality of the yam through seed appearance, the germination potential of the seed yam shoot, the seed yam size, and the scratch result of the seed yam. Seed yam cost also varies by season, as it decreases during harvest and increases during cropping season.

3.3. Labor Practices and Gender Role Differences

Yam farming depends mainly on manual labor from family and exchange/hire sources. All the farmers acknowledged depending on family labor composed of men, women, and children for cultivation. Alternative labor sources come from informal or organized labor exchange groups. There could be a need for hire, especially at the peak of farming season. Twenty-three percent of the respondents claimed that they complement family labor with exchange and hired sources to cope with the pressure of peak season farming. Fourteen percent said they depend on their family members and in rare cases complement with external source drawn from the local informal associational labor network. Eight percent said they mostly depend on family with hired labor sources (Table 4).

Table 4. Sources of labor for yam cultivation and their corresponding contribution. Yam cultivation labor distribution.

| Labor Segments | Number | Percentages % |
|-------------------------------|--------|---------------|
| Family Labor | 90 | 100 |
| Labor exchange group practice | 34 | 38 |
| Hired labor | 28 | 31 |
| Mechanized labor hire | 9 | 1 |

Labor exchange group hiring is social. It involves mutual labor support and assistance from families, groups, and cooperatives on a 'turn by turn' basis. An extremely small number of farmers (1%) with relatively bigger and larger farm size draw on mechanical sources (Table 5). The farm sizes range between 0.3 to 2.6 hectares. The plots are irregular in shape and are demarcated by trees planted to signify boundaries between plot sizes.

Table 5. Gender labor roles in yam cultivation.

| Labor Activities | Male | | Female | |
|---------------------------------|--------|-------------|--------|-------------|
| | Number | Percentages | Number | Percentages |
| Cutting/Clearing | 63 | 70% | 27 | 30% |
| Tilling/mound making (per heap) | 52 | 58% | 38 | 42% |
| Planting, Mulching, and staking | 60 | 67% | 30 | 33% |
| Weeding | 7 | 8% | 83 | 92% |
| Harvest | 27 | 30% | 63 | 70% |
| Others | 63 | 70% | 27 | 30% |

Although the study areas are generally perceived to be yam farmers, we found that only 20% of farmers were relatively full-time in the yam production business. They complement their income through extra paid labor services. Hired labor services were known to attract a different wage structure, from NGN1000 (USD2.17) and above depending on the size of the plot or amount of labor needed. There is usually more demand for three specific labor tasks, including cutting/clearing, mound making, and weeding. A woman in her late 40s explained that family labor is always available for cutting/clearing, mound making, and weeding tasks, but can also be hired out when relatively larger and bigger sizes of farmlands are involved. While cutting/clearing and mound making demand more strength, weeding requires more skills in execution. This perception justifies price differences; a higher pay of NGN 2000 (USD4.35) per plot mostly applies to cutting/clearing and weeding, which also depends on the farmland sizes. The mounding task could range between NGN10 (USD0.02) and NGN50 (USD0.10) per mound. A total of 92% of respondents preferred using women and girls for weeding due to the perceptions of their ability for greater weeding efficiency, as opposed to 70% respondents who preferred to engage the men for cutting/clearing tasks. Thirty-one percent of farmers claimed they depend much on communal rotational labor exchange practices, which can accomplish large-scale tasks in a large expanse of land with minimal cost and time.

Gender role differences also formed part of the labor practices and are embedded in the broader socio-cultural norms. Men and women perform different labor tasks from cultivation to harvesting. Such tasks are segmented into cutting/clearing, tilling/mound making, planting, mulching and staking, weeding, harvesting, and other minor tasks, including conveying yam tubers from farmlands to homes and regular farm visits, among others (Table 5).

A woman in her late 30s explained that the weeding task is culturally assigned to women. She said, 'women are naturally endowed to bend and weed for hours with ease and if a man tries to execute similar task, he will encounter health challenges if not immediately then later in his life'. Another female respondent in her late 60s explained that the old cultural values assign men the role of bush clearing and tilling/mound making. However, she noted that such role differences are gradually losing steam as a few men and women occasionally cross role boundaries to offset and make up for labor shortage as well as the opportunity to earn extra income through hire services. As can be seen in Table 4, 8% of men claimed they do engage in the weeding task, while 30% of women claimed they also ventured into land preparation tasks (cutting/tilling). Generally, women seem to perform the greater share of labor tasks in the cultivation process, and they seem to be comfortable in the fulfillment of cultural norms and societal expectations. Take for instance the arduous task of carrying yam tubers on the head from farms back home. A female respondent in her early 30s noted that the pride of carrying yam tubers on the head back home signifies healthy living and productivity, attracting goodwill in its wake.

3.4. Social Perception, Cultural Practices, and Indigenous Productivity-Enhancing Options

The processes of yam cultivation, marketing, and consumption are nested in social norms and cultural beliefs and taboos with implications on productivity. Landrace preferences, ritual practices, and gender role assignment shape productivity outcomes in different forms (Table 6).

Table 6. Socio-cultural perspectives on yam distribution practices.

| Yam-Related Cultural Practices and Routines in Distribution | Remarks |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Worship | <ul style="list-style-type: none"> - Varies by ethnic groups - Profitability is believed to be determined by spiritual forces - These spiritual forces have to be consulted before market transactions are carried out. |
| Yam transportation is highly gendered | <ul style="list-style-type: none"> - Culturally women do not own transport vehicles nor go into long-distance transportation business - Women are, however, actively involved in farming, collecting, and livelihoods tied to distribution, except long-distance transportation business. - Yam transportation business is exclusively in the preserve of the male gender. - Poor or no participation of women due to the exigencies and rigorousness of the business. |
| Excessive fixation on indigenous and native landraces | <ul style="list-style-type: none"> - Indigenous and native landraces are highly in demand - This attitude is reflective of traditional landraces attracting higher prices. - Preferences for these landraces by distributors are reflective of the perceptions of buyers who see these landraces as a prestige food as signified by its highly desired texture, taste, and appearance level. |
| The cultural practice of wholeness in yam distribution | <ul style="list-style-type: none"> - Yam is perceived as a whole, as any dent on it is perceived as a handicap, and it is thus disregarded by majority of the public (well-to-do). - Broken yams lose their value and sell cheaper than whole yams irrespective of the sizes. - Broken yams are mostly desired and purchased by those who cannot afford the whole yam. - Yam cultivated using fertilizers are avoided by distributors. |

Farming practices are steeped in cultural beliefs which rarely embrace innovation. A man in his 70s, for instance, argued that you can only be a bad person in the society for your yams not to thrive using the known dry season traditional method of cultivation. The context of a bad person refers to one who is not sociable or helpful and does not contribute to the numerous community development initiatives.

Over 90% of the respondents rarely subscribe to modern farming methods of mechanical and chemical farming. Most farmers prefer traditional means of soil fertility maintenance involving traditional manuring and religious practices. Most soil fertility enhancement practices are through mulching and animal manuring. All farmers interviewed indicated their desire for chemical fertilizer use. However, only 1% actually claimed they use chemical fertilizer, and the reason for low acceptance has to do with the poor market value of final products. A male respondent in his mid-40s claimed that consumers prefer yam tubers that are not cultivated with chemical fertilizers. He noted that they detect that through yield output and taste differences; '... It is difficult to make much profit when you farm with chemical fertilizers on account of low sales and poor pricing ...' argued the respondent. Respondents were discreet in revealing the physical appearance of yams cultivated with chemical fertilizer, although one explained that a yam cultivated with fertilizer will have excessive 'hairs' on its tuber, among other slight indicators such as color and texture. The yield capacity of yam is dominantly shrouded in religious beliefs, which necessitate annual and regular ritual practices and sacrifices. This limits opportunities for large-scale production.

Gender role differences that assign fix boundaries to men and women limit the scope of opportunities for men and women in yam production and marketing value chains. Women are not allowed ownership of yam barns and are traditionally excluded from fully participating in the transport employment chain. Beyond the cultural ties, the yam transport business needs a huge capital outlay, which most women might not meet.

3.5. Livelihood Assets of Yam farmers

The yam farmer's assets include physical, financial, human, social, and natural capital. These include farming inputs, energy, water and sanitation, shelter, and means of transport. Rudimentary farming inputs were utilized by small holder farmers in the study area.

Yam farmers' natural capital is the land and environment. Land ownership is mostly by ancestral transfer and inheritance from parents. Culturally a system of land rotation is practiced, although population growth has intensified pressure on land, causing most farmers to change this cultural system, as land has become fragmented with the resulting continuous cropping. Small holder farmers are financially limited to farm more than a single plot. Traditional land use transference of ownership rights to children and grandchildren creates land fragmentation and more pressure on plot cultivation.

Soil fertility augmentation is mostly carried out by the application of organic manure. Observation revealed four classes of housing architecture in the study area. Classed by materials used in building, they include the cemented block with corrugated zinc roof, the baked mud brick with corrugated zinc roof, the baked brick with thatch, and mud with thatch houses. These farmhouses also reveal the level of economic advancement of farmers. Among Obudu settlements, about 60% of houses were made of cemented block and corrugated zinc roofs, and 30% were baked mud brick houses with corrugated zinc roofs, reflecting a modest level of socio-economic attainment, while others dotted the landscape, revealing low levels of economic attainment. The number of households that reside in these buildings could not be clearly identified, as a female respondent in her late 40s revealed that "family houses are always opened to any one even after they leave to their own homes. During the farming seasons my sons with their families come back home to dwell and farm on the family land".

A female respondent in her late 30s narrated the cooking experience of rural yam farming households. She explained that kerosene cooking fuel was generally utilized by major households. However, due to a 100% increase in price, yam farmers have resolved to

use wood for cooking, thus resulting in the gradual depletion of forest cover and impacts on farming, exponentially escalating the vulnerability of subsistence yam farmers in southern Nigeria. Another female respondent in her early 60s revealed how the Abacha stove (a specially fabricated stove to maximize heat produced) helped the farming communities. She explained “that has been my only benefit from any government intervention program in 1997”.

A yam farmer in his late 30s revealed that most farming households cannot afford the outrageous electricity bills, which are as high as NGN3000-5000 (USD6.52-10.86) a month; such households prefer to stay off-grid: “after all the electric power is rarely available and farmers barely have electrical appliances”. He further added that due to the high cost of kerosene now, households prefer to use small rechargeable lamps, which they charge in outlets that retail electricity.

Furthermore, the increase in energy price increased transportation costs of organic manure, farm inputs, and other needs, thus increasing the cost of yam production. This also impacts yam price as farmers try to make even. The energy price increase also has impacts across the yam value chain on the vulnerability of collectors, middlemen, transporters, wholesalers, retailers, processors, and consumers.

Yam farming households in the study area were observed to be in highly sanitary condition. A respondent explained that community sanitation was regularly observed in the community as supervised by Osu (the regal chief) and his enforcers. He explained that monitoring is not that necessary, as cleanliness is part of their culture due to the shame attached to an unclean environment. Toilet facilities are mostly found in households, as the only public toilet was located at the commercial vehicle station. The public toilet charged NGN50 (USD0.11) for urinating and NGN100 (USD0.22) for defecating. The types of private toilet facilities range from the pit toilet to modern toilet system, depending on the farming household’s income levels. A yam farmer in his late 60s explained that it was practical during farming to add human waste to the other animal waste to ensue appropriate organic manure. He revealed that this is done in a very responsible way.

Yam farmers mostly utilized well water as their major water sources. An elderly woman explained that before borehole drilling technology was utilized, “everyone cooks, eats and irrigate farmlands with well water and if household or farmland is close to the stream with stream water as well”. She explained that now farmers perceive that borehole water is the cleanest and spend as much as NGN20 (USD0.04) to purchase it in 15–25-liter buckets. She revealed that there were also highly vulnerable people who purchased water packed in polythene bags or satchels for pure water. A bag of water contains between 15 and 20 smaller bags’ worth of 50–70 cl of water, depending on the company of production. Odum revealed that when these are shared in ceremonies like the new yam, households will be perceived as having a bumper harvest and presumed to be well-to-do. She revealed, however, that most farmers are modest and generally rely on borehole water for drinking purposes, while well water is use for other purposes including farm irrigation.

Yam farmers basically utilize the public transportation system, which has, in the order of highest frequency, motorcycles, tricycles, and cars, to mention but a few. Yam farmers possess and more frequently utilize wheelbarrows, bicycles, motorcycles, and tricycles in moving yam from farm to the sale destination. Routes in the interior areas are untarred, causing a certain level of difficulty in yam transportation, as the undulating terrain more often than not causes ‘wound’ (accidental peel) to yams, reducing their market value. Most of these accidentally peeled yams are sent back home for consumption, reducing the selling stock of farmers. Respondents claimed that their earnings cannot meet their needs, as some have merged farming with other jobs. Yam farmers with one traditional plot of farmland revealed that they do not get good prices for their farm products, so such farmers prefer just to consume the yams. This group, after the sale of excess yams, utilizes the money to finance their other household needs. They rarely save and have to rely on other sources of income to survive.

Farmers cultivating more than a hectare of land often belong to groups like cooperatives. ‘Ubiam’, ‘Osusu’, and ‘Beyietin’ local cooperative groups in Obudu have yam farmers who are involved in financial activities, such as registration for membership, savings, loan collection, and contributions (a system where farmers in a group of five, ten, or more contribute a certain amount to give to a member to use for any purpose), to mention but a few. However, for this group, up-scaling is usually a challenge and needs to be studied in detail. An anonymous farmer specified that funding from commercial banks is “too detailed, cumbersome with very high interest rates”, prompting most farmers to default in payment due to the challenges of farming in southern Nigeria. This raises more caution from the commercial banks in administering loans to farmers. Other farmers ignore the risk of accessing commercial loans altogether. Some were not even aware that the Nigerian Government had such an intervention in place to assist rural farmers. Further information on services offered by Nigerian Agricultural Insurance Company (NAIC) was unknown to yam farmers. Most farmers examined revealed that access to credit will result in more labor hire, thereby increasing production.

The human capital of yam farmers in southern Nigeria is composed of manual labor and skilled labor. The majority of the farmers had at least a primary school education and could speak at least two languages. Smallholding farmers often utilize family labor alone. They carry out other livelihood activities such as petty trading, shoe repairs, wood repairs, motorcycle repairs and riding, retailing food, blacksmithing, and bricklaying, to mention but a few, to augment their income. Manual labor hire is social capital in nature, as families, groups, and cooperatives take turns farming for each other. Yam farmers in southern Nigeria access the social capital of communicating in groups by word of mouth where demand is needed. A total of 70% of respondents had mobile phones, with all having knowledge of how to operate a mobile phone. Smart phones were not accessed by the labor who responded to this study. All yam farmers also acknowledged ownership of a radio, granting them access to information.

3.6. Livelihood Opportunities, Socio-Economic Network, and Social Support Services

The processes of producing, distributing, and marketing of yams involves chains of interconnected activities and services, including various farming implements, inputs, structures, and associated infrastructures. Rudimentary farming implements including hoes, spades, shovels, and knives are still commonly used, providing opportunities for direct labor engagement and indirectly supporting local producers and marketers. A flourishing business community of local tool fabricators and retail has sprung up to support year-round yam farming (Table 7).

Table 7. Yam farming tool purchase frequency and seasonality.

| Farm Tools | Average Price (Naira) | January–April | | May–August | | September–December | |
|-----------------------|-----------------------|---------------|----|------------|----|--------------------|----|
| | | Number | % | Number | % | Number | % |
| Hoes | 700 | 28 | 47 | 21 | 35 | 11 | 18 |
| Spade/Shovel | 2500 | 36 | 60 | 17 | 28 | 7 | 12 |
| Knife/Machetes | 3000 | 31 | 52 | 15 | 25 | 14 | 23 |
| Agro-allied chemicals | Varies per liter | 18 | 30 | 28 | 47 | 14 | 23 |

Most of the equipment shops also sold all kinds of general goods, including different types of yam seedlings and farm chemicals. Yam production, processing, distribution, and marketing provide livelihood support to many economic actors and equally contribute to the flourishing of social networks to further strengthen farming practices and to provide social support to farmers and other agents (Figure 2).

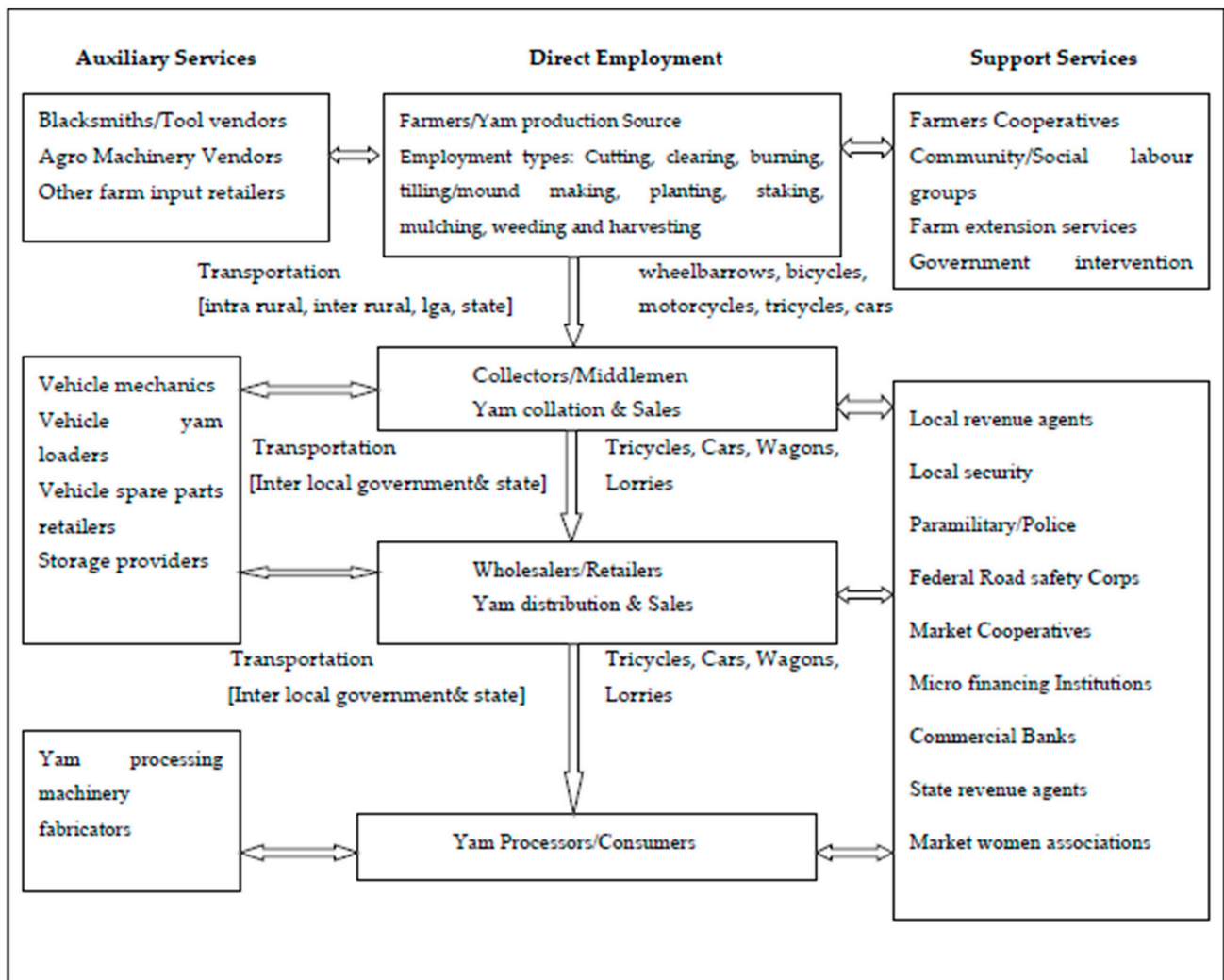


Figure 2. Flowchart of yam employment and livelihood chains.

Ownership of these farm tool shops was dominated by males, though sales were administered by a female member of the family. The socio-cultural construct aligned the female gender as being better sales/administrative representatives. These roles were closely supervised by male farm tool shop owners in the study. Female respondents also dominated the seed yam sales. They appealed to their customers and met their needs differently.

Many economic actors were identified in the yam production and intermediary chains, as follows.

Box 1 above explains the job description of the different actors involved in the yam value chain, as listed in Figure 2. It was observed that there exists a dynamic flow of yam value through farmers, collectors, middlemen, transporters, wholesalers, retailers, processors, and consumers, as detailed in Box 1. Farmers cultivating more than a hectare of land mostly operate through social networks and cooperatives to encourage savings, lending, and labor exchanges, in addition to providing welfare and insurance services to their members. Socio-economic groups and networks are collectively funded through membership levies, donations, profit from investments, and other forms of support. Available groups include ‘ubiam’, ‘osusu’, and ‘beyietin’. Specifically, associational networks serve to provide basic education and share experiences on farming and storage methods, marketing opportunities, and other services, as needs arise. Their services to members are more critical considering funding limitations and the difficulties/complexities of accessing

financial products and services from commercial banks. A female farmer in her early 50s noted: ‘... these associations are very important to use, and it will be difficult to achieve success here without them ... government is not helping and if they help, it does not get to the real farmers ... commercial banks are not useful ... their loan services come with high interest rate and conditions that are too difficult to fulfil ... in fact they do not have human face ...’ She added that the farmers find solidarity and a sense of belonging through the diverse informal network and associations: ‘... members provide support in festivities and come to our rescue during challenges ...’.

Box 1. Economic actors in the yam production and intermediary chains.

Farmers:

The main actors in yam production are households engaging in farming. This is the starting point of the yam value chain. Small holder farmers residing in hamlets across linear, nucleated, and dispersed settlements make up about 80% of yam cultivators in the study area. They are mainly equipped with the indigenous knowledge systems for cultivation of yams. They are socially networked to share labor, seed yams, and other farm input. Most livelihood activities include the cultivation of other crops such as groundnut, afang, cocoa, and cassava, to mention but a few, in mixed cropping systems. Traditional seed yam is cultivated for mostly family consumption and harvested yearly. Upon harvest, enough stocks are selected to feed the family for the year. The excess is transported using wheelbarrows, bicycles, motorcycles, and tricycles to the village markets for exchange with the collectors. Farmers are exposed to exploitation by collectors, as they seek to sell in order to purchase other needs, thus selling cheaply.

Collectors:

These actors are mostly relatives of farmers who live in the rural hamlets. They are mostly business speculators. They consist of young village entrepreneurs, former businessmen, and retired civil servants who retire to the rural areas, to mention but a few. Only 24% of collectors are full-time in this business. Other collectors are involved in diverse trading and service activities. Forty-three percent of these respondents were female. During harvest, they purchase directly from the farmers and stock their local barns. They buy from farming households and village markets such as Utugwang. They stock their purchase from these markets and rarely sell unless an urgent need for money arises. However, these collectors are not limited to the purchase and storage of yam alone but are connections between the middleman and the farmer. They possess limited capital and cannot purchase much yam nor store it over a long period of time. They transport their yams to bigger markets in the local government headquarters. Their modes of transportation are mostly pickups and wagons (automobiles).

Middlemen:

These are bigger players in the value chain, as they possess more capital than the collectors and are fewer in number. They understand the demand and supply dynamics of the market and influence pricing greatly. They have large store houses and make purchases from bigger markets like Obudu, Ogoja, Ikom, Yakurr, Yala, etc. Their market reach is not limited to a few yam wholesalers, as they sell directly to yam retailers. They belong to strong trade unions that cooperate to share information and cost of transportation. Together they utilize lorries to transport their goods to the city market. However, as individuals, they possess pickups reaching long distances and ‘dyna’.

Transporters:

Transporters engage in yam and non-yam transport tasks with a mix of wheelbarrows, bicycles, motorcycles, tricycles, wagons, trucks, and lorries, depending on the location. They provide the linkage across different locations and service points. They begin from the rural hamlets to the city consumer. A respondent in his late 30s explained: “Yam is mostly hauled by Lorries from far distance farms and all kinds of wagons from local farms ...” At the peak of harvest, there is an increase in mobility, as traders flock into local farms to collect yam tubers for distribution to major cities of Calabar, Uyo, and Obudu.

Wholesalers:

They have an open profit strategy of making money through trade. They are often the leaders of yam market unions and own warehouses and lorries. They are fewer in number than the middle men. Wholesalers coordinate the yam market as they create opportunities for the middlemen they lead. They have traded for a long time and are educated in the rudiments of accessing credit. They are vulnerable to road hazards and the storage problems which they sometimes encounter. They understand the market taxation system and often exempt themselves from the process.

Box 1. Cont.*Retailers:*

They play an important part in the distribution and marketing processes. They are often more in number when compared to the wholesalers. They often have social credit agreements with wholesalers to support their business and wade through market challenges.

Processors:

The yam processing value chain has a wide range of actors. The first group focuses on the conversion and preservation of yams. This group may be classified into the local processeors and organized processors. Local processors seek to preserve yams through frying, drying, grinding, and packaging yam and yam flour for preservation using locally fabricated materials. They often operate informally and appeal to local consumers. The organized processors are food firms who are guided by the food agency (such as NAFDAC) standards for processing yam into diverse forms. These firms often target urban and international markets for sales of their processed products. Their products are not limited to yam powder and chips. Other processors include retail outlets which sell yam products after value is added by converting it to different edible forms. These retail outlets are mostly small- and medium-scaled enterprises dotting the yam ecosystem. They sell all kinds of foods appealing to the culture of the location. They are located across junctions, along major and minor road routes, urban and rural areas, to mention but a few. Yam is often eaten as pounded dough with different kinds of soup such as afia efere eboto (white goat soup), melon, and afang, to mention but a few. The process of eating pounded yam is by swallowing after lubrication with soup. Processing yams involves peeling, washing, boiling, and pounding them into into a dough. This method is labor-intensive, especially during pounding. A less labor-intensive technique of using yam flour exists, but yam pounding ranks as the most preferred culturally by consumers based on its better mold texture, which is the standard for measuring good yam.

Consumers:

These are the end users of yams. They bear the total cost of the yam value chain. Consumers are classed into two types. First is the household consumers who shop for yam tubers from the market and convert them into different edible forms at home. Other consumers include those who patronize the different food processors mostly to satisfy their hunger and other recreational purposes.

4. Discussion of Findings

Yam farming has underpinned local livelihood, fostering indigenous practices and socio-cultural inter-relationship for many decades. Over 90% of families and individuals depend on yam as their main staple in porridge and pounded, boiled, chip, flake, powder, and many other forms. Yam tubers are distributed and sold within and across communities and cover regional, sub-regional, and international levels, contributing to the food and nutrition mix of the people, in addition to complementing the foreign exchange earnings of Nigeria. The findings of the present study have demonstrated that the socio-economic structure of the Obudu community has developed extensively on account of decades of yam production and processing, supporting networks of chains of livelihood, entrepreneurship, and relationships of mutual cooperation and co-existence.

The production, processing, distribution, and marketing processes for yam depend on indigenous practices and efforts and are underpinned by socio-cultural beliefs. While the cultivation and production processes are largely shaped by religious beliefs and social perception anchored on ritual practices and indigenous wisdom, labor practices draw significantly on communal solidarity and reciprocity through joint and communal efforts and social networks. In many respects, these have implications on sustainability, acceptance of innovation, and adaptation to the dynamics of environmental circumstances. Over 90% of farmers depend on long experiences in adjusting to seasonal challenges, storage practices, and fertility enhancement. Where and when to plant are decided on indigenous trial and error as well as religious beliefs and practices. In the circumstance of large-scale and significant atmospheric events such as climate change, indigenous wisdom and ritual practices are less likely to help. Although most of the farmers are aware of current climate challenges that lead to delayed/diminished or excessive rain, the solution depends on spiritual religious practices. Yam farming depends on the natural cycle of rainy and dry seasons, whose variability or changes could engender substantial risk. Uncertainties about handling seasonal fluctuations probably discourage young people from

participation in yam farming given the near absence of a public support system to mitigate possible challenges.

Farm-level information collected showed that the head of the household, usually a man and his wife, were asked who owned each crop in the field, a man, a woman, or the household members combined. The couple was also asked who performed each farm task in the field, namely land clearing, seedbed preparation, sowing of each crop, weeding, harvesting, and transporting of each crop from the field. Analyses of our dataset show that yam field ownership includes both men and women, i.e., both the male and the female genders grow yam in their own rights and make production, marketing, and utilization decisions. This contradicts an age-old speculation of yam as a man's crop in Nigeria. In several Nigerian cultures, wealth was controlled by the man who served as head of the household. It is noteworthy to mention that yam was the ultimate wealth and regarded as king of all crops where agriculture was the main business. Ohadike reported that the yam production requirement for masculine labor was a contributing factor to the expansion of cassava production in the Lower Niger in the twentieth century [20]. In the Lower Niger (the Niger basin from just above the Niger Delta on the coast to Lokoja), a series of three tragedies—a war of resistance against the imposition of British rule (1899 to 1914), the First World War (1914 to 1918), and the influenza epidemic (1918)—made sustenance of food security through yam production difficult [20]. In addition, it is noteworthy that yam production was adversely affected by the withdrawal of men from the villages to fight in the wars. This led to a scenario where people of the Lower Niger embraced cassava, which was hitherto unacceptable as inferior to yam but less labor-intensive to produce [20].

Our data analysis in Table 4 revealed that a high number of women provided the bulk of the labor for each task, which increased from a low level during land clearing to a higher level at weeding, harvesting, transporting, and marketing. By contrast, the number of the fields in which men provided the bulk of the labor was highest during land clearing, mound making, and planting. These findings show that both men and women are heavily engaged in different yam production and postharvest tasks. Contrary to a study in Plateau State, Nigeria, Stone et al.'s [21] findings revealed the male: female labor ratio, where men do 50% of the weeding and transplanting labor and 52% of harvesting, storage, and processing, while 42% of the heavy ridging and mounding are done by women. In terms of total work hours in all agricultural activities, women's contribution is 53%, and their per capita labor input is 46%. Stone et al.'s [21] labor distribution shows that more women engage in the bulk of labor activities, while both genders exhibit similar family and social labor structures. Kleih et al. [22] in their study explained that though the yam is primarily considered a man's crop, women participate in some agricultural activities such as weeding and transporting of the yam tubers, while planting of the tubers is traditionally carried out by men.

The traditional preference of soil fertility maintenance using organic and animal manuring is extremely beneficial to not only yam cultivation but also general ecological wholesomeness and sustainability. Neina [23] revealed that yam production is traditionally non-sedentary because of its high nutrient demand. Identifying soil fertility as the biggest driver, Neina's [23] data show that yam yields decline with time under mineral fertilizer application; on the contrary, yields increase chronologically under organic fertilizer application due to the additive effects of the latter on soil properties. These findings show that the native wisdom exhibited in our study enhances better yam production output in the long term.

Seed yam quality improvement has been extensively studied through scientific technological innovations and practices; however, these products are often not accessible to rural Nigerian yam farmers. Innovations emerging from research and developmental centers are often stalled at the grassroots level, as rural yam farmers find it difficult to assimilate the science. Other reasons could be the fact that farmers prefer and hold onto their cultural values and processes. This is in line with the study by Bergh et al. [24], who confirm the slow adoption of yam miniset technology that was introduced to yam farmers starting

in 1970. Seed yam production is culturally managed by most Obudu farmers as revealed above. Culturally perceived as the origin of life, seed yams are held sacred, with indigenous practices across farming seasons grading the good and bad seed yams. It is perceived that this continuous domestication process of yam enables this region to evolve highly desired and demanded yam outputs with widely acknowledged great taste, texture, and size, generally called 'Atam yam'. It is also worth noting that this yam domestication process also impacts on people's livelihoods via their cultures, as examined in the study, influencing their choices, attitudes, and spirituality. These indigenous practices are mostly transferred from father to son, with practical experiences gained in the art of yam cultivation and production.

5. Conclusions

The work shows the indigenous food yam cultivation and livelihood practices in Obudu local government area of Cross River State, Nigeria. It utilized the socio-ecology theory in explaining yam cultivation via its actor/individual—the farmer interacts with socio-cultural, economic, and environmental factors such as family, community, and direct and indirect services and structures that surround them.

The farmers, through yam cultivation in these locations, interact with ecology by employing native wisdom in processes like utilizing farm waste organic manuring, and indigenous technologies that simplify tilling/mound making. Other processes include indigenous staking to allow for maximum sunlight interception for plant photosynthesis, resulting in increased tuber yield, and vine trailing, which enhances vegetative growth, and thus efficient tuber bulking.

The trends in the level of contribution of labor by gender to yam production and postharvest activities are such that as the activities move from the field towards the home, women's contributions increase and men's contributions decline. This trend may be attributed to the fact that women do more work at home than men. Such homemaking activities include meal preparation and child care. Although yam is labeled a man's crop, men and women are involved in yam production; thus, each gender is permitted to make production and post production decisions. Both men and women engage in complementary yam production and post production tasks. In yam technology development and transfer, these roles of men and women are more pertinent issues for consideration than the labeling of yam as a man's crop.

The socio cultural construct that the female gender is more effective in resource management enables their strong presence in the tool and seed yam retail livelihood. It is perceived that their presence facilitates increased frequency in sales with accuracy and accountability in returns. The influence of cultural beliefs and spiritual practices pervades farmers' social attitudes toward improving farming operations. Crude implements (hoe, machetes, etc.) and indigenous methods of fertility enhancement (local manures, rotational farming and shifting cultivation, etc.) dominate farming operations and practices. These practices/experiences present less scope for engaging in modern and innovative farming methods and practices. It is also less likely to open up opportunities for large-scale investment and participation of the younger demographic groups. In another perspective, we found that some aspects of indigenous farming practices carry some sustainability implications. The cultural norm of living in harmony with nature probably sustains some conservative attitudes towards farming operations, as most farmers are less willing to compromise on their age-old tradition of a reciprocal relationship with nature. Shifting cultivation, rotational farming, the use of organic manure, and other indigenous sustainability practices may not produce a bigger effect of encouraging productivity and innovation. They have, however, been instrumental in sustaining the social economy and ecological health for the community.

Farmers engage in informal networking and local associations with diverse schemes to support and encourage members. Government and organizations could take advantage of these informal structures to reach out to farmers through micro-credits, education,

information, training, supervision, and mechanization, among many other forms of support. There is a huge potential of registering the different groups of actors into formal social structures such as cooperatives in order to take advantage of bulk buying, selling, and transportation. This will strengthen these associations, creating the platform for accessing funds, information, education, and training from public and non-governmental institutions. There has to be special support administered to them through regular observations of their recordkeeping, which will reflect their present status, dynamics, and turnover.

Our study has demonstrated the relationship between the yam, the social structure, and the environment [25–27], focusing on the interconnectedness of places and food on the one hand and social practices and food production on the other. These relationships are driven and governed by indigenous knowledge systems and associated cultural norms, and hardly cohere with the need for innovation and modern practices. These are probably justified given the near absence of a public support system in the areas of education, information and communication, and improved farming methods. Our study enriches the wealth of literature on the subject of discourse while revealing man as the central driver of yam production through his interaction with his environment via a socio-ecological system. The findings will be utilized as a basis and foundation for further investigations on the evolving indigenous practices and sustainability impact as well as how the organization of yam cultivation will shape the local socio-cultural, economic, and other livelihood practices in the future. It will also serve as a planning instrument for effective utilization of cultures to enhance productivity.

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