

Analysis of Gender Participation in the Marketing and Processing Phases of the Cassava Value Chain in Nigeria

by

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Abstract

The Nigerian cassava value chain shows different gender roles for men and women in marketing and processing activities. Women are typically found in the less profitable work and at the bottom of the value chain because of their position in the labor market. Considering this, this study analyzed gender participation in the marketing and processing phases of the cassava value chain. The study draws from the survey of 4 geopolitical zones in Nigeria conducted by IITA in 2010 that surveyed 952 respondents consisting of 221 women.

The study analyzed the results using descriptive statistics like frequencies, mean, range, and standard deviation and inferential tools like t-test, chi-square, correlation, and multiple linear regression to test the hypotheses. We draw from the sustainable livelihood approach for the theoretical framework. The analysis indicates that more women are involved in the marketing phase than men, while more men are in the processing node than women. Additionally, producing cassava now, land allocated to cassava farming, level of education, marital status, and household size registered correlation with the index of participation in marketing. However, only household size registered a weak correlation with the index of participation in processing.

Regarding participation in marketing, the results were statistically significant for both men and women. Similarly, the analysis shows a statistical significance for the index of participation in processing for both men and women.

Keywords: gender, value-chain, participation, cassava, Nigeria, Sustainable Livelihood framework.

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List of Abbreviations

SLF	Sustainable Livelihoods Framework
HQCF	High quality cassava flour
IITA	International Institute of Tropical Agriculture
IAR&T	Institute of Agricultural Research & Training
NCRI	National Cereals Research Institute
MPC	Micro-Processing Centers
DFID	Department for International Development
FAO	Food and Agriculture Organization
UNDP	United Nations Development Program
FCT	Federal Capital Territory
LGAs	Local Government Areas
NC	North Central
NE	North East
NW	North West
SS	South South
SW	South West
SE	South East
EAs	Enumeration Areas
NISH	National Integrated Survey of Households
GAD	Gender and Development
WAD	Women and Development
WID	Women in Development
VC	Value Chain

1.0 CHAPTER 1 INTRODUCTION

1.1 Background

Cassava (*Manihot esculentus*) is a crop of primary importance for the food security of farmers living in fragile ecosystems and socially unstable environments (FAO, 1999), as cited by (Lagat and Maina, 2017). This is because it can be transformed into an industrial raw material in the production of flour, baked products, paper, alcohol, and animal feeds, and staple foods like garri, fufu, starch, among others (Alves, 2002; Teeken, Olaosebikan, Haleegoah et al. 2018).

Cassava and cassava-based products are essential food for Nigerians. Cassava is a staple food consumed daily by almost all households in Nigeria. For instance, (Onyemauwa, 2012) conducted a study on the consumption pattern of cassava of people in southeastern Nigeria and found out that 53.3% and 34% consume various cassava products daily and every other day, respectively.

Gender-defined roles and relationships within agricultural value chains and households affect men's and women's access to productive resources, financial services, and control over incomes. Gender inequalities in resources result in different levels of participation, methods of production, and modes of marketing cash crops and bear consequences for women's potential outcome in the cultivation of these high-value crops (Lambrecht, et al., 2018; Vagas and Vigneri, 2011). However, the literature suggests that often women's work and productivity are undervalued. There are still inconsistencies in collected data on rural women's contributions in agriculture and other sectors. Women make significant additions to agriculture and rural economies, tackle hunger and poverty yet are grossly undervalued ((Nkuba 2007)).

There is considerable gender specialization in Nigeria between men and women in the cassava value chains ((Mukasa and Salami 2015)). Men specialize in fresh cassava roots, and women specialize in traditional processed cassava products, the less profitable nodes of the

chain, and do not fetch them much in terms of income. ((Nweke 1999) identified women's reproductive roles, unpaid labor as housekeepers and care-givers as some of the factors responsible for their placement at the bottom of the pyramid. A study by Ao, Vu, Le et al. 2019 on the 'Analysis of the Smallholder Farmers' Cassava (*Manihot Esculenta Crantz*) Value Chain through a Gender Perspective: The Case of Dak Lak Province, Vietnam' highlighted some factors like lack of mobility and numeracy skills and low level of education as inhibiting women from developing practical communication skills with other value chain actors. Thus, they remain as producers at the bottom of the agriculture commodities value chain. The benefits of participating in agricultural value chains for women are determined by their control of productive resources and household-level decisions (Anderson, et al. 2016; Apata, 2013; Coles and Mitchell, 2011).

1.2 The Problem

The cassava value chain reflects different gender roles for men and women in production and processing activities. In agricultural value chains with higher economic values, women are usually found in low-status work and at the bottom of the value chain where their participation is less visible, which contributes to a widening economic gap between women and men (Ajie and Uche, 2019). The highest returns are enjoyed by individuals who could access the most profitable and rewarding functions ((Coles and Mitchell, 2011). Women also tended to earn less than men in similar roles. The lack of gender equality in participation in agricultural value chains may prevent important development outcomes such as eradicating malnutrition and poverty and consequently lead to ineffective interventions.

To reach the poorest and most vulnerable rural women for transformative impacts, it is crucial to promote the value chain approach and focus on crops or /sectors in which poor households and women are already more present or could easily integrate. Thus, it is imperative

to understand the gender structure and functioning of traditional cassava value chains. Following this premise, this study aims to analyze gender participation in the, processing, and marketing phases of the cassava value chain in Nigeria.

1.3 Justification

Though a small number of quantitative researches have been done on cassava value chain participation among smallholder farmers in Tanzania, Malawi, and some states in Nigeria (Forsythe, 2017; Masahma, Thebe, and Uzokwe; 2018; Onyemauwa, 2012), none have tried to analyze the gender structure in value chain participation across the country, and little is still known about the differential participation of women in the two phases of the cassava value chain—processing, and marketing in Nigeria.

Onyemauwa (2012) analyzed women's participation in cassava production and processing in Imo state, Nigeria, finding that the dominant activities of the women were cultivation, cutting of cassava sticks, frying, and fire preparation. The significant constraints identified were non-ownership of farmland, pre-occupation with household chores, inadequate farm size, and high cost of processing. Similarly, a study on cassava entrepreneurship and gender participation in Udi local government area of Enugu State, Nigeria, by Emerole et al. (2014), concluded that both males and females are involved in cassava production, processing, and marketing. More male-headed cassava households processed their fresh tubers into garri, while female-headed cassava-based households sell fresh cassava tubers and process those not sold into fufu and tapioca.

To address this gap in the literature, this study will use the Sustainable Livelihoods Approach to map the gender structure and functioning of traditional cassava value chains and develop a conceptual framework for understanding Gender in the cassava value chain.

1.4 Research Objectives

The objectives of this research are to:

1. Develop a conceptual framework for understanding Gender in the marketing and processing phases of the cassava value chain.
2. Identify farm and individual factors that shape gender participation in various phases of the cassava value chain.
3. Measure gender differences in the marketing and processing phases of the cassava value chain.
4. Identify practical steps for improving the role of women in the cassava value chain.

1.5 Research Questions

The study will address the following research questions:

1. What farm and individual factors shape gender participation in various the processing and marketing phases of the cassava value chains?
2. What are the gender differences in participation in the cassava value chain?
3. What are the gender differences in participation in the cassava value chain

1.6 Hypothesis

H₀₁: Y (GP (processing)) = f (individual, household, farm variables). Where 'Y' is the dependent variable, and 'F' is the independent variable.

There is no significant relationship between gender participation in cassava processing and respondents' individual and farm characteristics.

H₀₂: Y (GP (marketing)) = f (individual, household, farm variables). Where 'Y' is the dependent variable, and 'F' is the independent variable.

There is no significant relationship between gender participation in cassava marketing and respondents' individual and farm characteristics.

H₀₃: Y (Male participation in cassava value chain = f (female participation in cassava value chain) Where 'Y' is the dependent variable, and 'F' is the independent variable.

There is no gender differences in participation in the cassava value chain.

2.0 CHAPTER 2 CONCEPTUAL FRAMEWORK

Value chain approaches increase the benefits for the poor and enhance the prospects for sustaining operations and benefits after the termination of an intervention (Devaux, Torero, and Donovan et al. 2018). Women play a vital role in the cassava value chain; about 90 percent of the people who market and process cassava into various forms are women Serplagi, et al. 2010; Hanan, 2013).

The cassava sector holds much potential to improve incomes for actors in the chain, enhance household food security and alleviate poverty in rural West-Africa. However, several bottlenecks serve as impediments in the efficient functioning of the cassava value chain in Nigeria. The value chain is underdeveloped and disjointed with inadequate large-scale processing, leading to production risks and low integration with the international markets. These challenges need to be resolved to realize the potential of the cassava sub-sector. There is a need for a more comprehensive approach that includes all the actors along the cassava value chain with a greater focus on industrialization.

2.1 What is a Value Chain?

Value-chain concepts represent a meaningful change in development and the relationships among agricultural producers, traders, processors, and consumers. The term "value chain" is used in different ways in the literature. In this study, a value chain refers to the sequence of interlinked agents and markets that transforms inputs and services into products with attributes that consumers are prepared to purchase (Devaux et al., 2018). Millions of low-income people, a large proportion of whom are women, participate in agricultural value chains as producers, traders, processors, and retailers.

The model considers that a product is rarely directly consumed at the place of its production. It is transformed, combined with other products, transported, packaged, and displayed until it reaches the final consumer. In this process, the raw materials, intermediate products, and final products are owned by various actors linked by trade and services, and each adds value to the product.

The value-chain concept represents an essential change in development and the relationships among agricultural producers, traders, processors, and consumers. The term "value chain" is used in different ways in the professional literature. Tokgoz et al., 2020 defined the agricultural value chain as consisting of all actors and activities involved in production and consumption. However, Devaux et al., 2018 sees it as a sequence of interlinked agents and markets that transforms inputs and services into products with attributes that consumers are prepared to purchase. Thus, this study views the value chain as a series of activities and actors involved in producing, processing, and marketing cassava and its products. Millions of low-income people, a large proportion of which are women, participate in agricultural value chains as producers, traders, processors, and retailers.

2.2 Gender and Women Distinction

There is a need to understand the distinction between women and gender constructs. Women are a category of people while gender is the socially constructed difference between women and men which is not so much about the biological differences but about how society gives meanings to these differences in femininity and masculinity and the power relations and dynamics that come about as a result of this (Agada, Onuche, and Mbah, 2018; Ahmadu and Idisi 2014; Folake, Adeyemi, and Ojo, 2020). In other words, gender is a societal concept based on the belief systems put in place around masculinity and femininity. Gender roles are behaviors, attitudes, and traits that are associated with being a man, woman, boy, or a girl. Understanding

women's role in agricultural value chain or household or how women or men spend their income is a first starting point but does not necessarily say anything about gender. Thus, the focus of gender analysis is not biological differences between men and women but rather on their experiences as members of society.

2.3 What is Participation?

Participation in a phase of the value chain is defined as a material contribution to decisions, activity, and benefits from the aggregating, process, or preparing cassava for sale and distribution to consumers or other participants in conveying the product to the market.

Recent literature has recognized women's roles in agricultural markets, particularly from a value chains perspective, which has made a significant contribution to highlighting the diversity of market actors and gender differences in marketing and upgrading barriers. Many millions more, including most of the developing world's poor, participate in agricultural value chains as laborers or consumers. Devaux et al. 2018; Hill and Vigneri 2014).

Gender participation gives insight into issues affecting women, and it is focused basically on the relationship of both men and women to society's social and economic structure. In most parts of rural Nigeria, the division of labor within the households is gender-specific and according to age. Men and women perform different roles, have unequal decision-making power, and have differences in access to and control over productive agricultural resources. Participating in roles that are shaped by gender and expressing oneself masculine and feminine ways are not inherently negative, rather the value placed on gender roles perpetuates inequality. Inequality exists between men and women and their associated roles and opportunities available to them in the agricultural value chains.

2.4 Why is Value Chain Important for Women?

From a value chain perspective, it makes sense to investigate different roles and tasks of men and women in value chains and to use a gender lens while identifying and addressing bottlenecks for value chain development. Women's work often takes place in the least valuable nodes of the value chain, for instance, as home-based workers or informal workers more generally. Women tend to be underpaid, and their jobs are less secure. In agricultural settings, women are often not visible while doing a large part of the farm activities. Moreover, it is well-documented that women-owned rural businesses tend to face many more constraints and receive far fewer services and support than those owned by men (Cramer et al. 2014). Thus, by understanding interactions in a value chain between all these actors, identifying points of intervention to increase efficiency, increasing total generated value, and improving the competence of intended actors to increase their share of the total generated value becomes easier.

Furthermore, (Cramer et al. 2014) identified the need for support for upcoming actors to explore new opportunities in existing value chains, boosting the negotiation power of the value chain actors, and the possibility of creating competitive advantages for the whole system as some of the benefits of the value chain for rural women. Moreover, when women do better, they become visible as specialists, and their contributions are recognized and valued. Also, the choice to move into activities further up the chain affords them control of their income. Besides, women gain the skills required and become more confident, constraints to leadership are removed, developing chain partnerships, and removing constraints to participation in decision-making while building their capacities to co-own enterprises and build direct linkages with other chain actors becoming chain owners.

2.5 Mapping the Nigerian Cassava Value chain

Mapping the cassava value chain starts with the inputs used to produce it and consists of everything that is done until it gets to the final consumers. The value chain examines the interactions among different actors involved in the value-addition process between production and final markets of an agricultural commodity. The chain actors include producers, marketers, processors, and consumers, while non-actors include governmental and non-governmental organizations, banking institutions, and other essential service providers along the supply chain (Darko-Koomson, Aidoo, and Abdoulaye 2020). Although there is no one way to conduct a value chain analysis in agriculture, it must map the actors participating in the production, processing, distribution, and marketing of agricultural products (Coker, et al. 2017; German; 2020; Kaplinsky and Morris, 2000).

The Nigerian cassava value chain consists of various actors performing different functions to move it to the final consumers. The data source identified the input suppliers, cassava farmers, cassava processors, traders, transporters, and consumers as the Nigerian cassava Value chain's primary actors.

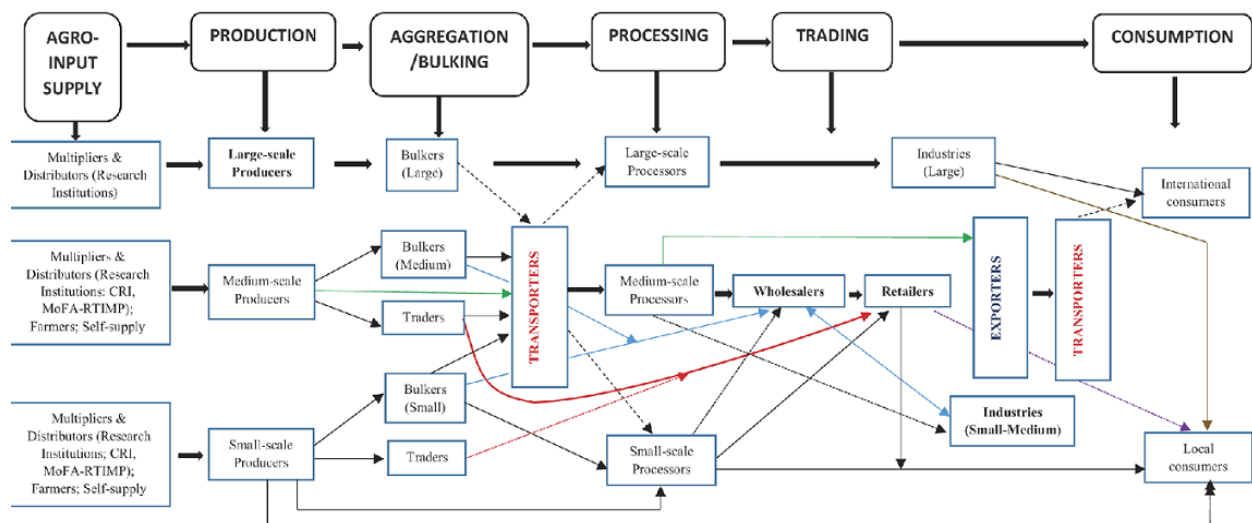


Figure 1: The Nigerian cassava value chain flow

Source: (Darko-Koomson, Aidoo, and Abdoulaye 2020)

2.5.1 Input Supply

The actors in this phase of the value chain are the input suppliers. They supply all the required inputs necessary for cassava cultivation. The input suppliers may include research institutes like IITA, IAR&T, NCRI, which provide improved cassava stems and extension and advisory services to the farmers. Among the input, suppliers are the private agro-dealers who sell fertilizers, herbicides, cassava stems, and other inputs necessary to plant cassava. The farmers also source for stems among themselves or recycle stem cuttings from previous harvests (Coulibaly, et al, 2014; Masamha 2018).

2.5.2 Cassava Production

In Nigeria, the primary actors in the cassava production node are the male and female farmers. Cassava has upgraded from a mere subsistent crop to a crop of high importance due to increasing recognition of its value as an industrial raw material. Apart from being a staple food crop of importance to the teeming population, cassava is also a raw material in producing high-quality cassava flour (HQCF), industrial starch, biogas, and ethanol (Gaffney, Kpaka, Slakie et al. 2019).

Cassava producers could be small-scale, medium-scale, or large-scale farmers depending on the availability of production resources like land, machines, or capital. The production activities include but are not limited to land preparation, planting, weeding, fertilizer application, manuring, herbicide application, harvesting, packing, and transportation. Women play essential roles in the production node of the cassava value chain as farmers, hired or family laborers involved in weeding, land preparation, planting, packing, manuring, fertilizer application, harvesting, packing, and transportation (Joshua Sikhu, Netsayi Noris, Anne et al. 2019). Figure 2

shows the analysis of the roles of women as hired laborers in cassava production. The data source identifies land preparation, planting, and weeding as the three main production activities in which women are engaged.



Figure 2: Chart of women in hired labor for cassava production.

Source: author

2.5.3 Cassava Processing

Previous literature and the analysis found that the bulk of the cassava produced is processed into foods like garri, lafun, fufu, or abacha. It can also be processed into starch, ethanol, HQCF, animal feeds. Locally there is a particular demand for high-quality cassava flour (HQCF). HQCF had become a significant component in bread flour, biscuits, confectioneries, and the production of native and modified starches (Samuel, Robert and Tahirou 2020). Cassava

processing is usually done at the household level, micro-processing centers (MPC), small to medium-scale processors, and large-scale processors. A more significant percentage of cassava processing occurs at the household level, and women and children serve as the main actors in this node of the Nigerian cassava value chain. They refine cassava manually into local cassava products. The medium-scale processors utilize shed, graters, pressers, and modern roasters with fire areas that protect workers from naked fire. (Kareem et al. 2017; Otunba-Payne, 2020; Shioya 2013) reported that large processors produce up to 100 tonnes of dry cassava per day for producing cassava starch and other products for industrial use. Otunba-Payne (2020) further highlighted that many of the extensive processing plants own their cassava fields to ensure enough cassava is available and make processing profitable.

2.5.4 Cassava Marketing

According to Darko-Koomson, Aidoo, and Abdoulaye (2020) and Otunba-payne (2020), there are three types of marketers or traders in the cassava value chain: bulkers/ aggregators, cooperatives, and retailers. The bulkers, sometimes referred to as collectors, visit cassava-producing regions to source fresh cassava roots and processed food items like garri from the farmers and deliver them to the open market or processors. The cooperatives sell their member farmers' cassava and processed products to larger processing companies and retailers, while the retailers source from the bulkers or cooperatives and sell to the final consumers (Mayanja, Mudege and Naziri 2016). Retailers sell processed cassava products such as garri and fufu and cassava food products. They distribute these foods in rural and urban markets, as well as on the roadside. Around 5-7% of farmers are also retailers selling their cassava products (Moyo 2013; Otunba-Payne 2020).

2.6 Constraints to Women's Participation in the Value Chain

Butterworth, Abdulsalam-Saghir, and Martin (2008); (Abdulsalam-Saghir 2011) outlined social, economic, and financial, associated with the limited time availability, especially for women with small children, technologies which are uncomfortable to use, limited capital to purchase raw materials, and lack of credit to invest in improved equipment as some of the constraints to women's participation in cassava value-adding activities. The compounded challenge of combining domestic duties as mothers and caregivers with farm activities contributes to women's time poverty, leaving them with little or no time to participate fully and move up the pyramid to the more productive nodes of the value chain. Women are also incapacitated by limited capital, exacerbated by lack of access to credit to expand to enjoy economies of scale.

Moreover, Nwachukwu et al., (2020) and (Moyo 2013) identified inadequate supply of cassava roots all year round, domestic chores, the tediousness of traditional processing methods, inadequate infrastructural facilities, low output due to weather, poor storage facilities, and inadequate access to productive resources as the challenges facing women participation in cassava processing. Since cassava is seasonal and the processing phase depends heavily on it, its unavailability all year round will make it expensive during its off-season, raising the cost of procurement. This stresses the already resource-poor women, further discouraging them from participating in cassava processing. Furthermore, women rely on tedious, traditional, and crude processing methods that are health hazardous. For instance, garri processors use fire areas that expose them to naked fire and smoke inhalation.

Similarly, (Azeez, Usman, Obadimu et al. 2021) conducted a study on women's involvement in the cassava value chain among cassava processors and marketers in the Afijio

local government area of Oyo State, Nigeria. They found marketing bureaucracy, market competition, and price fluctuation as the significant impediments militating against women's participation in cassava marketing. As Small-scale producers and marketers, women face tough competition from medium and large-scale enterprises with attractive packaging.

2.7 Gender and Development

Gender and development take a feminist approach to comprehend and addressing the disparate effects of economic development and globalization on people. The field has gone through major theoretical shifts, beginning with Women in Development (WID), the Women and Development, and finally Gender and Development. It differs from the previously dominant theory, WID (Women in Development), and is frequently confused with WID, despite its distinct characteristics.

The study of gender's relationship to development has sparked considerable interest in the past and was motivated by Ester Boserup, who believes that development affects men and women differently.

The Women in Development (WID) theoretical approach gained traction in the 1970s, fueled by the reemergence of women's movements in developed countries. Liberal feminism, which holds that women's disadvantages in society can be eliminated by breaking down traditional gender expectations, significantly influenced WID approaches. According to (Baden and Reeves 2000), women must play a more significant role in the development process which means that women's active participation in policymaking will result in more successful policies overall.

However, the WID movement has been criticized for several reasons, including the fact that it associates increased female status with the value of cash income. Critics of the WID also faulted it for its belief that moving into productive employment will improve women's status.

The underlying assumption behind the call to integrate women in developing countries into their national economy as if they were not already involved in the development, therefore, implying that the traditional work roles done by women in the developing world were inhibiting self-development.

The WAD paradigm emphasizes the relationship between women and their work as economic agents in their societies. It also emphasizes the distinct nature of women's roles in the preservation and development of their societies. Compared to WID, WAD is thought to provide a more critical conceptualization of women's positions. Both WAD and WID have been criticized for focusing more on income generating activities for women without recognizing the consequent effect of time poverty for them, hence, the emergence of the GAD approach.

The Gender and Development (GAD) approach focuses on gendered labor divisions and gender as a power relationship embedded in institutions. Unlike WID, the GAD approach is concerned with how society assigns roles, responsibilities, and expectations to both men and women. GAD policies aim to redefine traditional gender role expectations in order to achieve gender equality. Women are expected to manage their households, produce at home, bear and raise children, and care for family members. Women generally earn less than men on the job market. GAD employs gender analysis to discover how men and women collaborate, presenting findings in neutral terms. GAD was criticized for highlighting the social differences between males and females while overlooking their links and their potential for role changes. Another critique is that the GAD does not sufficiently dig into social relations and cannot explain how these relationships can undermine women's programs.

2.8 The Sustainable Livelihood Framework

This study examined participation in the Nigerian cassava value chain from a gender perspective through a sustainable livelihoods framework. The sustainable livelihood framework

is a widely recognized approach that studies how different people in different places live (Scoones 2009). Since the early 1990s, the livelihoods framework has evolved into a conceptual tool that identifies how household members use assets to manage stresses and shocks and how these choices are sustainable (Chambers and Conway 1991)). The Approach is mainly used in developing countries and at the household level and used by international development agencies, including DFID, the World Bank, FAO, UNDP, and Oxfam.

A livelihoods approach emphasizes the multi-faceted nature of livelihoods, vulnerability, and people-centered change (Dorward and Kydd 2003)). A central component is the analysis of capabilities, assets, and activities and how they are combined into livelihood strategies that result in a set of livelihood outcomes for rural households (Scoones, 1998). The Sustainable Livelihoods Framework (SLF) highlights the interaction between the use of capital assets (financial, human, natural, physical, and social) in developing individual and household livelihood strategies that improve well-being in the context of household vulnerability and transforming structures (policies, institutions, and processes).

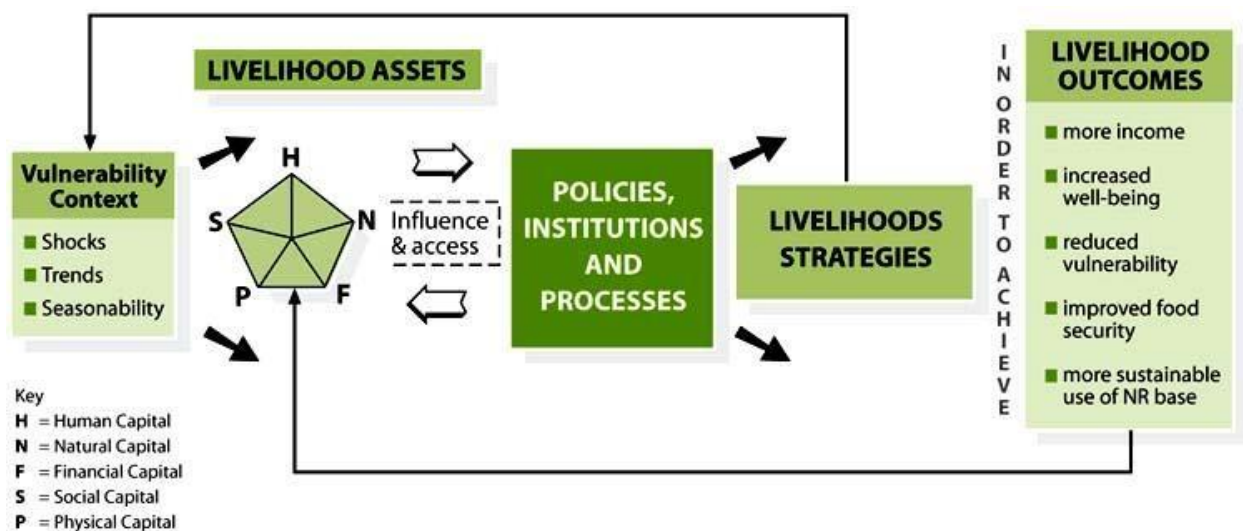


Figure 3: The sustainable livelihoods framework chart

Source: fao.org

2.9 Importance of Cassava to the Sustainable Livelihood Framework

As discussed earlier, the SLF framework enhances knowledge of the livelihoods of the poor. It organizes the factors that constrain or boost livelihood opportunities and shows how they relate. A livelihood encompasses the capacities, assets, and activities required for sustaining a living. A livelihood is sustainable when it survives stresses and shocks and maintain or enhance such capacities, assets, and activities both now and in the future while not depleting the natural resource base (Aganyira 2005; Serrat 2017).

The employ the SLF approach as the analytical framework for this study by analyzing how the outcomes of the marketing and processing phases of the cassava value chain as an alternative activity can bring about sustainable livelihoods of the resource-poor women. Even though women's contribution to the agricultural sector, their roles in promoting economic growth and social stability continue to be inadequately recognized. This lack of recognition is due to several factors like the gendered division of labor and harmful cultural practices that subordinate women to men, customs that forbid women from owning land, and the extent of unpaid productive domestic activities performed by women.

The low status of women in the Nigerian cassava value chain could be attributed mainly to traditional gender roles, which have confined mainly women to the domestic sphere. On the other hand, society gives greater authority and opportunities to men who exert control both within the family and the larger society. Women's low literacy levels, poverty, and inadequate access to opportunities and vital resources combine to put Nigerian women at a significant disadvantage economically and for participation in the development context. Therefore, this study focuses on the vulnerability context of the SLFA, which emphasizes the importance of

value chain characteristics and how the interaction between different types of actors in the value chain affects women's livelihoods.

3.0 CHAPTER 3 METHOD

3.1 Study Area

The study was carried out in four geopolitical zones in Nigeria. Nigeria shares land borders with the Republic of Benin in the west, Chad and Cameroon in the east, and Niger in the north. Its coast lies on the Gulf of Guinea in the south, and it borders Lake Chad to the northeast. Notable geographical features in Nigeria include the Adamawa highlands, Mambilla Plateau, Jos Plateau, Obudu Plateau, the Niger River, River Benue, and Niger Delta. Nigeria is the most populous country in Africa and has 36 States and a Federal Capital Territory (FCT) located in Abuja. The States are also sub-divided into smaller administrative units known as Local Government Areas (LGAs).

Found in the tropics, where the climate is seasonally damp and very humid, Nigeria is affected by four climate types; these climate types are distinguishable, as one moves from the southern part of Nigeria to the northern part of Nigeria Nigeria's middle belt. It is divided into six geopolitical zones; namely: Northcentral, North East, North West, South East, South-South, and South West. With over 206 million people, Nigeria is the most populous nation in Africa and the seventh most populous world. Nigeria has over 250 ethnic groups, of which the three most prominent are: Hausa, Igbo, and Yoruba, and these ethnic groups speak over 500 distinct languages and are identified with a wide variety of cultures. Agriculture remains an important sector of the economy, as of 2010, even though it used to be Nigeria's principal foreign exchange earner. The major crops include cowpea, rice, corn, cassava, millet, guinea corn, yam, soybean, sorghum, and melon, while the cash crops are cocoa, rubber, cashew, kola nut, and oil palm.

3.2 Data Source

Data were drawn from a survey carried out in 4 geopolitical zones in Nigeria conducted by IITA in 2010, where a total of 952 respondents, including 227 women, were surveyed. The survey was carried out in 4 geopolitical zones in Nigeria known for cassava production. These zones were the South-West (SW), South-South (SS), South-East (SE), and North Central (NC). A total of 952 respondents were selected, comprising 38% (N= 361) who participated in project R4D interventions (participants) and 62% (N=591) who did not (non-participants). The participants were selected based on their initial participation in the project. These included 160 respondents from the SW, 96 respondents from the SS, 70 respondents from the SE, and 35 respondents from the NC. The non-participants were selected randomly from non-participating communities in the regions. They included 262 from SW, 157 from SS, 114 from SE, and 58 from NC (Figure 1).

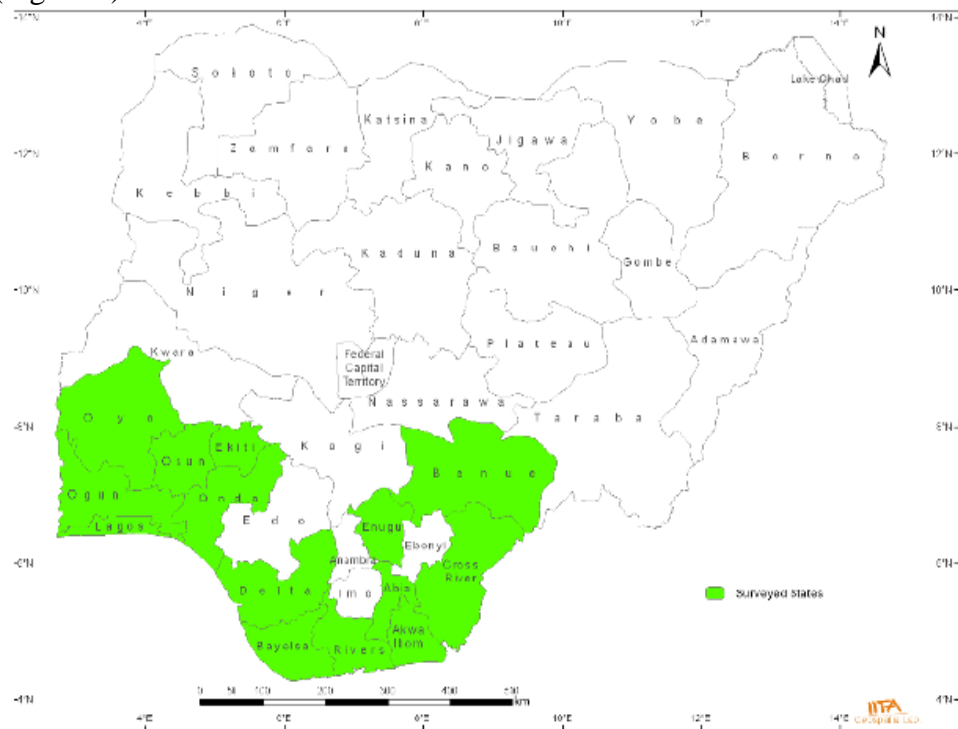


Figure 4: Map of the study area

To ensure a sub-nationally representative sample of communities and households, a three-stage stratified random sampling procedure was adopted, whereby States were used as strata to improve sampling efficiency. LGAs that are rural were used as primary sampling units (PSUs). Enumeration areas (EAs), defined as a cluster of housing units, were used as secondary sampling units (SSUs). The rural smallholder farming households were used as the final sampling units. LGAs were selected from each State based on probability proportional to size, where size is measured in terms of the number of EAs. The EAs that formed the sampling frame were obtained from the Nigerian Bureau of Statistics (NBS), which uses the 2003/2004 master sample frame of the National Integrated Survey of Households (NISH).

The advantage of using EAs as sampling units is that each is approximately equal in size. This ensured that all farmers had an equal probability of being selected, unlike when sampling units are towns or villages of unequal size. Within each LGA, four EAs were selected at random from a sampling frame of EAs classified as rural or semi-urban, giving a total of 80 EAs or villages. (As clusters of housing units, the EAs are similar to villages or communities.) 17 Finally, a list of households was developed for the selected EAs, and a sample of at least ten farming households was selected randomly in each of the sampled EAs. Trained enumerators administered community and household questionnaires under the field supervision of a senior agricultural economist and the direction of IITA's economist. The data was collected using a well-structured questionnaire.

3.3 Data Analysis

The study employs descriptive statistics like frequencies, and percentages to analyze farm and individual characteristics and inferential statistics like chi-square, t-test, Cramer's V correlation, and multiple regression to test the hypotheses.

The Descriptive analysis was performed to decode the distribution of the dependent and independent variables of this study. This study further utilized chi-square and t-test analysis to compare the dependent variable differences by gender to get a clear picture of how the variables differ for both men and women. Additionally, the study also adopted Cramer's V correlation to quantify the strength of the relationship between the dependent and independent variables of interest. Finally, we ran four multiple regressions to formulate the model and analyze the relationship between the dependent and independent variables.

3.4 Measures

3.4.1 Dependent Variables

Participation in the cassava value chain was measured in two ways: Y GP (processing) and GP (marketing).

$Y \text{ (GP (processing), GP (marketing))} = f \text{ (personal, household, farm variables)}$.

Index of participation in marketing. This indicator counts the number of marketing activities reported by the respondents. It ranges from zero to six. The component items are shown in Table 1.

Index of Participation in Processing. This indicator counts the number of marketing activities reported by the respondent. It ranges from zero to six. The component items are shown in Table 1.

3.4.2 Independent Variables

Table 1 summarizes the independent variables used in the analysis. The questions, codes, and treatment are detailed there.

Table 1: Study variables range, mean, and standard deviations, Nigeria cassava farmers 2010.

Variables	Response type	Frequency	Percentage (%)	Valid	Missing
Dependent					
<i>Index of participation in marketing</i>	Count	7		952	0
Marketing casava now	0 = No, 1 = Yes	0= 18, 1=804	0= 15.5, 1=84.5	952	0
Do you sell gari?	0 = No, 1 = Yes	0= 367, 1=585	0=38.6, 1=61.4	952	0
Do you sell fufu	0 = No, 1 = Yes	0= 724, 1=228	0= 76.1, 1=23.9	952	0
Do you sell starch?	0 = No, 1 = Yes	0= 931, 1=21	0= 97.88, 1=2.2	952	0
Do you sell flour paste?	0 = No, 1 = Yes	0= 917, 1=35	0=96.3, 1=3.7	952	0
Do you sell abacha?	0 = No, 1 = Yes	0= 871, 1=81	0=91.5, 1=8.5	952	0
Do you sell planting material?	0 = No, 1 = Yes	0= 1674, 1=278	0= 70.8, 1=29.2	952	0
<i>Index of participation in processing</i>					
<i>Index of participation in processing</i>	Count	0	6	952	0
Process cassava now	0 = No, 1 = Yes	0= 186, 1=766	0= 19.5, 1=80.5	952	0
Process gari now	0 = No, 1 = Yes	0= 303, 1=649	0= 31.8, 1=68.2	952	0
Process Fufu now	0 = No, 1 = Yes	0= 735, 1=217	0= 77.2, 1=22.8	952	0
Process starch now	0 = No, 1 = Yes	0= 931, 1=21	0= 97.8, 1=2.2	952	0
Process cassava flour(paste) now	0 = No, 1 = Yes	0= 902, 1=50	0= 94.7, 1=5.3	952	0
Process cassava chip(abacha) now	0 = No, 1 = Yes	0= 859, 1=93	0= 90.2, 1=9.8	952	0
Independent					
<i>Farm characteristics</i>					
Years of farming cassava	(Years) 1 = 1-10, 2 = 11-20, 3 = 21-30, 4 =	1=237, 2=294, 3=203, 4=135, 5=57	1=25.6, 2=31.7,	926	26

	31-40, 5 = 41 and above		3=21.9, 4=14.6, 5=6.2		
Producing cassava now?	0 = No, 1 = Yes	No = 38, Yes = 914	No = 4.0, Yes = 96.0	952	0
Land allocated to cassava farming	(Hectares) 1 = under 5, 2 = 6-10, 3 = 11-15, 4 = 16 and above	1=850, 2=38, 3=5	1=95.2, 2=4.3, 3=0.6	893	59
Tonnes of cassava harvested	(Tonnes) 1 = 1-10, 2 = 11-20, 3 = 21-30, 4= 31-40, 5= above 40	1=374, 2=219, 3=120, 4=48, 5=107	1=43.1, 2=25.2, 3=13.8, 4=5.5, 5=12.3	868	84
Main decision maker on farming activities	1= all members make decision, 0= else	1=17, 0=935	1=1.8, 0=98.2	952	0
Individual characteristics					
Age	(Years) 1 = <20, 2=21-40, 3=41-60, 4=61-80, 5=>80	1=8, 2=240, 3=575, 4=110, 5=5	1=0.9, 2=25.6, 3=61.3, 4=11.7, 5=0.5	938	14
Gender	0 = Female, 1 = Male	0= 221, 1=731	0=23.2, 1=76.8	952	0
Education	(Years) 1 = 1-5, 2 = 6-10, 3 = 11-15, 4 = 16 - 20, 5 = 21 and above	1=47, 2=254, 3=592, 4=58, 5=1	1=4.9, 2=26.7, 3=62.2, 4=6.1, 5=0.1	729	223
Married	1= Married, else = 0	0= 22, 1=930	0=2.3, 1=97.7	952	0
Household size	1 = 1-5, 2 = 6-10, 3 = 11-15, 4 = 16 - 20, 5 = 21 and above	1=236, 2=544, 3=119, 4=27, 5=20	1=24.9, 2=57.5, 3=12.6, 4=2.9, 5=2.1	946	6

3.5 Analysis

3.5.1 Chi-square Test

The chi-square test of independence, also called Pearson's chi-square test or the chi-square test of association, assesses observed frequencies against expected frequencies or proportions (Ross and Shannon 2011). It tests for an association between two or more categorical variables by utilizing a contingency table (crosstab) to analyze the data. Data for this study

satisfied the two assumptions for chi-square test- the variables should contain two or more categorical, independent variables and should be measured at an ordinal or nominal level.

Two null hypotheses were tested at 95% confidence level ($P \leq 0.05$) using Pearson's chi-square test in SPSS.

H₀₁: F (female participation in marketing) = F (male participation in marketing)

There is no relationship between gender and participation in the marketing phase of the cassava value chain.

H₀₂: F (female participation in processing) = F (male participation in processing)

There is no relationship between gender and participation in the marketing phase of the cassava value chain.

3.5.2 Correlation

The correlation coefficient is a measure of how two variables are related. We reported Cramer's V coefficient and a correlation matrix was constructed to examine the association between the different variables under study.

Cramer's V studies the correlation between two or more categorical variables when there is more than a two-by-two crosstab representing the association or correlation between the variables.

For correlation analysis, two null hypotheses were tested and Cramer's V coefficient was reported in the correlation matrix.

H₀₁: $V \geq 0$

There is no correlation between the index of participation in marketing with the respondents' farm and individual characteristics.

H₀₁: $V < 0$

There is no correlation between the index of participation in processing with the respondents' farm and individual characteristics.

3.5. 3 Multiple Regression Model

This study utilized regression analysis to test the hypotheses to formulate the model used to test the hypotheses and analyze the relationship between the dependent and independent variables. because of the large data sets involved. Multiple regression is a statistical analysis that uses several explanatory variables to predict the outcome of a response variable. It compares the relationship of two or more factors or trends to determine the correlation between the variables. In regression, the standardized beta coefficient compares the strength of each independent variable's effect to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect. It is reported in order to identify independent variables that have more impact on the dependent variable. Indeed, an independent variable with a larger standardized coefficient will significantly affect the dependent variable.

The relationship between gender and participation in cassava processing and marketing with respondents' individual and farm characteristics was analyzed using the regression model. This study used the multiple regression model to determine the relationship between the dependent and independent variables, which estimates the extent to which gender participation in processing and marketing correlated with the individual and farm characteristics of the respondents. Pearson correlation matrix was also constructed to examine the correlation between different variables under study.

The model is represented below:

$$Y = f (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10})$$

The explicit form of the model is represented thus.

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \varepsilon$ where,

Y_1 = Index of participation in marketing.

Y_2 = Index of participation in processing

X_1 = Years of farming cassava

X_2 = Producing cassava now

X_3 = Land allocated to cassava farming

X_4 = Quantity of cassava harvested

X_5 = Main decision maker

X_6 = Age of respondents

X_7 = Gender of respondents

X_8 = Education

X_9 = Marital status

X_{10} = Household size

$\beta_1 - \beta_{10}$ = estimated parameters

β_0 = autonomous level of participation known as the constant.

ε = error term

3.5.4 Hypotheses Test

The study tested two null hypotheses at 95% confidence level ($P \leq 0.05$), which states that:

H₀₁: There is no significant relationship between gender participation in cassava processing with respondents' individual and farm characteristics.

This further States that all regression coefficients are equal to zero.

H₀₁: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = 0$

H₀₂: There is no significant relationship between gender participation in cassava processing with respondents' individual and farm characteristics.

4.0 CHAPTER 4 RESULTS AND FINDINGS

This chapter discusses the results from descriptive analyses and hypotheses testing. Descriptive analyses provide a general understanding of the dependent and independent variables used to explain the processing and marketing nodes of the cassava value chain. Second, t-test analysis highlights the variable differences by gender in both processing and marketing nodes of the value chain. Third, Pearson's chi-square explains the association between gender and all the variables under study. Fourth, the correlation among explanatory variables is examined by cross-tabulations with the marketing and processing indices as a context. In the last section, a regression analysis tests the hypothesized relationships between gender participation in processing and marketing and individual and farm characteristics.

4.1 Descriptive Analysis

Table 1 provides a descriptive summary of the dependent and independent variables. The variables considered in this study are indices of participation in both marketing and processing and farm and individual characteristics of participants. The indices of participation in both marketing and processing consist of questions that indicate respondents' participation in the marketing and processing nodes of the cassava value chain. Farm characteristics include years of farming cassava, engagement in cassava production, hectares of land allocated to cassava farming, tonnes of cassava harvested, and primary decision-maker on farming activities. In contrast, the individual characteristics are age, gender, education, marital status, and household size. This study posits that the relationship between gender and participation in the marketing and processing nodes of the value chain would be affected by some farm and individual characteristics; hence both were used as control variables.

The result shows that the two major marketed products were cassava tubers (84.5 percent) and garri (61.4 percent) for the index of participation in marketing. Findings for the processing index were also consistent with the marketing index as the two major processed products were cassava tubers and garri. 80.5 percent of the participants currently engage in cassava processing, while 68.2 percent said they currently processed gari. The descriptive analysis of the farm characteristics reveals that most of the participants (31.7 percent) have 11-20 years of experience in farming cassava. Likewise, the majority, 96 percent, answered yes to currently producing cassava, while 95.2 percent allocate below 5 hectares of land to cassava production, which suggests that most of the respondents were smallholder farmers. About 43 percent of the participants harvested 1- 10 tonnes of cassava, while 25.2 percent harvested between 11-20 tonnes of cassava. Descriptive statistics of the primary decision-maker on farmer activities revealed that 98.2 percent responded that one of the following: the husband, wife, children, or both husband and wife decides on farming activities while only 1.8 percent responded that all members of the household make a joint decision on farming activities.

Results of individual characteristics indicate that majority of the respondents (61.3 percent) were within the age range of 41- 60 years, 25.6 percent were between 21-40 years, while the oldest was 100 years old. This means that most of the farmers are in their active years. The majority were male (76.8 percent), only 23.2 percent were female, while 97.7 percent were married. Lastly, the majority (57.5 percent) had a household size between 6-10 persons per house, while about 24 percent had between 11–15 years of education.

The descriptive analysis revealed that most respondents were male smallholder farmers in their active years, married, with large household size, and had more than secondary education.

Thus, we can infer that the respondents were educated with large family sizes to help in their processing and marketing operations.

4.2 Chi-square Test

A two-way chi-square statistic was completed in SPSS to assess the association between the study variables in the processing and marketing phases of the Nigerian cassava value chain and gender. Table 2 shows the significant test statistics at a 95 percent confidence level in bold. The result for the index of participation in marketing was significant at $p < .05$ with a chi-square statistic of ($\chi^2 = 14.776$). This means that participation in the marketing phase of the cassava value chain is associated with gender. Further, cassava tuber and garri marketing were statistically significant at 95 percent confidence level with ($\chi^2 = 8.354$ and 8.237). This implies that gender shapes participation in cassava tuber and garri marketing, explaining why there are more men marketing cassava tubers while we have more women selling garri.

Since there was an association between gender and participation in the marketing index, we rejected the null hypothesis that there is no relationship between gender and participation in the marketing phase of the cassava value chain.

Contrarily, the result for the index of participation in processing was not significant ($\chi^2 = 5.529$). However, there was a statistical significance for cassava chip (abacha) with $\chi^2 = 16.247$. This means that gender does not shape participation in the processing phase of the cassava value chain, which can be attributed to the heavy presence of the male gender in this phase of the cassava value chain. This finding is consistent with the Nigerian reality, as we have more men than women involved in large-scale processing. Most women processing cassava do so at the household level, mainly as food for the family, and sell the remaining, which often is insignificant. Therefore, we accepted the null hypothesis, which stated that there is no relationship between

gender and participation in the processing phase cassava value chain since we did not find an association between the processing index and gender.

Analysis of farm characteristics yielded a statistically significant chi-square value of $\chi^2=27.245$ for years of farming cassava and $\chi^2=25.695$ for tonnes of cassava harvested. Similarly, for individual characteristics, age, education, and household size yielded a statistically significant chi-square value of $\chi^2= 18.841$, $\chi^2=10.717$, and $\chi^2=18.959$, respectively.

4.3 t-test

Table 2: Study variable differences by gender, Nigeria cassava farmers 2010

Variable	Women	Men	t-test	Chi-square
<i>Index of participation in marketing</i>	2.50	2.13	-0.834	14.776
Marketing casasa now	0.78	0.86	-2.630	8.354
Do you sell gari?	0.70	0.59	2.984	8.237
Do you sell fufu	0.23	0.24	-0.347	0.12
Do you sell starch?	0.02	0.02	-0.457	0.209
Do you sell flour paste?	0.03	0.04	-0.458	0.211
Do you sell chips?	0.05	0.09	-2.141	3.504
Do you sell planting material?	0.31	0.29	0.753	0.568
<i>Index of participation in processing</i>	1.43	1.73	0.924	5.529
Process cassava now	0.80	0.81	-0.352	0.124
Process gari now	0.71	0.67	0.879	0.774
Process Fufu now	0.24	0.23	0.297	0.088
Process starch now	0.01	0.03	-1.951	2.258
Process cassava flour(paste) now	0.04	0.06	-0.897	0.805
Process cassava chip(abacha) now	0.03	0.12	-5.657	16.247
<i>Farm characteristics</i>				
Years of farming cassava	2.09	2.54	-5.412	27.245
Producing cassava now	0.95	0.96	-1.119	1.554
Land allocated to cassava farming	1.04	1.06	-1.136	1.972
Tonnes of cassava harvested	1.88	2.27	-3.544	25.695
Main decision maker on farming activities	0.03	0.01	1.432	3.133
<i>Individual characteristics</i>				
Age	46.01	50.01	0.561	18.841

Education	2.51	2.63	-2.397	10.717
Married	0.9864	0.9740	1.270	1.159
Household size	6.77	7.68	-4.523	18.959
Test statistics in bold $p < .05$				

Table 2 shows the study variable differences by gender. An independent sample T-test was conducted to determine whether the gender differences in the index of participation in the marketing and processing nodes of the Nigerian cassava value chain and the farm and individual characteristics of the participants are statistically different. As shown in table 3, the result was statistically significant for the index of participation in marketing, marketing cassava now, garri, and chips with a t value of -0.843, -2.630, 2.984, and -2.141, respectively at $p < .05$ and $p < .01$. For the index of participation in marketing and garri, results show that the mean for women (2.50 and 0.70) is slightly higher than men (2.13 and 0.59 respectively). However, for marketing cassava now and do you sell chips, the mean score for the men (0.86 and 0.09 respectively) is slightly higher than the women (0.78 and 0.05).

Again, t-test results show a statistically significant difference for starch and cassava chip processing with t-values of -1.951 and -5.657 at $p < .05$ and $p < .01$, respectively, but no statistically significant difference for tonnes of cassava harvested. The statistical significance for starch and cassava implies a gender difference in starch and cassava chip processing with a mean of 0.01 and 0.03 for women and 0.03 and 0.12 for men. For farm characteristics, t-test results were statistically significant for years of farming cassava, producing cassava, land allocated to cassava farming, and primary decision-maker on farming activities. A statistically significant t-test for years of farming cassava with a t-value of -5.412 at $p < .001$ with a slightly higher mean for men (2.54) than women (2.09) suggests that men have more years of experience in cassava production than their female counterpart. Also, there is a significant mean difference for both

men and women regarding cassava production with a t-value of -1.119 at $p = .014$ and a mean of 0.96 and 0.95 for both men and women, respectively. Additionally, a statistical significance for the primary decision maker on farming activities with a t-value of 1.432, $p < .001$ and a mean of 0.01 and 0.03 for men and women signifies that more women decide on farming activities than their male counterparts.

With regards to farm characteristics, table 23 further reports a statistically significant mean difference for level of education, marital status, and household size for both men and women with $t = -2.3397, 1.270, \text{ and } -4.523$ at $p < .001, .030, \text{ and } .012$, respectively.

Comparing the t-test and chi-square statistics for the index of participation in marketing in table 2, the t-test was significant for cassava chips, but the chi-square test did not show a significance, t-test was above the 0.05 level, while chi-square was slightly below, but the significant level was very close. This may be because chi-square is a more sensitive test to nonlinear differences. Besides, there was no anomaly in the index of participation in processing and farm characteristics as the same variables were significant for the two tests. However, for individual characteristics, chi-square was significant for age ($\chi^2 = 18.841$), but the t-test result did not show a significance because chi-square measured differences along five categories while t-test measured differences in an interval variable.

4.4 Correlation

Table 3 outlines the correlation matrix of the study variables. Correlation coefficients are used to quantify the strength of the relationship between two variables. It assesses how well the variables correspond in terms of high and low values. We reported the Cramer's V statistics, and the significant relationships are indicated in bold at .05 level of significance

Table 3: Cramer's V correlation matrix of study variables, Nigeria cassava farmers 2010

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Index of participation in marketing	1	0.174	0.106	0.307	0.054	0.128	0.065	0.092	0.125	0.072	0.053	0.124
2. Index of participation in processing	0.174	1	0.087	0.106	0.128	0.109	0.077	0.122	0.076	0.107	0.162	0.104
3. Years of farming cassava	0.106	0.087	1	0.097	0.1	0.107	0.098	0.265	0.172	0.093	0.119	0.15
4. Producing cassava now	0.307	0.106	0.097	1	0.025	0.06	0.027	0.139	0.04	0.055	0.04	0.076
5. Land allocated to cassava farming	0.054	0.128	0.1	0.025	1	0.174	0.03	0.143	0.047	0.059	0.035	0.136
6. Tonnes of cassava harvested	0.128	0.109	0.107	0.06	0.246	1	0.08	0.092	0.172	0.083	0.139	0.061
7. Main decision maker on farming activities	0.065	0.077	0.098	0.027	0.03	0.08	1	0.089	0.057	0.068	0.032	0.053
8. Age	0.092	0.122	0.265	0.139	0.143	0.092	0.089	1	0.142	0.037	0.08	0.143
9. Gender	0.125	0.076	0.172	0.04	0.047	0.172	0.057	0.142	1	0.106	0.035	0.142
10. Education	0.072	0.107	0.093	0.055	0.059	0.083	0.068	0.037	0.106	1	0.055	0.125
11. Married	0.053	0.162	0.119	0.04	0.035	0.139	0.032	0.08	0.035	0.055	1	0.051
12. Household size	0.124	0.104	0.15	0.076	0.136	0.061	0.053	0.143	0.142	0.125	0.051	1

Bold: Coefficient significant at the 0.05 level (2-tailed).

Table 3 outlines the correlation matrix of the study variables. Correlation coefficients are used to quantify the strength of the relationship between two variables. It assesses how well the variables correspond in terms of high and low values. We reported the Cramer's V statistics, and the significant relationships are indicated in bold at .05 level of significance.

As indicated in table 3, years of farming cassava, producing cassava now, tonnes of cassava harvested, gender, and household size ($V = 0.106, 0.307, 0.128, 0.125, \text{ and } 0.124$) registered correlation with the index of participation in marketing. The results signify that years of experience in cassava production, engagement in cassava farming, the quantity of cassava harvested, gender, and household size say quite a bit about participation in the marketing phase of the cassava value chain in Nigeria.

In contrast, land allocated to cassava farming, the quantity of cassava harvested, age, education, marital status, and household size ($V = 0.128, 0.109, 0.122, 0.107, \text{ and } 0.162$ at $p < .05$) registered an association with the marketing index. The correlation between the independent variables and the indices of participation in marketing and processing was weak by and large. This implies that the association between the dependent and independent variables did not say much about participation in the marketing and processing nodes of the VC. However, the correlation results signify that regression analysis will produce reliable estimates as there was no multicollinearity.

4.5 Regression Analysis

Table 4: Regression of value chain participation measures on selected farm and personal characteristics by gender, Nigeria cassava farmers 2010

Variable	Standardized beta coefficients			
	<i>Index of participation in processing</i>		<i>Index of participation in marketing</i>	
	Men	Women	Men	Women
Producing cassava now	0.056	<i>0.179</i>	<i>0.129</i>	<i>0.302</i>
Land allocated to cassava farming	-0.099	-0.067	-0.006	0.007
Tonnes of cassava harvested	-0.007	<i>0.211</i>	<i>-0.148</i>	<i>0.240</i>
Main decision maker on farming activities	<i>-0.009</i>	-0.011	-0.015	-0.086
Age	0.023	-0.020	-0.013	0.012
Education	<i>-0.083</i>	-0.033	-0.024	0.015
Married	<i>-0.092</i>	-0.014	-0.037	0.002
Household size	<i>0.087</i>	-0.023	<i>0.168</i>	0.093
R ²	0.034	0.078	0.063	0.169
Adjusted R ²	0.024	0.043	0.053	0.138
F-ratio	3.215	2.248	6.075	5.395
<i>N</i>	<i>731</i>	<i>221</i>	<i>731</i>	<i>221</i>

Bold: Coefficient significant at the 0.05 level (2-tailed).

Bold italic: Coefficient significant at the 0.01 level (2-tailed).

Table 4 details the standardized beta coefficients for the regression analysis of the cassava value chain participation on the selected farm and personal characteristics by gender. Regression is a statistical procedure used to predict individual scores on some variables based on the individual scores on other variables (Ross and Shannon 2011). Regression formulates the model and analyzes the relationship between the dependent and independent variables. It aims to check the degree of relationship between two or multiple variables.

4.5.1 Regression Analysis of Participation in Cassava Marketing by Gender

In this study, the variables of interest were the relationship between the indices of participation in marketing and processing with selected farm and individual characteristics. The significant relationships are indicated in bold italics and bold at **.01 and .05** levels of significance. Table 5 details the standardized beta coefficients for the regression analysis of the cassava value chain participation on the selected farm and personal characteristics by gender. Regression is a statistical procedure used to predict individual scores on some variables based on the individual scores on other variables (Ross and Shannon, 2011). Regression formulates the model and analyzes the relationship between the dependent and independent variables. It aims to check the degree of relationship between two or multiple variables.

In this study, the variables of interest were the relationship between the indices of participation in marketing and processing with selected farm and individual characteristics. The significant relationships are indicated in bold italics and bold at .01 and .05 levels of significance.

4.5.2 Regression Analysis of Participation in Cassava Processing by Gender

We ran two multiple linear regressions for males and females to address the research question asking if farm and individual characteristics (independent variables) acted as statistically significant predictors of participation in cassava processing by gender (dependent variable). Additionally, the standardized beta coefficients addressed the research question related to which of the independent variables carries more weight in predicting participation in cassava processing by gender.

A comparison of the standardized beta coefficients in table 5 indicates that the main decision-maker on farming activities, marital status, and household size statistically predict for men at $p < .01$ and $p < .05$ levels of significance while producing cassava now and tonnes of

cassava harvested are predictors for women at $p < .01$ level of significance. For men, the negative beta coefficients for educational level and marital status denote that a unit increase in education and marital status reduces the chances for men to participate in cassava processing. However, a positive beta coefficient for household size means that larger household size encourages the men to participate in cassava processing. This could be attributed to the fact that the processing node is quite labor-intensive.

Besides, for women, the positive beta coefficients for producing cassava now and tonnes of cassava harvested connotes that a unit increase in the two variables motivates women's participation in processing activities. Thus, we can safely conclude that the determining factor for women's participation in the processing node of the cassava value chain depends on whether they are involved in cassava production and the quantity of the cassava harvested. It could also mean that they process the cassava they produce.

The R^2 value of .034 for men shows that approximately 3.4 percent of the variance in cassava processing variance can be accounted for by its linear relationship with both farm and individual characteristics. For the women, the R^2 value of .078 reveals that approximately 7.8 percent of the variance in cassava processing variance can be accounted for by its linear relationship with both farm and individual characteristics.

4.5.3 Regression Analysis of Participation in Cassava Marketing by Gender

As in participation in cassava processing, we completed two multiple regressions for both males and females. Again, the standardized beta coefficients addressed the research question related to which of the independent variables carries more weight in predicting participation in cassava marketing by gender. Results show that producing cassava now, tonnes of cassava harvested, and household size was statistically significant for both men's and women's participation in cassava marketing at $p < .01$ level of significance.

A comparison of the standardized beta coefficients in table 5 indicates that the main decision-maker on farming activities, marital status, and household size statistically predict for men at $p < .01$ and $p < .05$ levels of significance while producing cassava now and tonnes of cassava harvested are predictors for women at $p < .01$ level of significance. This implies that for men, the primary decision-maker on farming activities, their level of education, marital status, and household size will determine their participation in cassava processing.

The positive beta coefficients for the men signifies that every increase in the quantity of cassava produced and household size increases the chances for men to participate in cassava marketing. This means that the higher the household size, the higher the chances of participating in the marketing node of the cassava value chain. On the other hand, the negative beta coefficient for tonnes of cassava for the men (-0.148) implies that every increase in the quantity of cassava harvested decreases the chances of men participating in cassava marketing. This means that they will prefer to process their harvest rather than selling, given a higher yield.

However, for women, the decision to participate in cassava processing depends on whether they plant cassava or not and the quantity of cassava harvested. Based on the positive beta coefficients for women, we can conclude that the higher the quantity of cassava produced and harvested, the more likely it is for women to participate. In other words, the availability of land for farming and higher yield will encourage women to participate in cassava marketing.

The R^2 value of .053 for men shows that approximately 5.3 percent of the variance in cassava marketing variance can be accounted for by its linear relationship with both farm and individual characteristics. Also, for the women, the R^2 value of .0138 reveals that approximately 1.38 percent of the variance in cassava processing variance can be accounted for by its linear relationship with both farm and individual characteristics.

4.6 Hypotheses Testing

This study proposed two hypotheses. The first hypothesis proposes that there is no significant relationship between gender and participation in cassava processing with respondents' individual and farm characteristics. The dependent variable (index of participation in processing) was tested against the independent variables (individual and farm characteristics). Our The result was statistically significant with F-ratios of 3.215 and 2.248 at $p < .01$ for men and women, respectively. Thus, we rejected the null hypothesis since we found an association between the dependent and independent variables.

Also, we found a statistical significance for the second hypothesis that proposes that there is no significant relationship between gender and participation in cassava marketing with respondents' individual and farm characteristics. Thus, for the F-ratios of 6.075 and 5.395 at 0.01 level of significance for both men and women, respectively, we reject the null hypothesis and accept the alternative hypothesis that there is a significant relationship between gender and participation in cassava marketing with respondents' individual and farm characteristics.

5.0 CHAPTER 5 CONCLUSIONS

Mapping the gender structure and functioning of the traditional cassava value chains ensures that women's position in the female-dominated nodes of the value chains is strengthened, ensuring more social and economic empowerment. Moreover, value chain analysis by gender also guarantees that women enter the more profitable male-dominated nodes of the cassava value chains, thereby promoting gender equality and economic development. Consequently, this study attempted to analyze gender participation in the processing and marketing phases of the cassava value chain in Nigeria by examining the relationship between some selected farms and individual characteristics and participation in the marketing and processing phases of the Nigerian cassava value chain. The study also used descriptive statistics like frequencies and percentages and inferential tools like t-test, chi-square, correlation, and multiple linear regression to test the hypotheses.

5.1 Major findings

This study revealed that the two dominant marketed products were cassava tubers and garri, while the major processed products were cassava tubers and fufu. T-tests were done to compare means for males and females, and results showed a statistical significance for the index of participation in marketing but were not significant for cassava processing. The higher mean score for women implies that we have slightly more women than men in the marketing node of the cassava value chain. The results indicate that men have more years of experience in cassava farming, have more land allocated to cassava production, and higher yields than their female counterparts. Also, the men were older, more educated, and had larger household sizes than the women.

For correlation analysis, producing cassava now, land allocated to cassava farming, level of education, marital status, and household size registered correlation with the index of

participation in marketing. However, only household size registered a weak correlation with the index of participation in processing.

Overall, the regression analysis supported the two hypotheses tested in this study. The dependent variable (index of participation in processing) was tested against the independent variables (individual and farm characteristics). The result was statistically significant with F-ratios of 3.215 and 2.248 at $p < .01$ for men and women, respectively. Thus, we rejected the null hypothesis since we found an association between the dependent and independent variables.

Likewise, we found a statistical significance for the second hypothesis that proposes that there is no significant relationship between gender and participation in cassava marketing with respondents' individual and farm characteristics. Thus, for the F-ratios of 6.075 and 5.395 at 0.01 level of significance for both men and women, respectively, we reject the null hypothesis and accept the alternative hypothesis that there is a significant relationship between gender and participation in cassava marketing with respondents' individual and farm characteristics.

5.2 Implications

5.2.1 Theoretical Implications

This study's findings are in line with the Sustainable Livelihood Framework and suggest that participation in the marketing and processing phases of the Nigerian cassava value chain is a livelihood strategy for the chain actors.

The Livelihoods framework constitutes the skills, assets (both material and social), and the strategies for individuals' and communities' survival. The sustainability element connotes that these individuals or communities can cope with moments of stress and crisis and maintain or even improve current and future skills and assets without depleting natural resources (Krantz 2001).

The SLF provides a way of understanding rural livelihood and conceptualizes this through the capital which people need, means of earning a living; the context for which kind of support is designed, and factors that could strengthen subsistence resilience to moments of stress and crisis (Aganyira, 2015; Forsythe 2017; Serat 2017; and Krantz 2001).

The findings are firmly in line with the submission of UNDP, 2017, that there is likely a strong interdependence between (a) structures and processes for transformation and the level of vulnerability in each context; and (b) achievements in livelihoods and assets which influence livelihoods. In this study, we established statistically significant farm characteristics and the indices of participation in the marketing and processing phases of the Nigerian cassava value chain. Notably, we discovered that education, primary decision-maker, marital status, and household size were motivating factors for men to participate in the cassava processing phase while producing cassava now, and tonnes of cassava harvested were determining factors for both men and women in the marketing phase of the cassava value chain. The SLF sheds light on how the poor live and coordinate assets to cope with vulnerabilities for a sustainable livelihood outcome.

Capital assets that the rural poor draw upon as a source of livelihood include human, social, natural, physical, and financial capital. (Serrat 2017) states that human assets refer to health, nutrition, education, knowledge and skills, capacity to work, and capacity to adapt. However, this study extends human capital to include all household members working together to sustain a livelihood. In terms of human asset, the study finds that household size was significant for the male. The implication of this is that male-headed households will have more hands to support their processing or marketing venture, consequently cushioning the effects of shock, seasonality, or critical trends that may threaten their livelihood strategies. This finding

supports Forsythe's (2015) argument that human assets are vital for labor supply for agricultural activities in the rural context, comprising primarily family labor.

Family labor is vital to smallholder farmers because of its lower cost and better quality of farmhands than hired labor because household members have vested interests in the benefits of production activities. However, household size was not significant for women, which translates to increased vulnerability for female-headed households as this will limit the scale of production, hence, reducing their abilities to cope with shocks, seasonality, or critical trends that may arise. This may lead to reduced well-being of the womenfolk, reduced food security, and increased vulnerability, negatively impacting rural women's livelihood outcomes.

However, the study cannot analyze assets like social, natural, physical, and financial capital. Since land allocated to cassava farming was not significant for this study. This study did not consider credit facilities availability and respondents' involvement in any social or producer organizations.

One limiting factor of the Sustainable Livelihood Framework is that it does not take gender into cognizance, hence, this study also utilized gender and development for our analytical framework. The Gender and Development (GAD) approach focuses on the socially constructed differences between men and women, the need to challenge existing gender roles and relations, and the creation and effects of class differences on development. Findings for this study are also in line with the prediction of Ester Boserup (Boserup 2007), the pioneer of the theoretical perspective of gender and development, about the gendered division of labor in agricultural value chains and what motivates the different actors for development.

This study established a significant gender disparity in access to productive resources and decision-making. For instance, household size, primary decision-maker on farming activities,

education, and marital status significantly predicted men's participation in the marketing and processing nodes of the VC, which may be due to the social relationship between men and women which has systematically subordinated women. Our results showed that most male respondents had larger household sizes than their female counterparts, consistent with the Nigerian reality; a large household size has an economic advantage. With a large household, respondents will have more hands to support them in their marketing and processing activities. Large household size also means that they have more mouths to feed, hence the motivation to increasing their production scale. Women are the ones who bear the burden and feel the heat of having a large household. This is because they are responsible for taking care of everyone in the family; they are saddled with the responsibilities of caring for the sick and elderly, bearing and rearing children, and other day-to-day house-keeping activities, further guaranteeing that they are not at par with their male counterparts.

5.2.2 Practical Implications

Effective value chains has the potential for strategically supporting production, value addition, and distribution of all agricultural products. In Nigeria's case, value chain function and access have consequences for a significant proportion of the population and economy. The role of women in value chains in Nigeria is both severely disadvantaged and critical. Nigeria must address the issues facing women within its agricultural sector for economic progress. The cassava value chain, a significant import sub-sector in guaranteeing food security and income generation, needs an overhaul. The development of higher-functioning and more inclusive value chains will require the engagement, education, and support of all value chain actors, both male and female.

The findings established a differential gender participation in the marketing and processing phases of the Nigerian cassava value chain, albeit a slight difference. Men had a

higher representation in cassava processing than women. This finding corroborates the submission of Forsythe (2015) that cassava processing has become more commercialized, but men still increasingly own and manage cassava processing enterprises.

The government needs to support the integration of gender equality and women's empowerment objectives in agri-food value chain interventions and ensure that they are inclusive and socially sustainable and seek support on how best to address gender issues in their work on agri-food value chains.

Furthermore, the findings uncovered gender disparity in education, decision-making regarding farming activities, the quantity of cassava harvested, land allocated to cassava production, and participation in the marketing and processing phase of the cassava.

Thus, assessing the broader context from a gender lens in analyzing the value chain helps understand both women's and men's playing ground within the economy. It identifies the areas in which gender discrimination is more pronounced (e.g., with education, financial inclusion, or ownership of agricultural assets) and anticipates the challenges and opportunities women are likely to face in food value chains. Therefore, agricultural policies and strategies should adequately consider gender concerns to ensure a level playing ground for male and female actors in the value chain. Gender relations determine access to assets and resources, participation, and decision-making power, all of which directly impact the performance and governance of the chain.

Since producing cassava now and tonnes of cassava harvested are predictors for participation in the processing and marketing phases of the value chain, the government should intensify its efforts to remove the cassava production barriers to facilitate a robust and more

inclusive cassava industry that has the potential to promote more equitable access to value chain entrepreneurship opportunities and advance Nigeria's economic revitalization goals.

Also, both government and Non-governmental organizations need to intensify campaigns on gender inequalities to sensitize the Nigerian public on disaggregating control of resources and decision making within the household, planning for balancing work and household responsibilities to reduce the time poverty for women. Lastly, interventions should involve women in planning and needs assessment through a participatory research approach.

5.2.3 Future Research

The study identified four nodes of the cassava value chain in this study; input supply, cassava production, cassava processing, and cassava marketing but only analyzed two nodes. Thus, further studies should investigate the input supply and access to productive resources. Also, this study did not have enough data to analyze gender participation in cassava production; hence, further studies should analyze gender participation in cassava production to have a clear picture of the Nigerian cassava value chain and to further that women enter the profitable node of the Nigerian cassava value chain.

Literature review revealed an emerging commercial opportunity in the HQCF for women. However, this study did not examine the supply of cassava tubers to large-scale processors and did not exhaust all the processed cassava products, including High-quality cassava flour (HQCF), earning potential other processed products. Thus, further research might want to look at the barriers preventing women from unlocking the higher earning potential in this profitable venture in the Nigerian cassava value chain. New commercial opportunities for processed products could increase women's direct benefit through increased income and employment opportunities.

Because this study is purely quantitative utilizing a secondary data set, future studies may want to analyze gender participation in the cassava value using a qualitative approach to capture the nuances and views of the participants that a quantitative design would not capture.

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