ANALYSIS OF GENDER EQUITY OPPORTUNITIES AND RESOURCE USE IN CEREAL VALUE CHAIN: EVIDENCE FROM YOUTH ENGAGEMENT IN RICE VALUE CHAIN IN SOUTH-EAST, NIGERIA

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CERTIFICATION

This is to certify that this work "Analysis of Gender Equity Opportunities and Resource Use in Cereal Value Chain: Evidence from Youth Engagement in Rice Value Chain in South-East, Nigeria" was carried out by TIM-ASHAMA, AKUNNA CHINENYENWA (Reg. No: 20154986258) in partial fulfillment for the award of the degree of Doctor of Philosophy (Ph.D) in Agricultural Economics in the Department of Agricultural Economics of the Federal University of Technology, Owerri.

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DEDICATION

This work is dedicated to my loving husband, The Revd. Canon Tim Ashama PhD and our wonderful children: Zara, Leta, Lezirim and Zuwo.

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ABSTRACT

The study analyzed gender equity opportunities and resource use in cereal value chain: evidence from youth engagement in rice value chains in Nigeria. it identify the actors and gender roles along rice value chain; examine by gender, the socioeconomic characteristics of actors along the rice value chain; determine the level of gender equity gap in opportunities along the rice value chain; determine the technical efficiency and sources of inefficiency among male and female actors along the rice value chain; determine the value added and the share of the value added by gender along the rice value chain; estimate the factors affecting value added by gender along rice value chain and, identify the constraints to youth engagement in the rice value chain, by gender. A multistage sampling technique was adopted for this study. The sample size consists of 476 youth rice value chain actors randomly selected from 48 villages across three states in South-East Nigeria. The data were collected using questionnaires and analyzed using Modified Gender Equity Index (MGEI), stochastic meta-frontier, value addition and multiple regression models. Descriptive statistics such as frequency, percentages, charts and mean were also used to realize some additional results. Results from MGEI show that the level of gender equity opportunities for youth rice producers, processors and marketers were -0.21, -0.21 and -0.04, respectively, indicating inequity against the female youth. The mean technical efficiency for male and female producers are 0.64 and 0.59, processors 0.70 and 0.69 and marketers 0.52 and 0.61. The determinant factors of technical inefficiency among male and female youth in the study area were level of education, membership of cooperative society, years of experience and access to credit. The overall value-added per tonne by the male youth actors was ₦52,281 and the female youth actor was ₦52,229. The share of the value-added by male youth producers, processors and marketers were 51.65%, 49.41% and 47.78% while the female youth were 48.38%, 50.59% and 52.22%, respectively. Some factors affecting value added by actors in rice value chain were level of education, years of experience, capital invested, information and distance to actor's node. The major constraints to youth engagement in rice value chain include lack of capital to start up, lack of access to credit, drought, lack of access to better technology, high cost of hiring/operating machines, lack of technical knowhow/skills, and stressful nature of rice value chain. In addition, the female processors added marital challenges and responsibilities as a major challenge while male marketers included lack of government support as an important challenge. This study recommends that Policies and interventions that ensure equal access to resources, opportunities, and decision-making power for both male and female youth actors should be implemented through targeted training programmes, awareness campaigns and capacity-building initiatives that promote gender equality. In addition, access to affordable credit and financial services for youth involved in rice value chain should be strengthened through establishment of financial institutions and mechanisms specially targeting youth in agricultural sectors.

Keywords: Gender Equity, Resource Use, Value Chain, Youth Engagement, Analysis

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Part of the major challenges facing the sub-Saharan Africa and indeed most developing countries in the world is the high level of unemployment which is predominant especially with regards to the teaming youth population of these countries (Nigerian Youth Employment Action Plan [NIYEAP], 2021). According to International Labour Organization, [ILO], (2020) young people are three times as likely as adults to be unemployed. Thus, any attempt or effort to address this malaise must be geared towards adequately engaging the youth in major viable and productive sectors of economic development such as the agricultural sector (Agossadou *et al*, 2018).

According to NIYEAP (2021), agriculture has over time remained a consistent contributor to the economic growth and development of many countries in the world, thereby, becoming a source of foreign exchange, stabilizing and sustenance of many economies of the world. In 2017, for instance, agriculture contributed 24 percent to Nigeria's Gross Domestic Product [GDP]. While agriculture still accounts for the highest share of employment (48 percent in 2017), the sector is one of the sectors that can offer important business opportunities for youth [NIYEAP, 2021; Agossadou *et al,* 2018). In essence, a redirection of the productive energy of the vast populace of unemployed graduate youths to the agricultural sector especially rice production could be the solution and far reaching cure to the negative consequences of unemployment that is ravaging many parts of Africa. Youth engagement in the rice sector could help in creating employment for the rural youth and in turn reducing poverty as well as urban migration which has placed enormous pressure on the limited infrastructures and land resources in the urban areas. It could

also help to achieve the Sustainable Development Goal of no poverty, food security and economic growth.

While discussing the concept of youth engagement in agriculture, it is imperative to note that gender is a critical factor in the degree to which production is achieved or attained. Gender refers to socially and culturally determined roles, rights and responsibilities of men and women (Beuchelt, 2016). Consequently, gender is a determining factor in defining who does which activity, who owns a good or resource, who decides, and who has power (United Nations International Children's Emergency Fund, [UNICEF], 2011 in Beuchelt, 2016). The assignment of specific culturally practiced agricultural roles and duties based on gender cannot be ignored especially on studies as this which is African in context and background, thus bringing into perspective the agricultural pattern and practice of a given people. In many locales, the gender role becomes obviously distinctive and separated along the agricultural system and value chains as well as the sequence of the production activities. In essence, there are role specifics which have been practiced for generations and there may not be any plan to change or alter it soon which possess its own challenge on the success of agricultural interventions and development (Beuchelt & Badstue 2013).

Agricultural value chain describes the whole range of activities necessary to bring an agricultural product from its conception to its final users. Henriksen, et. al., (2010) stated that at the heart of value chain concept is the idea of actors connected along a chain producing and delivery goods and services to the final consumers through sequence of activities. According to Matua *et al.* (2014), although, value chains offer tremendous opportunities for men and women through better market linkages and employment opportunities, the way these value chains operate can affect some groups negatively thereby, creating gender inequity opportunities along the value chain.

Considering the afore-stated, the concept of gender equity readily comes to play as it will help to create a conducive playing field to accommodate and enhance the strength and weaknesses of male and female with relation to historical and social advantages or disadvantages in gender relations. Gender equity aims at improving gender relations, roles, and achieving gender equality (FAO, 2013). The essence of equity does not always mean that women and men should be treated exactly the same but the treatment should be considered equivalent in terms of rights, benefits, obligations and opportunities (UNICEF, 2017). Clearly stated, gender equity can be understood and perceived as the process or approach of treating women and men fairly. Gender equity is a means where equality is achieved (Berman *et al*., 2013, Grozanick, 2016).

In more specific term, there exist obvious factors that hinder women from attaining expected results of agricultural productivity, especially, in patriarchal societies. Women face discrimination in access to key productive resources such as land, credit facilities, extension services, education, etc (FAO, 2013; Bravo-Monroy & Tzanopoulos 2016). Thus, according to (FAO, 2016), access to productive resources is central to understanding rural women and men's opportunities for economic advancement. Access to financial services is especially critical for women in terms of enhancing their ability to participate in value chains beyond producer's roles to add value to agricultural produce (Fletschner & Kenney, 2011). Food and Agricultural Organization asserts in their report in 2011 that developing countries of the world have the potential of increasing their agricultural output by 2.5 – 4.0 % provided that they are able to reduce productivity gap between male and female farmers to its least minimum (Joe-Nkamuke, *et al*., 2019). Accordingly, they posited that, if women have access to equal level of resources, gender gap will be reduced significantly.

Thus, closing the gap between the women and their obvious prominent male counterpart or by every means, making it significantly narrow can go a long way to meeting the food need of many developing countries and Nigeria in particular. Youth engagement is key to solving the food problem ravaging the African continent and also to provide means for foreign exchange to grow the GDP of the continent away from the existing mono economy obtainable in many countries in the continent. Furthermore, considering the production of major staple foods and economic empowerment in South East Nigeria with respect to gender access, Akter et. al., (2016) and Oseni et. al. (2014), affirm that cereals, especially rice are indispensable for food security. Therefore, ensuring equitable gender access and opportunities along rice value chains are thus, paramount to achieving the Sustainable Development Goals to eradicate poverty and hunger, and promote gender equality.

1.2 Problem Statement

Rice is one of the major staple foods in Nigeria. It has been grossly observed, empirically, to be in short supply from the local production, hence, leading to high level of importation of the commodity Akpan et. al. (2014). The government of Nigeria few years ago banned the smuggling of rice that finds its way into the country through her porous borders in order to promote the local production of the commodity and encourage the local farmers (Ukwuja & Chukwukere, 2021). According to Terwase & Madu, (2014), this policy saw a short supply of rice in the market, prices skyrocketing and the smuggling of the commodity intensified by the perpetrators of the crime. The negative economic impact arising from the short fall in the supply of the commodity (rice) has been attributed to many factors including the lack of engagement or minimal engagement of youths in rice value chain in the region. In addition, blatant apathy by the youths has also been fingered as a major factor why many youths are not engaged in the rice

value chain in the region as they see it as a business for the old and elderly. Consequently, in the recent times, in Nigeria, various agricultural programmes have been initiated which focus on youth empowerment in order to at least upgrade youth engagement and participation in agriculture to an appreciable level. The Youth Employment in Agriculture Programme [YEAP] which was launched by the Federal Government to engage youths in agricultural activities, (ILO, 2016). Also, the Anchor Borrowers' Programme which was launched in 2015 to provide loans to smallholder farmers for the cultivation of various crops including rice, and targets young farmers to encounrage their participation, (Development Finance Department Central Bank of Nigeria, 2021). Another programme is the Agricultural Transformation Agenda [ATA] which aimed at transforming Nigeria agriculture and creates jobs, especially for the youth along the value chains of crops, (African Development Bank, [AfDB], 2013). However, irrespective of these efforts, the gaping vacuum existing as a result of this phenomenon still waits to be filled.

Furthermore, the gap in the production of the commodity apart from the problem of lack of youth engagement is the traditional practice of gender inequity and to some extent discrimination resulting in the inability of the female gender to access opportunities and resources as provided by the government as well as international organizations. According to FAO (2018), inequity in gender relations, due to discriminatory attitudes and practices, result in diverse constraints faced by women and men in accessing and controlling the resources needed to carry out their activities, hence influencing the efficiency of the food value chain in many ways. The societal definition of gender roles has led to gender bias, which has resulted in the preference of one gender over the other.

Gender equity is a significant issue that has gotten more attention recently. In addition to being a fundamental human right, gender equality is also crucial for fulfilling the Sustainable

Development Goals, according to the United Nations. Women and young people have historically had restricted access to resources and opportunities, including credit, training, information and market, in the agricultural sector, which is generally controlled by men. Gender equity has effects on every aspect of the rice value chain, including production, processing, and marketing. Women do not actively participate in the labour force compared to men, and this disparity affects the value added by women and deprives them of access to some resources along the agricultural food value chain. As reported by Jeckoniah et. el. (2013), women involvement in agricultural production most times, contributes to increased production and export of high value crop but, women do not equally benefit from the value chain as men and this is partly due to the gender relations that segregate women from participating or benefiting from certain tasks in agricultural value chains (Lasterria, 2006 in Jeckoniah *et al*, 2013).

Training is critical for the progress and development of any system. As vital as this could be for sustaining and enhancing production in rice value chain, the discriminatory approach to training and capacity building has also negatively affected the expected result with respect to the policy and financial resources invested on it. In essence, due to the level of patriarchy/religious adherence existing among many cultures/peoples, most women in regions where rice production is predominant are not allowed access or exposure to available as well as required trainings that would enhance their profitable contribution and participation in the rice value chain. In addition, inequity also appears to exist in the formal training between men and women. In some societies, men receive formal training more than women, while the reverse is the case in some societies. Some authors such as Twin (2014), de Brauw (2015), and others believe that women do not receive the same training and resources available to men along food crop value chains. As a result, formal training of men is believed to contribute more to agricultural value chain

development, thereby marginalizing women and depriving women the access to formal training. Development in Gardening (DIG) reported that the number of hungry people in the world could be reduced by more than 100 million people if women in rural areas were given equal access to the same resources as men.

Moreover, efforts at improving agricultural production and distribution have always been concentrated on increasing production, processing and marketing through the breeding, processing and marketing of high yielding varieties with little emphasis on resource use efficiency (Giller, et. al., 2021). Resource utilization is therefore an important determinant of profitability and so every rational value chain actor aims at minimizing cost in order to maximize profit as asserted by Okeke & Amaechi (2021). Regrettably, resources are not efficiently utilized by actors in the value chain. There are differences in the productivity and technical efficiency of men and women. Against this background, this study is aimed at contributing to bridging the knowledge gap in "gender equity opportunities and resource use in rice value chain by focusing on the youth engagement in rice value chain"

1.3 Objectives of the Study

The broad objective of the study was to analyze gender equity opportunities and resource use in rice value chain, with focus on youth in the South-East Nigeria. The specific objectives were to;

i. identify the actors and gender roles along rice value chain,
ii. examine by gender, the socioeconomic characteristics of actors along the rice value chain,
iii. determine the level of gender equity gap in opportunities along the rice value chain,

iv. determine the technical efficiency and sources of inefficiency among male and female actors along the rice value chain,

v. determine the value added and the share of the value added by gender along the rice value chain,

vi. estimate the factors affecting value added by gender along rice value chain and,

vii. identify the constraints to youth engagement in the rice value chain, by gender.

1.4 Hypotheses of the Study

The null hypotheses to be tested were that:

i. Gender opportunities in rice value chain are not equitably distributed.
ii. Value added by male and female actors at each node is not significantly different along the rice value chain.
iii. Male and female actors are not technically efficient along the rice value chain.
iv. Socioeconomic factors of the male and female actors do not significantly affect value added along the rice value chain.

1.5 Justification for the Study

The underperforming state of agricultural sector especially in Sub Saharan Africa, Nigeria inclusive is largely due to gender inequities in opportunities which undermine the sustainable and inclusive agricultural development (United Nations Entity for Gender Equality and the Empowerment of Women, (UN Women, 2019)). Agricultural value chain development requires equity in opportunities among men and women along the value chain, and this can only be done through interventions recommended by gender equity studies such as the present study. Successful interventions are usually transformative, whether through creating opportunities, new commodities and services or through changing the ways people do things (Beuchelt, 2016). Identifying potential gender or social equity trade-offs may lead to opportunities to address them

straight away in research. This may lead to the discovery of complementary measures that can improve food crop value chains and opportunities along the chain. Therefore, there is need to analyse the gender equity opportunities in rice value chains in South-east, Nigeria.

This study attempts to determine the level of gender equity opportunities, and to accurately measure this, there is need to employ Modified Gender Equity Index (MGEI).According to Fernández-Sáez *et al.* (2013) the MGEI can easily be interpreted and the value indicates in which sense inequity is produced by varying its range of values between −1 (inequity towards women) and 1 (inequity towards men).This study will be of great use to policy makers and scholars in gender issues who may wish to understand and monitor the results of specific equity policies and to determine the length of time for which these policies should be maintained in order to correct long-standing structural discrimination against men or women.

Finally, in resource poor country likes Nigeria; the scope of cereal's value chain can be expanded and sustained through the efficient use of resources given the existing resource base and available technology. The efficient method of production, processing and marketing among male and female actors in rice value chain is that which uses the least number of resources, as the increase in efficiency of resource use could present a ray of hope and lead to an improvement in the welfare of these value chain actors and consequently a reduction in their poverty level and food insecurity. Therefore, there is need to determine how technically efficient rice value chain actors are in resource use. This result will be of considerable interest and benefits to stakeholders in rice value chain and agricultural economists.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Literature

2.1.1 The concept of Gender

Gender is socially constructed roles, behaviours and characteristics that a given society considers appropriate for males and females. These roles and characteristics are acquired through socialization processes: people are born female or male but learn to be women or men. Unlike sex, which is biological, gender attitudes can change and develop over time (Food and Agriculture Organization [FAO], 2014a). Gender refers not to male and female, but to masculine and feminine - that is, to qualities or characteristics that society ascribes to each sex. Perceptions of gender are deeply rooted, vary widely both within and between cultures, and change over time. But in all cultures, gender determines power and resources for females and males (Kulich & Chipeaux, 2019). Gender is a central organizing factor in societies, and it can significantly affect the processes of production, consumption, and distribution. In fact, the influence of gender on rural people's lives and livelihoods is so substantial that "by any indicator of human development, female power and resources are lowest in rural areas of the developing world. Rural women make up the majority of the world's poor. Notwithstanding recent improvements in their status, they have the world's lowest levels of schooling and the highest rates of illiteracy. In all developing regions, female-headed rural households are among the poorest of the poor (Awomi, & Tariang, 2022)). Social and economic inequalities between men and women undermine food security and hold back economic growth and advances in agriculture (FAO, 2011).

Gender relations refer to the ways in which men and women relate to each other over the whole range of social institutions. The activities practiced by men and women influences access to resources, benefits and decision-making. The typology of these activities underlies the "Gender roles" that men and women play. The words "Sex" and "Gender" are commonly used interchangeably. However, to fully grasp the concept behind gender relations, it is important to understand that "Sex" refers to biological and physiological characteristics, while "Gender" refers to behaviours, roles, expectations, and activities in society. Thus, gender is about how society gives meaning to differences in femininity and masculinity, and the power relations and dynamics that come about because of this (Kachel, et. al. 2016). Gender is the socially constructed difference between women and men. This results in certain power relations and dynamics, causing inequality in people's capacity to make choices. As women often lag in this respect, many development interventions focus on the empowerment of women (FAO, 2014a).

Gender analysis is the study of different roles and responsibilities of men and women; their differentiated access to and control of resources; and their priority needs to better understand and address gender inequalities (FAO, 2011). Gender analysis requires data on mixed households, as well as on male- and female-headed households. This data is often not directly available, making gender analysis essential. Gender is shaped by other social factors, including country/region, ethnic group, age, economic class and religion. Gender defines the roles and relations between men and women, as well as boys and girls. Gender roles are socially constructed; determine social and economic activities; reflect biological differences; vary according to regions and cultures; and change over time. Gender roles, status and relations vary according to place (countries, regions, and villages), groups (class, ethnic, religious, caste), generations and stages

of the lifecycle of individuals. Gender is, thus, not about women but about the relationship between women and men.' A gendered Value Chain Analysis, (VCA), is a methodology that describes existing gender relations in a particular environment, ranging from within households or firms to a larger scale of community, ethnic group, or nation, and organizes and interprets, in a systematic way, information about gender relations to clarify the importance of gender differences for achieving development objectives (Matua et. al. 2014).

2.1.2 Concept of Gender Equity

Gender equity refers to the processes and approaches that lead to gender equality, which is the end-goal. *Gender equity* is the process or approach of treating women and men fairly. It takes into consideration the different needs of women and men and includes measures to address women's historical and social disadvantages. Gender equity is a means to achieve gender equality (Berman, *et al.,* 2013*).* Gender equity aims at improving gender relations and gender roles and achieving gender equality. The essence of equity is not identical treatment - treatment may be equal or different but should always be considered equivalent in terms of rights, benefits, obligations, and opportunities" (FAO, 2011). Improved gender equity in agricultural contexts has shown positive development outcomes at the household and individual levels (Meinzen-Dick *et al.,* 2011). Women and men should not only be given equal access to resources and equal opportunities, but they should also be given the means of benefiting from this equality. This is where the concept of 'gender equity' comes into play. Gender equity implies fairness in the way women and men are treated. The different life experiences and needs of men and women are taken into consideration and compensation is made for women's historical and social disadvantages. The lower status of women in society often constitutes a handicap and provisions should be made to redress this inequality before they can take advantage of the opportunities

provided. Gender equity thus serves to level the playing field and empower women. Therefore, we can say that equity is essential to achieve true equality.

There are three reasons why gender equity is important in Value Chain Development (VCD). First, value chains exist within a social context, which conditions differential access to productive resources (land, labour capital, credit, and training), gender differentiated labour force hence choice of wealth generating strategies, and legal frameworks and social beliefs that restrict people's ability to accumulate wealth according to gender category. Second, VCD affects gender roles and relations, which in turn influences the type of intervention or upgrading strategy to adopt. Third, VCD and gender equity are complementary goals. For example, gender inequality can affect competitiveness by limiting productivity, economic growth, and trade performance. (Matual *et al*. 2014).

Gender equality is defined in various ways but tends to refer to five main components: rights, opportunities, value, situation and outcome and agency" (United Nations Development Programme, UNDP, 2018). A gender and equity inclusive process would entail (i) giving women and the poor at all levels a voice in the process (ii) gender disaggregation of all data to identify areas of gender difference (iii) investigating areas of gender difference to identify whether this is due to gender inequalities of opportunity or differences in choice (iv) gender equitable planning which mainstreams equality of opportunity and identifies supportive strategies needed to enable women to realize these opportunities, and to promote the support of men for the necessary changes and (iv) gender accountable implementation and learning which involves women as well as men in implementation, incorporates gender indicators in monitoring and informs women as well as men of learning outcomes.

2.1.3 Concept of Agricultural Value Chain

The agricultural value chain concept has been used since the beginning of the millennium, primarily by those working in agricultural development in developing countries. It normally refers to the whole range of goods and services necessary for an agricultural product to move from the farm to the final customer or consumer. The term value chain was first popularized in a book published in 1985 by Michael Porter, who used it to illustrate how companies could achieve what he called "competitive advantage" by adding value within their organization. Subsequently the term was adopted for agricultural development purposes (Seward, 2021). At the heart of the agricultural value chain concept is the idea of actors connected along a chain producing and delivering goods to consumers through a sequence of activities (Henriksen et. al, 2010). However, Porter's value chain approach is restricted to the firm level neglecting the analysis of up or downstream activities beyond the company. In the 1990s, Gereffi, (1994) developed the global commodity chain (GCC), originally derived from Wallerstein's commodity chain (Bair, 2005). Gereffi established four core elements (Kaplinsky & Morris 2002): (a) input-output structure, (b) territorial (international) structure, (c) institutional framework, and (d) governance structure. The focus was set on governance referring to institutional mechanisms and inter-firm relationships. The main attention was paid to balance the power embedded in the coordination of globally fragmented but interlinked production systems. Gereffi concluded that many chains are characterized by some dominant actors, who determine the overall character of the chain. These actors become responsible for upgrading possibilities, knowledge transfer, and interaction coordination within the value chain. Based on Gereffi's GCC, Messner (2002) developed the world economic triangle. Messner's concept assumes that actors, governance and regulation systems determine the scope of action in the global commodity chains. This approach

focuses on upgrading entire regions or clusters through their integration into chains. Hence, the horizontal (cluster development) and vertical approaches (value chain) are linked (Kaplinsky & Morris 2002).

The value chain describes the full range of activities, which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), to delivery to final consumers, and final disposal after use" (Kaplinsky & Morris, 2002). Based on the definition of Kaplinsky and Morris, the most used value chain consists of six stages as shown in figure 2.1.

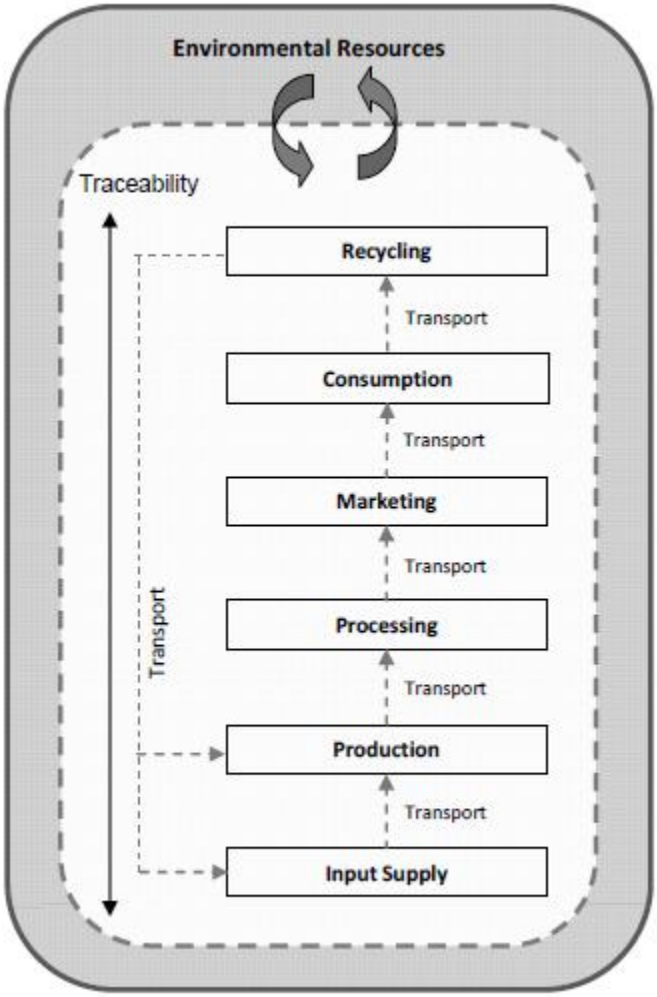


Figure 2.1: Six stages of a value chain. **Source:** Faße, Grote, and Winter (2009)

The value chain, as shown in figure 2.1, is often termed as ‘vertical’ value chain. However, the point of view can also be ‘horizontal’ by establishing so-called clusters, e.g., similar enterprises in a certain region. In practice, value chains are certainly more complex compared to this linear conceptual illustration. There can be multiple links within a chain and various connections to other chains, e.g., using the same input suppliers. Typically, intermediary producers or traders are involved in more than only one chain denoted as a value chain network (Roduner, 2004).

The term value chain describes ‘all activities that are requisite for bringing a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use’ (Kaplinsky & Morris 2000 in Rosales et. al. 2017). The term ‘chain’ denotes the fact that most goods and services are the result of a series of activities at domestic, national, or international level (Farnworth, 2011). The complex network of activities carried out by different actors in multiple enterprises along a value chain means that attention must be paid to the activities that people are involved in, how they are linked together through services such as transportation, insurance, telecommunications, quality control, and management coordination (Arndt & Kierzkowski 2001). Whereas the flow of goods is crucial in value chains, other determinants of value chain participation such as credit/financial flows, changes in ownership rights and markets need to be considered (Coles & Mitchell, 2011).

Adopting the value chain approach as a development strategy provides an opportunity for all actors to understand each other’s functions and the activities involved; increase their viability, visibility, voice, and market share; and identify and correct barriers and gaps that cause inefficiencies. Corrective value chain interventions aim at creating or enhancing horizontal relationships (among actors within the same level in value chains) and/or vertical relationships

(among actors in different levels of a value chain) with an aim of improving returns and increasing efficiency. They may include formation of new value chains, forging or strengthening new links within an existing value chain, increasing the capabilities of target groups to improve the terms of value chain participation, and minimizing the possible negative impacts of value chain operations on non-participants and/or adjacent communities (Riisgaard *et al.,* 2010). Value chains can either be market driven or relation-based depending on the form of governance they adopt (Farnworth, 2011). Market driven value chains are those for whom price is the determinant of who the actors will be and how long their transactional relationship will last (e.g., local tomato markets). Relational value chains are those in which lead actors, such as producers in dairy cooperatives, buyers in contract farming for chicken or and intermediaries (exporters) in tea, coffee and horticultural trade determines the transactional framework within which other actors will work, resulting in producer-driven, buyer-driven, or intermediary-driven relational value chains respectively.

Value can be added to products without changing their physical forms, and processing (in the sense of changing the form of the product) does not necessarily add value to the product. Value addition does involve processing in the sense that the product undergoes some process (which can involve just cleaning, grading, or labeling), after which a buyer is willing to pay a price for the product that more than compensates the value of the inputs used in the process. In a market economy, this added value is typically manifested by the processor earning a profit (Staatz, 2011). Farmers contribute a much higher share of the total value added than the wholesalers and retailers, but the proportion of profits share earned is considerably much smaller for farmers (Mushi & Kundi, 2016). The value added at various stages of rice production, wholesaling and retailing involves costs and profits (Mushi & Kundi, 2016).

2.2 Theoretical Literature

2.2.1 Feminist Theories on Gender Equity

Feminist theories have been instrumental in shaping beliefs on gender equity through the last few decades. With the first wave of feminism taking place in the 19th and 20th centuries in the United States, rights were established that women exercise regularly today—the right to vote, to own property, to initiate a divorce, to go to college, and more. First wave feminists fought for women's equal rights in political and social life. Second wave feminism, which started in the late 1960s, shifted its focus to the ways in which women were more disadvantaged than men, confronting sexual oppression of women, and political and legal deficiencies between men and women (Lorber, 2012). According to Lorber (2012), the goal of feminism as a political movement is "to make women and men more equal legally, socially, and culturally".

The following examine dominant feminist theories that have contributed largely to gender equity. Although there are numerous theories that have been important in advancing gender equity through the decades, four theories have been chosen and justified for their contributions: social construction feminism, multiracial/multiethnic feminism, men's feminism, and feminist ethics of care. The first three theories focused on how gender is socially constructed and maintained through practicing gender and focusing on multiple sources of inequality. The shift from focusing on women to focusing on gender started in the 1980s and ultimately questioned the stability and necessity of the whole gendered social order (Lorber, 2012). Lastly, ethics of care feminism examines the gendered division of labor in the home—women primarily taking on most of the caretaking for children and elderly within families—and the devalued (socially and economically) nature of such care that women are primarily responsible for.

i. Social Construction Feminism

This theory addresses gendering practices (woman and femininity versus man and masculinity) that are prevalent throughout society, including those in cultural values, work organization, and division of labor in the family. The theory argues that gender differences are produced and maintained by socialization processes, including shaping aspects of one's behavior, emotions, and relationships. The role of culture and language are essential to the process of gendering. Gender conformity and norms are reproduced and individuals and groups that deviate from the norm are then stigmatized. Most importantly, gender becomes institutionalized within society because all the major social organizations are divided according to gender, and within the divisions, there are discrepancies in power, privilege, and economic resources. The institutionalization is prevalent in paid work, marriage and family, and legal and economic systems. The social construction of gendered differences provides for the disparities between men and women, producing gender inequality and resulting in women's devalued status that permeates legal, political, social, and cultural spheres (Lorber, 2012). Social construction feminism's value to gender equity is that when society recognizes the individual gendering that eventually feeds into the institutionalization of gender, it can begin to remedy the societal structures through "degendering". According to Lorber (2012), degendering is the "recognition of the myriad ways that we do gender—and deliberately not continuing these practices". Without the awareness of how much we truly do gender in all spheres of private and public life, we cannot begin to degender. Although remedying the gendered socialization and institutionalization will be an intensive and long-term process, it is necessary in order to achieve gender equity in the future.

ii. Multiracial/Multiethnic Feminism

This theory encompasses the intersection of racial, ethnic, social class, and gender discrimination while placing an emphasis on the cultural devaluation of women of subordinate racial and ethnic groups by the dominant culture. While being developed during the second wave of feminism, this theory primarily challenged white feminists to address the differences among women—among African American women, Native American women, Latin women, and Asian American women. Moreover, this feminist theory stresses that one cannot look at one of the social status disadvantages alone, nor lump them together. Rather, multiracial/multiethnic feminism plays to the constructions of social locations that are oppressive because they are the result of multiple systems of domination where a member of the subordinate racial and ethnic group is caught in a "matrix of domination." The matrix of domination showcases how gender is deeply intertwined with and cannot be separated from other social statuses that dictate advantage and disadvantage, Jackson et. al., (2021). A collaborative multiracial/multiethnic feminist movement would depend on the recognition of similar experiences of oppression, biographies, and differences within communities of women, and their men (Lorber, 2012). Multiracial/multiethnic feminism's value to gender equity is that when society is challenged to address the differences among women and multiple systems of domination, especially for those in the subordinate racial and ethnic cultures, gender equity can be better addressed by both men and women. When the intersections of race, ethnicity, socioeconomic class, and gender are examined in relation to and against one another, subordinate groups can address their various concerns, shared experiences, and differences. Subordinate groups can then begin to challenge the dominant culture in its power position. Multiracial/multiethnic feminism reminds one that even if gender equity is attainable, there are

many other structural societal differences that affect one's political, legal, social, and cultural standing within a society.

iii. Men's Feminism/Feminist Studies of Men

This theory aims to address hegemonic masculinity and patriarchal privilege—the dominance of economic and political power and cultural values by elite men. Hegemonic masculinity refers to the most powerful, wealthy, prestigious, and heterosexual men in a societal structure. It is also the pattern of practice that allows men's dominance over women to continue (Jewkes, et. al., 2015). The theory scrutinizes masculinity in its different forms and addresses the many subordinate men throughout societies, including working-class men. Due to the range of men's social positions, masculinity is better constructed as multiple masculinities, including dominant, subordinate, and intersected with the norms of social class, nationalities, religion, racial and ethnic status, and sexual orientations. This stratification of men means that they also benefit or lose differently from structures of masculinity. Men's studies have called on the need to rework gender relations on a more equitable basis, given that the current gendered order oppresses and inhibits men as well as women. Constant through most forms of masculinities, however, is the marginalization and sexualization of women. Other valuable contributions of men's feminism studies include research on the body, sexuality, violence, personality development, health, and family relationships (Lorber, 2012). Men's feminism's value to gender equity lies in recognizing the status of men who are disadvantaged by race, ethnicity, social class, etc. Once acknowledging the differing statuses and disadvantages men face, women and men can better address hegemonic masculinity and work toward gender equity. The hope is that once men can recognize their position and privileges, they might share them with women and other subordinate men. Shifting hegemony in terms of both inter-gendered (men as a group are hegemonic

compared to women) and intra-gendered (deviations of power, prestige, and wealth among men) ways is imperative to reaching gender equity. The challenge to men's feminism in working toward gender equity, however, is the difficulty of convincing and finding hegemonic men who are willing to give up their dominance.

iv. Feminist Ethics of Care

This theory was developed during the 1980s responding to the phenomenon of care. In particular, the theory addresses care as an ethical reflection in terms of informal care (especially for children and the elderly) being an undervalued, but necessary piece for the well-being of society. Traditional moral theories, principles, and practices are deficient to the degree they lack, ignore, trivialize, or demean values and virtues culturally associated with women, like caring. Women tend to disproportionately be the primary caregivers for children, the elderly, and the disabled more than men. A feminist ethics of care calls for the development of a more robust caring conception that includes men as well as women (Gilligan, 2011). In other words, a feminist ethics of care "calls for an approach to ethics in which women's experience must be taken as seriously as men's, and the morality of care is given significant standing". Other sub-theories of feminist ethics of care hold that a woman is not in a position to truly care for someone if she is economically, socially, and/or psychologically forced to do so—most notably under male domination. So long as women do more than their fair share of care giving work, both sexes will remain morally deprived (Kim & Woo, 2022). The theory of feminist ethics of care has also argued that once caregiving responsibilities have been equalized between men and women, social cooperation, conceptions of reciprocity, a level playing field, and fair equality of opportunity can begin to emerge for both men and women (Kittay, 2011). Feminist ethics of care's value to gender equity is that when societal and psychological constraints of care are

acknowledged and addressed, discourse about the patriarchal construction of relationships can occur. If men and women were to have more balanced care giving roles, both could benefit. Women could be less economically dependent upon men and could have the chance for opportunities outside of the home. Men could be more involved in child rearing and elder care, giving them new perspectives and experiences that carry across other spheres of society. Women can also be assured that when their care for another (whether a child or an elderly person) impedes their ability to care for and fend for themselves, they can depend on another (men) for sustenance and aid (Kittay, 2011). When the responsibility of care giving is more balanced between men and women, perhaps then added societal value can be given to dependency work, whether privately or publicly (especially in terms of compensation). Great value to gender equity can occur when care giving responsibilities are better shared between men and women.

2.2.2 Youth Development Theory

Youth development theory is an approach that focuses on promoting positive growth and well-being among young individuals. The theory emphasizes providing young people with opportunities and support to develop essential skills, competencies, and qualities that contribute to their personal, social, and emotional growth. It recognizes that adolescence is a critical period of development, and investing in young people's positive development can lead to healthier, more engaged, and successful adults in the future.

Key aspects of youth development theory include:

i. Strengths-Based Approach

Youth development theory adopts a strengths-based perspective, focusing on identifying and building upon the inherent strengths, assets, and potentials of young individuals. By recognizing

and nurturing their talents, interests, and capabilities, it aims to foster a sense of competence and self-worth.

ii. Holistic Development

The theory acknowledges that young people's development is multifaceted, encompassing cognitive, physical, emotional, social, and moral aspects. It emphasizes providing opportunities for well-rounded growth and promoting positive outcomes in various areas of their lives.

iii. Positive Youth Outcomes

Youth development theory is concerned with fostering positive outcomes in young individuals, such as resilience, self-esteem, social competence, leadership skills, empathy, and a sense of purpose. These outcomes contribute to their ability to navigate challenges and thrive in different contexts.

iv. Youth-Centered and Empowering

The theory advocates for involving young people in decision-making and actively engaging them in shaping their own developmental pathways. Empowering youth through meaningful participation and agency helps build their confidence and sense of responsibility.

v. Supportive Relationships

Youth development theory recognizes the importance of supportive relationships with caring adults, peers, and mentors. Positive relationships provide emotional support, guidance, and role models, which are essential for healthy development.

vi. Opportunities for Learning and Skill-Building

Creating environments that offer opportunities for learning, skill-building, and experiential learning is a fundamental aspect of youth development theory. These opportunities can be in

formal educational settings, extracurricular activities, community programs, and leadership experiences.

vii. Positive Youth Development Programs

Youth development theory has influenced the design of various programs and interventions aimed at promoting positive youth outcomes. These programs often emphasize hands-on learning, character education, leadership development, and community involvement.

Generally, youth development theory advocates for a proactive and comprehensive approach to young individuals' growth and well-being. By focusing on their strengths, providing supportive environments, and offering opportunities for skill development and meaningful engagement, the theory aims to empower young people to become healthy, resilient, and contributing members of society.

2.3 Empirical Literature

2.3.1 Gender Roles and Opportunities along Agricultural Value Chain

FAO, (2018) reported that in agricultural value chains, women make up a large part of the work force. Women rights and benefits they derive from their participation in the value chain are frequently violated, and their contribution to the economy is largely invisible. In the context of value chain development, excluding women, results in underutilization of their labour force which may decrease agricultural productivity. Lastarria, 2006 in Ingram et. al. 2015, asserted that while women involvement in agricultural production has increased; their participation in value chain development activities is concentrated in lower levels of the value chain especially in production. According to World Bank and IFAD (2008), there is a growing trend of more women being involved in agriculture as men seek alternative income generating activities in non-

farm activities. Nevertheless, due to patriarchal nature of most rural societies, women generally do not have the same rights to productive resources as men. While women involvement in agricultural production contributes to increased production and export of high value crop as reported by Lastarria 2006 in Ingram et. al. 2015, women do not equally benefit as men this is partly because of the gender relations that segregate women from participation or benefit from certain tasks in agricultural value chains. World Bank and IFAD (2008) suggested that the existing gender inequality in agricultural production affects economic development and benefits especially for women, while in recent years, value chain development has been adopted as a key approach in increasing the income of small and medium producers and the economically active poor. According to the reports of KIT, Agri-ProFocus & IIRR, (2012), the role of women in agricultural value chains which are usually under-recognized has started to become more and more obvious. Studies by Pyburn, et. al., (2023). on the impact of value chains on gender and empowerment found that positive changes for women with respect to their access to capital, training and extension, decision making in the production process and position in the chain has been realized. The authors further revealed that changes in gender roles have resulted into more workload for women; women participation in management of the chain is limited. The study also did not establish whether women's changing role in the chain was appreciated and valued at the household level. Other scholars including Coles & Mitchell (2011) have argued that the transformation in gender roles acquired at value chain level does not always translate into the household level. According to KIT *et al.* (2012) the resistance for change in gender roles is rooted in power relations, and the fear that by giving some women more power, others (especially men) will lose out. However, it has also been reported that value chain intervention resulted into changes in gender roles and relations. Such changes are a necessary step towards

women empowerment. The authors reported from evidence collected from seven case studies where changes in gender roles between men and women have been acquired. These value chain from which evidence were collected are from diverse background ranging from sheer butter making, livestock, dairying, and green agriculture from different countries in Africa, Asia, and South America.

Bello et. al. (2021) observed that women in developing countries are widely recognized as the face of farming, especially among smallholders. The growing trend of women's engagement in agriculture, commonly referred to as feminization of agriculture, has resulted in changes in gender roles. Muza (2009) cited by KIT, Agri-ProFocus & IIRR, (2012) found that: in some areas women participation in agricultural activities has increased due absence of men who have moved out into non-agricultural income generating activities in urban areas. In such instances women are responsible for taking care of the family farm, participate more in nonfarm activities to supplement income from farm activities, receive wages and start making marketing decisions over all household issues that were the male domain. Changes in gender relations is an important factor in determining the division of labour between what is considered productive and reproductive; this is argued to be the basis for the distribution and allocation of work, income, wealth and assets, and productive inputs as reported by Makama, (2013). During the past three decades research on gender issues in agriculture and natural resource management has been given amplified consideration. United States Agency for International Development (USAID, 2009) opined that new research focusing on agricultural credit, land tenure security, managing risk, access to assets, and the agricultural policy environment aim to discover how gender roles and relations affect these issues. Research on gender and agriculture in Tanzania by Jeckoniah, et.

al., (2013) also indicates that traditional gender roles in agriculture are changing, although causes for such changes are different and location specific thus difficult to generalize.

2.3.2 Level of Gender Equity Opportunities

Kaur and Letic (2012) investigated the impact of female education on economic growth through human capital and fertility rates. India and Niger were taken as sample in the under discussion study. They gave descriptive and theoretical illustration of the topic by using the period between 1990 and 2010. In both countries cases, they found that female education is significantly affecting economic growth by lowering fertility rate and enhancing the quality of human capital, but both countries exhibit social and cultural discrepancies in case of female education. The authors also pose their result in favor of positive impact of female education on economic growth directly and indirectly. Dahal (2011) investigated the link between gender equality in education and economic growth in case of Nepal using district level data of 75 districts of Nepal for the year 2001. The researcher used Cobb Douglas production function and employed OLS method for estimation. He found an obvious negative impact of gender inequality on district level GDP per capita of Nepal. Klasen & Lamanna (2008) conducted a similar study on gender inequality in education and employment for developing countries by using panel data. They have updated their previous work by extending the data. The data period covers from 1960 to 2000 for cross country regression. They used multiple regressions for estimations. Their results show that economic growth is on slower pace due to gender gap in education and employment, considerably increasing effects on growth difference among different regions, like Middle East, North Africa, and South Asia.

Klasen & Lamanna (2003) studied the inequality in education and employment in gender perspective in the Middle East and North Africa. They used panel data estimation for update of

previous studies on education from 1960 to 2000. They also estimated the magnitude of the effects of different indicators on actual growth. They found low gender gap in East Asia and Pacific. They also found that gender gap in employment is adversely affecting the growth as compared with gender gap in education. Klasen (2002) examined the link between gender inequality in education and economic growth between 1960 and 1990. Cross country and panel regression analysis were used in his study. He found the direct and indirect effects of gender inequality on economic growth through increasing the inequality lowering the quality of human capital directly and through lowering the investment and population growth indirectly. There are also differences in annual per capita growth rates due to differences in gender gaps among different regions.

2.3.3. Determinant of Technical Efficiency

According to Bezat-Jarzębowska and Jarzębowski (2013), efficiency of resource use is the main factor for a long term and effective performance of firms. Gender differences exist in resource use efficiency. In cereals value chain, male actors are technically efficient than their female counterparts. The male higher technical efficiency scores could be attributed to their higher labour participation in the value chain (Addison, Ohene- Yankyera & Fredua-Antoh, 2016).

Korir, et. al. (2013) examined the determinants of Bambara groundnut production in Western Kenya using the stochastic frontier analysis (SFA) and found out that farmers' farm size, amount of labour used, and quantity of seeds were the major factors influencing Bambara groundnut production in the study area. The empirical results also indicated that, on the average, groundnut farms in the study area could increase their output by 62% using the same input level. That is, the study found the mean TE to be 38%. Another study on the determinants of production and TE among cotton farmers in the Northern part of Ghana was conducted by Adzawla, et. al. (2013)

The transcendental (translog) production frontier was used to estimate the production function. The empirical results revealed that farm size, labour, and fertiliser utilisations are the main determinants of cotton production in the Northern part of Ghana. Danso-Abbeam, et. al. (2015) also used the translog production frontier to analyse their data set. The results from the SFA indicated that labour and quantity of seeds exerted significant and positive effects on groundnut output, whilst the area of land allocated to groundnut cultivation had a negative and significant effect on groundnut output. Groundnut farmers in the study area had a mean TE score of about 84%, indicating an output loss of 16% due to inefficiency.

Many researchers have also demonstrated that institutional factors, demographic factors, and socioeconomic factors influence the efficiency of a firm in production (Danso-Abbeam *et al*., 2015; Mabe *et al*., 2018; A-lhassan, (2019). Danso-Abbeam *et al*. (2015) found that various sources of efficiency include education, farming experience, household size, membership of farmer-base organisation, and farmers' contact with extension personnel in groundnut production in Northern region of Ghana. Mabe *et al*. (2018) also indicated that factors such as age, sex, household size, years of education, extension visits, contract farming, access to improved seeds, access to irrigation, high rainfall amount, and less lodging of rice influence the level of TE of rice farmers in Ghana. Another study was conducted on TE in smallholder paddy farms in Ghana; an analysis based on different farming systems and gender by A-lhassan (2012) showed that credit availability, family size, and non-farm employment significantly determine the TE of smallholders.

Over the years, allocative efficiency of resources in production has been analysed in the agricultural field by researchers. For instance, Awunyo- Vitor, et. al. (2016) looked at resource-use efficiency among maize farmers in Ghana. The results showed that generally, maize farmers

in Ghana were inefficient in their use of resources available to them. Fertiliser, herbicide, pesticide, seed, manure, and land were underutilised, while labour and capital were overutilised by the farmers. The results further showed that maize farmers in Ghana exhibit increasing returns to scale, indicating that the famers can increase their output by increasing the use of some of the key resources. Ishiaku, et. al., (2017) also conducted their study on resource-use efficiency of fadama III small-scale rice farmers in Nasarawa State, Nigeria. The research demonstrated that the overall production elasticity of the inputs used was 1.045 and 1.356 for participants and non-participants. Participants used all the resources more efficiently than the non-participants with a ratio of 6.40 as against 9.04 for labour, 6.71 as against 7.60 for fertiliser, 3.74 as against 7.11 for seed, 7.00 as against 10.92 for herbicide, and 3.25 as against 5.27 for farm size. Also, Kadiri, et. al. (2014) analysed RUE and allocative efficiency of paddy rice production in Niger Delta Region of Nigeria. Result of the allocative efficiency of inputs confirmed that rice producers in the area did not attain optimal allocative efficiency, seed input (0.94) had the highest allocative efficiency, while land input (0.05) showed the least allocative efficient input. Current studies of this kind either focussed on other crops or were conducted in a different country. Also, there is a lack of studies on RUE in rice production in Ghana. Therefore, this research seeks to estimate the level of technical and RUE of smallholder rice farmers at the farm level and to identify the determinants of TE in production.

2.3.3 Factors Affecting Equity in Value Chain

According to Matua et. al. (2014) value chains exist and operate within a given social context that affects the distribution of resources, benefits, and opportunities. Gender relations affect and are affected by the ways in which value chain function. Gender is thus an important aspect of value chain analysis. Value chains offer tremendous opportunities to men and women through

better market linkages and employment opportunities. At the same time, the way these value chains operate can affect some groups negatively. For example, transnational corporations can take advantage of existing gender inequalities in bargaining power to cut production costs by employing large numbers of women at low levels of value chains and for minimum or lower than minimum wage as witnessed in Export Processing Zones in Kenya, Mexico, and Nicaragua

According to Pyburn et. al. (2023) barriers like access to capital and technologies influence people, and especially women's, participation, and benefits from value chains. Women have lower access to capital and technologies than men (which decreases their participation in levels of the value chains with the highest economic returns and confines them to lower profit nodes as reported by Coles & Mitchel (2011). Women in sub-Saharan Africa own about 15% of all land, with fewer than 5% in Mali to over 30% in countries such as Botswana, Cape Verde and Malawi as reported by FAO (2011). Fletschner & Kenney (2011) asserted that land is an important form of collateral for formal credit. As very few women own it, thus cannot use it as collateral, they have a lower access to financial services than men. Access to financial services is especially critical for women in terms of enhancing their ability to participate in value chains beyond producer roles to include, for example, the ability to add value to agricultural produce. Analysis of how differential access to productive assets constrains women from participating in value chains and development of strategies that can be used to increase women's access to financial services are essential prerequisites to the success of all agricultural value chain development projects.

Analysis of some of the barriers to entry and opportunities presented by different value chains for women can lead to an understanding of the possible value chain interventions that have an income as well as an equity focus on their outcomes. According to Matua et. al. (2014)

understanding women's position in a value chain, how changes in a value chain might affect gender inequality, and the main constraints for women in terms of gaining from value chain participation, requires one to place gender in the context of intra-household bargaining and of broader social processes.

Kaplisky & Morris (2000) asserted that value chain analysis does not stop at the level of the actors or groups of firms, producers, or market actors. It also draws attention to the national system of innovation—the network of institutions which support economic actors. According to these authors, what institutions do impinge on the competitive performance of firms and groups of firms and is also subject to the support and regulation provided by governments, whose actions, too, need to be located in value chain analysis. How supportive or prohibitive institutions are to different groups of actors including women actors should constitute key foci in gender integrated value chain analysis. For instance, communities have different norms and practices that affect the participation of men and women in value chains. Land tenure systems and property ownership practices dictate which household members have access, control and/or ownership to means of production. Traditionally, land is owned by men; and women's access and use is determined by the decisions the owners make. Women tend to execute their productive and reproductive roles simultaneously as reported by Bhattarai & Leduc (2009) in Matua et. al. (2014) and this causes women to engage mainly in value chain activities/nodes that allow them to be closer to the homestead, whereas men may freely engage in activities that require them to be away from home such as value chain nodes away from home, which are often more profitable.

KIT *et al.*, (2006) and Muflikh et. al., (2021) reported that the systemic view of value chain involves integrating three important levels of the value chain, such as value chain actors (people or firms directly dealing with the products), value chain supporters (people or firms providing

services but do not directly deal with the products) and value chain influencers (regulatory framework, policies, infrastructure that enhance the performance of the chain), to allow discovering of potentials and bottlenecks within these levels and the dynamic interactions between them as illustrated in Figure 2.2. Opportunities and bottlenecks can emanate from different levels within the chain, which could at a local, national, global or a combination of the three levels shown in Figure 2.2.

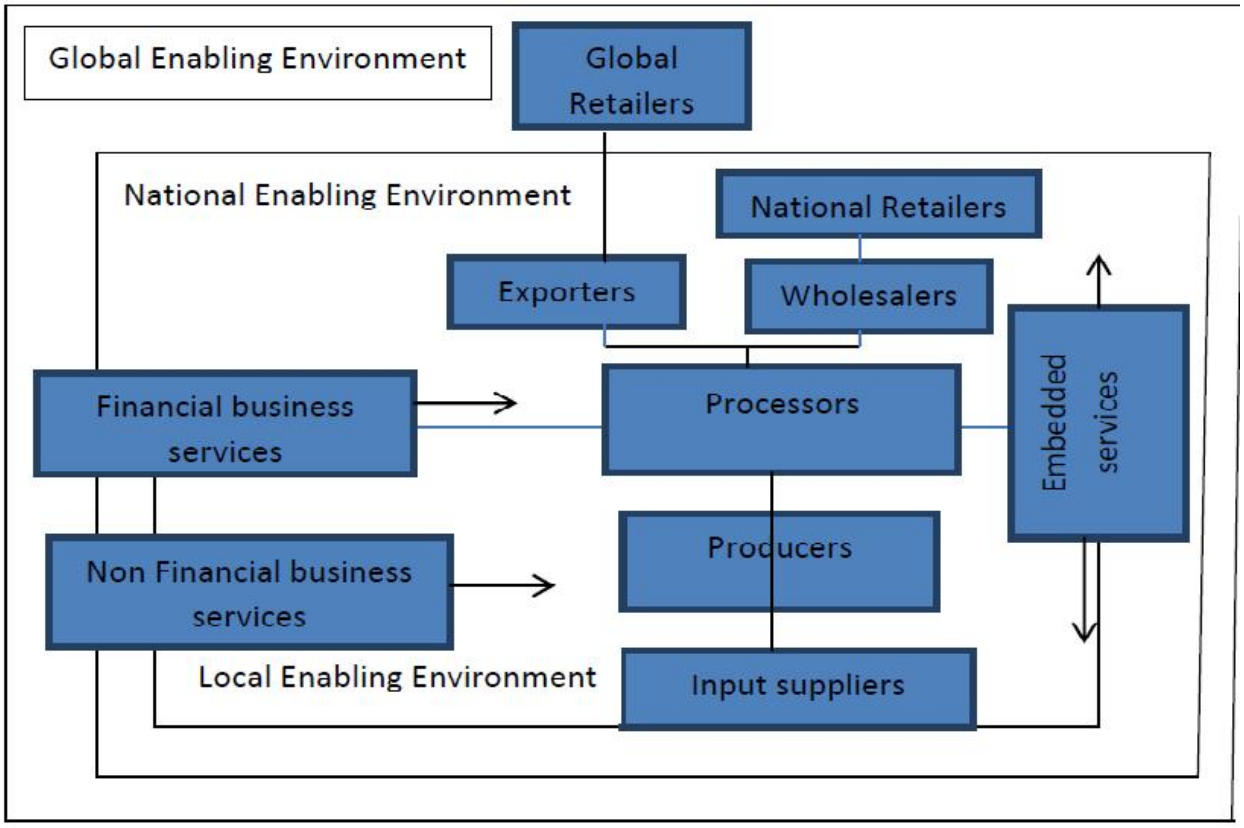


Figure 2.2: The value chain system (adapted from USAID, 2006)

Taking into consideration the three levels is critical in gendering the value chain because identification of value chain upgrading strategies that lead to gender equitable outcomes is possible at this stage. Coles & Mitchell (2011) identified five upgrading strategies that can be applied to improve interaction among chain actors, chain supporters and chain influencers,

thereby resulting in efficiency and equity. Such strategies include process and product upgrading (improving chain efficiency and quality), functional upgrading (changing the mix of functions performed like producers upgrading to processing), horizontal coordination (development of relationships among actors within functional nodes, e.g. strengthening of producer groups), vertical coordination (developing relationships among actors between nodes, e.g. contracting); chain upgrading (applying existing skills in a new chain) and upgrading of the enabling environment (involves changes to policy, law, institutions, support organizations e.g. provision of credit services for women in smallholder groups). At a macro level, for example, gender-sensitive value chain upgrading strategies are likely to have positive impacts on economic growth and development. Gender inequality may negate economic development by hindering wealth creation among men and women smallholder farmers. For instance, gender inequalities at the household level such as lack of capital, property rights, lack of access to education and unequal division of labour have implications on women's ability to earn incomes and hence their welfare and that of their children as reported by FAO (2011). According to Oduol & Mithöfer (2014), knowing the bottlenecks and their causes is critical in tailoring the upgrading strategies to the needs and conditions of the marginalized groups.

2.3.4 Constraints to Equity Opportunities Along Food Crop Value Chains

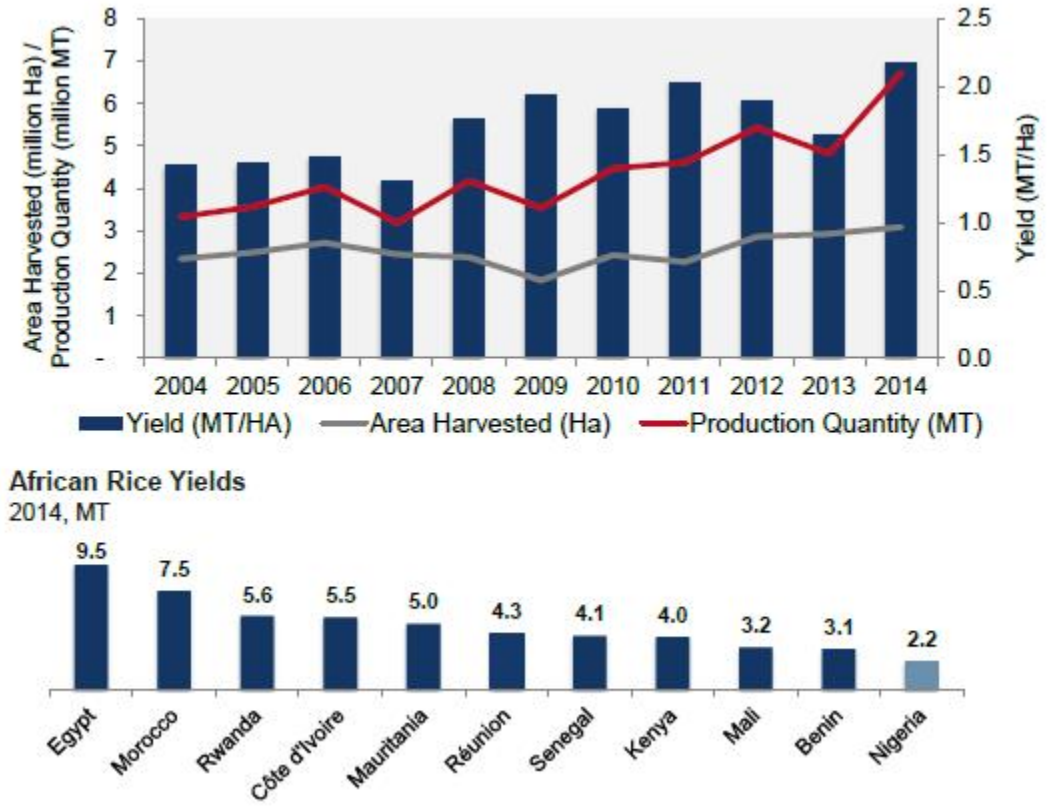
According to Oduol *et al.* (2017), while market failure is a major constraint to smallholder farmers, the effects are compounded for the marginalised groups such as the poor, women, and households in low potential areas. The challenges are huge for smallholder women farmers because they face higher entry barriers than men in modern value chains. FAO (2011) reported that women have the least access to and control of productive resources such as land, capital and agricultural services like credit and training that are necessary for increasing yields and moving

from subsistence to market oriented production. According to Quisumbing & Pandolfelli (2010) in Oduol et. al. (2017) likewise, in most sub-Saharan African countries, the distribution of physical (land, agricultural equipment, and livestock) and human capital favours men and the differences in rights and responsibilities within the household bring about inefficient resource allocation and constrain women's ability to respond to price incentives. Asfaw *et al*. (2011) and Verkaat, et. al., (2017) asserted that the gender gap in market participation has been exacerbated by the stringent standard requirements on food safety and the increasing awareness of consumers of the quality standards (Inputs and knowledge are required to produce such specialty products, yet women have limited resources and access to training services as reported by Quisumbing & Pandolfelli (2010). Consequently, Oduol, et. al., (2017) found that women generally produce for more localized spot markets and in small volumes than men, and when they are involved in marketing of agricultural produce, they tend to be concentrated at the lower levels of the supply or value chain, in perishable or low value products. Furthermore, the report of FAO (2011) indicated that women's engagement in agricultural production and marketing activities does not necessarily translate into increased incomes for them or improved decision making regarding the use of the income generated from agricultural activities. According to the report of FAO, ILO & IUF (2007), women constitute only 20-30% of agricultural wage workers in modern agricultural value chains yet these chains usually offer wage and self-employment with better pay and working conditions than traditional agriculture. Oduol, et. al., (2017) note that when women are employed in the modern value chains, they predominate in the high value industries for export or domestic supermarkets, such as fresh fruits, vegetables, flowers, poultry, and seafood. However, Meartens & Swinnen, (2009) and Iguodala-Cole & Anto (2021) opined that they tend to be

employed as casual labourers to do labour intensive and manually unskilled tasks and occupy unstable and flexible jobs that lack social security and other benefits

2.3.5 Rice Value Chain in Nigeria

According to Context and Sahel Capital (2016), rice represents the second largest grain crop in Nigeria after maize and is a key food crop across the country, constituting more than 20% of total food expenditure among urban and rural households. It is grown on approximately 3 million ha, but experts estimate that this is less than 40% of the land suitable for its production in the country6. Nigeria is the leading producer of paddy rice in Africa, with 6.7 million MT in 2014 and an average paddy yield of 2.2 MT/Ha as indicated in FAOSTAT (2015). Rice was a priority crop under the previous administration's ATA, and the increase in paddy production from 4.8 million MT in 2013 can be attributed to rice production intensification through dry season rice farming under the Agricultural Transformation Agenda (ATA). According to Context and Sahel Capital (2016), despite the ATA focus on the rice value chain, rice yields in Nigeria are well below other regional producers and among the lowest in Africa (Figure 2.3). Smallholder farmers, who dominate the production of paddy rice, generally neither utilize good agronomic practices nor improved inputs, accounting in large measure for low yields. Rice can be grown year-round in Nigeria, with the use of irrigation in the dry season, an increasingly popular practice in the north. Paddy production occurs in three main systems: rainfed lowland (47% of national area and 53% of national production); rain fed upland (30% of national area and 17% of national production); and irrigated lowland (17% of national area and 27% of national production). The 6% balance in total national production is shared between mangrove swamps and flooded areas in the north and south.



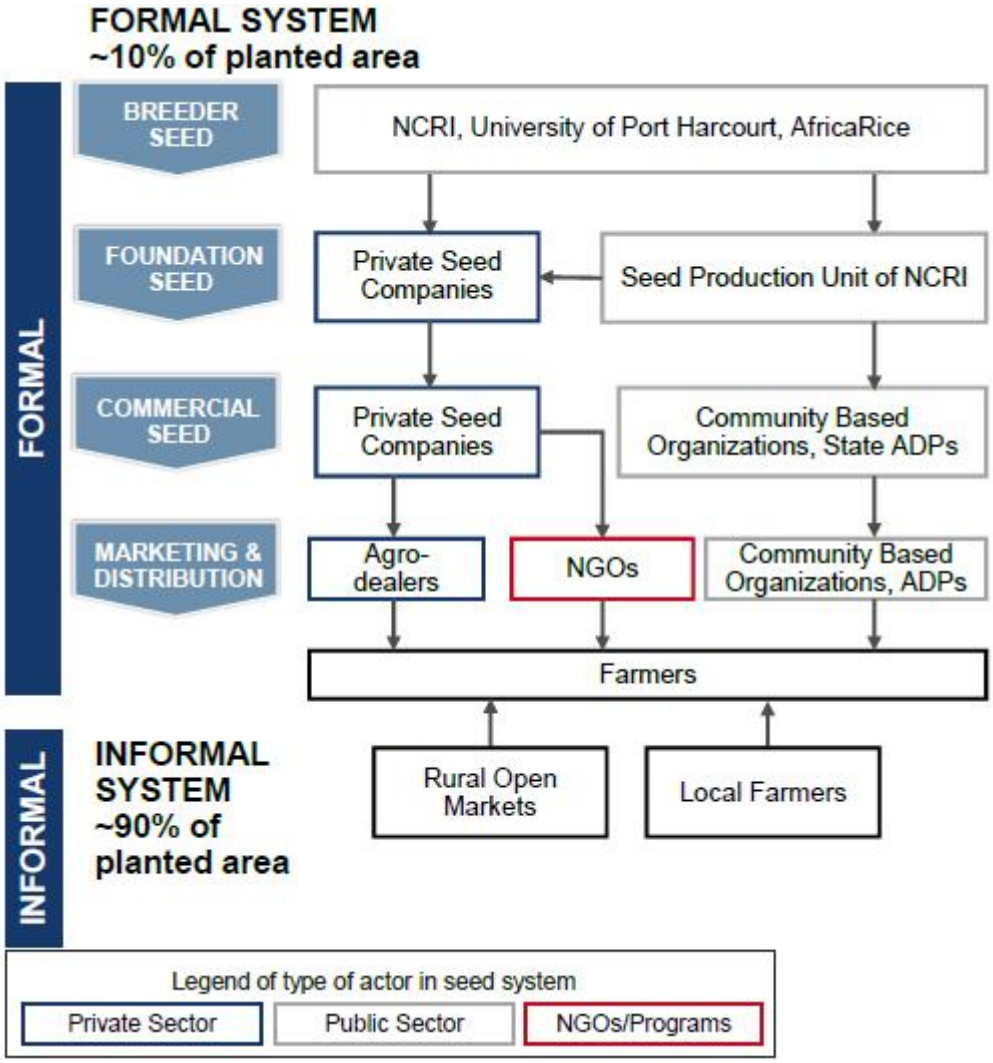
Source: Context and Sahel Capital (2016)

Figure 2.3: Rice Yield and Production Quantity

According to USDA Economic Research Service (2014), rice is an important food source for all households, regardless of lifestyle, and it is easier to prepare than staples such as yam, cassava, millet, and sorghum. In 2014, demand for milled rice in Nigeria was estimated at 5.4 million MT. However, only an estimated 3.8 million MT of milled rice was produced locally, leading to a demand-supply deficit of 1.6 million MT that was filled by imports. In 2014, Nigeria was the world's second-largest rice importer after China, importing an estimated 2.4 million MT of milled rice from countries including Thailand and India.

According to USAID Report (2014), majority of locally produced rice is sold to cottage millers and large-scale integrated millers. There are approximately 700 rice mills in Nigeria, which are mainly cottage millers. In 2014, there were 21 integrated rice mills in Nigeria, with a combined

annual capacity of more than 1 million MT. However, they operate below capacity due to a shortage of rice resulting not only from poor yields but from competition with cottage millers who process most of the rice produced by smallholder farmers for rural and peri-urban markets. The integrated mills have relied on imported brown rice to make up for the shortfall in domestic rice. There are also a few large commercial processors that engage in processing local rice such as Ofada and import brown rice to meet specific demand characteristics for local dishes targeting urban consumers. While brown rice is considered more nutritious than Ofada, only a small urban segment consumes brown rice as Ofada. According to Context and Sahel Capital (2016), in rice seed system, only 10% of rice-planted area is supported by the formal seed system, while 90% is planted with seeds sourced through informal means such as open markets, farmer-saved seed, and farmer exchanges, is responsible for the production of breeder seeds while the private sector plays a key role in subsequent multiplication and distribution of seeds, as shown in figure 2.4.



Source: Context and Sahel Capital (2016)

Figure 2.4: Structure of rice seed systems.

Context and Sahel Capital (2016) further asserted that National Cereals Research Institute, NCRI is responsible for genetic improvement, varietal maintenance, and breeder seed production of rice in Nigeria. With support from NASC and AfricaRice, NCRI has access to national, regional, and international gene banks for the development of new varieties. The National Crop Variety Registration and Release Committee under National Agricultural Seed Council, NASC is responsible for the evaluation, release, and withdrawal of varieties. AfricaRice works in partnership with NCRI, NASC, and Federal Ministry of Ariculture and Rural Development,

FMARD's rice value chain team to produce breeder seeds of new varieties. A few universities that have breeding capabilities, such as the University of Port Harcourt, Rivers State, also partners with NCRI and AfricaRice to produce new rice varieties under donor-funded initiatives. The informal system plays a large and important role in seed distribution because the formal system cannot meet current EGS and certified seed demand. As with many other crops, the informal system is dominated by farmer-saved seed. However, farmers also obtain seeds from grain sellers in rural open markets and neighboring farmers when their saved seeds are not sufficient for planting. In addition, farmers fall back on saved seeds and grains from local markets when donor-supported community-based intervention programs that distribute free seeds through ADPs are not available. This is particularly common in the north.

2.4 Analytical Literature

2.4.1 Modified Gender Equity Index (MGEI)

The Gender Equity Index (GEI) was launched by Social Watch in 2007 and is aimed at helping to promote gender equity and the autonomy of women, which is the third Millennium Development Goal. The GEI has been used in research (Costantini & Monni, 2009). The index consists of three dimensions—the gap in education, the gap in economic activity and the gap in empowerment. The Gender Equity Index (GEI) investigates the gap in achievements across gender by taking the ratio of performance in each dimension. It focuses on socio-economic opportunities. In contrast to the Gender Development Index (GDI) and thus like the Gender Equity Model (GEM), it introduces political empowerment in addition to education and economic participation (Social Watch, 2005). Institutions such as the World Bank or the Global Development Network have used this new index extensively. The GEI was designed to identify inequity solely towards women. The way the GEI is formulated has one drawback which

impedes its contribution to raising awareness about human rights in that it only reveals inequity towards women and does not consider those situations where women are relatively better off than men, i.e., inequity towards men (Social Watch, 2006). As a result, the index conflicts with the aims for which it was created. GEI values range from 0 (inequity) to 1 (equity). However, in those situations where the percentage of women (numerator) is greater than the percentage of men (denominator), and the value of the ratio is thus greater than unity, Social Watch equals the gap to 1(Hanefeld, 2008). The greater the denominator with respect to the numerator, the greater the inequity towards women. Furthermore, if the numerator and the denominator coincide, i.e., if the gap is equal to unity, the proportions are maintained and consequently, there is no gender gap, i.e., a situation of equity is reached. However, in those situations where the numerator is greater than the denominator, and therefore the value of the gap is greater than unity (which is possible from an algebraic point of view), Social Watch truncates the result obtained and the value of the gap then equals 1 (Hanefeld, 2008).

However, the methodological proposal for calculating the gender gaps between women and men for the GEI dimensions, termed the modified Gender Equity Index (MGEI), considers situations of gender inequity that are unfavourable towards men and women, applying a methodological change to the definition of the gender gap for the three GEI dimensions, the MGEI identifies and highlights the different areas of inequities between gender groups. It is aimed at comparing the proportions of women and men with a particular characteristic (c) in absolute terms (difference PWc− PMc), standardising the result so that the "modified gap" (MGap.c) is defined as follows (Fernández-Sáez *et al.,* 2013):

$$\boldsymbol{MGap_c} = \frac{\boldsymbol{Pw_c - Pm_c}}{\boldsymbol{Pw_c + Pm_c}} \qquad \text{eqn. } \mathbf{(2.1)}$$

The proportions have values of between 0 and 1, from which it results that: − (Pwc + Pmc) ≤ Pwc− Pmc≤ Pwc + Pmc, whilst dividing by Pwc + Pmc results in − 1 ≤ MGap. c ≤ 1. The GEI values are positive, and vary between 0 (gender inequity towards women) and 1 (gender equity), whereas the interpretation of the modified gap is the following:

- If MGap.c = 0, the numerator of the gap equals 0, with both proportions coinciding, and a situation of EQUITY is reached, since there is no disparity between women and men for the characteristic c.
- If MGap.c = -1, then Pwc-Pmc = - (Pwc+Pmc) and therefore Pwc =0, this indicates a situation of MAXIMUM INEQUITY towards women. Negative gap values reflect the existence of inequity towards women, and the closer the gap is to -1, the greater this inequity becomes.
- If MGap.c = 1, then Pwc-Pmc = Pwc+Pmc and consequently, Pmc=0, indicating a situation of MAXIMUM INEQUITY towards men. Positive gap values reveal the existence of inequity towards men, which increases the closer the gap value, is to 1.

Moreover, interpreting the gap in absolute terms enables the distance between both genders to be measured: gap values close or equal to 0 indicate an absence of distance (equity), whereas the closer the values become to unity, the greater the gap between both genders for the characteristic considered (inequity).

Once the gender gap has been calculated, the GEI is calculated as the arithmetic mean of the 3 gaps:

$$GEI = \frac{\text{Empowerment:Gap} + \text{Economic:Activities.Gap} + \text{Education:Gap}}{3} \qquad \text{eqn. (2.2)}$$

For social watch GEI values: 0(inequity), -1(gender equity); while for modified GEI values: -1 (women inequity), 0 (equity), 1 (men inequity). The values of the MGEI show greater dispersion than those of other indices, indicating that the proposed method is a more accurate tool for identifying situations of inequity, as reported by Social Watch (2008).

2.4.2 Calculation of Value Added

The value added for each step of the chain as well as the overall value added of the entire chain are calculated and interpreted as the creation of economic wealth by one or more productive activities (FAO 2005). The amount of total value added measures the contribution of the commodity chain to Gross Domestic (or National) Product" (FAO 2005). The calculation of the value-added (VA) is defined as:

$$VA = Y - II \qquad \text{eqn. (2.3)}$$

Where,

II is the value of the intermediate inputs used in the productive activities,

Y is the value of the output.

VA is the value added.

The difference represents the value-added from an individual agent *j*. Thus, to calculate the value added, all costs and sales for the relevant stages must be measured. In addition, the underlying product and input prices are essential. Hence, financial and economic analyses differ in the underlying price. While financial analysis is based on actual market prices, economic analysis is based on shadow prices. Consequently, if there are any price distortions, the financial analysis will reflect those. The overall value added is the following:

$$\mathbf{VA_{CHAIN} = Y_{CHAIN} - II_{CHAIN} = \sum VA_{AGENTS}} \qquad \text{eqn. } \mathbf{(2.4)}$$

Now it is possible to identify which stage contributes to the highest share of the value added, which stage to the lowest, and if there is an overall positive value added. Thus, another possibility of calculating the value-added is the following:

$$VA = (GP - d) + w + s + i + t \qquad \text{eqn. (2.5)}$$

Where w is the return of labor and social payments. i is the interest charges. **t** is the government administration the taxes. GP is the gross profit. d is the depreciation. S is the wage and salaries. Based on the results of value added, other indicators of the financial probability, the overall efficiency of the chain, the processes of price determination, and transfers between agents can be identified (FAO 2005). Details on indicators for financial economic value chain analysis are provided in the modules of the FAO (2005). After calculating the creation and distribution of the value added among the agents, the next step is the economic impact analysis. It includes the investigation of upstream induced effects of productive activities because of the demand for intermediate inputs from the rest of the national economy. In this part of the analysis, the chain is viewed as an integral part of the national economy similar to input-output analysis. Indicators are built to evaluate the chain's impact on growth and income in terms of chain distribution to developmental policy objectives (FAO 2005). Here the impact on the four targets can be calculated: (a) agents, (b) government, (c) foreign exchange rate, and (d) economic growth (FAO, 2005). The value added - now calculated by shadow prices -is again the basis to compute the indicators for economic growth.

2.4.3 Stochastic Meta-frontier Approach in Measuring Resource Use among Value Chain Actors

Resource use efficiency refers to the ability to achieve maximum output or productivity while minimizing the use of resources. It involves utilizing inputs such as land, labor, capital, and technology in a way that optimizes productivity, reduces costs, and maximizes profitability.

Some of the key aspects of resource use efficiency are: Technical efficiency, Allocative efficiency and Economic efficiency.

Technical efficiency (TE) is the measure of the farms success in producing maximum output from a given set of resources or is the ability of producing a given level of output with a minimum quantity of inputs under a given technology. Technical efficiency is defined as the ratio of the observed output (Y) to the corresponding frontier output (Y*) conditional on the levels of inputs used by the firm. Two prominent methods of analyzing technical efficiency are: Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA), Gamayina *et al,* (2020). This study will determine TE of actors using the stochastic metafrontier approach.

Allocative efficiency is the ability of the farmer to use the inputs in optimal proportions given their respective prices and the production technology. Economic efficiency is the product of the technical and allocative efficiencies (Edet *et al*, 2018). Improving the resource-use efficiency is most important means of increasing the output of the products especially for poor farmers who are responsible for the bulk of the consumed in the nation (Goni, *et al.* 2013 and Abdulkadir, & Umar, 2015). An input is said to be efficiently utilized when it is put to the best possible use at the lowest possible cost and quantity (Tambo and Theresa, 2010).

The stochastic meta-frontier approach is an extension of meta-production function model. The stochastic meta-frontier method is the best option for groups (value chain actors) that have differences in technology. Meta-frontier function is an envelope of the stochastic frontiers of the different groups says male and female, such that it is defined by all observations in the different groups in a way that is consistent with the specifications of a stochastic frontier model (Battese & Rao, 2002). The approach involves estimating of stochastic frontier for each of the two groups (that is, one with female actors and the other with male actors); performing Likelihood Ratio (LR) tests to determine whether the technological difference between the two categories is statistically significant; constructing meta-frontier if the test indicates significant difference; estimating Technology Gap Ratio (TGR) and Technical Efficiency Ratio (TER), and estimate a multivariate regression model to verify the determinants of technical efficiency. The model is used to measure technical efficiency ratios as well as technology gap ratios in a group, as male and female actors may not have the same level of technology and hence efficiency.

The stochastic meta-frontier model is stated as (Addison, Ohene-Yankyera & Fredua-Antoh (2016); Coelli *et al*. (2005); Battese & Rao, 2002):

$$\boldsymbol{Y_{ij} = f(x_{ij}, \beta_j) e^{v_i - u_i}} \qquad \text{eqn. (2.6)}$$

The equation (2.6) is an exponential function, and to make the parameters estimable, the natural logarithm of both sides of the equation is taken, expressed as:

$$\boldsymbol{lnY_{ij} = \beta_0 + \sum_{i=1}^{n} \beta_j \, lnx_{ij} + v_i - u_i} \qquad \text{eqn. (2.7)}$$

Where,

Y_{ij}= output of the ith actor for jth gender

X_{ij}= Vector of inputs of the ith actors for the jth gender

$\boldsymbol{v_i}$ = systematic random error that accounts for measurement error and other factors that are not under the control of the actors

U_i = asymmetric non-negative random error component that measures technical efficiency effects.

$\boldsymbol{\beta_j}$ = Vector of parameters to be estimated.

However, the stochastic metafrontier function has three ratios, namely, the technology gap ratio (TGR), the random error ratio (RER) and the technical efficiency ratio (TER), stated as:

$$\boldsymbol{TGR_i} \equiv \frac{e^{x_i\beta}}{e^{x_i\beta^*}} \equiv \boldsymbol{e^{-x_i(\beta^*-\beta)}} \qquad \text{eqn. (2.8)}$$

The technology gap ratio has values between zero and one, and measures the ratio of the output for the frontier production function for the jth group relative to the potential output defined by the metafrontier function, given the observed inputs.

$$\boldsymbol{RER_i} \equiv \frac{e^{V_i}}{e^{V_i^*}} \equiv \boldsymbol{e^{V_i-V_i^*}} \qquad \text{eqn. (2.9)}$$

$$\boldsymbol{TER_i} \equiv \frac{e^{-U_i}}{e^{-U_i^*}} \equiv \frac{\boldsymbol{TE_i}}{\boldsymbol{TE_i^*}} \qquad \text{eqn. (2.10)}$$

The technical efficiency (TE_i) of the jth gender group can be computed using the expression stated as:

$$\boldsymbol{Y_i} = \boldsymbol{e^{-U_{i(j)}}} \times \frac{\boldsymbol{e^{x_i\beta_j}}}{\boldsymbol{e^{x_i\beta^*}}} \times \boldsymbol{e^{x_i\beta+V_{i(j)}}} \qquad \text{eqn. (2.11)}$$

Therefore,

$$\boldsymbol{TE_i} = \frac{\boldsymbol{Y_i}}{\boldsymbol{e^{x_i\beta_{(j)}+V_{i(j)}}}} = e^{-u_{i(j)}} \qquad \text{eqn. (2.12)}$$

Where,

TE_i= Technical efficiency

Y_i is the observed output.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The study was conducted in three states in the South-East known for production, processing and marketing of rice. It comprised Anambra, Ebonyi and Imo State. Anambra state lies in the humid tropical agro-ecological zone of Nigeria within Latitudes 6º45' and 5º44' and Longitudes 6º36' and 7º29'. Anambra State consists of twenty-one LGAs and four agricultural zones. It has a population of about 4,177,828 persons and land area of 4,865km^2 ((National Bureau of Statistics, NBS, 2011). It has two dominant season seasons which are: the rainy and dry season, with an annual temperature of 23º-33ºC. Farming is the predominant occupation of the people and, the major crops cultivated are: cassava, yam, rice, maize and leafy vegetables. The livestock reared include sheep, goats, cattle, fishes, pigs and poultry.

Ebonyi state lies in the humid tropical agro-ecological zone of Nigeria within Longitudes 7º30ˈE and 8º30ˈE and Latitudes 5º40ˈN and 6º45ˈN (Onyeabor, 2022). It has a land area of 5,935 km2 with a projected population of 2,253,140 persons (National Population Commission, 2006). It is delineated into three agricultural zones. There are thirteen Local Government Areas (LGAs) in the state. It has two dorminant seasons which are rainy season between April and October and dry season which occur between November and March. Mean annual temperature stands at 28ºC with average rainfall of 1200mm - 2500mm (Onyeneke, et. al., 2020). The soil of Ebonyi state is mostly clayey and loamy soil. The clayey swampy soil is suitable for rice farming. Ebonyi is primarily an agriculture producing region. It is a leading producer of rice, yams, potatoes, maize, beans, and cassava. The livestock reared include poultry, pigs, sheep and goats

Imo State has a population of 3,927,563 people and a land area of 5,430 km^2 (National Bureau of Statistics, NBS, 2011). The state is divided into three Agricultural zones namely: Owerri, Orlu and Okigwe with twenty-seven Local Government Areas (LGAs). It lies within Latitude 4°45' and 7°15'N and Longitudes 6°50' and 7°25'E. The state has two dorminant seasons: dry and rainy seasons. The annual rainfall is between 1500 – 2500mm while the annual temperature is between 26 – 28°C with a relative humidity of about 90% during the rainy season (NBS, 2011). Agriculture is the major economic activity of the people, although a few are civil servants, business people and artisans. Mixed cropping is widely practiced with oil palm, raffia palm, cassava, rice, yam, maize, cocoyam, melon as their major crops. The livestock reared include sheep, goats, fishes, pigs and poultry. Table 3.1 shows the agricultural zone, Local Government Areas, and Communities selected for the study. Also fig 3.1 shows the map of the study area.

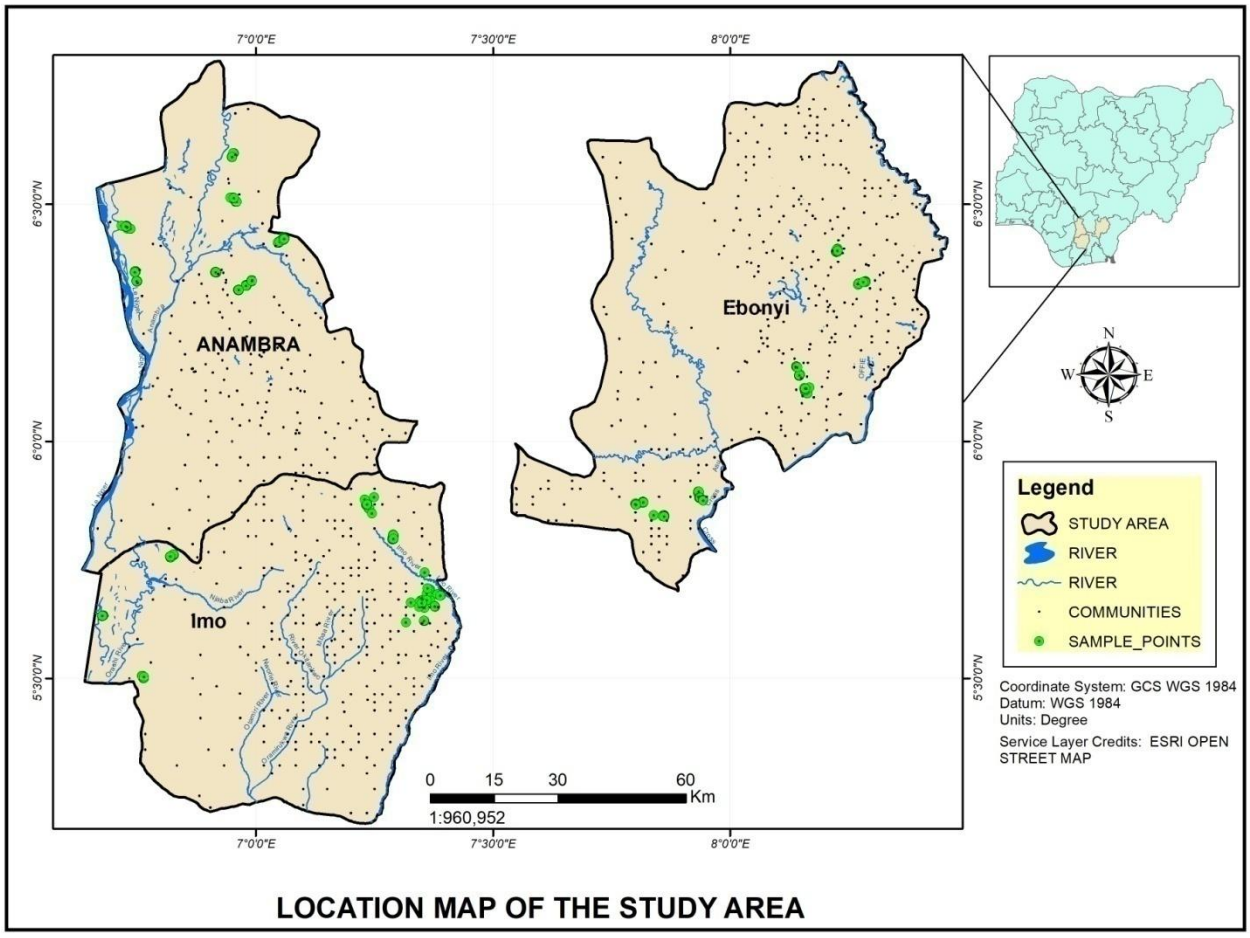


Fig 3.1: Map of Nigeria Showing the location of the Study Area

Table 3.1: Survey States, Agricultural Zones, Local Government Areas and Communities

State	Agricultural Zone	Local Government Area	Communities
Anambra	Akwa	Awka North	Awba Ofemili/Ugbenu, Achalla
		Ayamelu	Ifitte Ogwari/Umumbo,
			Omor/Omasiri
	Anambra	Anambra East	Igbariam/Umueri, Aguleri
		Anambra West	Nzam/Umudora, Umuenwerem
Ebonyi	Ebonyi North	Izii	Nwezenyi, Iboko/Ndieze
		Ikwo	Ndufu Echara, Ndufu Alike
	Ebonyi South	AfikpoNorth	Ohaisu, Nkpoghoro
		Afikpo South	Oso Edda, Amangwu Edda
Imo	Owerri	Oguta	Egbuoma/Egwe, Akiri/Eziorsu
		Ohaji/Egbema	Mmahu, Asaa/Obile
	Okigwe	Ihitte/Uboma	Onicha Uboma, Ezimba/Uzinomii
		Okigwe	Ndiakem/Agbogwu/Umulolo,
			Ezenachi/Ndianaeze/Amauro

Source: Authors Compilation

3.2 Sampling Techniques

The multi-stage sampling technique was used in the selection of the sample. The respondents are youth producers (farmers), processors and marketers of rice and were randomly selected for the study. In the first stage, 2 agricultural zones were purposively chosen from each of the selected states giving a total of 6 agricultural zones. The second stage involved purposive selection of 2 Local Government Areas (LGAs) from each of the selected agricultural zones giving a total of 4 LGAs for each state and 12 LGAs for the three states. In the third stage, 2 communities from each of the selected LGAs were randomly selected giving a total of 8 communities for each state and 24 communities for the three states. In the fourth stage, 2 villages were selected from each of the selected communities giving a total of 16 villages for each state and 48 villages for the three states.

To ensure representativeness of the sample, a pre-survey sampling frame was determined by compiling lists of male and female youth rice producers, processors and marketers in the selected villages in the 3 states. The age bracket of youth (18 - 35years) was used for this study. The lists of youth rice producers, processors and marketers were compiled by the Agricultural Extension Officers at the Local Government Areas, Market Heads and Traders Association. The lists put together served as the sampling frame from which the sample was drawn. The Sample frame was stratified into different actors which gave a sample frame of 282 youth households who are producers, 128 processors and 211 youth marketers across the chains. Finally, a stratified random sampling was then employed to select 212 youth producers, 86 youth processors and 178 youth marketers for the study. These gave a sample size of 476 youth actors.

3.3 Data Collection

The study used both primary and secondary data. A pretest of the questionnaires was conducted. The pretest is designed to provide clarity of the questionnaires, estimate the time needed to apply the questionnaire per respondent and test for additional information needed to be included to the questionnaires. During the pretest, interviews were held with rice value chain actors on some aspects of the study. It was observed that rice producers were harvesting their crops. We were able to take photograph of their rice farms (see appendix). Based on the information derived, the questionnaire for the final survey was developed.

The field survey was conducted between December 2020 and January 2021. Agricultural Extension Agents and five enumerators were involved in the data collection. The enumerators were trained extensively to carry out the field survey. The purpose of the survey was discussed with the enumerators. Each of the questions was also discussed in detail including translation in the local language.

The primary data were collected with the aid of structured questionnaires coded into electronic tablet software (Surveybe). The questionnaires were grouped based on the value chain actors and objectives of the study. The variables in the data include, socioeconomic characteristics of the respondents, such as gender, age, level of education, household size, membership of cooperatives, number of extension agent visits per annum, distance to actor's node, information access, labour force participation, credit access, value of output, value of intermediate products, capital invested, population of male and female actors in rice value chains. Also, information on inputs and outputs, cost and returns of the respondents were obtained etc. Respondent's consent was obtained before the interview.

3.4 Data Analysis

Data collected were analysed using Functional Analytical tool, Descriptive Statistics, Value Addition, Modified Gender-Equity Index (MGEI), Ordinary Least square (OLS) Multiple Regression Technique, Stochastic Meta-frontier Model and Z-statistics.

Objective (i) was achieved using Functional Analytical tool. This analysis provides an overall description of the value chain system. It identifies the main actors and their roles at each node. The key components in value chain system are the products, actors concerned and functions they fulfill.

Objectives (ii) and (vii) were achieved using descriptive statistics such as mean and percentages. This analysis was used to examine the socioeconomic characteristics of youth rice value chain actors by gender such as age, marital status, household size, educational level, membership to cooperative, access to extension services, access to credit, and years of experience.

Objective (iii) was achieved using Modified Gender-Equity Index (MGEI). The Modified Gender-Equity Index (MGEI) considers situations of gender inequity that are unfavourable towards men and women, applying a methodological change to the definition of the gender gap for the three GEI dimensions. The opportunities will be based on the indicators such as formal training (basic education) gap, access to credit gap and membership of cooperative association. It is aimed at comparing the proportions of women and men with a particular characteristic (i) in absolute terms, stated as in (Fernández-Sáez *et al*, 2013):

$$mGap_{ij} = \frac{Pw_{ij} - Pm_{ij}}{Pw_{ij} + Pm_{ij}} \quad \text{eqn. (3.1)}$$

Where,

$$Pw_{ij} = \frac{W_{ij}}{n_{wj}} \quad \text{eqn. (3.2)}$$

$$Pm_{ij} = \frac{M_{ij}}{n_{mj}} \quad \text{eqn. (3.3)}$$

$mGap_{ij}$ = Gender gap for the ith characteristic for the jth node of the chain

W_{ij}= Number of women with the ith characteristic for the jth node of the chain

M_{ij}= Number of men with the ith characteristic for the jth node of the chain

Pw_{ij}= Proportion of women with ith characteristic for the jth node of the chain

Pm_{ij}= Proportion of men with ith characteristic for the jth node of the chain

n_{wj}= Total number of women for the jth node of the chain

n_{mj}= Total number of men for the jth node of the chain

The proportions have values of between -1, 0 and 1, from which it results that: $-(Pw_i + Pm_i) \leq Pw_i - Pm_i \leq Pw_i + Pm_i$, whilst dividing by $P_{Wi} + Pm_i$ results in $-1 \leq MGap_i \leq 1$.

The GEI values are positive, and vary between 0 (gender inequity towards women) and 1 (gender equity), whereas the interpretation of the modified gap is the following:

i. If $mGap_i = 0$, the numerator of the gap equals 0, with both proportions coinciding, and a situation of equity is reached, since there is no disparity between women and men for the ith characteristic.

ii. If $mGap_i = -1$, then $Pw_i - Pm_i = -(pw_i + pm_i)$ and therefore $pw_i = 0$, this indicates a situation of maximum inequity towards women. Negative gap values reflect the existence of inequity towards women, and the closer the gap is to -1, the greater this inequity becomes.

iii. If $mGap_i = 1$, then $Pw_i - Pm_i = Pw_i + Pm_i$ and consequently, $Pm_i = 0$, indicating a situation of maximum inequity towards men. Positive gap values reveal the existence of inequity towards men, which increases the closer the gap value, is to 1.

Moreover, interpreting the gap in absolute terms enables the distance between both genders to be measured: gap values close or equal to 0 indicate an absence of distance (equity), whereas the closer the values become to unity, the greater the gap between both genders for the characteristic considered (inequity). From this gender gap, the gender-equity index (GEI) will be calculated using the GEI model stated as:

$$\boldsymbol{GEI_j = \frac{\varphi_i + \mu_i + \vartheta_i}{3}} \qquad \text{eqn. (3.4)}$$

Where,

$\boldsymbol{GEI_j}$ = Gender Equity Index for the jth node of the chain

φ_i = Gender gap in formal training (will be determined using equation 3.1)

μ_i= Gender gap in credit access (will be determined using equation 3.1)

ϑ_i = Gender gap in membership of cooperative (will be determined using equation 3.1)

In this case, GEI values -1 implies women inequity (favouring men), 0 (equity opportunities) and 1 entails men inequity (favouring women).

Objectives (iv) was achieved using Stochastic Meta-frontier Model.

Following Addison, Ohene-Yankyera & Fredua-Antoh (2016) and Coelli *et al*. (2005) and Battese & Rao (2002), the stochastic metafrontier model is stated as

$$\boldsymbol{Y_{ij} = f(x_{ij}, \beta_j)e^{v_i - u_i}} \qquad \text{eqn. (3.5)}$$

Equation (3.5) is an exponential function. To make the parameters in equation (3.5) estimable, it is linearized by taking natural logarithm of both sides of the equation expressed as:

$$\boldsymbol{lnY_{ij} = \beta_0 + \sum_{i=1}^{n} \beta_j \, lnx_{ij} + v_i - u_i}$$ eqn. (3.6)

Where,

Y_{ij}= output of the ith actor for jth gender (kg)

X_{ij}= Vector of inputs of the ith actors for the jth gender

v_i = systematic random error that accounts for measurement error and other factors that are not under the control of the actors

U_i = asymmetric non-negative random error component that measures technical inefficiency effects.

β_j = Vector of parameters to be estimated.

At production Node:

Y_{ij}= Output of the ith actor for jth gender (kg)

X_1 = farm size of the ith actor for the jth gender (hectares)

X_2 = labour employed by the ith actor for the jth gender (mandays)

X_3 = cost of planting material (intermediate product) for the jth gender (naira)

X_4 = cost of agrochemicals incurred by the ith actor for the jth gender (naira)

X_5 = capital inputs (depreciation on farm tools/implements) incurred by the ith actor for the jth gender (naira)

At Processing Node:

Y_{ij}= Output of the ith actor for jth gender (kg)

X_1 = rent paid by the ith actor for the jth gender (naira)

X_2 = labour employed by the ith actor for the jth gender (mandays)

X_3 = cost of intermediate products incurred by the ith actor for the jth gender (naira)

X_4 = cost of preservatives, storage and other operational costs (fuel, electricity bill, etc) incurred by the ith actor for the jth gender (naira)

X_5 = capital inputs (interest on loan) incurred by the ith actor for the jth gender (naira)

At Marketing Node:

Y_{ij}= Sales of the ith actor for jth gender (kg)

X_1 = rent paid by the ith actor for the jth gender (naira)

X_2 = Handling costs (including costs of loading and off-loading) incurred by the ith actor for the jth gender (naira)

X_3 = cost of intermediate products (amount of purchased) by the ith actor for the jth gender (naira)

X_4 = cost of preservatives, storage and other operational costs incurred by the ith actor for the jth gender (naira)

X_5 = capital inputs (interest on loan) incurred by the ith actor for the jth gender (naira)

However, the stochastic metafrontier function has three ratios, namely, the technology gap ratio (TGR), the random error ratio (RER) and the technical efficiency ratio (TER), stated as:

$$\boldsymbol{TGR_i \equiv \frac{e^{x_i\beta}}{e^{x_i\beta^*}} \equiv e^{-x_i(\beta^*-\beta)}} \qquad \text{eqn. (3.7)}$$

The technology gap ratio has values between zero and one and measures the ratio of the output for the frontier production function for the jth group relative to the potential output defined by the metafrontier function, given the observed inputs.

$$\boldsymbol{RER_i \equiv \frac{e^{V_i}}{e^{V_i{}^*}} \equiv e^{V_i - V_i^*}} \qquad \text{eqn. (3.8)}$$

$$\boldsymbol{TER_i \equiv \frac{e^{-U_i}}{e^{-U_i{}^*}} \equiv \frac{TE_i}{TE_i^*}} \qquad \text{eqn. (3.9)}$$

The technical efficiency (TE_i) of the jth gender group can be computed using the expression stated as:

$$\boldsymbol{Y_i} = \boldsymbol{e^{-U_{i(j)}}} \times \frac{\boldsymbol{e^{x_i\beta_j}}}{\boldsymbol{e^{x_i\beta^*}}} \times \boldsymbol{e^{x_i\beta+V_{i(j)}}} \qquad \text{eqn. (3.10)}$$

Therefore,

$$\boldsymbol{TE_i} = \frac{\boldsymbol{Y_i}}{\boldsymbol{e^{x_i\beta_{(j)}+V_{i(j)}}}} = e^{-u_{i(j)}} \qquad \text{eqn. (3.11)}$$

Where,

TE_i= Technical efficiency

Y_i is the observed output.

To measure the determinants of technical efficiency, an inefficiency model is specified which relates inefficiency to a vector of socioeconomic variables including gender and input used. The model is stated as:

$$\boldsymbol{U_{ij}} = \boldsymbol{\delta_0} + \sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} \boldsymbol{\delta_j Z_{ij}} + \boldsymbol{\varepsilon_i} \qquad \text{eqn. (3.12)}$$

Where,

$\boldsymbol{U_{ij}} =$ asymmetric non-negative random error component that measures technical inefficiency effects for the jth gender and the i^{th} actor.

$\boldsymbol{U_{ij}}$ = 1, for male producers in rice value chain,

2 for female producers in rice value chain,

3 for male processors in rice value chain,

4 for female processors in rice value chain,

5 for male marketers in rice value chain, and

6 for female marketers in rice value chain.

For Producers

Z_{ij} = vector of socioeconomic variables.

Z_1= Age (years)

Z_2= Level of education (years)

Z_3= Marital Status (Dummy, 1 = Married, 0 = Single)

Z_4= Household size (Number of persons)

Z_5= Experience in value addition (years)

Z_6= Membership of cooperative (dummy, member =1, non-member =0)

Z_7= Extension contact (Number of visits per annum)

Z_8= Source of labour (Dummy, 1 = Hired, 0 = Family)

Z_9= Capital (Naira)

Z_{10}= Farm Size (Ha)

δ_0 and δ_j = Parameters to be estimated

ε_i = error term.

For Processors and Marketers

Z_{ij} = vector of socioeconomic variables.

Z_1= Age (years)

Z_2= Level of education (years)

Z_3= Household size (Number of persons)

Z_4= Experience in value addition (years)

Z_5= Access to credit (Dummy, 1 = access, 0 = otherwise)

Z_6= Membership of cooperative (dummy, member =1, non-member =0)

Z_7= Extension contact (Number of visits per annum)

Z_8= Distance to actor's node (km)

Z_9= cost of intermediate product (naira)

δ_0 and δ_j = Parameters to be estimated

ε_i = error term.

Objective (v) was achieved using Value Addition and Percentage-Share Index. The value added by gender for each node of the chain was calculated using Value Addition model, stated as (FAO, 2005):

$$\boldsymbol{VA_{ij} = Y_{ij} - U_{ij}} \qquad \text{eqn. (3.13)}$$

Where,

VA_{ij} =Value added by the ith actor for the jth node

Y_{ij}= value of output of the ith actor for the jth node

U_{ij}= Value of intermediate input of the ith actor for the jth node

Thus, to calculate the value added, all costs and sales for the relevant stages have to be measured. In addition, the underlying product and input prices are essential. This also identify the gender that contributed to the highest share of value added for each node, and which node contributed to the lowest if there is an overall positive value added. However, the overall value added was calculated using the model stated as (FAO, 2005):

$$\boldsymbol{VA_{chain} = Y_{chain} - U_{chain} = \sum_{i=1}^{n} VA_{actors}} \qquad \text{eqn. (3.14)}$$

Objective (vi) was achieved using Multiple Regression technique. The effects on value added by gender were estimated for each node of the chain. The model is stated implicitly as:

$$\boldsymbol{Q_{i1} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, e_1)} \qquad \text{eqn. (3.15)}$$

$$\boldsymbol{\partial_{i2} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, e_2)} \qquad \text{eqn. (3.16)}$$

$$\boldsymbol{Q_{i2} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, e_1)}$$ eqn. (3.17)

$$\boldsymbol{\partial_{i2} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, e_2)}$$ eqn. (3.18)

$$\boldsymbol{Q_{i3} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, e_1)}$$ eqn. (3.19)

$$\boldsymbol{\partial_{i3} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}\, e_2)}$$ eqn. (3.20)

Where,

$Q_{i1} - Q_{i3}$= Value Added by female actors (naira)

$\partial_{i1} - \partial_{i3}$ = Value added by male actors (naira)

X_1= Age (years)

X_2= Educational Level (years)

X_3= Household size (Number of persons)

X_4= Experience in value addition (years)

X_5= Access to credit (Dummy, 1 = access, 0 = otherwise)

X_6= Membership of cooperative (dummy, member =1, non member =0)

X_7= Extension contact (Number of visits per annum)

X_8= Distance to actor's node (km)

X_9= Capital invested (Naira)

X_{10} = Information access (Number of information sources which the farmer has access)

X_{11}= cost of intermediate product (naira)

e_1 and e_2= error terms

The four functional forms of the multiple regression model namely: Linear, Semi-log, Double-log and Exponential were fitted to select the lead equation on the basis of statistical and econometric criteria.

3.4.1 Tests of Hypotheses

Hypothesis (i) which stated that Gender opportunities in rice value chain are not equitably distributed was tested from the results of objective (iii). Decision rule was to reject the null hypothesis if the Modified Gender Equity Index (MGEI) value equals 0 and accept the null hypothesis if the MGEI value is negative (inequity towards female) or positive (inequity towards male).

Hypothesis (ii) which stated that value added by male and female actors at each nodes are not significantly different along rice value chain was tested using the Z-statistics. The model is stated as:

$$Z = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \qquad \text{eqn. (3.21)}$$

Where,

Z = the value for judging the significance in value added by male and female actors

$\overline{X_1}$ = Mean of value added by female actors

$\overline{X_2}$= Mean of value added by male actors

S_1^2= Variance of the value added by female actors

S_2^2 = Variance of the value added by male actors

n_1 = number of female actors

n_2 = number of male actors

The computed Z-values were compared with the tabulated Z-values at 5% level of significance. Decision rule was to reject the null hypothesis if the Z-calculated value is greater than the Z-tabulated value and accept the null if otherwise.

Hypothesis (iii) which stated that male and female actors are not technically efficient along the rice value chain was realized from the results of objective (iv). Decision rule was to reject the null hypothesis if TE = 1 (the gender actors are technically efficient), and accept the null hypothesis if TE < 1 (the gender actors are technically inefficient) or if TE > 1 (the gender actors are technically inefficient).

Hypothesis (iv) which stated that socioeconomic factors of rice producers do not significantly affect value added along the rice value chain was tested from the results of multiple regression analyses carried out to achieve objective (vi). The computed t-ratios were compared with the tabulated t-ratios at 5% and 1% alpha levels and n-k degrees of freedom to test the hypothesis. Decision rule was to reject the null hypothesis if the t-computed value is greater than the t-critical values at either 5% and 1% and accept the null if otherwise.

CHAPTER FOUR

RESULTS AND DISCUSION

This section presents the descriptive and analytical findings of the research carried out in this study.

4.1 Functional Analysis of Youth Actors in Rice Value Chain by Gender

Table 4.1 shows the functional analysis of actors in rice value chain by gender

Table 4.1: Functional Analysis of Actors in Rice Value Chain by Gender

Value Chain Actors	Functions Male	Female	Agents	Outputs
Producers	Cultivation/ Production	Cultivation/ Production	Smallholder farmers, Millers (backward integration)	Paddy Rice
Processors	Processing (parboiling, milling, further processing)	Processing (parboiling, milling)	Village and clustered parboilers, millers, Village and clustered millers, Integrated rice mills	Parboiled rice, Basic milled rice, Polished, sorted and de-stoned rice
Marketers	Trade, Storage, Transportation	Trade, Storage, Transportation	Wholesale and Retail traders, Transporters	Rice delivered to city Markets

Source: Computed from Field Survey, 2021

a. Producers

The table shows that for the rice producers, the role of the males include rice cultivation/production, while the females are also involved in cultivation/production of rice. The output of rice production is paddy rice.

b. Processors

For the rice processors, the roles of the males include processing (parboiling, milling, and further processing) while the role of the females include processing (parboiling, milling, further processing). The agents that assist the processors are village and clustered parboilers, village and clustered millers, and integrated rice mills. The outputs of rice processing are parboiled rice, basic milled rice, and polished sorted rice.

c. Marketers

For the rice marketers, the roles of the males include marketing, storage and transportation, while the role of the females includes marketing, storage and transporting. The agents involved in rice marketing are wholesalers and retailers and transporters. The output of rice marketing is rice delivered to city marketers.

4.2 Socioeconomic Characteristics of Youth Rice Value Chain Actors by Gender

4.2.1 Age of Actors

The distribution of youth rice value chain actors by age is presented in Table 4.2.

Table 4.2: Distribution of Rice Value Chain Actors by Age (Years)

	Male		**Female**	
Actor's Age Range	Frequency	Percentage(%)	Frequency	Percentage(%)

Producers	11 – 20	4	3.77	2	1.89
	21 – 30	22	20.76	31	29.25
	31 – 40	80	75.47	73	68.87
	Total	**106**	**100.00**	**106**	**100.00**
	Mean	**35**		**35**	
Processors	11 – 20	0	0	4	9.30
	21 – 30	9	20.93	13	30.23
	31 – 40	34	79.07	26	60.47
	Total	**43**	**100.00**	**43**	**100.00**
	Mean	**35**		**33**	
Marketers	11 – 20	4	4.49	7	7.87
	21 – 30	25	28.09	42	47.19
	31 – 40	60	67.42	40	44.94
	Total	**89**	**100.00**	**89**	**100.00**
	Mean	**34**		**31**	

Source: Computed from Field Survey, 2021

The results in Table 4.2 represent the age distribution of youth rice value chain actors sampled in the study area. Results indicate that 75.47% of male rice producers are within the age bracket of 31-40 years while 68.87% of female rice producers are also within the same age range. Equally, 79.07% male rice processors and 60.47% female rice processors are within the same age range 31-40 years. Similarly, 67.42% of male rice marketers are within the age of 31-40 years while 47.19% female rice marketers are within the age of 21-30 years. The majority of youth engaged in rice production, processing, and marketing in the study area fall within the age range of 31-40

years. This suggests that individuals in their 30s are actively participating in various stages of the rice value chain and it also indicate a potential for sustained involvement in the rice value chain. This age group may have the energy, experience, and capacity for long-term engagement in the industry. The mean age for male and female rice producers was 35years. Male rice processors also had mean age of 35years while female processors were 33years. The mean age for male and female rice marketers were 34 and 31 years respectively. The finding agrees with Adam & Bidoli (2018) that majority of rice processors involved in the Agricultural Transformation Agenda Support Program in Kebbi State were between the age bracket of 31-40 years implying that they were within their active age.

4.2.2. Marital Status

The distribution of youth rice value chain actors by marital status is presented in Table 4.3.

Table 4.3: Distribution of Rice Value Chain Actors by Marital Status

	Producers				**Processors**				**Marketers**			
Marital	**Male**		**Female**		**Male**		**Female**		**Male**		**Female**	
Status	Freq	%	freq	%	Freq	%	Freq	%	Freq	%	freq	%
Married	83	78.30	102	96.23	36	83.72	34	79.07	58	65.17	65	73.03

Single	23	21.70	4	3.77	7	16.28	9	20.93	31	34.83	24	26.97
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**

Source: Computed from Field Survey, 2021

Results in Table 4.3 show that 78.30% male and 96.23% female youth rice producers were married with only 21.70% male and 3.77% female of the youth rice producers/farmers single. Also, 83.72% male and 79.07% female youth rice processors were married with only 16.28% male and 20.93% female youth rice processors single. Likewise, 65.17% male and 73.03% female youth rice marketers were married with 34.835 male and 26.97% female youth rice marketers single respectively. Therefore, the finding suggests that majority of youth rice actors engaged in rice production, processing and marketing are married. The high percentage of married individuals among rice producers, processors, and marketers implies that a significant portion of youth engaged in the rice value chain have family commitments. This could influence their decision-making processes and availability for work to enhance their productivity and sales.

4.2.3 Household Size

The distribution of youth rice value chain actors by household size is presented in Table 4.4.

Table 4.4: Distribution of Rice Value Chain Actors by Household Size

	Producers				**Processors**				**Marketers**			
Household	**Male**		**Female**		**Male**		**Female**		**Male**		**Female**	
Size	freq	%	Freq	%	Freq	%	freq	%	freq	%	freq	%
1 – 5	35	33.02	45	42.45	18	41.86	16	37.21	30	33.71	35	39.33

6 – 10	60	56.60	59	54.72	22	51.16	27	62.79	54	60.67	51	57.30
11 – 15	11	10.08	3	2.83	2	4.65	0	0.00	3	5.62	3	3.37
16 – 20	0	0.00	0	0.00	1	2.33	0	0.00	0	0.00	0	0.00
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**
Mean	**7**		**6**		**6**		**6**		**6**		**6**	

Source: Computed from Field Survey, 2021

The result of analysis on household size shows that 56.60% male and 54.72% female youth rice producers, 51.16% male and 62.79 female processors, 60.67% male and 57.30% female marketers have household size of 6-10 persons. The mean household size for male youth producers was 7persons while female youth producers were 6persons. The mean household size for male and female processors and marketers were 6 persons respectively. The result implies that the youth come from a moderately-sized household which is small given the labor-intensive rice value chain that predominate the area. This agrees with findings of Edeoghon *et al* (2019) and Ben-Chendo, *et al* (2017) that rice value chain actors could barely draw some family labour from their household that will be sufficient in rice production thus, the decision to use hired labor rather than family labor was explained.

4.2.4. Level of Education

The distribution of youth rice value chain actors by level of education is presented in Table 4.5.

Table 4.5: Distribution of Rice Value Chain Actors by Level of Education

Level of	**Producers**				**Processors**				**Marketers**			
Education	**Male**		**Female**		**Male**		**Female**		**Male**		**Female**	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%

No formal	2	1.89	9	8.49	1	2.33	2	4.65	2	2.24	1	1.12
Primary	31	29.25	35	33.02	8	18.60	17	39.54	21	23.60	30	33.71
Secondary	49	46.22	48	45.28	26	60.47	20	46.51	46	51.69	46	51.69
Tertiary	24	22.64	14	13.21	8	18.60	4	9.30	20	22.47	12	13.48
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**

Source: Computed from Field Survey, 2021

The Table shows that, 46.22% of male youth producers had secondary level education with only 1.89% without formal education while 45.28% female youth producers had secondary level education with 8.49% without formal education. For rice processors, 60.47% youth male had secondary education with 2.33% without formal education while 46.51% female youth processors had secondary level of education with 4.65% without formal education. Similarly, 51.69% of both Male and female youth rice marketers had secondary level education with 2.24% male and 1.12% female youth marketers without formal education.

The results imply that youth rice producers and processors had few females without formal education while marketers had few male. Majority of youths engaged in rice value chain in South-East had basic education and are literate. With this level of education they will be more receptive to information and adoption of new technologies becomes easy (Obasi *et al*, 2015). According to FAO *et al* (2014), adequate education improves productivity and acquisition of skills.

4.2.5. Membership of Cooperative Association

The distribution of youth rice value chain actors by membership to cooperative association is presented in Table 4.6.

Table 4.6: Distribution of Rice Value chain Actors by Membership to Cooperative Association

Items	Producers	Processors	Marketers

	Male		Female		Male		Female		Male		Female	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Yes	41	38.68	23	21.70	13	30.23	3	6.98	27	30.34	14	15.73
No	65	61.32	84	78.30	30	69.77	40	93.02	62	69.66	75	84.27
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**

Source: Computed from Field Survey, 2021

The Table shows that 61.32% of male and 78.30% producers do not belong to any cooperative association. For processors, 69.77% of males and 93.02% of females do not belong to any association. Also, 69.66% of male and 84.27% of female do not belong to any association. Although, majority of youth engaged in rice value chain in the area do not belong to cooperative associations, the number of youth female producers, processors and marketers not belonging to any association is higher than their male counterpart. The result implies that male youth engaged in rice value chain had more access to cooperative associations and access to benefits from membership than the female youth. According to FAO, (2012), evidence shows that associations have the capacity to empower their members economically and socially and create sustainable employment.

4.2.6. Access to Extension Services

The distribution of youth rice value chain actors by access to extension services is presented in Table 4.7.

Table 4.7: Distribution of Rice Value Chain Actors by Access to Extension Services

Item	Producers		Processors		Marketers	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**

	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Yes	40	37.74	19	17.92	10	23.26	2	4.65	19	21.35	9	10.11
No	66	62.26	87	82.08	33	76.74	41	95.35	70	78.65	80	89.89
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**

Source: Computed from Field Survey, 2021

The result in Table 4.7 represents accessibility of actors to extension services. Generally, youth engaged in rice value chain had poor access to extension services. Similarly, 37.74% male and 17.92% female youth producers had access to extension services. Likewise, 23.26% male and 4.65% female processors had access to extension services. For marketers, 21.35% male and 10.11% female marketers had access to extension services. The result implies that male youth actors engaged in rice value chain had more access to extension services than the female youth actors engaged in rice value chain. This suggests a gender disparity in access to crucial information, technology, and agricultural support services. Poor access to extension services implies limited knowledge transfer and technology adoption among youth engaged in the rice value chain. This could hinder the adoption of best practices, modern techniques, and innovations in rice production, processing, and marketing. This finding conforms to the findings of Bravo-Monroy, *et al* (2016) who opines that women access to technology, information and agricultural extension services tends to be more limited compared to men. Improved access to extension services will empowers female youth actors, contributing to their skill development, confidence, and overall empowerment.

4.2.7. Access to Credit

The distribution of youth rice value chain actors by access to credit is presented in Table 4.8.

Table 4.8: Distribution of Rice Value Chain Actors by Access to Credit

Items	Producers		Processors		Marketers	
	Male	Female	Male	Female	Male	Female

	freq	%	Freq	%	freq	%	Freq	%	Freq	%	Freq	%
Yes	6	5.66	3	2.83	2	4.65	2	4.65	4	4.49	6	6.74
No	100	94.34	103	97.17	41	95.35	41	95.35	85	95.51	83	93.26
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**

Source: Computed Field Survey, 2021

The table shows that 5.66% of male had access to credit while 2.83% of female producers had access to credit. Male producers had more access to credit than the female producers but majority, (94.34% and 97.17%) of male and female youth producers do not have access to credit facilities in the study area. For processors, equal percentage (4.65% and 4.65%) of male and female youth rice processors had access to credit. In contrast, 4.49% male marketers had access to credit while 6.74% of female had access to credit. This implies that female marketers had more access to credit than their male counterpart in the study area. Generally, the result shows low access to credit facilities among youth engaged in rice value chain. Fasakin, *et al* (2022) opines that low access to credit facilities is one of the major factors limiting youth from intensively engaging in agriculture.

4.2.8. Years of Experience

The distribution of youth rice value chain actors by years of experience is presented in Table 4.9.

Table 4.9: Distribution of Rice Value Chain Actors by Years of Experience

Items	**Producers**	**Processors**	**Marketers**

	Male		Female		Male		Female		Male		Female	
	freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
1 – 5	26	24.53	38	35.85	20	46.51	19	44.19	31	34.83	48	53.93
6 – 10	39	36.79	32	30.19	9	20.93	13	30.23	24	26.97	26	29.21
11-15	22	20.75	20	18.87	7	16.28	3	6.98	21	23.60	6	6.74
16-20	14	13.21	15	14.15	6	13.95	6	13.95	11	12.36	5	5.62
21-25	5	4.72	1	0.94	1	2.33	2	4.65	2	2.25	4	4.50
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**
Mean	**10**		**9**		**8**		**8**		**9**		**7**	

Source: Computed Field Survey, 2021

The distribution of actors according to years of experience shows that 36.79% male and 30.19% female youth producers had between 6-10years of rice farming experience. Also, 46.51% of male and 44.19% female processors had between 1 – 5years experience in rice processing similarly, 34.83% male and 53.93% female marketers had between 1-5years experience in rice marketing. The mean years of experience for male producers was 10years while female producers had 9years of farming experience. This implies that male youth producers were more experienced than the female youth producers.

The mean years of experience for both male and female youth rice processors were 8years which suggest that they had equal years of experience in processing in the research area. For marketers, the mean years of marketing experience for male youth marketers was 9years and female youth had 7years experience in rice marketing. This also suggests that male marketers are more

experienced than their female counterparts. Generally, producers have the most years of experience than those of other actors. Obasi *et al* (2022) asserted that years of experience are an important requirement for the success of any business. It enhances decision-making, risk management, adaptability, and efficiency in business operations.

4.2.9. Land Acquisition

The distribution of youth rice value chain actors by land acquisition is presented in Table 4.10.

Table 4.10: Distribution of Rice Value Chain Actors by Land Acquisition

Items	Producers	Processors	Marketers

	Male		Female		Male		Female		Male		Female	
	Freq	%Dist	Freq	%Dist	Freq	%Dist	Freq	%Dist	Freq	%Dist	Freq	%Dist
Purchase	20	18.87	24	22.64	6	13.95	23	53.49	3	3.37	28	31.46
Inheritance	53	50.00	52	49.06	27	62.79	14	32.56	27	30.34	19	21.35
Rented/Leased	33	31.13	30	28.30	10	23.26	6	13.95	59	66.29	42	47.19
Total	**106**	**100.00**	**106**	**100.00**	**43**	**100.00**	**43**	**100.00**	**89**	**100.00**	**89**	**100.00**

Source: Computed from Field Survey, 2021

Results in Table 9 shows that 50% male and 49.06% female youth producers acquired land for rice production through inheritance. Similarly, 31.13% of male producers acquired land through rent/lease while 28.30% female producers acquired land through rent/lease. In addition, 18.87% male producers acquired land through purchase while 22.64% female producers acquired land through purchase. This implies that female producers had more access to purchased land than the male producers.

For processors, 62.79% male youth acquired land through inheritance, 23.26% through rent/lease and 13.95% through purchase while 32.56% female youth acquired land through inheritance, 13.95% through rent/lease and 53.49% through purchase. Similarly, 30.34% male youth rice marketers acquired land through inheritance, 66.29% through rent/lease and 3.37 through purchase while, 21.35% female youth rice marketers acquired land through inheritance, 47.19% through rent/lease and 31.46% through purchase. This corroborates the findings by FAO (2011) that women are less likely to own a land through inheritance and less likely to have access to rented land. Societal norms and traditional gender roles often dictate that men are the primary landowners. These norms can influence inheritance patterns and contribute to the marginalization of women in land ownership and access.

4.3. Level of Youth Gender Equity Opportunities along the Rice Value Chain

Gender equity opportunities along the rice value chain is presented in Table 4.11

Table 4.11: Gender Equity Opportunities along Rice Value Chain

Dimensions and indicators			
Education	**Economic**	**Empowerment**	**GEI**

Value Chain Actors		(Formal Education)	Activity (Access to Credit)	(Membership of Value Chain Associations)	
	Male	104	6	41	
	Total Male	106	106	106	
	P_m	**0.98**	**0.06**	**0.39**	
Producers	Female	97	3	23	
	Total Female	106	106	106	
	P_F	**0.92**	**0.03**	**0.22**	
	Gap	**-0.03**	**-0.33**	**-0.28**	
MGEI					**-0.21**
	Male	42	2	13	
	Total Male	43	43	43	
	P_m	**0.98**	**0.05**	**0.30**	
Processors	Female	41	2	3	
	Total Female	43	43	43	
	P_F	**0.95**	**0.05**	**0.07**	
	Gap	**-0.02**	**0**	**-0.62**	
MGEI					**-0.21**
	Male	87	4	27	
	Total Male	89	89	89	
	P_m	**0.98**	**0.05**	**0.30**	
Marketers	Female	88	6	14	
	Total Female	89	89	89	
	P_F	**0.99**	**0.07**	**0.16**	
	Gap	**0.01**	**0.17**	**-0.30**	
MGEI					**-0.04**

Source: Computed from Field Survey (2021)

-1 (Female inequity) 0 (equity) 1 (Male inequity)

The table shows that there is disparity between male and female actors in the areas of education, access to credit and membership to value chain association. For producers, result indicated negative gap value of -0.03 for education, -0.33 for access to credit and -0.28 for membership to association which reflected the existence of inequity towards the female producers, although, the education gender gap between the male and female producers was low (-0.03). The Modified

Gender Equity Index (MGEI) was -0.21 which implies female inequity in rice production in the research area.

The education gap value for processors was -0.02 which indicated inequity towards female although, the gap was very low. Access to credit gap value for processors was 0, indicating equity which means there is no disparity between male and female in access to credit. The gap value for membership to association for processors was -0.62 reflecting the existence of inequity towards women in membership to association. The closer the gap is to -1, the greater the inequity. The MGEI for rice processors was -0.21 which implies inequity towards female (favouring male) in rice processing in the research area.

Rice marketers' education gap value was 0.01 which implies inequity towards male although; the gap between both genders was very low indicating absence of distance. The gap value for access to credit was 0.17 which implies inequity towards male. Membership of association gender gap value was -0.30 indicating inequities towards female. The MGEI for marketers was -0.04 which implies women inequity (favouring male).

Therefore, the level of gender equity opportunities for youth rice producers, processors and marketers in the research area using the MGEI was -0.21, -0.21 and -0.04 respectively which implies gender inequity that were unfavourable towards the female youth. This result shows that there is inequitable distribution of opportunities among male and female youth actors in rice value chain in the study area.

4.4. Technical Efficiency of Resource Use and Sources of Inefficiency among Male and Female Youth Actors along the Rice Value Chain

4.4.1. Parameter Estimates of Stochastic Frontier for Rice Producers

The maximum likelihood (ML) estimates of the stochastic frontier parameters for rice producers are presented in Table 4.12

Table 4.12: Parameter Estimates of Stochastic Frontier for Rice Producers

Variable	Male Producers	Female Producers	Pooled Data
Constant	19.4613 (4.6709)* *	17.2914 (4.3429) * * * *	27.1042 (4.4781)* *
Farm Size (X_1)	0.6709 (3.1857)* * * * *	0.5542 (3.8864) * * * *	0.6913 (3.2578)* *
Labour (X_2)	0.5521 (2.6116)* *	0.6173 (2.9201) * * * *	0.8125 (3.5112) * * * *
Cost of planting materials (X_3)	-0.4926 (-2.4717)*	-0.8215 (-2.9039)* *	-0.5826 (-2.9938) * * * *
Cost of Agrochemicals (X_4)	-0.3348 (-3.2759) * * * * *	-0.4926 (-3.7718)* *	-0.7133 (-3.3854) * * * *
Capital inputs (X_5)	1.8713 (2.7855)* * * * *	1.7335 (2.8639) * * * *	1.6527 (3.304) * * * *
Log-likelihood value	-107.4421	-108.4415	-112.3446
Sigma Square (σ^2)	7.1348 (4.9925)* *	7.8126 (4.3343)* *	8.3917 (6.0849) * * * *
Lamda (λ)	6.0935 (4.4426)* * * * *	6.1944 (3.6169) * * * *	7.1226 (5.0145) * * * *
Chi-squared (X^2)	64.1259* * * * *	63.0826* *	66.8219* *

Gamma (ɣ)	0.9738*	0.9746*	0.9807*
n	**106**	**106**	**212**

Source: Computed from Field Survey, 2021.

Figures in Parenthesis are t-ratios;* * Significance at 1% and * Significance at 5%

The estimated variance (σ^2) or sigma square was statistically significant at 1% indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error term for the male rice producers, female rice producers and pooled sample of rice producers. Besides, the variance of the non-negative farm effects is a small proportion of the total variance of rice output. Gamma (ɣ) was estimated at 0.9738, 0.9746 and 0.9807 which were statistically significant at 5% level indicating that 97.38%, 97.46% and 98.07% of the total variation in rice output of male rice producers, female rice producers and pooled sample of rice producers respectively were due to technical inefficiency. The coefficients for farm size, labour, and capital had the desired positive signs and were statistically significant at 1% showing direct relationship with rice output for the male rice producers, female rice producers and pooled sample of rice producers. This implies that as farm size, labour and capital increased by a unit, the output of rice increased by 0.6709, 0.5521 and 1.8713 units respectively for male producers; 0.5542, 0.6173 and 1.7335 units respectively for female producers. Farm size and capital had a positive relationship with rice output corroborating with Obianefo *et al*, (2020).

The coefficients of cost of planting materials and cost of agrochemicals had the desired negative signs and were statistically significant at 1% for the female rice producers and pooled sample of rice farmers. However, cost of planting material was significant at 5% for the male rice producers, while the cost of agrochemicals was significant at 1% level. The negative coefficients of cost of plating materials and agrochemicals for male and female producers imply that as cost

of planting materials and agrochemicals was increased by 1 unit each, output decreased by 0.4926 and 0.3348 for male producers; 0.8215 and 0.4926 for female producers.

4.4.2. Technical Efficiency of Individual Youth Rice Producers by Gender

The technical efficiency of individual male rice producers, female rice producers, and pooled sample of rice farmers are presented in Table 4.13.

Table 4.13: Distribution of Technical Efficiency of Rice Producer

Technical Efficiency (%)	**Male Producers**		**Female Producers**		**Pooled Data**	
	Frequency	%	Frequency	%	Frequency	%
≤ 50	21	19.8	29	27.4	22	10.4
51 – 60	8	7.6	9	8.5	19	9.0
61 – 70	20	18.9	25	23.6	34	16.0
71 – 80	37	34.9	33	31.1	71	33.5
81 – 90	17	16.0	9	8.5	64	30.2
91 – 100	3	2.8	1	0.9	2	0.9
Total	**106**	**100**	**106**	**100**	**212**	**100**
Minimum Value	34.42		31.14		32.29	
Maximum Value	90.25		92.06		94.41	
Mean Value	64.269		58.665		70.071	
Likelihood Ratio (LR)					0.5204	
Technical Gap Ratio (TGR)					0.587	
Technical Efficiency						

Ratio (TER)	0.8932	0.8105

Source: Computed from Field Survey, 2021

The table shows that the individual technical efficiency indices for the male youth rice producers' range between 34.42% and 90.25% with a mean of 64.27% which imply that the average male producer can still optimize or increase their output by 35.73%. The technical efficiency indices for the female rice producers' range between 31.14% and 92.06% with a mean of 58.67% which suggests that the average female producer can still optimize or increase their output by 41.33%. Results also show that 80.2% of male rice producers and 72.6% of female rice producers had technical efficiency index of above 50%. Although, a few (19.8% of male youth producers and 27.4% female youth producers), had technical efficiency index below 50%. The Likelihood Ratio (LR) was 0.5204 which was not significant at 5%. The Technical Gap Ratio (TGR) was 0.587, and this was not significant at 5%, implying that the rice, producers applied similar technologies in their rice production activities in the study area. While the Technical Efficiency Ratios (TER) was 0.8932 and 0.8105 for the male rice producers and female rice producers respectively, implying that the male rice farmers had a higher Technical Efficiency Ratio than the female rice producers in the study area. The result that male producers are more efficient than female producers is consistent with Mohammed *et al*, (2016) and Amusa & Esheya (2022).

4.4.3. Technical Efficiency among Male and Female Youth Processors along the Rice Value Chain

The summary of results of Maximum Likelihood Estimates (MLE) of the stochastic frontier parameters for rice processors are presented in Table 4.14.

Table 4.14: Parameter Estimates of Stochastic Frontier for Rice Processors

Variable	Male Processors	Female Processors	Pooled Data
Constant	20.6719 (6.5158)* *	19.0029 (4.0681)* * *	25.1806 (4.6448) * * *
Rent (X_1)	-1.8029 (-3.5921)* * *	-1.4707 (-2.4339)*	-1.4492 (-2.8349)* *
Labour (X_2)	1.7715 (2.7133)* *	1.3943 (3.3777)* *	1.8704 (3.2016) * * *
Cost of Intermediate Products (X_3)	-1.0926 (-2.6436)* *	-1.8216 (-2.2099)* *	-1.8314 (-3.5728)* *
Cost of Preservatives (X_4)	-0.6654 (-3.2474)* *	-0.5428 (-4.4638)* *	-1.3942 (-3.3733) * *
Capital inputs (X_5)	1.8902 (2.6158)*	1.3349 (2.9001)* *	1.7529 (2.9123)* *
Log-likelihood value	-107.1907	-109.4413	-110.2914

Sigma Squared (σ^2)	7.3308 (4.6021)**	7.3318 (4.3051)***	6.7033 (5.0999)***
Lamda (λ)	6.5219 (4.4321)**	6.0229 (4.1331)***	5.3916 (5.1222)**
Chi-squared (X^2)	68.2413**	67.4412**	68.2914**
Gamma (γ)	0.9770*	0.9732*	0.9667*
n	43	43	86

Source: Computed from Field Survey, 2021.
Figures in Parenthesis are t-ratios.** Significance at 1%, and * Significance at 5%

The values of Gamma were 0.9770, 0.9732 and 0.9667 for male rice processors, female rice processors, and all rice processors respectively, which are statistically significant at 5% level indicating that 97.70%, 97.32% and 96.67% of the total variation in rice processing for male youth rice processors, female youth rice processors and all youth rice processors respectively are due to technical inefficiency. The values of Lamda were 6.5219, 6.0229 and 5.3916 for youth male rice processors, female rice processors, and all rice processors respectively and were significant at 1% level, implying that variation in actual rice processing quantity from maximum rice processing quantity mainly arose from differences in processor practices rather than random variability. The estimated sigma square is significant at 1% level, indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error term for the youth male rice processors, female rice processors and pooled sample of rice processors.

The table shows that for rice processors the coefficients of rent, cost of preservatives, and capital inputs were significant at the 1% level and had the desired signs for both youth male and female rice processors, while the coefficient of rent and cost of intermediate products were significant at 5% level for female youth processors and 1% for male processors with the desired signs. The

negative coefficients of rent, cost of intermediate products and preservatives for youth male and female processors shows that as the amount spent on rent, intermediate products and preservatives increased by 1 unit, output decreased by 1.8029, 1.0926 and 0.6654 for male; 1.4707, 1.8216 and 0.5428 for female respectively. The coefficients of labour (1.7715 and 1.3943) for male and female processors were positive and significant at 1%; this implies that a unit increase in the number of labour used or increased in the number of hours the labourers put into rice processing will increase the quantity of processed rice by 1.7715 and 1.3943 respectively. This result is in agreement with Akpan & John, (2020) who observed that labour was positive in the study of technical efficiency of small scale cassava based processors in Akwa Ibom

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4.4.4. Technical Efficiency of Individual Youth Rice Processors by Gender

The technical efficiency of individual male, female and pooled youth rice processors are presented in Table 4.15.

Table 4.15: Distribution of Technical Efficiency of Rice Processors

Technical Efficiency (%)	**Male Processors**		**Female Processors**		**Pooled Data**	
	Frequency	%	Frequency	%	Frequency	%
≤ 50	5	11.6	4	9.3	10	11.6
51 – 60	3	7.0	6	14.0	5	5.8
61 – 70	6	14.0	9	20.9	15	17.5
71 – 80	17	39.5	13	30.2	34	39.5
81 – 90	11	25.6	10	23.3	21	24.4
91 – 100	1	2.3	1	2.3	1	1.2
Total	**43**	**100**	**43**	**100**	**86**	**100**
Minimum Value	33.12		34.13		31.16	
Maximum Value	92.18		93.14		92.18	

Mean Value	69.861	68.709	69.395
Likelihood Ratio (LR)			0.509
Technical Gap Ratio (TGR)			0.528
Technical Efficiency Ratio (TER)	0.9027	0.9896	

Source: Computed from Field Survey, 2021

The table shows that the individual technical efficiency indices range between 33.12% and 92.18% with a mean of 69.86% for male rice processors. The technical efficiency indices for the female rice processors range between 34.13% and 93.14% with a mean of 68.71%, while the technical efficiency indices of the pooled rice processors range between 31.16% and 92.18% with a mean of 69.40%. Results also indicate that 88.4%, 90.7% and 88.4% of male rice processors, female rice processors and pooled rice processors respectively had technical efficiency index of above 50%. The results obtained for the technical efficiencies of rice processors show that none of the individual rice processors attained technical efficiency of 100%, implying that none of the male and female youth processors were technically efficient in resource use. The Likelihood Ratio (LR) was 0.5091 which was not significant at 5% significant level and the Technical Gap Ratio (TGR) was 0.5284, which was not significant at 5% significant level, suggesting that the technologies used by the rice processors in their rice processing activities are similar.

The Technical Efficiency Ratios (TER) was 0.9027 and 0.9896 for the male rice processors and female rice processors respectively, implying that the female rice processors had a higher Technical Efficiency Ratio than the male rice processors in the study area. The result that female processors are more efficient than male processors is in disagreement with the findings of Umaru & Hassan (2018) that male processors are more efficient than female processors.

4.4.5. Technical Efficiency among Male and Female Youth Marketers along the Rice Value Chain

The results of Maximum Likelihood Estimates (MLE) of the stochastic frontier parameters for rice marketers are presented in Table 4.16

Table 4.16: Parameter Estimates of Stochastic Frontier for Rice Marketers

Variable	Male Marketers	Female Marketers	Pooled Data
Constant	18.0821 (5.8495)* *	17.9312 (5.7531)* *	19.0829 (4.4059)* *
Rent (X_1)	-0.7126 (-3.2899)* *	-0.6608 (-3.0835)* *	-0.5724 (-3.7509) * *
Handling Cost (X_2)	-0.4833 (-2.6776)* *	-0.5913 (-2.8999)* *	-0.4839 (-3.4838) * *
Cost of Intermediate Product (X_3)	-0.3718 (-1.2629)	-0.7504 (-1.0856)	-0.3316 (-1.1031)
Cost of Preservatives (X_4)	-0.4429 (-2.5961)* *	-0.5122 (-2.8533)* *	-0.3187 (-2.7286) * *
Capital inputs (X_5)	-0.1156 (-2.9045)* *	-0.1902 (3.5157)* *	-0.2914 (-3.4856) * *

Log-likelihood value	-106.1509	-109.1431	-112.0925
Sigma Squared (σ^2)	6.1942 (4.2388)**	7.1148 (5.3438)**	8.3904 (5.3421)**
Lamda (λ)	5.0731 (4.3707)**	6.0839 (5.2407)**	7.0312 (4.7438)**
Chi-squared (X^2)	63.0923**	62.1505**	63.8172**
Gamma (ɣ)	0.9626*	0.9737*	0.9802*
n	89	89	178

Source: Computed from Field Survey, 2021.
Figures in Parenthesis are t-ratios;** Significance at 1% and * Significance at 5%

The values of Lamda were 5.0731, 6.0839 and 7.0312 for male rice marketers, female rice marketers, and all rice marketers respectively and were significant at 1% level, implying that variation in actual rice sales quantity from maximum rice sales quantity mainly arose from differences in marketer practices rather than random variability. The estimated sigma square (σ^2) is significant at 1% indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error term for the male rice marketers, female rice marketers and all the rice marketers. The values of Gama were 0.9626, 0.9737 and 0.9802 for male rice marketers, female rice marketers, and all rice marketers respectively, which are statistically significant at 5% level, indicating that 96.26%, 97.37% and 98.02% of the total variation in rice sales quantity of male rice marketers, female rice marketers, and all rice marketers respectively are due to technical inefficiency.

The coefficients for rent, handling cost, cost of preservative and capital inputs have the desired negative signs and are significant at 1% implying inverse relationship with rice sales quantity for the male rice marketers, female rice marketers, and rice marketers.

The coefficient of cost of intermediate products was also negative as expected but not significant at 5% or 1% level of probability for the male rice marketers, female rice marketers, and all the rice marketers. Thus, increasing the cost of intermediate products does not guarantee an increase or decrease in the quantity of rice marketed

4.4.6. Technical Efficiency of Individual Youth Rice Marketers by Gender

The results of technical efficiency estimated for male, female and pooled rice marketers are presented in Table 4.17.

Table 4.17: Distribution of Technical Efficiency of Rice Marketers

Technical Efficiency (%)	**Male Marketers**		**Female Marketers**		**Pooled Data**	
	Frequency	%	Frequency	%	Frequency	%
≤ 50	33	37.1	14	15.7	12	6.7
51 – 60	9	10.1	16	18.0	19	10.7
61 – 70	28	31.5	30	33.7	6.7	37.6
71 – 80	14	15.7	22	24.7	70	39.3
81 – 90	3	3.4	7	7.9	9	5.1
91 – 100	2	2.2	0	0	1	0.6
Total	**89**	**100**	**89**	**100**	**178**	**100**
Minimum Value	31.08		34.13		31.12	

Maximum Value	95.16	89.17	92.15
Mean Value	52.3933	61.3764	67.6573
Likelihood Ratio (LR)			0.5206
Technical Gap Ratio (TGR)			0.5907
Technical Efficiency Ratio (TER)	0.7775	0.9154	

Source: Computed from Field Survey, 2021

The table shows that the individual technical efficiency indices range between 31.08% and 95.16% with a mean of 52.39% for the male rice marketers. The technical efficiency indices for the female rice marketers' range between 34.13% and 89.17% with a mean of 61.38%, while the technical efficiency indices for the pooled rice marketers range between 31.12% and 92.15% with a mean of 67.66%.

Results also show that 62.9% of male rice marketers, 84.3% of female rice marketers, and 93.3% of the rice marketers had technical efficiency index of above 50%. The Likelihood Ratio (LR) was 0.5206 and this was not significant at 5% level. The Technical Gap Ratio (TGR) was 0.5907 which was not statistically significant, suggesting that the technologies applied by the rice marketers are similar. The Technical Efficiency Ratios (TER) was 0.7775 and 0.9154 for the male rice marketers and female rice marketers respectively, implying that the female rice marketers had a higher TER than the male rice marketers in the study area. This result is also in disagreement with the findings of Aiyedun *et al* (2021) who opined that male rice marketers are efficient than the female rice marketers.

4.5. Determinants of Technical Inefficiency among Male and Female Youth Actors in the Rice Value Chain

4.5.1. Determinants of Technical Inefficiency in Rice Production

The estimated determinants of technical inefficiency among male rice producers, female rice farmers and pooled sample of rice producers are presented in Table 4.18.

Table 4.18: Maximum Likelihood Estimates of Determinants of Technical Inefficiency in Rice Production

Variable	Male Rice Producers	Female Rice Producers	Pooled Data
Constant	17.4903 (4.0754)**	19.0064 (4.0503)**	21.4219 (4.9118)**
Age (Z_1)	-1.3393 (-3.2499)**	-1.6702 (-3.1283)**	-1.3728 (-4.3887)**
Level of Education (Z_2)	1.5213 (3.2286)**	1.4926 (2.5673)*	1.4419 (4.7824)**
Marital Status (Z_3)	0.4617 (1.1701)	0.3844 (1.2301)	0.6492 (1.1558)
Household Size (Z_4)	-1.0842 (-1.1729)	-1.3914 (-1.3624)	-1.0522 (-1.1507)
Farming Experience (Z_5)	1.3891 (3.1485)**	1.5216 (3.2956)**	1.4436 (2.8295)**
Membership of Cooperative (Z_6)	0.4926 (3.7603) **	0.8125 (2.6025)**	0.3826 (3.4719)**
Extension Contact (Z_7)	0.4416 (4.2625)**	0.4112 (1.0535)	0.7413 (3.9161)**

Source of Labour (Z_8)	0.5125 (3.6897)**	0.3617 (1.1571)	0.5926 (1..2835)
Capital (Z_9)	1.3391 (3.1207)**	1.3845 (3.0052)**	1.7702 (3.3918)**
Farm Size (Z_{10})	0.4726 (3.4074)**	0.4119 (1.0529)	0.8912 (4.2117)**
n	106	106	212

Source: Computed from Field Survey, 2021
Figures in Parentheses are t – ratios. ** Significant at 1%; * Significant at 5%

Variables with positive signs and significant were the major contributors to technical inefficiency of input utilization while those with a negative sign were the one contributing to reducing technical inefficiency (Brummer and Loy 2000; Coelli *et al*. 2005). The coefficients of level of education, membership of cooperative, extension contact, source of labour, farming experience, farm size, and capital were positive and statistically significant at 1%, while the coefficient of age was negative and significant at 1% for the male rice producers. For the female rice producers, the coefficients of membership of cooperative, farming experience, and capital were positive and significant at 1% level, while the coefficient of level of education was positive and significant at 5%, implying that these variables are sources of technical inefficiency among the female rice producers in the study area. The coefficient of age was negative and significant at 1% level for the female producer which implies that this variable contributed to technical efficiency. The fact that age is negatively related to technical inefficiency for both youth male and female rice producers implies that as age increased technical efficiency in resource use also increased. This is an indication that as youth producers increase in age the tendency to acquire more technical know-how in rice production increase – hence reduces the level of inefficiency in production activities in the area. The coefficient of age for both the female and male youth rice producers were consistent with the findings of Amaechi *et al* (2014) & Azumah et. al. (2019).

Level of education is positively related to technical inefficiency of both youth male and female rice producers which shows that there was increased level of technical inefficiency as the level of education increased. This implies that as male and female youth producers advance in education, their attention is diverted from rice production to non-farm businesses, leading to a decline in their efficiency in rice production. Youth male and female producers' attention is drawn out of rice production and possibly into non-farm businesses and in turn decreases their level of competency in rice production as they advance in education. This is in line with Onumah *et al* (2013) who observed that producers with higher education are less efficient than those with a lower level of education. Mohammed *et al* (2016) also argued that this could be attributed to the fact that producers don't have content related education. Farming experience was also positively related to technical inefficiency for youth male and female producers suggesting that there was an increase level of technical inefficiency as farming experience increased for both male and female producers. This could be attributed to the use of traditional outdated practices over years and not easily adopting innovative technologies to improve efficiency in resource use (Onumah et. al*.,* 2013). The fact that the coefficients of capital were positive for both youth male and female rice producers implies that as capital increased technical efficiencies decreased. Extension contact was positive and significant at 1% for male youth producers which imply that as extension contacts increased, the level of technical inefficiency increased. This agrees with Muhammad-Lawal *et al* (2009) who observed that extension contact has a negative effect on the efficiency of youth in agriculture. Similarly, it is in conformity with Mohammed *et al*, (2016) who argued that the reason being producers unwillingness to adopt extension information because they see it as unimportant. For the female youth producers, extension contacts were not a source of inefficiency because it was not significant at 1% and 5% level of probability.

However, the coefficients of household size and marital status were not significant for the male, female and the pooled rice producers. Also, the coefficients of extension contact, and sources of labour were not significant for the female rice producers, while the coefficient of source of labour was not significant for the pooled sample of rice producers, implying that they are not sources of technical inefficiency to the rice producers in the study area.

4.5.2. Determinants of Technical Inefficiency of Rice Processors

The results of determinants of technical inefficiency among rice processors are presented in Table 4.19

Table 4.19: Maximum Likelihood Estimates of the Determinants of Technical Inefficiency of Rice Processors

Variable	Male Processors	Female Processors	Pooled Processors
Constant	22.0918 (4.1989)**	20.0989 (3.1908)**	29.0526 (4.5456)**
Age (Z_1)	-1.0442 (-2.5332)*	-1.0512 (-2.4315)*	-1.3349 (-3.2385)**
Level of education (Z_2)	1.8219 (2.7862)**	1.3229 (2.9163)**	1.6713 (2.9102)**
Household size (Z_3)	-1.3708 (-1.3824)	-1.4718 (-1.4914)	-1.4922 (-1.1556)
Processing Experience	1.4529 (2.8936)**	1.5519 (2.7906)**	1.6006 (2.9504)**
Access to credit (Z_5)	0.6613 (3.4479)**	0.6843 (3.5447)**	0.7143 (3.3162)**
Membership of cooperative (Z_6)	0.0526 (3.7842)**	0.0716 (3.9182)**	0.3882 (3.7836)**
Extension contact (Z_7)	0.4412 (1.1175)	0.4602 (1.2195)	0.4174 (1.0669)

Distance (Z_8)	-1.8173 (-3.1177)**	-1.8417 (-3.2197)**	-1.3846 (-3.6161)**
Cost of intermediate products (Z_9)	-1.4605 (-3.1308)**	-1.4809 (-3.1519)**	-1.4491 (-2.8347)**
n	43	43	86

Source: Computed from Survey Data, 2021

Figures in Parentheses are t – ratios. ** Significant at 1%, * Significant at 5%

Results show that the coefficients of level of education, processing experience, access to credit, membership of cooperative, distance and cost of intermediate products were statistically significant at 1% level for the male rice processors, female rice processors and pooled rice processors respectively. The coefficients of level of education, processing experience, access to credit and membership to cooperatives were positive for the youth male and female processors indicating a positive relationship between these variables and technical inefficiency. This implies that an increase in the level of education, processing experience, access to credit and membership of cooperative by 1 unit will increase the level of technical inefficiency. This suggests that an increase in educational attainment of male and female youth processors by one percent increases the level of technical inefficiency by 1.8219% and 1.3229 respectively. This implies that, additional training and knowledge acquired by the male and female youth processors draw their attention out of rice processing and possibly into other businesses and in turn decreases their level of competency in rice processing as they advance in education. Processing experience was also positively related to technical inefficiency for youth male and female processors suggesting that there was an increase level of technical inefficiency as processing experience increased for both male and female processors. This could be attributed to the use of outdated practices over years and not easily adopting or having access to innovative technologies to improve efficiency

in resource use. This result is in disagreement with the findings of Akpan &John, (2020) and Dzever et. al., (2016), who opines that the number of years a processor spent in business is the measure of business sustainability over time.

However, the coefficient of age was negative and significant at 5% for the male and female rice processors, and significant at 1% pooled rice processors, implying that as youth male and female rice processors age increased, technical efficiency in resource use also increased. This is an indication that as youth male and female processors increase in age the tendency to acquire more technical know-how in rice production increase – hence reduces the level of inefficiency in processing activities in the area. This result of is consistent with the findings of Aminu et at (2017) and in disagreement with the findings of Chikezie *et al*, (2020). Also, the coefficients of distance to their processing node and cost of intermediate product were significant at 1% level and negatively related to technical inefficiency for both youth male and female processors indicating that as these variables increased, technical efficiency in resource use also increased. This could be linked to the fact that as youth processors focus more on rice processing business as they move little out of their domestic chores. The coefficient of cost of intermediate products of male and female processors was negative and statistically significant at 1% level. This implies that an increase in the cost of intermediate products by 1 unit, the level of technical inefficiency decreases by 1.4605 and 1.4809 respectively. This could be linked to the fact that as male and female youth processors buy more paddy for processing, more rice is processed and more profits generated. The coefficients of household size and extension contact were not significant at 5% level for the male rice processors, female rice processors and pooled rice processors, implying that these variables are not the sources of technical inefficiency among the rice processors in the study area.

4.5.3. Determinants of Technical Inefficiency of Rice Marketers

The results of determinants of technical inefficiency among rice marketers are presented in Table 4.20.

Table 4.20: Maximum Likelihood Estimates of the Determinants of Technical Inefficiency of Rice marketers

Variable	Male Marketers	Female Marketers	Pooled Marketers
Constant	16.0729 (6.7206)**	19,0036 (4.3359)**	23.0526 (4.1981)**
Age (Z_1)	-1.4217 (-2.3542)*	-1.3915 (-3.0771)**	-2.7603 (-3.2759)**
Level of education (Z_2)	1.8826 (3.1678)**	1.0528 (2.5442)*	1.1942 (2.8894)**
Household size (Z_3)	-0.4609 (-1.2416)	-0.4821 (-1.2317)	-1.3318 (-1.2988)
Marketing Experience	1.3392 (2.7369)**	1.1904 (3.4585)**	2.5203 (3.9288)**
Access to credit (Z_5)	0.7425 (2.3782)*	0.4526 (1.1564)	0.3912 (3.1014)**
Membership of cooperative (Z_6)	0.3412 (3.3917)**	0.0744 (3.1129)**	0.4456 (4.0253)**
Extension contact (Z_7)	0.0893 (1.1261)	0.0529 (1.2418)	0.3908 (1.2546)
Distance (Z_8)	-0.4122	-0.3815	-1.4216

	(-3.1322)**	(-3.3791)**	(-3.5241)**
Cost of intermediate products (Z_9)	-0.5219 (-1.1036)	-0.4922 (-1.3014)	-1.5922 (-3.1207)**
n	89	89	178

Source: Computed from Survey Data, 2021
Figures in Parentheses are t – ratios. ** Significant at 1%, * Significant at 5%

Results show that the coefficient of level of education, marketing experience, membership of cooperative, and distance were significant at 1% level, while the coefficients of age and access to credit were significant at 5% level, implying that they are the sources of technical inefficiency among the male rice marketers in the study area.

The coefficients of extension contact and cost of intermediate products were not significant at 5% level, implying that these variables are not the sources of technical inefficiency among the male rice marketers in the study area. On the part of the female rice marketers, the coefficients of age, marketing experience, membership of cooperative, and distance to place of sales were significant at 1% level, while the coefficient of level of education was significant at 5% level, implying that these variables are the sources of technical inefficiency among the female rice marketers in the study area.

The coefficients of age was negative which implies that an increase in age of youth male and female marketers by 1 unit, decreases the level of technical inefficiency in rice marketing by 1.4217 and 1.3915 respectively. This is an indication that as male and female youth marketers increased in age, they increase in technical know-how in increasing rice sales. The coefficient of youth male and female marketers' distance to their place of marketing was negatively related to technical efficiency. This implies that an increase in distance to the place of sales increases the

level of technical efficiency in rice marketing. This could be linked to the fact that the place of sale is far from home reduces non-accounted domestic consumption of rice meant for sale.

The coefficient of level education is positively related to technical inefficiency of both youth male and female rice marketers which shows that there was increased level of technical inefficiency as the level of education increased. This is in line with the findings of Gamayina, et. al., (2020). The coefficient of marketing experience, access to credit, and membership to cooperative were positively related to technical inefficiency of both male and female rice producers which implies that as the level of education, marketing experience, access to credit, and membership to cooperative increased, technical inefficiency for both youth male and female rice marketers in resource use also increased.

4.6. Net Return, Value Added and the Share of the Value Added by Gender along the Rice Value Chain

Table 4.21: Cost and Returns of 1ha of Rice Production by Gender

Item	Unit Price(₦)	Male producers		Female Producers	
		Quantity	Amount (₦/ha)	Quantity	Amount (₦/ha)
A) Value of paddy produced (Y)	**98,000/MT**	**2.6MT**	**254,800**	**2.3MT**	**225,400**
B) Intermediate Inputs					
Seed	185/kg	50kg	9250	50kg	9250
Agro Chemicals					
a) Herbicides	2600/litre	4litres	10400	4litres	10400
b) Insecticides	1200/litre	2litres	2400	2litres	2400
c) Fertilizer	7500/50kg	200kg	30000	200kg	30000
Labour Cost					
• Land clearing	1500	15	22500	12	18000
• Land preparation	1800	12	21600	10	18000
• Nursery	600	10	6000	8	4800
• Planting/transplanting	1000	14	14000	10	10000
• Application of herbicides/pesticices	1000	4	4000	3	3000
• Application of fertilizer	1000	4	4000	3	3000
• Weeding	700	10	7000	9	6300
• Bird scaring	3000	2	6000	2	6000
• Harvesting	500	70	35000	60	30000
• Threshing/winnowing	1000	8	8000	6	6000
• Bagging	500	3	1500	3	1500
Transportation Cost			9300		6900
C) Total Value of Intermediate inputs (*II*)			**190,950**		**165,550**
D) Value Added (VA = Y – *II*)			**63,850**		**59,850**
E) Fixed Cost					

a) Depreciation on equipment	7300	5200
b) Rent on land	10000	7000
F) Total Fixed Cost	**17300**	**12200**
G) Total Cost (TC= TFC+TVC)	**208,250**	**177,750**
H) Net Return (Y – TC)	**46,550**	**47,650**
I) Return on Naira Spent (H/G)x100	**22.35%**	**26.81%**
	(₦22.35)	**(₦26.81)**

Source: Computed from Field Survey, 2021

The table shows that the youth male and female rice producers earned revenue per hectare of ₦254800 and ₦225400 respectively and incurred total cost of production per hectare of ₦216190 and ₦169790 respectively. This implies that the male youth rice producers earned higher revenue per hectare than the female youth rice producers while, the male youth rice producers incurred higher cost than the female rice producers. The female youth rice producers had a higher net return of ₦47,650 per hectare while the male youth rice producers had net return of ₦46,550. The results on Return in naira spent shows that one naira invested in rice production in the study area would return ₦22.35 to the male youth rice producers and ₦26.81 to the female youth rice producers, which implies that the female youth rice producers earn higher net return in rice production than the male rice producers. This contradict the findings of Ruvuna & Mweruli, (2021) that male are more profitable in rice production than the female rice producers. Generally, the results on net return and return in naira invested of youth male and female producer shows that rice production is a profitable farm enterprise in the study area. This is in line with the findings of Ewuzie et. al. (2020) that rice production is very profitable.

4.6.2. Cost and Returns of Rice Processing Per Tonne

The analysis of the cost and returns of rice processing per tonne by gender are presented in Table 4.22.

Table 4.22: Cost and Returns per Tonne of Rice Processing by Gender

		Male Rice Processors		**Female rice Processors**	
Item	**Unit Price (₦)**	**Quantity**	**Amount (₦)**	**Quantity**	**Amount (₦)**
A) Value of Processed Rice (Y)					
Milling fee	**12600/MT**	**1MT**	**12600**	**1MT**	**12600**
B) Intermediate Inputs					
Labour	2500	1MT	2500	1MT	2500
Utilities (electricity, water, etc)			1700		1500
C) Total Value of Intermediate (*II*)			4200		4000
Value added (VA = Y – *II*)			**8400**		**8600**
D) Fixed Cost					
Rent			1750		1350
Tax			135		85
Depreciation on capital inputs			1350		1005
Repairs and maintenance			450		250
E) Total Fixed Cost			3685		2690
F) Total Cost (TC- TFC+TVC)			7885		6690
G) Net Return (A – F)			**4715**		**5910**
H) Return o Naira spent (G/F) x 100			**59.80%**		**88.34%**

	(₦59.80)	**(₦88.34)**

Source: Computed from Field Survey, 2021

The analysis of the cost and returns of rice processing per tonne by gender are presented in Table 4.22. The results show that the youth male and female rice processors earned revenues of ₦12,600 and ₦12,600 per tonne respectively and incurred total costs of ₦7,885 and ₦6,690 respectively. The net returns per tonne for male youth and female youth rice processors were ₦4,715 and ₦5,910 respectively. This result implies that female youth rice processors had a higher net return than male youth rice processors in the study area. Results on Return on naira spent shows that one naira invested in rice processing in the study area would return ₦59.79 and ₦88.34 to the male and female rice processors respectively. This implies that female rice processors earned higher return on naira spent than the male rice processors and this indicates that the female youth processors incurred lower cost (₦6,690) per metric tonne of rice processed compared to the male youth marketers (₦7,885). Based on the findings, it can be concluded that rice processing is profitable in the study area. This is in line with the findings of Ewusie, et. al*.,* (2020) and Ruvuna & Mweruli (2021) that rice processing is profitable business.

4.6.3. Cost and Returns of Rice Marketing per Tonne

The analysis of the cost and returns of rice marketing per tonne by gender are presented in Table 4.23.

Table 4.23: Cost and Returns per Tonne of Rice Marketing by Gender

	Male Rice Marketers		**Female rice Marketers**	
Item	Quantity	Amount (₦)	Quantity	Amount (₦)
A) Value of Rice Sale (Y)		**195,170**		**192,300**
B) Intermediate Inputs				
Purchase price	1MT	168,000	1MT	165,000
Transportation		4900		3800
Labour		4700		4300
C)Total Value of Intermediate (*II*)		177,600		173,100
Value added (VA = Y – *II*)		**17570**		**19200**
D) Fixed Cost				
Rent		470		430
Tax		120		90
Depreciation on capital inputs		1530		1020
Repairs and maintenance		520		350
E) Total Fixed Cost		2640		1890
F) Total Cost (TC=TFC+TVC)		180,240		174,990
G) Net Return (A – F)		**14,930**		**17,310**
H) Return o Naira spent (G/F) x100		**8.28%**		**9.89%**

	(₦8.28)	**(₦9. 89)**

Source: Computed from Field Survey, 2021

The table indicates that the male and female rice marketers earned revenue of ₦195,170and ₦192,300 per metric tonne respectively, and incurred total costs of ₦168,000 and ₦165,000 respectively. The net return per metric tonne for youth male and female rice marketers were ₦14,930 and ₦17,310 respectively.

Additionally, results on Return on naira spent shows that every naira invested in rice marketing in the study area, the female youth marketers receives higher return (₦9.89) compared to the male (₦8.28) to the male. Therefore, the female youth rice marketers have a higher net return and return on naira spent than the male youth rice marketers.

Based on the findings, it can be concluded that rice marketing in the study area is profitable. This is in line with the findings of Ewusie, et. al*.,* (2020) and Ruvuna & Mweruli (2021) that rice marketing is a profitable business.

4.6.4. Overall Value Added and Share of Value Added

The result of the value added and share of value added by gender in rice value chain is presented in Table 4.24.

Table 4.24: Overall Value Added and Share of Value Added by Gender along the Rice Chain

Actors	Value Added by Male Actors (₦/MT)	Value Added by Female Actors (₦/MT)	Total Value Added (₦/MT)	% Share Male	% Share Female
Producers	26,061	24,429	50,490	51.62	48.38
Processors	8,400	8,600	17,000	49.41	50.59
Marketers	17,570	19,200	36,770	47.78	52.22
Total Value Added	52,281	52,229	104,510	50.03	49.98

Source: Computed from Field Survey, 2021

For the producers, the value added per tonne by male youth was ₦26,061 and female youth was ₦24,429. The total value added per tonne by youth male and female rice producers was ₦50,490. For the processors, the value added per tonne by male youth was ₦8,400 and female ₦8,600. The total value added by male and female youth rice processors was ₦17,000. The value added by male youth marketers was ₦17,570 and female youth rice marketers were ₦19,200. The total value added by male and female youth rice marketers was ₦36,770.

The total value added by male and female youth in rice value chain was ₦52,281 and ₦52,229 respectively, and the total value added by youths in the study area was ₦104,510. The overall value added indicates that there is relatively small difference between the contributions of male

and female actors in the value chain. The value added share by male youth producers, processors and marketers were 51.62%, 49.41% and 47.78% respectively. This implies that the share of value added by male actors decreased along the rice value chain from producers with the highest value added share and the marketers with the least value added share. The value added share by female youth producers, processors and marketers were 48.38%, 50.59% and 52.22% respectively. It implies that the share of value added by actors increased along the rice value chain from the producers with the least value added share and the marketers with the highest value added share. This finding is in agreement with the findings of Osuji et. al.,(2017) and Igwenagu et. al., (2020) that net value added increased along the chain thereby explaining incremental cost and complementary returns.

4.7. Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Value Chain Actors

4.7.1. Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Producers.

The results of multiple regression analysis on the socioeconomic factors affecting value added by gender among rice producers is presented in the Tables 4.25.

Table 4.25: Multiple Regression Analysis on the Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Producers

	Male Rice Producers		**Female Rice Producers**		**Pooled**	
Explanatory variable	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
Age (X_1)	-0.0651	-2.8428**	0.0665	-2.9955**	0.0048	-3.6923**
Level of education (X_2)	0.0548	4.7241**	0.0922	3.1684**	0.0048	3.4737**
Household size (X_3)	0.0722	1.1759	0.0387	1.4073	0.0074	2.5517*
Farming experience (X_4)	0.0912	3.6923**	0.0521	3.1012**	0.0091	3.6401**
Access to credit (X_5)	0.0415	1.2351	0.0522	1.2639	0.0093	1.2237
Cooperative membership (X_6)	0.0613	2.5649*	0.0617	2.5602*	0.0087	3.1071**
Extension contact (X_7)	0.0722	1.1778	0.0538	1.2933	0.0042	1.4483
Distance (X_8)	-0.0516	-3.6596**	-0.0617	-2.4387*	-0.0073	-3.3182**
Capital (X_9)	0.0933	2.9432**	0.0419	3.1037**	0.0087	3.1071**
Information (X_{10})	0.0526	3.7842**	0.0952	2.3051*	0.0096	3.5556*
Cost of intermediate products (X_{11})	-0.0719	-1.1845	-0.0813	-1.1648	-0.0083	(-1.2029)
Constant	183.4413		136.4419		183.0926	
R^2	0.7616		0.7115		0.8531	

F-Value	27.2584**	20.8651	105.6923
n	106	106	212

Source: Computed from Field Survey, 2021.

** Significant at 1% * Significant at 5%.

Based on the magnitude of the coefficient of multiple determinations (R^2), F-value and statistical significance of the parameter estimates, the double-log function was selected as the lead equation for male and female rice producers, while the exponential function was selected as the lead equation for the pooled sample of rice producers. The results of the three other functional forms for each of male rice farmers, female rice farmers and pooled sample of rice farmers are shown at the Appendix.

On the part of male youth rice producers, the value of $R^2$was 0.7616 which indicates that about 76% of the variation in value added was accounted for by the joint action of the independent variables included in the double-log multiple regression model. The F-value was 27.2584 which were statistically significant at the 0.01 level, indicating that the double-log function gave a good fit to the data fitted in the analysis. The coefficients of age, level of education, farming experience, distance to actor's node, capital, and information were significant at 1% level of probability while the coefficient of cooperative membership was significant at 5% level. The result implies that these variables are the socioeconomic factors affecting value added among male rice farmers in the study area. The coefficients of level of education, farming experience, membership of cooperative, capital and information were positive, which indicates that increases in the magnitude of these factors lead to significant increases in value added among the male youth rice producers in the study area. The coefficients of age and distance were negative, which suggests that increase in the magnitude of these factors lead to significant reduction in value

added among the male youth rice producers in the study area. The coefficients of household size, access to credit, extension contact, and cost of intermediate products were not significant at 5% level of probability, which implies that these variables are not socioeconomic factors affecting value added among male rice farmers in the study area.

On the part of the female youth rice producers the value of R^2 was 0.7115 which implies that about 71% of the variation in value added was accounted for by the joint action of the independent variables included in the double-log function. The F-value was 20.8651 which were significant at 1% level, implying that the double-log function gave a good fit to the data fitted in the analysis. The coefficient of age, level of education, farming experience, and capital were significant at 1% level, while the coefficients of cooperative membership, distance and information were significant at 5% level, implying that these variables are the socioeconomic factors affecting value added among female rice producers in the study area. The coefficients of level of education, farming experience, membership of cooperative, capital and information were positive, which indicates that increases in the magnitude of these factors lead to significant increase in value added among the female youth rice producers in the study area. The coefficients of age and distance were negative, which suggests that increase in the magnitude of these factors lead to significant reduction in value added among the female youth rice producers in the study area. The coefficients of household size, access to credit, extension contact, and cost of intermediate products were not significant at 5% level, implying that these variables are not socioeconomic factors affecting value added among female rice farmers in the study area.

Results of the pooled sample of rice farmers show that the value of R^2 was 0.8531, which implies that about 85% of the variation in the value added was accounted for by the combined action of the independent variables included in the exponential function. The F-value was 105.6923,

which was significant at 1% level, and implies that the exponential function gave a good fit to the data fitted in the analysis.

The coefficients of age, level of education, farming experience, cooperative membership, distance and capital were significant at 1% level, while the coefficients of household size, and information were significant at 5% level, which implies that these variables are the socioeconomic factors affecting value added among rice producers in the study area. The coefficient of access to credit, extension contact, and cost of intermediate products were not significant at 5% level, implying that these variables are not socioeconomic factors affecting value added among rice producers in the study area.

The findings that coefficients of age are negatively related to value added by youth producer and level of education is positively related to value added by youth producer are consistent with Ashiegbu et. al., (2018).

4.7.2. Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Processors.

The results of multiple regression analysis on the socioeconomic factors affecting value added by gender among rice processors is presented in the Tables 4.26.

Table 4.26: Results of Multiple Regression Analysis on the Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Processors.

	Male Rice Processors		**Female Rice Processors**		**Pooled Rice Processors**	
Explanatory variable	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
Age (X_1)	-0.0618	-1.2141	-0.0664	-1.2943	-0.0081	-4.2632**
Level of education (X_2)	0.0744	4.4929**	0.0713	2.4502*	0.0073	4.5625**
Household size (X_3)	0.0813	3.3734**	0.0829	2.9821**	0.0092	4.8421**
Processing experience (X_4)	0.0912	3.3285**	0.0717	2.8566**	0.0086	2.9655**
Access to credit (X_5)	0.0543	3.9348**	0.0883	3.8899**	0.0099	3.5357**
Cooperative membership (X_6)	0.0919	3.2021**	0.0912	2.9804**	0.0083	3.0741**
Extension contact (X_7)	0.0526	1.2736	0.0491	1.4149	0.0064	1.0847
Distance (X_8)	-0.0747	-3.3801**	-0.0688	-3.1852**	-0.0093	-1.1772
Capital (X_9)	0.0614	2.9951**	0.0654	3.1292**	0.0074	2.8462**
Information (X_{10})	0.0713	3.4116**	0.0713	3.0471**	0.0082	2.8276**
Cost of intermediate products (X_{11})	-0.0833	-3.8037**	-0.0841	-3.0252**	-0.0087	-3.1071**
Constant	257.1826		213.4449		203.0069	
R^2	0.8709		0.8438		0.8216	
F-Value	207.3571**		15.2201**		30.9921**	
n	43		43		86	

Source: Computed from Field Survey, 2021

** Significant at 1%, * Significant at 5%.

The table indicates that the double-log functions gave the lead equation for the male and female youth rice processors, while the exponential function gave the lead equation for the pooled sample of youth rice processors. The results of the three other functional forms are shown in Appendix.

Results for the male youth processors show that the value of coefficient of multiple determinations (R^2) was 0.8709, which implies that about 87% of the variation in value added by male rice processors was accounted for by the combined action of the independent variables included in the double-log function. The F-value was 207.3571, which was statistically significant at 1% level, and implies that the double-log model gave a good fit to the data used for the analysis. The coefficients of level of education, household size, processing experience, access to credit, cooperative membership, distance, capital, information access, and cost of intermediate products were all significant at 1% level, implying that they are the socioeconomic factors affecting value added by male youth rice processors in the study area. The coefficients of level of education, household size, processing experience, access to credit, cooperative membership, capital, and information access emerged with positive signs, which imply that increases in their magnitudes lead to significant increase in value added by rice processors in the study area. The coefficient of age, distance and cost of intermediate products were negative, and these inverse relationships implies that increase in the magnitude of these variables lead to significant decreases in value added by the male youth rice processors in the study area.

The coefficients of age, and extension contact were not statistically significant at 5% level, implying that these variables were not socioeconomic factors affecting value added by male rice processors in the study area.

The results for the female youth rice processors show that the value of R^2 was 0.8438, which implies that about 84% of the variation in value added by female rice processors was accounted for by the joint action of the independent variables included in the double-log model. The F-value was 15.2201, which was significant at 1% level, and implies that the double-log function gave a good fit to the data. The coefficients of household size, processing experience, access to credit, cooperative membership, distance, capital, information access and cost of intermediate products were highly significant at 1% level, while the coefficient of level of education was significant at 5% level, implying that these variables were the socioeconomic factors affecting value added by female youth rice processors in the study area. The coefficients of level of education, household size, processing experience, access to credit, cooperative membership, capital, and information access emerged with positive signs, which imply that increases in their magnitudes lead to significant increase in value added by rice processors in the study area. The coefficient of age, distance and cost of intermediate products were negative, and these inverse relationships implies that increase in the magnitude of these variables lead to significant decreases in value added by the female youth rice processors in the study area.

The coefficient of age and extension contact were not significant at 5% level, implying that they were not socioeconomic factors affecting value added by female rice processors in the study area.

The results for the pooled sample of rice processors showed that the value of R^2 was 0.8216, which implies that about 82% of the variation in value addition was accounted for by the combined action of the independent variables included in the exponential function. The F-value was 30.9921, and this was significant at 1% level, implying that the exponential function gave a good fit to the data used for the analysis. The coefficients for age, level of education, household size, processing experience, access to credit, cooperative membership, capital, information

access and cost of intermediate products were highly significant at 1% level, implying that these variables were the socioeconomic factors affecting value added by rice processors in the study area.

The coefficients of extension contact, and distance were not significant at 5% level, implying that they were not socioeconomic factors affecting value added by rice processors in the study area.

4.7.3. Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Marketers.

The results of multiple regression analysis on the socioeconomic factors affecting value added by gender among rice marketers' is presented in the Tables 4.27.

Table 4.27: Multiple Regression Analysis on the Socioeconomic Factors Affecting Value Added by Gender among Youth Rice Marketers

	Male Rice Marketers		**Female Rice Marketers**		**Pooled Marketers**	
Explanatory variable	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**	**Coeff.**	**t-ratio**
Age (X_1)	-0.0059	-3.1053**	-0.0065	-1.3265	-0.0677	-3.1636**
Level of education (X_2)	0.0046	3.8333**	0.0073	2.8077**	0.0891	3.1263**
Household size (X_3)	0.0079	5.2667**	0.0091	3.1379**	0.0641	1.2186
Marketingexperience (X_4)	0.0086	2.9655**	0.0094	3.6154**	0.0709	3.3286**
Access to credit (X_5)	0.0083	3.7778**	0.0083	2.9643**	0.0813	3.2008**
Cooperative membership (X_6)	0.0071	1.2034	0.0072	2.6667*	0.0567	3.0649**
Extension contact (X_7)	-0.0083	-2.9643**	0.0067	1.3137	0.0883	1.2367
Distance (X_8)	-0.0074	-2.9601**	-0.0083	-2.9643**	-0.0942	-3.2041**
Capital (X_9)	0.0088	3.1209**	0.0059	3.1053**	0.0665	3.1075**
Information (X_{10})	0.0092	3.1724**	0.0068	2.9565**	0.0729	3.4225**
Cost of intermediate products (X_{11})	-0.0056	-1.3659	-0.0094	-1.0805	-0.0895	-1.2535
Constant	106.4219		116.0739		241.0094	
R^2	0.8834		0.7942		0.8638	
F-Value	53.1848**		26.7407**		95.7761**	
n	89		89		178	

Source: Computed from Field Survey, 2021

** Significant at 1%, * Significant at 5%.

Results show that the exponential functions emerged as the lead equations for the male and female rice marketers, while the double-log function gave the lead equation for the pooled sample of rice marketers, based on having the highest value of coefficient of multiple determinations (R^2), highest F-value, and highest number of significant variables. The results of three other functional forms are presented at Appendix. The results of the lead equations were therefore used for discussion and further analysis.

For the male youth rice marketers, the value of R^2 was 0.8834, which implies that about 88% of the variation in value added was accounted for by the combined action of the independent variables included in the exponential model. The F-value was 53.1848, which was significant 1% level, and indicates that the double-log function gave a good fit to the data fitted in the analysis.

The coefficients of age, level of education, household size, marketing experience, access to credit, extension contact, distance, capital, and information were statistically significant at 1% level, implying that these variables are the socioeconomic factors affecting value added by male youth rice marketers in the study area. The coefficients of cooperative membership and cost of intermediate products were not significant at 5% level, implying that these variables are not socioeconomic factors affecting value added by male rice marketers in the study area.

On the part of female youth rice marketers, the coefficient of multiple determinations (R^2) was 0.7942, which implies that about 79% of the variation in value added by female rice marketers was accounted for by the joint action of the independent variable included in the exponential model. The F-value was 26.7407, which was significant at 1% level, and implies that the double-log function gave a good fit to the data fitted for the analysis. The coefficients of level of education, household size, marketing experience, access to credit, cooperative membership,

distance, capital, and information were highly significant at 1% level, implying that these variables are socioeconomic factors affecting value added by female rice marketers in the study area. The coefficient of age, extension contact, and cost of intermediate products were not significant at 5% level, indicating that these variables are not the socioeconomic factors affecting value added by female rice marketers in the study area.

For the pooled sample of rice marketers, the value of $R^2$was 0.8638, which implies that about 86% of the variation in value added by the rice marketers was accounted for by the joint action of the independent variables included in the double-log function.

The F-value was 95.7761, which was significant at 1% level, indicating that the double-log model gave a good fit to the data used for the analysis. The coefficients of age, level of education, marketing experience, access to credit, cooperative membership, distance, capital, and information were highly significant at the 1% level, implying that these variables are the socioeconomic factors affecting value added by rice marketers in the study area. The coefficients of household size, extension contact, and cost of intermediate products were not significant at 5% level, implying that they are not socioeconomic factors affecting value added by rice marketers in the study area.

The coefficients of age distance and cost of intermediate products were negative, which suggests that increases in the magnitude of these factors lead to decreases in value added among the rice marketers. The coefficients of level of education, marketing experience, household size, access to credit cooperative membership, extension contact, capital and information were positive, and this direct relationship implies that increases in the magnitude of these factors lead to increases in value added among the youth rice marketer in the study area.

The positive relationship of education level, membership to cooperative, market information, and the negative relationship of distance to market and value added by youth marketers are consistent with Nyein et. al., (2018), Getahun, (2015) and Martey et. al., (2012).

4.8. Constraints to Youth Engagement in Rice Value Chain.

4.8.1. Constraints to Youth Engagement in Rice Production

The distribution of rice producers by constraints to youth engagement in rice production are presented in Table 4.19.

Table 4.28: Constraints to Youth Engagement in Rice Production

Constraints	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Lack of capital	80	75.47	100	94.34
Lack access to credit	80	75.47	76	71.70
Drought	72	67.93	28	26.41
Lack access to better technology	64	60.38	66	62.26
It is tedious	62	58.49	78	73.58
High Cost of hiring machines/high operating cost	61	57.55	64	60.38
High price of inputs (seeds, fertilizer, pesticides and insecticides)	36	33.96	24	22.64
Flooding	32	30.19	68	64.15
Low profitability	26	24.53	18	16.98
Poor access road	24	22.64	16	15.09
Inadequate land/access to land	20	18.87	66	62.26
Pest and diseases	20	18.87	54	50.94
Lack of technical knowhow/skills	14	13.21	16	15.09
Unavailability of irrigation facilities	14	13.21	16	15.09
High cost and shortage of labour	12	11.32	67	63.21
Communal/herdsmen clash	12	11.32	16	15.09
Lack of government support	6	5.66	8	7.55
Marital challenges/responsibilities	6	5.66	14	13.21

Source: Computed from Field Survey, 2021

Multiple Responses

For male youth rice producers, the most commonly mentioned factors were lack of capital to start up rice production (75.47%), lack of access to credit (75.47%), drought (67.93%), lack of access to better technology (60.38%), rice production is very tedious (58.49%) and high cost of hiring machines/high operating cost (57.55%).

The major factors that limit female youth engagement in rice production in the study area were, lack of capital of capital to start up rice production (94.34%), rice production is tedious/stressful (73.58), lack of access to credit (71.70%), flooding (64.15%), high cost and shortage of labour (62.26%), lack of access to better technology (62.26%), high cost of hiring machines/high operating cost (60.38%) and lack of know how/skills (50.94%).

Male and female youth producers mentioned lack of capital and access to credit the major constraints. According to Mulema *et. al.* (2021), capital is required for the purchase of inputs and equipments which in most cases are not affordable by youths. Availability of capital according to Udemezue, (2019), will enable youth producers to access assets and essential inputs for production. Rice production was seen as been stressful by most male and female youth producers which is in line with the findings of Yami et. al. (2019) that, agricultural production is laborious and offers less in return. Mulema et. al. (2021), stated that majority of youth engaged in production activities of rice value chain considered rice production as tedious and less profitable. Majority of male and female youth producers encountered unfavourable weather conditions (drought and flooding) which affected the quantity and quality of output produced in that farming season in the study area.

4.8.2. Constraints to Youth Engagement in Rice Processing

The distribution of rice processors according to identified constraints to youth engagement in rice processing presented in Table 4.20.

Table 4.29: Constraints to Youth Engagement in Rice Processing

Constraints	Male		Female	
	Frequency	Percentage	Frequency	Percentage
It is tedious	38	88.37	34	79.07
Lack of capital	30	69.77	38	88.37
Insufficient knowhow/skills	30	69.77	4	9.30
Lack of access to improved technology	24	55.81	20	46.51
Lack of access to credit	24	55.81	26	60.47
High cost of machine/maintenance/high operating cost	20	46.51	40	93.02
Lack of Government support	16	37.21	8	18.61
Lack of basic amenities (electricity, water, etc.)	12	27.91	18	41.86
Risk and uncertainty	8	18.61	4	9.30
High labour cost	6	13.95	20	46.51
Marital challenges and responsibilities	0	0	24	55.81

Source: Computed from Field Survey, 2021

Multiple Responses

The table shows that majority (88.37%, 69.77%, 69.77%, 55.81, 55.81% and 46.51%) of the male youth rice processors reported that the major constraints that limit youth engagement in rice processing were that rice processing is stressful/tedious, lack of startup capital, insufficient know how/skills, lack of access to improved technology, and high cost of machines/maintenance/operating respectively. Also, 93.02%, 88.37%, 79.07%, 60.47%, 55.81%, 46.51% and 46.51% of the female youth rice processors reported the constraints of insufficient

skills, high cost of machine/maintenance/operating, lack of capital, lack of access to credit, marital challenges and responsibilities, high labour cost and lack of improved technology.

Majority of male and female youth processors are face the problem of capital which limits their access to improve technology, Mulema et. al. (2021). In addition, lack of access to improved technology and high cost of machines/maintenance is one of the major constraints to youth engagement in rice processing in the study area. Most processing machines according to Linn & Maenhout (2019) are outdated, which leads to frequent machine breakdowns, high cost of repairs and maintenance and poor quality of processed rice. Insufficient knowhow/skill on rice processing is a challenged to male and female youth processors. Possession of specialized skills and knowhow in rice processing is important for management of the enterprise, (Robinson-Pant, 2016)

4.8.3. Constraints to Youth Engagement in Rice Marketing

The distribution of rice marketers according to identified constraints limiting youth engagement in rice marketing is presented in table 4.21.

Table 4.30: Constraints to Youth Engagement in Rice Marketing

Constraints	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Lack of access to credit	82	92.14	80	89.89
Lack of capital	76	85.39	79	88.76
It is tedious (lifting a bag of rice)	55	61.80	63	70.79
Unstable market price	51	57.30	18	20.23
Lack interest in rice marketing	51	57.30	18	20.23
Lack of government support	40	44.94	12	13.48
Poor access road	38	42.70	70	78.65
Low profitability	12	13.48	24	27.00
Poor patronage	6	6.74	4	4.49
Lack of sensitization of the viability of rice marketing	2	2.25	30	33.71

Source: Field Survey, 2021

Multiple Responses

The major constraints to male rice marketers were, lack of access to credit (92.14%), lack of capital to startup (85.39%), rice marketing is a tedious business (89.89%), unstable market price (57.30%), lack of government support (44.94%) and poor access road (42.70%). Also, 88.76%, 78.65%, 70.79%, 61.80 and 33.71% of female youth rice marketers reported the constraints of lack of access to capital, poor access road; rice marketing is tedious, lack of access to credit, and lack of sensitization of the viability of rice marketing.

Access to credit and capital is a major constraint and it's needful for expansion of the rice business by the male and female youth marketers. Linn & Maenhout (2019) pointed out that capital and credit are needed to run or expand rice business and difficulty in accessing credit creates difficulties in the value chain. Male and female youth marketers were also constraint by poor access road. According to mulema et. al. (2021), poor access road leads to high cost of transportation, reducing profit of the youth marketer.

4.9. Tests of Hypotheses

Hypothesis 1

Hypothesis 1 stated that gender opportunities in rice value chain are not equitably distributed. From Table 4.11, the level of gender equity opportunities for youth rice producers, processors and marketers in the research area using the MGEI were -0.21, -0.21 and -0.04 respectively which implies gender inequity that were unfavourable towards the female. This result shows inequitable distribution of opportunities among the youth male and female actors in rice value chain in the study area. Therefore, the null hypothesis was accepted, and we concluded that gender opportunities in rice value chain were not equitably distributed.

Hypothesis 2

Table 4.31: Results of Z-test on significant difference between male and female actors at each node along the rice value chain

Rice Value Chain Actors	Sample Size	Mean Value Added Net Return (₦)	Standard Deviation	Z-Value	Decision
Producers					
Male	106	46,550	3126	-1.67	Accept the null
Female	106	47,650	6013		Hypothesis
Processors					
Male	43	4,715	943	-5.39*	Reject the null
Female	43	5,910	1105		Hypothesis
Marketers					
Male	89	14,930	2019	-6.92*	Reject the null
Female	89	17,310	2541		Hypothesis

Source**:** Computer from Field Survey, 2021
Z-critical value at 5% = 1.96, * Z-cal significant at 5% level

To test hypothesis 2 which stated that value added by male and female actors at each node is not significantly different along the value chains of rice, the Z-statistics was employed. The results of the Z-test are presented in Table 4.31. The table shows that the mean value added net returns for the rice producers were ₦46,550 and standard deviation of 3126 for male rice farmers, and mean value added net returns of ₦47,650 and standard deviation of 6013 for female rice farmers. The Z-test resulted in a Z-value of -1.67 which was not significant at 5% level for a two-tail test. Hypothesis 2 was therefore accepted for the rice producers because there was no significant difference in value added by the male and female rice farmers.

For the rice processors, the mean value added net returns was ₦4,715 with standard deviation of 943 for the male rice processors, and mean value added net return of ₦5,910 and standard deviation of 1105 for the female rice processors. The results of Z-test gave a Z-value of -5.39 which was significant at 5% level for a two-tail test when compared with the critical Z-value of 1.96. Therefore, hypothesis 2 was rejected for the rice processors because there was a significant difference in value added by the male and female rice processors in the study area.

For the rice marketers, the mean value added net return was ₦14,930 with a standard deviation of 2019 for the male rice marketers, and mean value added net return of ₦17,310 with standard deviation of 2541 for the female rice marketers. The Z-test for significant difference produced Z-value of -6.92 which was significant at 5% level for a two tail test when compared with the critical Z-value of 1.96. Therefore, hypothesis 2 was rejected for the rice marketers because there was a significant difference in value added by the male and female rice marketers in the study area.

Hypothesis 3

Hypothesis 3 which stated that male and female actors are not technically efficient along the rice value chains was tested using the result of mean technical efficiency of actors. From Table 4.13, the mean technical efficiency of male youth rice producers was 0.64 and female youth rice producers was 0.58 which were less than 1, indicating that youth male and female rice producers were not technically efficient in resource use. The null hypothesis was therefore, accepted.

Likewise, Table 4.15 shows that the mean technical efficiency of male youth rice processors was 0.70 and female youth rice processors was 0.69 which were less than 1, indicating that youth male and female rice processors are not technically efficient in resource use. The null hypothesis was accepted.

From Table 4.17, the mean technical efficiency of male youth rice marketers was 0.52 and female youth rice marketers was 0.61 which were less than 1, indicating that youth male and female rice producers were not technically efficient. The null hypothesis was therefore, accepted. Male and female youth rice producers, processors and marketers had mean technical efficiency that were less than 1 and the null hypothesis was accepted for actors. We concluded that male and female actors are not technically efficient along the rice value chain

Hypothesis 4

Hypothesis 4 stated that socioeconomic factors such as age, level of education, household size, experience, access to credit, membership to cooperative, extension contact, distance to actors' nodes, capital invested, information access and cost of intermediate product do not significantly affect value added by gender along the rice value chain. From table 4.25, the coefficients of age, level of education, farming experience, membership to cooperative, distance to actor's node, capital invested and access to information were significant. Therefore, the null hypothesis was rejected, and we concluded that these factors significantly affected value added by both male and female youth rice producers in the study area. The null hypothesis was accepted for household size, access to credit and extension contact since their coefficients were not significant and we concluded that these factors do not significantly affect value added by male and female youth rice producers in the study area.

From Table 4.26, the coefficients of level of education, household size, processing experience, access to credit, membership to cooperative, distance to actor's node, capital invested and access to information were significant for both the male and female youth rice processors. Therefore, the null hypothesis was rejected, and we concluded that these factors significantly affected value

added by male and female youth rice processors in the study area. The null hypothesis was accepted for age and extension contact since, their coefficients were not significant, and we concluded that these factors do not significantly affect value added by male and female youth rice processors in the study area.

Likewise, from Table 4.27, the coefficients of age, level of education, household size, marketing experience, access to credit, extension contact, distance to actor's node, capital invested and access to information were significant for male youth rice marketers. For the female youth marketers, the coefficients of level of education, household size, marketing experience, access to credit, membership to cooperative, distance to actor's node, capital invested and access to information were significant. Therefore, the null hypothesis was rejected, and we concluded that these factors significantly affected value added by male and female youth rice marketers in the study area.

The coefficients of membership to cooperative and cost of intermediate products were not significant for the male youth rice marketers while age, extension contact, and cost of intermediate products were not significant for female youth rice marketers. Therefore, the null hypothesis was accepted, and we conclude that these factors do not significantly affect value added by male and female youth rice marketers in the study area.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study analyzed gender equity opportunities and resource use in cereal value chain: evidence from youth engagement in rice value chain in South-East, Nigeria. Specifically, it identify the actors and gender roles along rice value chain; examine by gender, the socioeconomic characteristics of actors along the rice value chain; determine the level of gender equity gap in opportunities along the rice value chain; determine the technical efficiency and sources of inefficiency among male and female actors along the rice value chain; determine the value added and the share of the value added by gender along the rice value chain; estimate the socioeconomic factors affecting value added by gender along rice value chain and identify the constraints to youth engagement in the rice value chain, by gender. The following null hypotheses were tested in the study: Gender opportunities in rice value chain are not equitably distributed; Value added by male and female actors at each node is not significantly different along the value chain of rice; Male and female actors are not technically efficient along the rice value chain and, Socioeconomic factors of the rice farmers do not significantly affect value added along the rice value chain.

The study was conducted in South-East, Nigeria. The sample size consists of 476 youth rice value chain actors randomly selected from 48 villages across three states in South-East Nigeria. The data were collected using structured questionnaires coded into electronic software (Surveybe) and analyzed using Modified Gender Equity Index (MGEI), stochastic meta-frontier, value

addition and multiple regression models and Z-Statistics. Descriptive statistics such as frequency, percentages, charts and mean were also used to realize some additional results.

Functional analysis shows that the role of both the male and female youth engaged in rice production was cultivation/production of rice and the roles of both the male and female processors were parboiling, milling and further processing. The roles of both the male and female rice marketers were trade, storage, and transportation of rice. Some of the agents involved in these functions include smallholder farmers, millers who integrate backwards, village and cluster parboilers, millers, village and clustered millers, integrated rice mills, wholesale and retail traders, transporters.

Analysis of the socioeconomic characteristics of youth engaged in rice value chain in the study area shows that 75.47% male and 68.87% female youth producers were within the ages the age range of 31-40 years, with mean age of 35years. 78.30% male and 96.23% female youth were married with mean household size of 7persons for the male youth producers and 6persons for the female producers. Also, 46.22% of the male and 45.28% of the female producers had secondary level of education. The result also shows that 61.32% male and 78.30% female youth engaged in rice production do not belong to any association; 62.26% male and 82.08% female youth do not have access to extension services; and 94.34% male and 91.17% female youth do not have access to credit facilities in the study area. The mean years of experience of the male youth producers was 10years while the female youth producers had 9years of experience. 50% male and 49.06% female youth producers acquired land through inheritance.

For the processors, result shows that 79.07% male and 60.47% female youth were within the ages the age range of 31-40 years, with mean age of 35years for male and 33years for the female. 83.72% male and 79.07% female youth were married with mean household size of 6persons for

both the male and female youth. Also, 60.47% of the male and 46.51% of the female processors had secondary level of education. The result also shows that 69.77% male and 93.02% female youth engaged in rice processing do not belong to any association; 76.74% male and 95.35% female youth do not have access to extension services; and 95.35% male and female youth do not have access to credit facilities in the study area. The mean years of experience of the male female youth processors were8years. 62.79% male youth acquired land through inheritance while 53.49% female youth processors acquired land through purchase.

For marketers, result shows that 67.42% male youth marketers were within the age range of 31-40 years and 47.19% female youth were within the ages the age range of 21-30 years, with mean age of 34years for male marketers and 311years for female marketers. 65.17% male and 73.03% female youth were married with mean household size of 6persons for both male and female youth marketers. Also, 51.69% of both male and female marketers had secondary level of education. The result also shows that 69.66% male and 84.27% female youth engaged in rice marketing do not belong to any association; 78.65% male and 89.89% female youth do not have access to extension services; and 95.51% male and 93.26% female youth do not have access to credit facilities in the study area. The mean years of experience of the male youth producers was 9years while the female youth marketers had 7years of experience. 66.29% male and 47.19% female youth marketers acquired land through rent/lease.

The modified Gender Equity Index (MGEI) was used to determine the level of gender equity among youths engaged in rice value chain in the study area. Results show that there was existence of gap in access to education, credit, and membership to association among youth producers, processors and marketers. Negative gap value of -0.03, -0.33 and -0.28 reflect the existence of inequity towards the female youth producers in access to education, credit, and

membership to association. Likewise, negative gap value of -0.02 and -0.62 reflect the existence of inequity towards the female youth processors in access to education and membership to association while, gap value which equals 0 shows that there is no disparity between the female and male youth processors in access to credit. Also, positive gap value of 0.01 and 0.17 reveals the existence of inequity towards the male youth marketers in access to education and credit while, negative gap value of -0.30 reflect the existence of inequity towards the female youth marketers in membership to association. Generally, the Gender Equity Index (GEI) of -0.21 for producers, -0.21 for processors and -0.04 for marketers reflects the existence of gender inequity that is unfavourable towards the female youth actors in access to resources.

The technical efficiency indices of the male youth producers' range between 34.42% and 90.25% with a mean of 64.27% which implies that, the average male can still optimize or increase their output by 35.73%. The technical efficiency indices for the female rice producers' range between 31.14% and 92.06% with a mean of 58.67% which suggest that the average female producer can still optimize or increase their output by 41.33%. The Technical Gap Ratio (TGR) was 0.587 which was not significant at 5%, implying that male and female youth producers applied similar technologies in rice production while, the technical efficiency Ratio (TER) was 0.8932 and 0.8105 for male and female youth producers respectively, implying that the male rice producer had a higher TER than the female rice producers in the study area. Likewise, the technical efficiency indices of the male youth processors range between 33.12% and 92.18% with a mean of 69.86% while, the technical efficiency indices of the female youth processors range between 34.13% and 93.14% with a mean of 68.71%. The TGR is 0.528 which was not significant at 5% significant level suggesting that the technologies used by the rice processors were similar; the TER was 0.9027 and 0.9896 for male and female youth processors respectively implying that the

female processors had a higher TER than the male youth processors. The technical efficiency indices the male youth marketers' range between 31.08% and 95.16% with a mean of 52.39% while the technical efficiency indices of the female youth marketers' range between 34.13% and 89.17% with a mean of 61.38%. The TGR was 0.5907 which was not significant at 5% significant level suggesting that the technologies used in marketing of rice by the male and female marketers are similar.

The sources of technical inefficiency among male youth producers were level of education, membership to cooperative, extension contact, source of labour, farming experience, farm size and capital. While the coefficient of membership to cooperative, farming experience, capital and level of education were the source of technical inefficiency among female youth producers in the study area. The sources of technical inefficiency among male and female youth engaged in rice processing were level of education, processing experience, access to credit and membership to cooperative. Likewise, the sources of technical inefficiency among male youth rice marketers were level of education, marketing experience, access to credit and membership to cooperative while, the sources of technical inefficiency among the female youth marketers were level of education, marketing experience and membership to cooperative.

The result of the cost and returns of youth engaged in rice production in the study area shows that the female youth rice producers had a higher net return of ₦47,650 per hectare with return on naira spent of 26.81% while the male youth rice producers had a net return of ₦46,550 with return on naira spent of 22.35%. This implies that rice production was profitable for both the male and female youth producers. The net returns per metric tonnne of milled rice shows that the female youth processors had higher net return of ₦5,910 with return on naira spent of 88.34% while the male youth processors had net return of ₦4,715 with return on naira spent of 59.80%.

this also indicated that rice processing was profitable in the study area. The cost and returns per metric tonne of rice marketing shows that the female youth engaged in rice marketing had a higher net return of ₦17,310 with return on naira spent of 9.89% while, the male youth had net return of ₦14,930 with return on naira spent of 8.28% per metric tonne. This also indicated that rice marketing in the study area was profitable.

The value added per hectare by male and female youth engaged in rice production was ₦63,850 and ₦59,850, the value added per metric tonne by male and female youth engaged in rice processing was ₦8400 and 8600 while, the value added per metric tonne by male and female youth engaged in rice marketing was ₦17,570 and ₦19,200. The percentage share of value added by the male youth producers, processors and marketers were 51.62%, 49.41% and 47.78% respectively, indicating that the share of the value added by the male actors decrease along the value chain; the producers having the highest value added share and the marketers with the least value added share. Likewise, the share of value added by the female youth producers, processors and marketers were 48.38%, 50.59% and 52.22% respectively indicating that the share of value added by female actors increased along the rice value chain; the producers having the least value added share and the marketers with the highest value added share.

Some factors which influenced value added by male and female producers positively were level of education, farming experience, membership to cooperative, capital and information. While factors such as; age and distance affected value added negatively. Factors which influenced value added by male and female youth processors positively were education, household size, processing experience, access to credit, cooperative membership, capital, and information while factors such as age, distance and cost of intermediate products influenced value added by male and female youth processors negatively. Likewise, some factors which affected value added by

male and female marketers positively were level of education, household size, marketing experience, access to credit, capital, and information while, factors such as age and distance affected value added negatively. The coefficient of extension contacts significantly affected the value added by the male youth marketers but was did not significantly affect the value added by the female youth marketers.

The analysis of factors constraining youth engagement in rice production shows that the most mentioned factors by male youth rice producers were lack of capital (75.47%), lack of access to credit (75.47%), drought (67.93%), lack of access to better technology (60.38%), it is tedious (58.49%) and high cost of hiring/operating machines (57.55%) while, the most mentioned factors by the female youth producers werelack of capital (94.34%), it is tedious (73.58%), lack of access to credit (71.70%), flooding (64.15%), high cost and shortage of labour (63.21%), lack of access to better technology (62.26%), inadequate land/access to land (62,26%), high cost of hiring/operating machine (60.38%) and pest and diseases (50.94%). The major factors constraining youth engagement in rice processing as mentioned by male youth processors were that rice processing is tedious (88.37%), lack of startup capital (69.77%), insufficient knowhow/skills (69,77%), lack of access to improved technology (55.81%), lack of access to credit (55.81%) and high cost of machine/maintenance/operating (46.51%) while, the most mentioned factors by the female youth processors were high cost of machine/maintenance/operating (93.02%), lack of startup capital (88.37%), it is tedious (79.07%), lack of access to credit (60.47%), marital responsibility (55.81%), lack of access to improved technology (46.51%) and high labour cost (46.51%). For youths engaged in rice marketing, the major factors mentioned by male marketers were lack of access to credit (92.14%), lack of startup capital (85.39%), it is tedious (61.80%), unstable market price (57.30%), lack

interest in rice marketing (57.30%), lack of government support (44.94%), and poor access road (42.70%), while the most mentioned factors by the female youth marketers were lack of access to credit (89.89%), lack of capital (88.76%), poor access road (78.65%) and rice marketing is tedious (70.79%).

5.2 Conclusion

The study concluded that majority of the male and female youth engaged in rice value chain in the study area were within the age of 31-40 years and had basic education. Majority of both the male and female youths do not belong to cooperatives association and had less access to full services limiting their access to information and improved technology. The study further concluded that there are disparities in access to education, credit and membership to cooperative associations among youth engaged in rice production, processing and marketing. These disparities indicated gender inequity towards the female youth actors.

In addition, both male and female youth actors were technically inefficient in resource use. The determinant factors of technical inefficiency among the male and female youth in the study area were level of education, membership to cooperative, experience and access to credit.

The value added by the male youth actors was slightly greater than the value added by the female youth actors. The percentage share of the value by male youth actors decreased along the rice value chain from the producers with the highest share and marketers with the least share. While the percentage share of value added by female youth increased along the chain from the producers with the least share and marketers with the highest value added share. Some factors affecting value added by actors were level of education, experience, capital invested, information and distance to actor's node.

By addressing the identified constraints to youth engagement in rice value chain such as lack of capital to start up, lack of access to credit, drought, lack of access to better technology, high cost of hiring/operating machines, lack of know how/skills and stressful nature of rice value chain, lack of government support, marital challenges and responsibilities for the female actors; stakeholders can enhance the overall efficiency and productivity of the rice value chain while fostering greater gender equity among youth actors in South-East Nigeria.

5.3 Recommendations

Based on the findings of the study, the following recommendations were made:

1. Promote gender equity: Recognize and address the existing gender gaps and inequities within the rice value chain. Implement policies and interventions that ensure equal access to resources, opportunities, and decision-making power for both male and female youth actors. This could be achieved through targeted training programmes, awareness campaigns and capacity-building initiatives that promote gender equality.

2. Enhance access to education and training: Improve educational opportunities for youth engaged in rice value chain and develop programmes that focus on agricultural training and agribusiness skills. This will enable youths to be better prepared to overcome challenges, adopt innovative practices, and contribute to sustainable development of the rice sector.

3. Strengthen access to credit and finance: Facilitate access to affordable credit and financial services for youth involved in rice production, processing and marketing. This can be achieved through the establishment of financial institutions and mechanisms specifically targeting youth in the agricultural sectors.

4. Improve technology adoption: Promote the adoption of improved and environmental sustainable technologies throughout the rice value chain. This includes providing access to modern farming techniques, processing equipments and efficient marketing channels. Technology transfer and extension services should be targeted at youth with focus on enhancing their productivity, improve the quality of product processed, and improving the overall efficiency of rice value chain.

5. Foster partnership and networking: Encourage youth engagement in associations, and cooperatives to facilitate knowledge sharing, collective decision-making, and access to market. This will enable youth to leverage economies of scale, negotiate better prices, and access to market information and opportunities.

By implementing these recommendations, stakeholders can contribute to the empowerment of youth, promote gender equity, enhance productivity, and foster sustainable development within the rice value chain in South-East, Nigeria.

5.4 Contribution to Knowledge

The study makes some contributions to knowledge. These contributions can be summarized as follows:

1. Gender Equity Gap: By quantifying the inequities in access to education, credit, and membership to association among male and female youth actors through the application of Modified Gender Equity Index (MGEI), the study contributes to the understanding of gender inequities within the rice value chains.

2. Technical Efficiency and Sources of Inefficiency: The study analyses the technical efficiency of male and female youth actors along the rice value chain. This knowledge

can inform strategies for improving resource utilization and productivity among youth engaged in rice production, processing and marketing.

3. Value Added and Share by Gender: By examining the value added and share of value along the rice chain, the study contributes to understanding the economic contributions of male and female youth actors in the rice value chain.

4. Constraints to Youth Engaged in Rice Value Chain: The study identifies the constraints faced by male and female youth engaged in rice production, processing, and marketing. This knowledge can guide the development of strategies and interventions to address these constraints and promote youth engagement in rice sectors.

Overall, the study contributes to existing knowledge on gender equity, resource use, and socioeconomic factors affecting youth engaged in the rice value chain. The findings provide valuable insights for policymakers, researchers, stakeholders, and practitioners to design targeted interventions and strategies that promote gender equity and youth empowerment.

5.5 Dissemination of Information on Research Output

1) A workshop was organized at the Department of Agricultural Economics, Faculty of Agriculture and Agricultural Technology and, Postgraduate School, Federal University of Technology Owerri; Involving youths and some farmers from neighbouring villages.
2) The research findings were presented to the Faculty of Agriculture and Agricultural Technology and, Postgraduate School, Federal University of Technology Owerri, involving students across the various Departments and Schools in the university.

3) The research findings will also be presented to learned associations (such as National Association of Agricultural Economics, Farm Management Association of Nigeria, Nigeria Agricultural Society, etc) conferences.
4) Publishing of research findings in National and International Journals.

REFERENCES

Abdulkadir, M., & Umar, A. (2015). Analysis of Resource-Use Efficiency and Productivity of Residual Soil Moisture Tomato Production in Kaduna State, Nigeria. International Letters of Social and Humanistic Sciences, 51:152-157. doi.org/10.18052/

Adam, A.G. and Bidoli, T.D. (2018). Assessment of Gender Involvement in Rice Processing Under Staple Crop Processing of Agricultural Transformation Agenda Support Program - 1 (Atasp-1) in Kebbi State. *Journal of Agriculture and Environment*, 14(2):55-62

Addison, M., Ohene-Yankyera, K. & Fredua-Antoh, E. (2016). Gender Role, Input Use and Technical Efficiency among Rice Farmers at Ahafo Ano North District in Ashanti Region of Ghana. *Journal of Food Security,*4(2): 27-35.

Adzawla, W., Fuseini, J., & Donkoh, S. A. (2013). Estimating technical efficiency of cotton production in Yendi Municipality, Northern Ghana. *Journal of Agriculture and Sustainability*, 4(1):115–140.

African Development Bank Group, AfDB (2013). Agricultural Transformation Agenda Support Program – Phase 1 (ATASP-1), Strategic Environmental and Social Assessment (SESA-Summary). https://www.afdb.org/sites/default/files/documents/environmental-and-social-assessments/nigeria_agricultural_transformation_agenda_support_program_

Agossadou, A. J; Fiamohe, R; Tossou, H. & Kinkpe, T. (2018) Agribusiness Opportunities for Youth in Nigeria: A Farmers Perceptions and Willingness to Pay for Mechanized Harvesting Equipment. 30th International Conference of Agricultural Economist. July 28-August 2, 2018, Vancouver.

A-lhassan, S. (2012). Technical efficiency in smallholder paddy farms in Ghana: an analysis based on different farming systems and gender. Journal of Economics and Sustainable Development, 3(5):91–106.

Akpan, S. B., Inimfon, V. P., & Samuel, J. U. (2014). Analysis of Monthly Price Transmission of Local and Foreign Rice in Rural and Urban Markets in Akwa Ibom State, Nigeria (2005 to 2013). *Inter. J. Agric. Forestry*, 4(1): 6-18.

Akpan, S.B. & John, D.N. (2020). Technica Efficiency of Small-Scale Cassava Based Processors (Cassava Grater Operatorss) in Eket Agricultural Zone of Akwa Ibom State, Nigeria. Nigerian *Journal of Agriculture, Food and Environment,* 16(3): 137-149.

Akter, S; Krupnik, T. J; Rossi, F & Khanam, F (2016). The influence of gender and product design on farmers' preferences for weather-indexed crop insurance. *Global Environmental Change (38) 217–229*

Aiyedun, E. A. Ebukiba, E. S. Otitoju, M. A. Ogbole, E. O. & Luka, A. (2021). Comparative Analysis of Marketing Efficiencies of Paddy and Locally Milled Rice (Oryza sativaL.) Marketers in the Federal Capital Territory, Nigeria. *European Journal of Agriculture and Food Sciences,* 3(6):1-7. DOI: http://dx.doi.org/10.24018/ejfood.2021.3.6.324

Ali, D., D. Bowen, K. Deininger, & M. Duponchel (2015) "Investigating the gender gap in agricultural productivity. Evidence from Uganda", Policy Research Working Paper, No.7262, The World Bank.

Amaechi E. C., Ewuziem, J. E. & Agunanna, M. U. 2014. Estimation of Technical Efficiency in the Translog Stochastic Frontier Production Function Model: An Application to the Oil Palm Produce Mills Industry in Nigeria. *Advances in Applied Science Research*, 5(3):230 – 236

Aminu, F. O., Rosulu, H. O., Toku, A. S. O., Dinyo, O. B., & Akhigbe, E. C. 2017. Technical Efficiency in Value Addition to Cassava: A Case of Cassava-Garri Processing in Lagos State, Nigeria. *Journal of Agriculture and Sustainability*, 10(1): 97 – 115.

Amusa, T.A. & Eshheya, S.E. (2022). Analysis of Gender Differentials in Technical Efficiency of Hungry Rice (Acha) Farmers in Plateau State, Nigeria. *Journal of Applied Agricultural Research*, 10(2):2-14.

Arndt, A. & Kierzkoski, H. (2001). Fragmentation: New production patterns in the world economy. Oxford, UK.

Asfaw, S., Shiferaw, B., Simtowe, F. & Haile, M.G. (2011). Agricultural Technology Adoption, Seed Access Constraints and Commercialization in Ethiopia. *Journal of Development and Agricultural Economics,* 3(9):436-477

Ashiegbu, G., Nnabuike-Eneh, S.A. Udensi, C.O. (2018). Effect of Socio-economic Characteristics of Youth Farmers on the Level of Rice Production in Ebonyi State, Nigeria. *Journal of Community and Communication Research*, 3(1):5-10.

Awomi, E. Z., & Tariang, W. (2022). Targeting the Poor Women-Headed Households in the Pursuit to End Poverty: A Case Study of Zunheboto District of Nagaland in North Eastindia. International *Journal of Research -GRANTHAALAYAH*, 10(11), 173–192. https://doi.org/10.29121/granthaalayah.v10.i11.2022.4910

Awunyo-Vitor, D., Wongnaa, C. A., & Aidoo, R. (2016). Resource Use Efficiency among Maize Farmers in Ghana. *Journal of Agriculture and Food Security,* 5,28. doi:10.1186/s40066-016-0076

Ayoola**,** J.B. & Dangbegnon**,** C. (2011). Socio-economic factors influencing rice production among male and female farmers in Northern Guinea Savanna Nigeria: lessons for

promoting gender equity in action research**.** *Agriculture and Biology Journal of North America*, 2(6):1010-1014**.** DOI:*10.5251/abjna.2011.2.6.1010.1014***.**

Azumah, S.B., Donkoh, S.A. & Awuni, J.A. (2019). Correcting for sample selection in stochastic frontier analysis: insights from rice farmers in Northern Ghana. *Agric Econ* 7(9). https://doi.org/10.1186/s40100-019-0130-z

Backiny-Yetna, P. & K. McGee (2015), "Gender differentials and agricultural productivity in Niger", Policy Research Working Paper, No.7199, The World Bank.

Bair, J. (2005): Global Capitalism and Commodity Chains: Looking Back, Going Forward. Competition & Change, Vol. 9, No. 2, pp. 153–180.

Barrett, C.B. (2008). Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa. *Food Policy* 33: 299-317.

Battese, G.E. and Prasada Rao, D.S. (2002). Technology Gap, Efficiency, and a Stochastic Metafrontier Function *International Journal of Business and Economics*, 1(2): 87-93.

Bello, L.O., Baiyegunhi, L.J.S., Danso-Abbeam , G., & Ogundeji, A. A. (2021). Gender Decomposition in Smallholder Agricultural Performance in Rural Nigeria. *Scientific African*, 13:1-12 https://doi.org/10.1016/j.sciaf.2021.e00875

Ben-Chendo, G.N., Lawal, M & Osuji, M.N. (2017). Cost and Returns of Paddy Rice Production in Kaduna State. European Journal of Agriculture and forestry Research 5(3): 44-48.

Bennell, P. (2010). Investing in the future: Creating opportunities for young rural people. IFAD, 24

Berman, L., Hartanto, J. & Dewi, R. (2013) *Women's Empowerment in Agricultural Assessment: Indonesia 2013, USAID, p. iv.*

Beuchelt T.D. & L. Badshue (2013). "Gender, nutrition and climate smart food production: Opportunitiesand trade-offs." *Food Security* 5:709-21.

Beuchelt, T.D. (2016). Gender, Social Equity and Innovation in Smallholder Farming System: Pitfalls and Pathways. Technological and Institutional Innovations for Marginal Smallholders in Agricultural Development pp 181-193.

Bezu, S. & S. Holden (2014). "Are Rural Youth in Ethiopia Abandoning Agriculture?" *World Development* Vol. 64, pp. 259–272, 2014 0305-750X/2014 Elsevier Ltd.

Bhattarai, B. & Leduc, B. (2009). *Engendering value chain development*. Kathmandu, Nepal: ICIMOD.

Bravo-Monroy, L., Potts, S. G., & Tzanopoulos, J. (2016) Drivers influencing farmer decisions for adopting organic or conventional coffee management practices. *Food Policy*, *58*, 49-61.

Brummer, B., and Loy. J.P. (2000). The technical efficiency impact of farm credit programmes: A case study in Northern Germany. *Journal of Agricultural Economics* 51 (3): 405–418.

Chikezie, C., Benchendo, G.N., Ibeagwa, O.B., Oshaji, I.O.& Onuzulu, O.A. (2020). Analysis of Technical Efficiency among Rice Farmers in Ebonyi State of Nigeria: A Stochastic Frontier Approach. *Journal of Agriculture and Food Science,* 18(1): 40-49.

Clottey, V.A., Gyasi, K.O., Yeboah, R.N., Addo-Kwafo, A. & F. Avornyo (2007): The Small Ruminat Production System in Northern Ghana: A Value Network Analysis. Livestock Research for Rural Development. Volume 19, Article #167. Retrieved on March 06, 2016, from http://www.cipav.org.co/lrrd/lrrd19/11/clot19167.htm.

Coelli, T.J., Rao, D.S.P., O`Donnell, C.J & Battese, G.E. (2005). *An introduction to efficiency and productivity analysis.* 2. Edition, Springer, New York, p. 64-83.

Coles, C. & Mitchell, J (2011). Gender and agricultural value chains: A review of current knowledge and practice and their policy implications.

Connell, R. W. (2005). Change Among the Gatekeepers: Men, Masculinities, and Gender Equality in the Global Arena. *Signs*. 30(3): 1801-1825.

Context Network and Sahel Capital (2016) Early Generation Seed Systems Study, Feed the Future: Building Capacity for African Agricultural Transformation (Africa Lead II). DAI Prime Cooperative Agreement No. AID-OAA-A-13-00085 for the U.S. Agency for International Development, Feed the Future: Building Capacity for African Agricultural Transformation (Africa LEAD II) Program.

Contreras, M. (2012). Bridges to Adulthood: Understanding the Lifelong Influence of Men's Childhood Experiences of Violence. Analyzing Data from the International Men and Gender Equality Survey (IMAGES).

Costantini V, & Monni S (2009) Gender disparities in the Italian regions from a human development perspective. Journal of Socio Economics. 38(2):256–269.

Dahal, P. (2011). Effect of Gender Gap in Education On District Level Gdp Per Capita of Nepal, Economic Journal of Development Issues Vol. 13 & 14 No. 1-2, Combined Issue.

Danso-Abbeam, G., Dahamani, A. M., & Bawa, G. A.-S. (2015). Resource-use-efficiency among smallholder groundnut farmers in Northern Region, Ghana. *American Journal of Experimental Agriculture,* 6(5):290–304.

Das, A. and Singh, S. K. (2014). Engaging Men: Challenging Stereotypes. Reflections on Working with Men on Gender Issues in India. *IDS Bulletin.* 45(1): 69-79

de Brauw, A. (2015). 'Gender, Control, and Crop Choice in Northern Mozambique'. *Agricultural Economics,* 46(3): 1–14.

Development Finance Department Central Bank of Nigeria (2021) Anchor Borrowers' Programme (ABP) Guidelines. https://www.cbn.gov.ng/out/2021/ccd/abp%20guidelines%20october%2013%202021%20-%20final%20(002).pdf

Development in Gardening (DIG) Women's Empowernment *https://www.dig.org/our-impact/womens-empowerment/* retrieved on 25/06/2022.

Dolan C., & Sorby K. (2003). Gender and employment in high value agriculture industries. Agricultural and Rural Development working paper No.7, Washington D.C.

Dolan, C., Sutherland, K. 2002. *Gender and employment in the Kenya horticulture value chain. Globalisation and Poverty Working Paper*. Overseas Development Group, University of EastAnglia, Norwich.

Donnelly, J. (2007). The relative universality of human rights. *Human Rights Quarterly, 29* (2): 281-306.

Dzever, D. D., Ayoola, J B., Alakali, J., Ater, P. I., Sanni, L., Ngadi, M., and Kok, R. (2016). Technical Efficiency among Small and Medium Scale Entrepreneurs in High Quality Cassava Flour in Four Geo-Political Zones of Nigeria. *European Journal of Physical and Agricultural Sciences*, 4(3): 52 – 64

Edeoghon, C.O.; Iyilade, A.O. & Nwachukwu, C.G. (2019). Assessment of Gender Participation in Rice Production in Abakaliki, Nigeria. *Journal of Biology, Agriculture and Healthcare.* 9(12):37-42.

Edet E.O., Udoe P.O. & Ifang E.D. (2018). Resource Use Efficiency of Groundnut Farmers in Bekwara Local Government Area, Cross River State, Nigeria. *Global Journal of Agricultural Sciences,* 17:75-84: https://dx.doi.org/10.4314/gjass.v17i1.9

Ewuzie, C.O., Ifedora, C.U. & Anetoh, J.C. (2020). Profitability of Actors In Rice Value Chain in Nigeria: A Comparative Analysis. *International Journal of Innovative Research and Advanced Studies (IJIRAS)*, 7(7): 59-66.

Farnworth, R.C. (2011). *Gender-aware value chain development*. Accra, Ghana: UN Women.

Fasakin, I.J.; Ogunniyi, A.I.; Bello, L.O.; Mignouna, D.; Adeoti, R.; Bamba, Z.; Abdoulaye, T.; Awotide, B.A. (2022). Impact of Intensive Youth Participation in Agriculture on Rural

Households' Revenue: Evidence from Rice Farming Households in Nigeria. *Agriculture 2022*, 12, 584. https://doi.org/10.3390/ agriculture12050584

Faße, A.; Grote, U.; Winter, E. (2009) : Value chain analysis methodologies in the context of environment and trade research, Diskussionsbeitrag, No. 429, Leibniz Universität Hannover, Wirtschaftswissenschaftliche Fakultät, Hannover

Fernández-Sáez, J; Ruiz-Cantero, M. T; Guijarro-Garví, M; Carrasco-Portiño, M; Roca-Pérez, V; Chilet-Rosell, E & Álvarez-Dardet, C (2013). Looking twice at the gender equity index for public health impact. *BMC Public Health* 13:659, 2-10.

Fletschner, D.& Kenney, L. (2011). *Rural women's access to financial services: Credit savings and insurance*. ESA workingpaper No. 11–07. Rome, Italy: Agricultural Development Economics Division, Food and Agriculture Organizationof the United Nations.

Food and Agriculture Organization (2005): EASYPol. On-line resource materials for policy making. Analytical tools. Module 045. Commodity Chain Analysis. Impact Analysis Using Market Prices. *www.fao.org/docs/up/easypol/332/CCA_045EN.pdf*

Food and Agriculture Organization (2008). FAOSTAT. Food and Agriculture Organization, Database Results.

Food and Agriculture Organization (2011). The state of food and agriculture: Women in agriculture – closing the gender gap for development. Rome, Italy: FAO. Retrieved on March 10, 2017, from http://www.fao.org/docrep/013/i2050e/i2050e.pdf.

Food and Agriculture Organization**(**2014b). Gender in Food and Nutrition Security. E-learning course, English Version 1.0 *http://www.fao.org/elearning/#/elc/en/course/FG*).

Food and Agriculture Organization (2016) Developing gender-sensitive value chains: A guiding framework. Rome, Italy.

Food and Agriculture Organization, International Labour Organization & International Union of Forestry Research Organization (2007). Agricultural workers and their contribution to sustainable agricultureand rural development. ILO Geneva

Food and Agricultural Organization (2012). Agricultural Cooperatives and Gender Equality. International Year of Cooperatives Issue, Brief Series. *https://www.fao.org/3/ap669e/ap669e.pdf*

Food and Agricultural Organization (2013).Training Guide - Gender and Climate Change Research in Agriculture and Food Security for Rural Development, CCAFS & FAO. *www.fao.org/climatechange/micca/gender*

FAO (2013). Policy on Gender Equality: Attaining Food Security Goals in Agriculture and Rural Development. FAO, Rome. *https://www.fao.org/3/i3205e/i3205e.pdf*

Food and Agricultural Organization (2014). *Why Gender*. Retrieved on February 28, 2017, from: *http://www.fao.org/gender/gender-home/gender-why/why-gender/en/*.

FAO (2016) Developing gender-sensitive value chains: A guiding framework. Rome, Italy.

FAO (2018). Gender and food loss in sustainable food value chain- a guiding note. Rome, Italy

FAO (2018). Developing Gender-Sensitive Value Chain- Guideline for Practitioners. Rome.

Gamayina, D.J., Shelleng, B.A., Haddabi, A.S. & Aliyu, A. (2020). Technical Efficiency of Cowpea Marketing in Mubi North. *International Journal of Engineering Technologies and Management Research,* 7(2): 81-102. DOI:10.2912/ijetmr.v7.i2.2020.541.

Gammage, S. (2009). *Gender and pro-poor value chain analysis.* Washington, DC, USA: USAID. Gendered value chain analysis: red gram, ground nut, neem and tamarind.

Gereffi, G. (1994). The organization of buyer-driven global commodity chains: how US retailers shape overseas production networks, in G. Gereffi and M. Korzeniewicz (eds) *Commodity Chains and Global Capitalism* (Westport, CT, Praeger).

Getahun, K. (2015). Profitability analysis and determinants of fruit tree based agroforestry system in Wondo District, Ethiopia. *African Journal of Agricultural Research. 10*, 1273–1280.

Giller, K.E., Delaune, T., Silva, J.V. Descheemaeker, K., Ven, G., Schut, A.G.T., Wijk, M., Hammond, J., Hochman, Z., Taulya, G., Chikowo, R., Narayanan, S., Kishore, A., Bresciani, F., Teixeira, H.M., Andersson, J.A. & van Ittersum, M.K (2021). The future of farming: Who will produce our food?. *Food Security*. 13, 1073–1099 https://doi.org/10.1007/s12571-021-01184-6

Gilligan, C. (2011). *Joining the Resistance*. Malden, MA: Polity Press.

Goni, M., Umar, A.S.S. & Usman. S. (2013). Analysis of Resource-Use Efficiency in Dry Season Vegetable Production in Jere, Borno State, Nigeria. *Journal of Biology, Agriculture and Healthcare*, 3(19):18-23.

Grozanick, R (2016). The Way Forward: Unpacking the Coffee Quality Institute's Partnership for Gender Equity Report. *https://sprudge.com/gender-equity-report-90475.html*

Hanefeld J. (2008). How have global health initiatives impacted don health equity. Promot Educ, 15(1):19–23.

Henriksen, L., Riisgaard, L., Ponte, S., Hartwich, F. & Kormawa, P. (2010). *Agro-food value chain interventions in Asia: Areview and analysis of case studies.* Vienna, Austria: UNIDO.

Igwenagu M.O., Ohajianya, D.O., Nwaiwu, I.U.O., Gbolagu, A.O. & Ehirim, N.C. (2020). Value Chain Mapping and Actors' Value added Share in Catfish Value Chain in Imo State, Nigeria. *Journal of Agriculture and Food Sciences,* 18(2):120-124.

Ingram, V., Yago-Ouattara, E.L., Lartey, A., Mogre, D., Wijnands, Jo H.M. & van den Berg, J. (2015). Gender Dynamics in Cashew and Shea Value Chains from Ghana and Burkina Faso. Wageningen, LEI Wageningen UR (University & Research centre), LEI Report 2015-039. 60 pp.; 5.

Iguodala-Cole, H & Anto, J.B. (2021) Impact of Casual Employment on Commitment of Workers in the new generation Banks in Abuja. *Gusau Journal of Sociology*, 2(1):1-15

International Finance Corporation (2016) Investing in Women along Agribusiness Value Chains. 2121 Pennsylvania Avenue, N.W. Washington, D.C. 20433

International Labour Organization, ILO (2016). Nigeria moving forward with ILO-supported Youth Employment in Agriculture Programme. https://www.ilo.org/africa/media-centre/pr/WCMS_458206/lang--en/index.htm

International Labour Organization, ILO (2016). Nigeria moving forward with ILO-supported Youth Employment in Agriculture Programme. https://www.ilo.org/africa/media-centre/pr/WCMS_458206/lang--en/index.htm

International Labour Organization, ILO (2020). Global Employment Trends for Youth 2020: Technology and the Future of Jobs. International Labour Office, Geneva.

Ishiaku, O. K., Haruna, U., Danwanka, H. A., & Suleiman, H. R. (2017). Resource use efficiency of fadama III small-scale rice farmers in Nasarawa State, Nigeria. *International Journal of Agricultural Economics and Extension.* 5 (4): 284–294.

Jauch, H. (2002). Export processing zones and quest for sustainable development: A southern African perspective. *Environment and Urbanization* 14:101–113.

Jackson, S.D., Mohr, J.J., & Kindahl, A.M. (2021). Intersectional experiences: A mixed methods experience sampling approach to studying an elusive phenomenon. *Journal of Counseling Psychology*, 68(3): 299–315. https://doi.org/10.1037/cou0000537

Jeckoniah, J; Mdoe, N & Nombo, C. (2013) Mapping Of Gender Roles And Relations Along Onion Value Chain In Northern Tanzania. *International Journal of Asian Social Science,* 3(2):523-541

Jewkes, R., Morrell, R., Hearn, J., Lundqvist, E., Blackbeard, D., Lindegger, G., Quayle, M., Sikweyiya, Y. & Gottzén, L. (2015). Hegemonic masculinity: combining theory and

practice in gender interventions. *Culture, Health & Sexuality*, 17(2): 112-127, DOI: 10.1080/13691058.2015.1085094

Joe-Nkamuke, U., Olagunju, K.O., Njuguna-Mungai, E. & Mausch, K. (2019). Is There Any Gender Gap in the Production of Legumes in Malawi? Evidence from the Oaxaca–Blinder Decomposition Model. *Review of Agricultural, Food and Environmental Studies*, 100:69–92. https://doi.org/10.1007/s41130-019-00090-y

Kachel, S., Steffens, M.C. & Niedlich, C. (2016). Traditional Masculinity and Femininity: Validation of a New Scale Assessing Gender Roles. *Frontiers I Psychology*, 7(956):1-19.

Kadiri, F. A., Eze, C. C., Orebiyi, J. S., & Onyeagocha, S. U. O. (2014). Resource-use and allocative efficiency of paddy rice production in Niger Delta Region of Nigeria. *Global Journal of Agricultural Research,* 2(4), 11–18.

Kaplinsky, R. & M. Morris (2002): Handbook for value chain research, IDRC. Retrieved on March 12, 2017, from, http://www.ids.ac.uk/ids/global/pdfs/VchNov01.pdf

Kaur, N.G., & Letic, J. (2012). Female Education and Economic Growth: Theoretical Overview and Two Country Cases, A thesis submitted for the degree of *Bachelor of Science in Economics* June 2012

Kebede, W. & Butterfield, A. K. (2009) 'Social networks among poor women in Ethiopia', *International Social Work* 52.3: 357-373

Kilic, T., A. Palacios-Lopez, & M. Goldstein (2013), "Caught in a productivity trap: A distributional perspective on gender differences in Malawian agriculture." Policy Research Working Paper, No. 6381, The World Bank.

Kim, S. & E.-U. Shin (2002): A Longitudinal Analysis of Globalization and Regionalization in International Trade: A Social Network Approach. *Social Forces*, 81(2) : 445-471.

Kim, A., & Woo, K. (2022) Gender differences in the relationship between informal caregiving and subjective health: the mediating role of health promoting behaviors. *BMC Public Health*, 22, (311):1-14. https://doi.org/10.1186/s12889-022-12612-3

Kiptot E, & Franzel S (2011) Gender and agroforestry in Africa: are women participating. World Agroforestry Centre (ICRAF), Nairobi. doi:10.5716/OP16988

Kittay, E. F. (2011). The Ethics of Care, Dependence, and Disability. *Ratio Juris,* 24: 49-58.

KIT, Faida MaLi and IIRR (2006) „Chain empowerment: Supporting African farmers to develop markets", Royal Tropical Institute, Amsterdam; Faida Market Link, Arusha; and International Institute of Rural Reconstruction, Nairobi. http://tinyurl. com/yjjuqwt

Klasen, S. (2002). Low Schooling for Girls, slower Growth for All? *World Bank Economic Review* 16: 345-373.

Klasen, S., & Lamanna, F. (2008). The Impact of Gender Inequality in Education and Employment on Economic Growth in Developing Countries: Updates and Extensions, EUDN Working Paper 2008–10 (Namur, Belgium: European Development Research Network).

Knowles, S., Lorgelly, P., K & Owen, P., D. (2002). Are educational gender gaps a brake on economic development? Some cross-country empirical evidence, Oxford Economic Papers, 54, 118-249.

Korir, M. K., Serem, A. K., Sulo, T. K., & Kipsat, M. J. (2013). A stochastic frontier analysis of bambara groundnut production in Western Kenya. 18th International Farm Management Congress, Methven, Canterbury, New Zealand. 3:74–80.

Kulich, C., & Chipeaux, M. (2019). Gender Inequality in Economic Resources. In: Jetten, J., Peters, K. (eds) The Social Psychology of Inequality. Springer, Cham. https://doi.org/10.1007/978-3-030-28856-3_3

Larson, D.F., S. Murray, & A. Palacios-Lopez (2015). 'Are women less productive farmers? How markets and risk affect fertilizer use, productivity, and measured gender effects in Uganda.' World Bank Policy Research Working Paper 7241. Washington, DC: World Bank.

Lastarria-Cornhiel, S. (2006) 'Feminization of Agriculture: Trends and Driving Forces, Background paper for *World Development Report 2008*

Linn, T. & Maenhout, B. (2019). Analysis of operational Constraints of Rice Value Chain in Ayeyarwaddy Region, Myanmar. *Asian Journal of Agriculture and Development,* 16(1): 53-76.

Lorber, J. (2012). *Gender Inequality: Feminist Theories and Politics*. New York: Oxford

Mabe, F. N., Donkoh, S. A., & Al-hassan, S. (2018). Accounting for rice productivity heterogeneity in Ghana: The two-step stochastic metafrontier approach. International Journal of Agricultural and Biosystems Engineering, 12(8):223–232. doi:10.1999/1307-6892/10009379

Makama, G.A. (2013). Patriarchy and Gender Inequality in Nigeria: The Way Forward. *European Scientific Journal,* 9(17):115-144

Mapcarta (2017). Southeast, Nigeria. https://mapcarta.com/Southeast_Nigeria

Matua, E., Njuki, J. & Waithanji, E. (2014). Review of Gender and Value Chain Analysis, Development and Evaluation Toolkits. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Maertens, M., & Swinnen, J.F.M. (2009). *Are African high-value horticulture supply chains bearers of gender inequality? Paper presented at the* FAO-IFAD-ILO Workshop on Gaps, trends and current research in gender dimensions of agricultural and rural employment: differentiated pathways out of poverty, Rome, 31 March-2 April 2009. Rome.

Martey, E.; Al-Hassan, R.M.; Kuwornu, J.K. (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research. 7*, 2131–2141.

Meinzen-Dick R., A. Quisumbing, J. Berhman, P. Biermeyr-Jenzano, V. Wilde, M. Noordeloos, C. Ragasaand, & N. Beintema (2011). *Engendering agricultural research, development and extension.* International Food Policy Research Institute (IFPRI). Washington, DC.

Meridian Institute (2013). *Innovation platforms and smallholder farmers: gaps and opportunities. A report on interviews with global thought leaders and practitioners.* Meridian Institute, Washington, DC.

Messner, D. (2002): The Concept of the "World Economic Triangle": Global Governance Patterns and Options for Regions. IDS Working Paper, Sussex.

Mgbanya, J.C., Eze, A.V., Amuta, L.A. & Igwe, E.O. (2019). Effect of Socioeconomic Characteristics of Youth Farmers on the Rice Production in Ishielu Local Government Area of Ebonyi State, Nigeria. *Direct Research Journal of Agricultural and Food Science.*7(4): 70-76

Mgbenka, R.N., Igbokwe, E.M.& Mbah, E.N. (2015). Farmers' Perception of Agricultural Development Activities of Local Government Councils in Southeast, Nigeria. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)1(2):19-25*

Muchoki, L. (2015). Empowering African Agricultures Biggest Actors: Women's Development Policy Forum, Friends of Europe. Retrieved on March 05, 2017, from http://www.friendsofeurope.org/global-europe/empowering-african-agricultures-biggest-actors-women/

Muflikh, Y. N., Smith, C. & Aziz, A.A. (2021). A Systematic Review of the Contribution of System Dynamics to Value Chain Analysis in Agricultural Development. *Agricultural Systems*, 189: https://doi.org/10.1016/j.agsy.2020.103044

Mulema, J., Mugambi, I., Kansiime, M., Chan, H.T., Chimalizeni, M., Pham, T.P., & Oduor, G. (2021). Barrier and opportunities for youth engagement in agricbusiness: empirical evidence from Zanbia and Vietnam. *Development in Practice,* 31(5): 690-706.

Mushi, D.P. & Kundi, B. (2016). Viable Approaches for Advancing Rural Livelihoods through Agriculture in Tanzania. *International Journal of Current Microbiology and Applied Sciences,*5 (4): 498-530

Muhammad-Lawal, A., Omotesho, O.A. and Falola, A. (2009). Technical Efficiency of Youth Participation in Agriculture: A Case Study of Youth-in-Agriculture in Ondo State, South Western Nigeria. *Nigerian Journal of Agriculture, Food and Environment,* 5(1): 20-26.

Mohammed, M.A. & Tamer, I. (2016). Technical Efficiency of Cassava Production in Savannah Zone of Northern Ghana: Stochastic Frontier Analysis. *Journal of Biology, Agriculture and Healthcare*, 6(20):62-72.

National Agricultural Seed Council (NASC), Federal Ministry of Agriculture and Rural Development. (2014). *Annual report.*

National Bureau of Statistics, NBS, (2011). Annual abstract of statistics. Federal Republic of Nigeria.

Nigerian Youth Employment Action Plan (NIYEAP) 2021-2024 (2021). Federal Ministry of Youth and Sports Development, Abuja.

National Population Commission, NPC, (2006), Abuja, Nigeria.

Nwajiuba, C.U. & R. Onyeneke (2010) Effects of climate change on the agriculture of sub-Saharan Africa: Lessons from Southeast Rainforest Zone of Nigeria. Oxford Business & Economics Conference Program, June 28-29, St. Hugh's College, Oxford University, Oxford, UK

Nussbaum, M. (2011). *Creating Capabilities: The Human Development Approach.* Cambridge, MA: Belknap Press of Harvard University Press.

Nyein, N.K., Soojung, A. & Sang H. L. (2018). Analysis of the Factors Influencing Market Participation among Smallholder Rice Farmers in Magway Region, Central Dry Zone of Myanmar. *Sustainability* 2018, *10*(12), 4441; *https://doi.org/10.3390/su10124441*.

Obasi, P.C., Henry-Ukoha, A., Anosike, O.N., & Ibekwe, U.C. (2015). Net return to cassava-based crop mixture in Imo State, Nigeria. *European Journal of Agriculture and Forestry Research,* 3(1), 15-21

Obasi, P.C., Nwaiwu, I.U.O., Ben-Chendo, G & Nnorom, E. (2022). Assessment of the Profitability and Market Share of Maize Value Chain in Imo State, Nigeria. *International Journal of Agricultural Science and Research,* 12(1): 125-132.

Obianeto, C.A., Nwigwe, C.A., Meludu, T.N. & Anyasie, I.C. (2020). Technical Efficiency of Rice Farmers in Anambra State Value Chain Development Programme. *Journal of Development and Agricultural Economics.* 12(2): 67-74.

Oduol, J. B. A & Mithöfer, D (2014) Constraints to and Opportunities for Women's Participation in High Value Agricultural Commodity Value Chains in Kenya. Working Paper No. 2014/11

Oduol, J.B.A., Mithöfer, D., Place, F., Nang'ole, E., Olwande, J., Kirimi, L. & Mathenge, M. (2017) Women's Participation in High Value Agricultural Commodity Chains in Kenya: Strategies for Closing the Gender Gap. *Journal of Rural Studies*, 50: 228-239

Okeke, G.C. & Amaechi, O.C. (2021). Investigating the Impact of Agricultural Development on Food Security in Nigeria an Econometric Synthesis. *University of Nigeria Journal of Political Economy,* 11(2): 492-511.

Okoye, B.C; Onyenweaku, C.E & Ukoha O.O (2010) An Ordered Probit Analysis of Transaction Cost and Market Participation by Small-Holder Cassava Farmers in Southeastern Nigeria. *Nigerian Agricultural Journal Vol.41 No. 2*October, 2010.

Oladeebo, J.O., & A.A. Fajuyigbe (2007). 'Technical efficiency of men and women upland rice farmers in Osun State, Nigeria.' Journal of Human Ecology, 22(2): 93–100.

Onyeneke R.U., Amadi, M.U., Njoku, C.L & Emenekwe, C.C. (2020). Empirical Trend Analysis of Climate Variability in Ebonyi State, Nigeria. *Nigerian Agricultural Journal*, 51(1):34-46.

Onyeabor, E. N., Okereke, C. O., Njoku, C., Onoh, P. N. and Egwu, P. N. (2022). Ecotourism and Poverty Reduction: The Case of Rural Households in Ebonyi State, Nigeria. *Nigerian Agricultural Journal*, 53(1): 206-211.

Onumah, J.A., Onumah, E.E., Al-Hassan, R.M. & Brummer, B. (2013). Meta-Frontier Analysis of Organic and Conventional Cocoa production in Ghana. Article in agricultural Economics (AGRICECON) – Czech, 59(6): 271-280.

Oseni, G., Corral, P., Goldstein, M., & Winters, P. (2014). Explaining Gender Differentials in Agricultural Production in Nigeria. The World Bank Development Research Group Poverty and Inequality Team, Policy Research Working Paper 6809.

Osuji M., Ibekwe, N. Eze C.C, Obasi U.C, Benchendo G.N., Nwaiwu I.O.U., Uhuegwulem I. & Anyanwu U.G (2017). Analysis of Cassava Value Chain in South-East: A Seemingly Unrelated Regression Model Case. Conference Proceedings of the 18th Annual National Conference of the Nigerian Association Of Agricultural Economists Held At Federal University of Agriculture, Abeokuta, Nigeria 16'" - 19th October, 2017, Pp 43-52.

Organisation for Economic Co-operation and Development (2006) 'Enhancing Women's Market Access and Promoting Pro-poor Growth' in *Promoting Pro-Poor Growth: Private Sector Development*, 63–72. Retrieved on March 11, 2017, from *http://www.oecd.org/dataoecd/24/41/36563805.pdf*

Palacios-López, A. & R. López (2015), “The gender gap in agricultural productivity: The role of market imperfections”, The Journal of Development Studies, 51 (9): 1175-1192.

Peterson, V.S. & Runya, A.S. (2010). *Global Gender Issues in the New Millenium,* (3rd Ed.). Westview Press.

Poulton C., Kydd, J, & Dorward A. (2006). Overcoming Market Constraints on Pro-Poor Agricultural Growth in sub-Saharan Africa. Development Policy Review, 24(3): 243-277.

Pyburn, R. & J. Woodhill (eds.) (2014). *Dynamics of Rural innovation – a primer for emerging professionals.* LM Publishers, Arnhem, The Netherlands.

Pyburn, R., Slavchevska, V. & Kruijssen, F. (2023). Gender dynamics in agrifood value chains: Advances in research and practice over the last decade. *Global Food Security*, 39:1-12. https://doi.org/10.1016/j.gfs.2023.100721

Quisumbing A.R., &Pandolfelli L. 2010. Promising approaches to address the needs of poor female farmers: resources, constraints and interventions. World Development vol. 38(4) pp. 581-592

Rencher, Alvin C.; Christensen, & William F. (2012), "Chapter 10, Multivariate regression – Section 10.1, Introduction", *Methods of Multivariate Analysis*, Wiley Series in Probability and Statistics, 709 (3rd ed.), John Wiley & Sons, p. 19, *ISBN 9781118391679*.

Riisgaard, L., Fibla, A. and Ponte, S. (2010). Gender and value chain development. Copenhagen, Denmark: Danish Institute for International Studies.

Robinson-Pant, A. (2016). Learning Knowledge and Skills for Agriculture to Improve Rural Livelihood. International Fund for Agricultural Development, Rome.

Roduner, D. (2004): Report on Value Chains: Analysis of existing Theories, Methodologies and Discussions of Value Chain Approaches within the Development Cooperation Sector, LBL, Bern

Rosales, R.M., Pomeroy, R., Calabio, I.J., Batong, M., Cedo, K. Escara, N., Facunla, V., Gulayan, A., Narvadez, M., Sarahadil, M., & Sobrevega, M.A. (2017). Value Chain Analysis and Small-Scale Fisheries Management. *Marine Policy*, 83:11-21.

Royal Tropical Institute (KIT), FaidaMaLi & IIRR, (2006). Chain empowerment: Supporting african farmers to develop markets.

Royal Tropical Institute (KIT), Agri-ProFocus & International Institute for Rural Reconstruction (IIRR), (2012). Challenging chains to change: Gender equity in agricultural value chain development. KIT Publishers, Royal Tropical Institute, Amsterdam.

Ruvuna, E. & Mweruli, F.T. (2021). Productivity and Profitability of Rice Producers of Kirimbi Marshland in Nyamasheke District, Rwanda: A Gender Wise Analysis. *European Journal of Social Sciences Studies*, 6(2): 214-239.

Sen, A. (2009). *The Idea of Justice*. Cambridge, MA: Harvard University Press.

Sen, A (2012). The Global Reach of Human Rights. *Journal of Applied Philosophy.* 29(2): 91-100

Seward, D.M. (2021). Case Study on Value Chain Analysis of Natural Resource Exports in Liberia. *Journal of Service Science and Management*, 14: 597-626

Silberschmidt, M. (2001). Disempowerment of Men in Rural and Urban East Africa: Implications for Male Identity and Sexual Behavior. *World Development*, 29(4): 657-671.

Social Watch (2005). Roars and whispers gender and poverty: Promises versus action. Social Watch: Montevideo.

Social Watch (2006). Gender Equity Index 2006: Inequity Persists. ITeM: www.socialwatch.org

Staatz, J. (2011). Enhancing Agricultural Productivity. In *Agribusiness for Africa's Prosperity*, edited by K.K. Yumkella, P.M. Kormawa, T.M. Roepstorff and A.M. Hawkins. Vienna: United Nations Industrial Development Organization (UNIDO).

Sweetman, C. (2013). Working with Men on Gender Equality. *Gender & Development*. 21: 1-13.

Tambo, J.A. & Theresa, G. (2010). Resource-Use Efficiency in Tomato Production in the Dargne West District, Ghana. Paper Presented on Conference on International Research on Food Security, National Resource Management and Rural Development.

Twin (2014) Empowering Women Farmers in Agricultural Value Chains, Twin, London

Terwase, I.T.& Madu, A.Y. (2014). The Impact of Rice Production, Consumption and Importation in Nigeria: The Political Economy Perspectives *International Journal of Sustainable Development & World Policy*. 3(4): 90-99.

Umaru, I. G & Hassan, N. S. (2018). Determinants of Acha Productivity and its Contribution to Income Generation and Employment. *Dutse Journal of Economics and Development Studies* (DUJEDS), 6 (2), 120 – 129.

Udemuzue, J.C. (2019). Agriculture for All: Constraints to Youth Participation in Africa. *Current Investigations in Agriculture and Current Research,* 7(2): 904-908. Doi:10.32474/CIACR.2019.07.000256.

Ugwuja, A.A. & Chukwukere, C. (2021). Trade Protectionism and Border Closure in Nigeria: The Rice Economy in Perspective *UJAH* 22(1): 79 - 106*http://dx.doi./org/10.4314/ujah.v22i1*.

United Nations Development Programme, UNDP, (2018). Gender Equality Strategy 2018-2021. https://www.undp.org/sites/g/files/zskgke326/files/migration/am/UNDP-Gender-Equality-Strategy-2018-2021.pdf

United Nations Development Programme (UNDP, 2010). Human Development Reports, Gender Inequality Index, *http://hdr.undp.org/en/content/table-4-gender-inequality-index*

United Nations International Children's Fund (UNICEF, 2011). *Promoting Gender Equality: An Equity Focused Approach to Programming.* UN Children's Fund (UNICEF), New York.

United Nations Children's Fund (UNICEF, 2017). GENDER EQUALITY: Glossary of Terms and Concepts. UNICEF Regional Office for South Asia. https://www.unicef.org/rosa/media/1761/file/Genderglossarytermsandconcepts.pdf

United Nations Entity for Gender Equality and the Empowerment of Women, (UN Women, 2019) The Gender Gap in Agricultural Productivity in Sub-Saharan Africa: Causes, Costs and Solutions. Brief No. 11. https://www.unwomen.org/en/digital-library/publications/2019/04/the-gender-gap-in-agricultural-productivity-in-sub-saharan-africa.

United States Agency for International Development. (2009). Integrating gender in value chain analysis (INGIA) Tanzania. Washington, DC, USA: USAID.nb

USAID Nigeria. (April 2014). Feasibility of the establishment of paddy aggregation centers in Nigeria. Prepared by Chemonics International Inc. and Africa Rice.

United States Agency for International Development. (March 2014). *Contribution to the CAADP process: Regional seed policy and farmer access to quality seeds in West Africa.* Supported by the West and Central African Council for Agricultural Research and Development (CORAF/WECARD), and Economic Community of West African States (ECOWAS).

Van der Gaag, N. (2011). Because I am a Girl: So, what about boys?. Retrieved from http://plan-international.*org/about-plan/resources/publications/campaigns/because-i-am-a-girl-so-what-about-boys/*

Vargas-Lundius R. & Suttie D. (2014). Improving young rural women's and men's livelihoods The most sustainable means of moving to a brighter future, Policy Brief IFAD.

Verkaart, S., Munyua, B.G., Mausch, K. & Michler, J.D. (2017). Welfare Impacts of Improved Chickpea Adoption: A Pathway for Rural Development in Ethiopia? *Food Policy*, 66: 50–61. doi: 10.1016/j.foodpol.2016.11.007

Webber, C. M.; &P. Labaste (2010). "Building competitiveness in Africa's agriculture: A guide to value chain concepts and applications.". *World Bank, Washington DC. pp1-187.* siteresources.worldbank.org/INTARD/Resources/Building_Competitiveness_in_Africa_Ag.pdf

World Bank, F. &International Fund for Agricultural Development (2008). Gender in agriculture: A sourcebook. Washington: World Bank.

World Bank (2014). *Levelling the Field–improving opportunities for women farmers in Africa.* 83pp

Wyrod, R. (2008), 'Between Women's Rights and Men's Authority: Masculinity and shifting discourses of gender difference in Urban Uganda', *Gender and Society, 22(6)*, 799-823.

Yami, M., Feleke, S., Abdoulaye, T., Alene, A.D., Bamba, Z., and Manyong, V. (2019). African Rural Youth Engagement in Agribusiness: Achievements, Limitations, and Lessons. *Sustainability,* 11:185. Doi:10.3390/su11010185.

APENDICES

PRODUCERS/FARMERS QUESTIONNAIRE

ANALYSIS OF GENDER EQUITY OPPORTUNITIES AND RESOURCE USE IN CEREALS VALUE CHAIN: A CASE STUDY OF YOUTH ENGAGEMENT IN RICE VALUE CHAINS IN SOUTH-EAST, NIGERIA

SECTION A: SOCIOECONOMIC CHARACTERISTICS & ROLES OF VALUE CHAIN ACTORS

Name of State: …….

Agricultural Zone: ……

Local Government Area: ……..

Community: ……..

Village: …….....

GPS Coordinates ……

1. Gender (a) Male ☐ (b) Female ☐
2. Are you the household head? (a) Yes ☐ (b) No ☐
3. If No, what is your relationship to the household head? …….
4. Kindly indicate your Age (in complete years) ……
5. Marital Status: (1) Married ☐ (2) Single ☐ (3) Divorced ☐ (4) widow ☐ (5) Widower ☐
6. Number of wives/husband ……
7. What is your household size (persons living and eating together in your house)? ……..
8. Number of children below 5 years ……
9. Number of children between 5 and 14 years …….……
10. Number of household members between 15 and 35 years ……..
11. Number of household members between 36 and 65 years ……..
12. Number of household member above 65 years …….
13. Status of respondent in the household (a) Household head ☐ (b) Member of household ☐
14. Highest educational qualification obtained:
    a) No formal education ☐
    b) First School Leaving Certificate (FSLS) ☐

c) WASC/GCE ☐
d) OND/NCE ☐
e) B.Sc., B.A/HND ☐
f) M.Sc./PhD ☐

15. How many years did you spend in school? …….
16. Is rice production your major occupation? (a) Yes ☐ (b) No ☐
17. If No, what is your major occupation? (1) Civil service ☐ (2) Trader ☐ (3) Artisan ☐ (4) Transportation ☐
18. On the average, what is your annual income from rice farming? (₦) …….
19. On the average, what is your monthly income from other sources? ……
20. How long have you been in rice farming (in years)? ……..
21. Do you belong to any Association/Cooperative (a) Yes ☐ (b) No ☐
22. If yes, list the Association/Cooperative you belong to
    (1) Farmer/Producers Cooperative Society ☐
    (2) Multi-Purpose Cooperative Society ☐
    (3) Cooperative Produce Marketing ☐
    (4) Rice Millers Association ☐
    (5) Traders Association ☐
    (6) Agro Dealers Association ☐
    (7) Others, specify ……

SECTION B: LEVEL OF GENDER EQUITY OPPORTUNITIES

23. What are the major sources of fund for your farm business?

(a) Commercial bank ☐
(b) Cooperative/Association ☐
(c) Friends and relatives ☐
(d) Spouse
(e) Esusu ☐
(f) Personal savings ☐

24. Do you have access to bank loan in the last 2 years? (a) Yes ☐ (b) No ☐
25. What is the interest rate on loan?……(percent)
26. Have you started repaying? (a) Yes ☐ (b) No ☐

27. If yes, how much have you repaid to date? (percent) ……
28. If No, why? ……..
29. Any grace period (period after due date when payment is made without penalty)? (a) Yes ☐ (b) No ☐
30. If Yes, how many months? …….
31. What was the total amount invested in the last rice farming season? (₦) ……...
32. What is the nearest distance to your farm from your home in kilometer? .....
33. What is your source of labour (1) Family labour ☐ (2) Hired ☐ (3) Both ☐
34. If family labour, indicate the number of: (1) Male …… (2) Female …… (3) Children …..
35. Do you know any extension agent? (a)Yes ……. (b) No …….
36. In the last two years, have you received any service, training, or advice from any extension agent in relation to your rice farming business? (a) Yes …… (b) No …….
37. What kind of support/training have you received?
    (1) How to select seed variety, prepare soil and do sowing ☐
    (2) Pest and disease management; water and weed management ☐
    (3) How to apply different fertilizers, pesticides/herbicides in a proper way ☐
    (4) Maintenance of agricultural machinery and management and management of post-harvest ☐
    (5) Provide advice with better access to credit facilities ☐
    (6) Provide advice/assistance with better access to processing machinery ☐
    (7) Provide information on market opportunities and marketing products ☐
38. If yes, how often do you receive such services from an extension agent visit in a month? …….
39. What is your farm size in Hectares? ……
40. What variety of rice did you produce? (1) Local ☐ (2) Improved ☐
41. Where did you get your rice seed/seedlings?
    (1) Own farm ☐ (2) local market ☐ (3) Research Institutes ☐
    (4) Fellow farmers ☐ (5) Extension Agents ☐
42. How did you acquire your farmland? (1) Purchase ☐ (2) inheritance ☐ (3) Rented/leased ☐
43. If rented, how much does it cost for a faming season? (₦) ……..
44. Have you received any training on rice production? (a) Yes ☐ (b) No ☐
45. If No, where did you learn rice production? ……..
46. Do you receive information on new rice variety? Yes …… No …….

47. If yes, where do you get your information from …….

SECTION C: TECHNICAL EFFICIENCY OF RESOURCE USE & VALUE ADDITION

37. What quantity of rice seed/seedlings did you cultivate in the last season? (Kg).....

38. What is the cost per kg…….

39. What is quantity of fertilizer did you use (in bags)? ……

40. What is the cost of fertilizer per bag? .....

41. What is the quantity of herbicides and pesticides used (Kg)? ……

42. Indicate the cost of herbicides and pesticides used (in naira)…….

44. What quantity of paddy rice did you produced in the last production season? (Kg) ……

45. How much did you sell the paddy rice per 100kg bag? ……..

46. What quantity of 100kg bag did you sell? ……..

47. What quantity did the farm family consumed (kg)? ……

48. What quantity of paddy rice did you give as gift (kg)? ……...

49. Did you sell your paddy at farm gate? (a) Yes ☐ (b) No ☐

50. If No, where did you sell your paddy rice? …….

51. How much did it cost to transport the paddy to the point of sale? (₦) .....

52. How much did you pay to store the paddy rice before sale? (₦) ……...

53. How much did you pay for loading and off-loading? (₦) ……

54. What other cost did you incur after harvesting to the point of sale Please, specify the activity and cost: (i) ……..

(ii) …….

(iii) ……

(iv) ……

55. How much did you pay for labour by gender in the last production cycle?

Labour Utilization and Wages

Activity	Category of labour (number)			Hours worked /day	No of days worked/ week	Wage(₦/day)		
	Adult Male	Adult Female	Child			Adult Male	Adult Female	Child
Land clearing Land preparation Nursery Planting/transplanting Weeding Fertilization application Application of herbicides/pesticides Harvesting Threshing/Winnowing Bird scaring Bagging Others, please specify …… …… …… …….								

Farm Tools Used

Items	Number owned	Unit cost (₦)	Year of purchase	If hired, unit cost(₦)	Number Hired
Hoes Cutlass Wheelbarrow Shovel Sickle Rake Tractor Trans-planter Seed drill Harvester Others (Specify) • ……. • ……. • …….					

SECTION D: CONSTRAINTS TO GENDER EQUITY OPPORTUNITIES

56. What the factors do think are limiting male or female engagement in your business area? Please specify:

i. ……

ii. ……

iii. …….

iv. …….

v. …….

57. What can be done to ensure that male and female have equal right to be engaged in rice production, processing or marketing?

A. ……..

B. ……...

C. ……

D. ……

E. …….

QUESTIONNAIRE FOR PROCESSORS

ANALYSIS OF GENDER EQUITY OPPORTUNITIES AND RESOURCE USE IN CEREALS VALUE CHAINS: A CASE STUDY OF YOUTH ENGAGEMENT IN RICE VALUE CHAINS IN SOUTH-EAST, NIGERIA

SECTION A: SOCIOECONOMIC CHARACTERISTICS & ROLES OF VALUE CHAIN ACTORS

Name of State: …….

Agricultural Zone: ……

Local Government Area: ……..

Name of Community: ……...

Name of Village: ……..….

GPS Coordinates ……...

1. Gender: (a) Male ☐ (b) Female ☐
2. Are you the household head? (a) Yes ☐ (b) No ☐
3. If No, what is your relationship with the household head? ……
4. Kindly indicate your Age (in complete years) ……
5. Marital Status: (1) Married ☐ (2) Single ☐ (3) Divorced ☐ (4) widow ☐ (5) Widower ☐ (5) Farmer ☐
6. Number of wives/husband ……..
7. What is your household size (persons living and eating together in your house)? …….
8. Number of children below 5 years …….
9. Number of children between 5 and 14 years.....

10. Number of household members between 15 and 35 years ……
11. Number of household member between 36 and 65 years …….
12. Number of household member above 65 years …….
13. Highest educational qualification obtained:
    a) No formal education ☐
    b) First School Leaving Certificate (FSLC) ☐
    c) WASC/GCE ☐
    d) OND/NCE ☐
    e) B.Sc/B.A/HND ☐
    f) M.Sc/Ph.D ☐
14. How many years did you spend in formal education? .....
15. How many years have you been in rice processing? …….
16. Is rice processing your major occupation? (a) Yes ☐ (b) No ☐
17. If No, what is your major occupation? (1) Civil service ☐ (2) Trader ☐ (3) Artisan ☐ (4) Transportation ☐
18. On the average, what is your yearly income from rice processing? (₦)
19. On the average, what is your monthly income from other sources? ……
20. Do you belong to any Association/Cooperative? (a) Yes ☐ (b) No ☐
21. If yes, list the Association/Cooperation you belong to
    (1) Farmer/Producers Cooperative Society ☐
    (2) Multi-Purpose Cooperative Society ☐
    (3) Cooperative Produce Marketing ☐
    (4) Rice Millers Association ☐
    (5) Traders Association ☐
    (6) Agro Dealers Association ☐
    (7) Others, specify ……..
22. What is the nearest distance to your business area in kilometer or metre? .....
23. What is the nearest distance to your business area in minutes? .....
24. What is your source of labour (1) Family labour ☐ (2) Hired ☐ (3) Both ☐
25. Do you know any extension agent? (a)Yes ……. (b) No …….

26. In the last 2 years, have you received any service, training, or advice from any extension agent in relation to rice processing? (a) Yes …….. (b) No ……..

27. What kind of support/training have you received?

(1) How to select seed variety, prepare soil and do sowing ☐

(2) Pest and disease management; water and weed management ☐

(3) How to apply different fertilizers, pesticides/herbicides in a proper way ☐

(4) Maintenance of agricultural machinery and management and management of post harvest ☐

(5) Provide advice with better access to credit facilities ☐

(6) Provide advice/assistance with better access to processing machinery ☐

(7) Provide information on market opportunities and marketing products ☐

28. If yes, how often do you receive such services from an extension agent visit in a month? .....

29. How many tones/Kg per day do you process? ……

30. Do you receive any information on processing cost? (a) Yes ……. (b) No …….

31. If yes, where do you get your information from? …….

SECTION B: GENDER ROLES

32. What are the processing activities performed from purchase of paddy rice to rice processing?

……

……

……

……

……

……

……

SECTION C: LEVEL OF GENDER EQUITY OPPORTUNITIES

33. What are the major sources of fund for your business?

(a) Commercial bank ☐

(b) Cooperative/Association ☐

(c) Friends and relatives ☐

(d) Spouse ☐

(d) Esusu ☐

(e) Personal savings ☐

(f) Microfinance bank ☐

34. Do you have access to bank loan in the last 2 years?(a) Yes ☐ (b) No ☐
35. What is the interest rate on loan?……(percent)
36. Have you started repaying the loan? (a) Yes ☐ (b) No ☐
37. If Yes, how much have you repaid today? (percent) …….
38. If No, why? ……
39. Did the bank allow any grace period (period after due date when payment is made without penalty)? (a) Yes ☐ (b) No ☐
40. If Yes, how many Months? ……..
41. What was the total amount invested in the last processing cycle? (₦) ……
42. Have you received any training on rice processing? (a) Yes ☐ (b) No ☐
43. If No, where did you learn rice processing from? ……
44. Where do you purchase your paddy? (1) Farmgate ☐(2) Cooperative Society☐(3) Market ☐
45. How did you acquire your business Area/land for your business activities?

(1) Purchase ☐ (2) Inheritance ☐ (3) Rented/leased ☐

SECTION D: TECHNICAL EFFICIENCY OF RESOURCE USE & VALUE ADDITION

46. How much is 100kg of paddy rice?
47. What quantity of paddy did you process in the last cycle? …….kg
48. What quantity of paddy rice do you process daily? ……
49. How many days in a week do you process rice? ……..
50. How many months in a year do you process rice? ……
51. Kindly, indicate the months

S/N	Month	Quantity Processed (Kg)
1	January	
2	February	
3	March	
4	April	

5	May	
6	June	
7	July	
8	August	
9	September	
10	October	
11	November	
12	December	

52. What is the cost of processing 100kg bag of paddy (₦) ……

53. Do you use the mill to process other food commodities? (a) Yes ☐ (b) No ☐

54. If Yes, what other commodities do you process?

(1)Wheat ☐ (2) Maize ☐ (3) Millet ☐ (4) Others, specify……..

55. How much did you pay as rent in the last processing year? (₦) ……...

56. What is the cost of transporting the milled rice to the point of sale? (₦) …….

57. What is the cost of loading and off-loading the milled rice? (₦)……..

58. How much do you sell 100kg of milled rice? (₦) ……

59. What is the cost preservatives used if any? (₦) .....

60. Indicate the total costs of fuel, diesel, and electricity used

Input	**Cost(₦)**
Fuel	
Diesel	
Electricity	
Firewood	

61. What quantity of water do you use? ……..

62. Do you buy water for parboiling? (a) Yes ☐ (b) No ☐

63. If Yes, indicate the total amount of water used (₦) ……

64. What is the quantity of rice consumed at home? (Kg) …….

VALUE ADDITION

65. Apart from the normal processing of rice you are known for, what other form of processing do you do to improve rice quality?

…….

…….

…….

…….

…….....

66. How much does it cost by 50kg bag of rice to perform this further processing?(₦)…….

67. How much do you sell this improved processed quality rice per 50kg? (₦) ……

68. What further costs do you incur in this further processing? (₦)

i)……

ii)……

iii)……

69. How much did you pay for labour by gender in the last cycle?

Labour Utilization and Wages

Activity	Category of Labour (Number)			Hours worked/day	No of days worked/week	Wage (₦/day)		
	Adult Male	Adult Female	Child			Adult Male	Adult Female	Child
Parboiling								
Cleaning/De-stoning								
Hulling								
Milling								
Polishing								
Grading/Sorting								
Packaging/Bagging								

Others, specify …….. …….. …….								

Permanent Employees

Types of Function	Number		Wage/Person/Month
	Male	Female	
Manager			
Operator			
Cashier			
Attendant			
Others, please specify …….. …….. ……..			

70. Indicate the various processing machines/ tools used

Category of Machine	Number of machine	Unit cost (₦)	Year of purchase
Englebers/Conodisc (miller)			
Jet peeler (miller)			
Destoner			
Colour Sorter			
Sheller			
Drying mat/Dryer			
Wheelbarrow			
Basins			
Rakes			
Drums			

Traditional Pots			
Wooding Stoves			
Others, please specify ……... ……... ……...			

SECTION E: CONSTRAINTS TO GENDER EQUITY OPPORTUNITIES

71. What factors do you think are limiting male engagement in your business area? Please specify:

vi. ……

vii. ……

viii. …….

ix. …….

x. …….

72. What factors do you think are limiting female engagement in your business area? Please specify:

xi. ……

xii. ……

xiii. …….

xiv. …….

xv. …….

73. What can be done to ensure that male have equal right to be engaged in rice production, processing, or marketing?

F. ……..

G. ……...

H. ……

I. ……

74. What can be done to ensure that female have equal right to be engaged in rice production, processing, or marketing?

J. ……..

K. ……...

L. ……

M. ……

MARKETERS QUESTIONNAIRE

ANALYSIS OF GENDER EQUITY OPPORTUNITIES AND RESOURCE USE IN CEREALS VALUE CHAINS: A CASE STUDY OF YOUTH ENGAGEMENT IN RICE VALUE CHAIN IN SOUTH-EAST, NIGERIA

SECTION A: SOCIOECONOMIC CHARACTERISTICS & ROLES OF VALUE CHAIN ACTORS

Name of State: ……

Agricultural Zone: ……

Local Government Area: ……..

Name of Community: ……...

Name of Village: ……

Name of Market: ……

GPS Coordinates ……

1. Gender (a) Male ☐ (b) Female ☐
2. Are you the household head? (a) Yes ☐ (b) No ☐
3. If No, what is your relationship with the household head? ……..
4. Kindly indicate your Age (in complete years) ……
5. Marital Status: (1) Married ☐ (2) Single ☐ (3) Divorced ☐ (4) widow ☐
6. Number of wives/husband ……

7. What is your household size (person living and eating together in your house) …….
8. Number of children below 5 years ……...
9. Number of children between 5 and 14 years ……..
10. Number of household members between 15 and 35 years …….
11. Number of household members between 36 and 65 years …….
12. Number of household member above 65 years ……..
13. Highest educational qualification obtained:
    - g) No formal education ☐
    - h) First School Leaving Certificate(FSLC) ☐
    - i) WAEC/GCE ☐
    - j) OND/NCE ☐
    - k) B.Sc/B.A/HND ☐
    - l) M.Sc/Ph.D ☐
14. How many years did you spend in school? ……..
15. How long has it been since you started rice marketing (years) ……..
16. Is rice marketing your major occupation? (a) Yes ☐ (b) No ☐
17. If No, what is your major occupation? (1) Civil service ☐ (2) Trader ☐ (3) Artisan ☐ (4) Transportation ☐ (5) Farmer ☐
18. On the average, what is your monthly income from rice marketing? (₦) …….....
19. On the average, what is your monthly income from other sources? (₦) …….
20. Do you belong to any Association/Cooperative (a) Yes ☐ (b) No ☐
21. If yes, which Association/Cooperation you belong to
    - (1) Farmer/Producers Cooperative Society ☐
    - (2) Multi-Purpose Cooperative Society ☐
    - (3) Cooperative Produce Marketing ☐
    - (4) Rice Millers Association ☐
    - (5) Traders Association ☐
    - (6) Agro Dealers Association ☐
    - (7) Others, specify ……...
22. What was the total amount invested in the last rice marketing? (₦) ……

23. What is the nearest distance to your business area (Shop or market) from your house in kilometer? .....
24. What is your source of labour (1) Family labour ☐ (2) Hired ☐ (3) Both ☐
25. Do you have contact with any extension agent? (a) Yes ……. (b) No ……..
26. In the last two years, have you received any service, training, or advice from any extension agent in relation to your rice marketing business? (a) Yes ……. (b) No …….
27. What kind of support/training have you received?
    (1) How to select seed variety, prepare soil and do sowing ☐
    (2) Pest and disease management; water and weed management ☐
    (3) How to apply different fertilizers, pesticides/herbicides in a proper way ☐
    (4) Maintenance of agricultural machinery and management and management of post harvest ☐
    (5) Provide advice with better access to credit facilities
    (6) Provide advice/assistance with better access to processing machinery ☐
    (7) Provide information on market opportunities and marketing products ☐
28. If yes, how often do you receive such services from an extension agent in a month? .....
29. Do you receive any information on market price? (a) Yes …… (b) No ……
30. If yes, where do you get your information from? ……

SECTION B: LEVEL OF GENDER EQUITY OPPORTUNITIES

31. What are the major sources of fund for your business?
    a. Commercial bank ☐
    b. Cooperative/Association ☐
    c. Friends and relatives ☐
    d. Spouse ☐
    e. Esusu ☐
    f. Personal savings ☐
    g. Microfinance bank ☐
32. Did you have access to bank loan in the last 2 years? (a) Yes ☐ (b) No ☐
33. What is the interest rate on loan?……(percent)

34. Have you started repaying the loan? (a) Yes ☐ (b) No ☐
35. If Yes, how much have you repaid to date (₦) …….
36. If No, why? ……..
37. Did the bank allow any grace period (period after due date when payment is made without penalty)? (a) Yes ☐ (b) No ☐
38. If Yes, how many months? ……....
39. Please indicate the one that best describes your marketing function?
    a) Wholesaler ☐
    b) Retailer ☐
    c) Middle man ☐
40. Do you have sales persons? (a) Yes ☐ (b) No ☐
41. If Yes, how many employee in total do you have (male and female)?
    - How many Male ……..… b) How many Female ……
42. On the average, how much is their monthly salary? (₦)
    (a) Male …….. (b) Female …….....
43. How many family members assist you in your marketing activities? ……..
44. If you were to pay them, how much would be their monthly salary? (₦)
45. How did you acquire your stall/shop/stand?
    (1) Purchase ☐ (2) inheritance ☐ (3) Rented/leased ☐
46. If purchased, what is the cost? (₦) …….
47. If rented, what is the rent per annum? (₦) …….

SECTION C: TECHNICAL EFFICIENCY OF RESOURCE USE & VALUE ADDITION

48. What quantity of rice did you purchase in the last marketing cycle? (50kg bags) …….....
49. On the average, how many 50kg bags of rice do you sell last marketing season? …….
50. How much is 50kg bag of rice sold? …….
51. How much did you pay for loading and off loading (₦)? …….....
52. How much did you spend as market charges? (₦) ……
53. Do you use any preservative? (a) Yes ☐ (b) No ☐
54. If Yes, what is the cost of preservatives used if any? (₦) .....
55. Indicate the various marketing tools used?

Marketing Tools

Items	Number of items	Unit cost (₦)	Year of Purchase	Number of years of useful life
Measuring cups				
Empty bags				
Tins				
Measuring paints				
Basin				
Basket				
Weighing scale				
Bucket				
Sieve				
Wheelbarrow				
Others, Please Specify: a) …….. b) …….. c) ……..				

SECTION F: VALUE ADDITION

56. In what form do you purchase the rice? (a) Paddy ☐ (b) Processed ☐
57. If you purchased the rice in paddy form, in what form do you sell it? (a) Paddy ☐ (b)Processed ☐
58. If you sell in paddy form, what was the purchase price per 50kg? ₦……, and what was the price you sold it? ₦……
59. How much did you spend on transportation? ₦……..
60. If you sell in processed form, what was the purchase price per 50kg? ₦……, and what was the price you sold it? ₦……..
61. How much did you spend on transportation? ₦……..
62. How much did it cost to do additional processing before sale? ₦…….

SECTION D: CONSTRAINTS TO GENDER EQUITY6 OPPORTUNITIES

63. What factors do you think are limiting male youth engagement in rice marketing in your area? Please specify:

xvi. ……..

xvii. ……..

xviii. ……..

xix. ……..

xx. ……..

64. What factors do you think are limiting female youth engagement in rice marketing in your area? Please, specify:

xxi. ……..

xxii. ……..

xxiii. ……..

xxiv. ……..

65. What can be done to ensure that male have equal right to be engaged in rice production, processing or marketing?

N. …….

O. …….....

P. …….

Q. …… ....

66. What can be done to ensure that female have equal right to be engaged in rice production, processing or marketing?

R. ……

S. ……

T. ……

U. ……

Fig 1: Rice farm at Ihitte/Uboma, Imo State
Source: Field Survey, 2021

Fig 2: Harvesting of rice at Ihitte/Uboma Imo State. Source: Field Survey, 2021

Fig 3: Tedious and laborious parboiling system
Source: Field Survey, 2021

Fig 4: Poor milling techniques/technology
Source: Field survey, 2021

Fig 5: Rice Marketing
Source: Field Survey, 2021

Researcher, Mrs Tim-Ashama, Akunna and Dr. Ojide Makauchukwu (field guide and facilitator) with the Enumerators in Ebonyi State

MALE PRODUCERS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Rice Output (kg); Rhs=One;

Farm size (X_1), Labour (X_2), Cost of planting material (X_3), Cost of agrochemicals (X4),
Capital inputs (X5); Production, Model; Efficiency factors;

Household size (Z_1) Age (Z_2), Marital Status (Z_3), Education (Z_4), Membership of cooperative
(Z5); Extension (z6); Source of Labour (Z_7); Experience (Z_8);

Farm size (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Male Producers Output	(Kg)
Labour	
Number of observations	106
Iterations completed	189
Log likelihood function	-107.4421
Variunaces: Sigma-squared(v)=	0.8526
Sigma-squared(u)=	0.1432

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	19.4613	4.2219	4.6096	0.0116	
Farm size	0.6709	0.2106	3.1857	0.0124	1.18
Labour	0.5521	0.2114	2.6116	0.0133	205.13
Cost of planting materials	-0.4926	0.1993	-2.4717	0.0521	4972.15
Cost of agrochemicals	-0.3348	0.1022	-3.2759	0.0138	685.24
Capital inputs	1.8713	0.6718	2.7855	0.0142	8917.33

Variance Parameters for Compound Error

Lamda	6.0935	1.376	4.4426
Sigma	7.1348	1.4291	4.9925

Model Chi-square 64.1259

DETERMINANTS OF TECHNICAL EFFICIENCY OF MALE PRODUCERS

Variable	Coefficient	Standard Error	b/St.Er.
INTERCEPT	17.4903	4.2916	4.0754
Household size	-1.0842	0.9244	-1.1729
Age	-1.3393	0.4121	-3.2499
Marital status	0.4617	0.3946	1.1701
Education	1.5213	0.4712	3.2286
Membership of Cooperative	0.4926	0.1301	3.7603
Extension	0.4416	0.1036	4.2625
Source of Labour	0.5125	0.1389	3.6897
Experience	1.3891	0.4412	3.1485
Farm size	0.4726	0.1387	3.4074
Capital	1.3391	0.4291	3.1207

TECHNICAL EFFICIENCY OF PRODUCERS/FARMERS

(1) Male Farmers

	U_i
Maximum	0.9025
Minimum	0.3442
Mean	0.6415

FEMALE PRODUCERS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Rice Output (kg); Rhs=One;

Farm size (X_1), Labour (X_2), Cost of planting material (X_3), Cost of agrochemicals (X4), Capital inputs (X5); Production, Model; Efficiency factors;

Household size (Z_1) Age (Z_2), Marital Status (Z_3), Education (Z_4), Membership of cooperative (Z5); Extension (z6); Source of Labour (Z_7); Experience (Z_8);

Farm size (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Female Producers Output	(Kg)
Labour	
Number of observations	106
Iterations completed	189
Log likelihood function	-108.4415
Variunaces: Sigma-squared(v)=	0.8312
Sigma-squared(u)=	0.1484

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	17.2914	3.9815	4.3429	0.0114	
Farm size	0.5542	0.1426	3.8864	0.0117	0.75
Labour	0.6173	0.2114	2.9201	0.0121	183.41
Cost of Planting materials	-0.8215	0.2829	-2.9039	0.0132	316.41
Cost of agrochemicals	-0.4926	0.1306	-3.7718	0.0118	497.35
Capital inputs	1.7335	0.6053	2.8639	0.0141	6433.19

Variance Parameters for Compound Error

Lamda	6.1944	1.7126	3.6169
Sigma	7.8126	1.8025	4.3343

Model Chi-square 63.0923 63.0826

DETERMINANTS OF TECHNICAL EFFICIENCY OF FEMALE RICE PRODUCERS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	19.0064	4.6926	4.0503
Household size	-1.3914	1.0213	1.3624
Age	-1.6702	0.5339	-3.1283
Marital Status	0.3844	0.3125	1.2301
Education	1.4926	0.5814	2.5673
Membership of Cooperative	0.8125	0.3112	2.6025
Extension	0.4112	0.3903	1.0535
Source of Labour	0.3617	0.3126	1.1571
Experience	1.5216	0.4617	3.2956
Farmsize	0.4119	0.3912	1.0529
Capital	1.3845	0.4607	3.0052

TECHNICAL EFFICIENCY OF FEMALE FARMERS

	U_i
Maximum Value	0.9206
Minimum Value	0.3114
Mean Value	0.5821

POOLED RICE PRODUCERS

Maximum iterations reached. Exit iterations with status=1.

Abnormal exit from iterations. If current results are shown check convergence values shown below. This may not be a solution value (especially if initial iterations stopped).

Gradiant value: Tolerance= 100D-06, current value= .5204D-01

Function chg. : Tolerance= .0000D+00, current value= .1644D-01

Smallest abs. parameter change from start value = .2008D+00

Stochastic Production Frontier; Lhs = Rice Output (kg); Rhs=One;

Farm size (X_1), Labour (X_2), Cost of planting material (X_3), Cost of agrochemicals (X4), Capital inputs (X5); Production, Model; Efficiency factors;

Household size (Z_1) Age (Z_2), Marital Status (Z_3), Education (Z_4), Membership of cooperative (Z_5); Extension (z6); Source of Labour (Z_7); Experience (Z_8);

Farm size (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Rice Producers Output	(Kg)
Labour	
Number of observations	212
Iterations completed	305
Log likelihood function	-112.3446
Variunaces: Sigma-squared(v)=	0.8138
Sigma-squared(u)=	0.1751

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
	27.1042	6.0526	4.4781	0.0112	
Farm size	0.6913	0.2122	3.2578	0.0131	1.38
Labour	0.8125	0.2314	3.5112	0.0141	296.37
Cost of planting materials	-0.5826	0.1946	-2.9938	0.022	4926.15
Cost of agro chemicals	-0.7133	0.2107	-3.3854	0.0122	803.44
Capital inputs	1.6527	0.5002	3.3041	0.0129	8192.33

Variance Parameters for Compound Error

Lamda	7.1226	1.4204	5.0145
Sigma	8.3917	1.3791	6.0849

Model Chi-square 66.8219

DETERMINANTS OF TECHNICAL EFFICIENCY OF RICE PRODUCERS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	21.4219	4.3613	4.9118
Household size	-1.0522	0.9144	-1.1507
Age	-1.3728	0.3128	-4.3887
Marital status	0.6492	0.5617	1.1558
Education	1.4419	0.3015	4.7824
Membership of Cooperative	0.3826	0.1102	3.4719
Extension	0.7413	0.1893	3.9161
Source of Labour	0.5926	0.4717	1.2835
Experience	1.4436	0.5702	2.8295
Farm size	0.8912	0.2116	4.2117
Capital	1.7702	0.5219	3.3918

TECHNICAL EFFICIENCY OF RICE PRODUCERS

	U_i
Maximum Value	0.944
Minimum Value	0.3229
Mean Value	71.8264

MALE RICE PROCESSORS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Processors' Output (kg); Rhs=One;
Rent (X_1), Labour (X_2), Cost of intermediate Products (X_3), Cost of Preservatives, Storage
and other Operational Costs (X_4), Capital inputs (X5); Production, Model; Efficiency factors;
Age (Z_1) Education (Z_2), Household Size (Z_3), Experience (Z_4), Access to Credit (Z_5);
Membership of Cooperative (z6); Extension (Z_7); Distance (Z_8); Cost of Intermediate
product (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Male Rice Processsors Output	(Kg)
Labour	
Number of observations	43
Iterations completed	116
Log likelihood function	-107.1907
Variunaces: Sigma-squared(v)=	0.8502
Sigma-squared(u)=	0.1367

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	20.6719	3.1726	6.5158	0.0115	
Rent	-1.8029	0.5019	-3.5921	0.0121	2941.06
Labour	1.7715	0.6529	2.7133	0.0132	5426.45
Cost of intermediate products	-1.0926	0.4133	-2.6436	0.0141	1133.09
Cost of preservatives	-0.6654	0.2049	-3.2474	0.0133	986.17
Capital inputs	1.8902	0.7226	2.6158	0.0141	5116.05

Variance Parameters for Compound Error

Lamda	6.5219	1.4715	4.4321
Sigma	7.3308	1.5926	4.6031

Model Chi-square 68.2413

DETERMINANTS OF TECHNICAL EFFICIENCY OF MALE PROCESSORS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	22.0918	5.2613	4.1989
Age	-1.0442	0.4122	-2.5332
Education	1.8219	0.6539	2.7862
Household size	-1.3708	0.9916	-1.3824
Experience	1.4529	0.5021	2.8936
Access to Credit	0.6613	0.1918	3.4479
Membership o Cooperative	0.0526	0.0139	3.7842
Extension	0.4412	0.3948	1.1175
Distance	-1.8173	0.5829	-3.1177
Cost of intermediate products	-1.4605	0.4665	-3.1308

TECHNICAL EFFICIENCY OF MALE RICE PROCESSOR

	U_i
Maximum Value	0.9412
Minimum Value	0.3312
Mean Value	0.6241

FEMALE RICE PROCESSORS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Processors' Output (kg); Rhs=One;
Rent (X_1), Labour (X_2), Cost of intermediate Products (X_3), Cost of Preservatives, Storage
and other Operational Costs (X_4), Capital inputs (X5); Production, Model; Efficiency factors;
Age (Z_1) Education (Z_2), Household Size (Z_3), Experience (Z_4), Access to Credit (Z_5);
Membership of Cooperative (z6); Extension (Z_7); Distance (Z_8); Cost of Intermediate
product (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Female Rice Processsors Output	(Kg)
Labour	
Number of observations	43
Iterations completed	116
Log likelihood function	-109.4413
Variunaces: Sigma-squared(v)=	0.8216
Sigma-squared(u)=	0.1671

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	19.0029	4.6713	4.0681	0.0112	
Rent	-1.4707	0.6042	-2.4339	0.0521	2106.13
Labour	1.3943	0.4128	3.3777	0.0126	4214.29
	-1.8216	0.8243	-2.2099	0.0461	1044.16
Cost of preservatives	-0.5428	0.1216	-4.4638	0.0113	478.39
Capital inputs	1.3349	0.4603	2.9001	0.0129	3091.25

Variance Parameters for Compound Error

Lamda	6.5219	1.4715	4.4321
Sigma	7.3308	1.5926	4.6031

Model Chi-square 67.4412

DETERMINANTS OF TECHNICAL EFFICIENCY OF FEMALE PROCESSORS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	22.0918	5.2613	4.1989
Age	-1.0442	0.4122	-2.5332
Education	1.8219	0.6539	2.7862
Household size	-1.3708	0.9916	-1.3824
Experience	1.4529	0.5021	2.8936
Access to Credit	0.6613	0.1918	3.4479
Membership o Cooperative	0.0526	0.0139	3.7842
Extension	0.4412	0.3948	1.1175
Distance	-1.8173	0.5829	-3.1177
Cost of intermediate products	-1.4605	0.4665	-3.1308

TECHNICAL EFFICIENCY OF FEMALE RICE PROCESSOR

	U_i
Maximum Value	0.9314
Minimum Value	0.3413
Mean Value	0.6842

POOLED RICE PROCESSORS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Rice Sales quantity (kg); Rhs=One;
Rent (X1), Labour (X2), Cost of intermediate Costs (X3), Cost of Preservative, Storage
and other Operational Costs (X4), Capital inputs (X5); Production, Model; Efficiency factors;
Age (Z_1) Education (Z_2), Household Size (Z_3), Expereience in Value addition (Z_4), Access to
Credit (Z_5); Membership of Cooperative (z6); Exytension Contact (Z_7); Distance (Z_8); Cost of
Intermediate product (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Rice Processors Output	(Kg)
Labour	
Number of observations	86
Iterations completed	173
Log likelihood function	-110.2914
Variunaces: Sigma-squared(v)=	0.8422
Sigma-squared(u)=	0.1547

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	25.1806	5.4213	4.6448	0.0116	
Rent	-1.4492	0.5112	-2.8349	0.0141	4219.15
Labour	1.8704	0.5842	3.2016	0.0129	8173.38
Cost of intermediate products	-1.8314	0.5126	-3.5728	0.0122	2049.27
Cost of preservatives	-1.3942	0.4133	-3.3733	0.0131	1675.44
Capital inputs	1.7529	0.6019	2.9123	0.0137	8825.22

Variance Parameters for Compound Error

Lamda	5.3916	1.0526	5.1222
Sigma	6.7033	1.3144	5.0999

Model Chi-square 63.0923 68.2914

DETERMINANTS OF TECHNICAL EFFICIENCY OF RICE PROCESSORS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	29.0526	6.3913	4.5456
Age	-1.3349	0.4122	-3.2385
Education	1.6713	0.5743	2.9102
Marital Status	-1.4922	0.2912	-1.1556
Household size	1.6006	0.5425	2.9504
Access to Credit	0.7143	0.2154	3.3162
Membership of Cooperative	0.3882	0.1026	3.7836
Extension	0.4174	0.3912	1.0669
Distance	-1.3846	0.3829	-3.6161
Cost of intermediate products	-1.4491	0.5112	-2.8347

TECHNICAL EFFICIENCY OF RICE PROCESSOR

Maximum Value	0.9218
Minimum Value	0.3116
Mean Value	0.6714

MALE RICE MARKETERS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Rice Sales quantity (kg); Rhs=One;
Rent (X1), Handling Costs (X2), Cost of intermediate products (X3), Cost of Preservative, Storage
and other Operational Costs (X4), Capital inputs (X5); Production, Model; Efficiency factors;
Age (Z_1) Education (Z_2), Household Size (Z_3), Expereience in Value addition (Z_4), Access to
Credit (Z_5); Membership of Cooperative (z6); Extension Contact (Z_7); Distance (Z_8); Cost of
Intermediate product (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Maximum Likelihood Estimates	
Male Sales Quantity	(Kg)
Capital inputs	
Number of observations	89
Iterations completed	138
Log likelihood function	-106.1509
Variunaces: Sigma-squared(v)=	0.8517
Sigma-squared(u)=	0.1372

Primary Index Equation for Model

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	18.0821	3.0912	5.8495	0.0113	
Rent	-0.7126	0.2166	-3.2899	0.0141	1034.29
Handling Costs	-0.4833	0.1805	-2.6776	0.0122	556.08
Cost of Intermediate Products	-0.3718	0.2944	-1.2629	0.2706	678.16
Cost of Preservatives	-0.4429	0.1706	-2.5961	0.0133	115.33
Capital inputs	-0.1156	0.0398	-2.9045	0.0126	813.46

Variance Parameters for Compound Error

Lamda	5.0731	1.1607	4.3707
Sigma	6.1942	1.4613	4.2388

Model Chi-square 63.0923

DETERMINANTS OF TECHNICAL EFFICIENCY OF MALE MARKETERS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	16.0729	2.3916	6.7206
Age	-1.4217	0.6039	-2.3542
Eeducation	1.8826	0.5943	3.1678
Household size	-0.4609	0.3712	-1.2416
Experience	1.3392	0.4893	2.7369
Access to Credit	0.7425	0.3122	2.3782
Membership of Cooperative	0.3412	0.1006	3.3917
Extension	0.0893	0.793	1.1261
Distance	-0.4122	0.1316	-3.1322
Cost of Intermediate products	-0.5219	0.4729	-1.1036

TECHNICAL EFFICIENCY OF MARKETERS

Maximum Value	0.9516
Minimum Value	0.3108
Mean Value	0.5213

POOLED RICE MARKETERS

Maximum iterations reached. Exit iterations with status=1.
Abnormal exit from iterations. If current results are shown
check convergence values shown below. This may not be a
solution value (especially if initial iterations stopped).
Gradiant value: Tolerance= 100D-06, current value= .5204D-01
Function chg. : Tolerance= .0000D+00, current value= .1644D-01
Smallest abs. parameter change from start value = .2008D+00
Stochastic Production Frontier; Lhs = Rice Sales quantity (kg); Rhs=One;
Rent (X1), Handling Costs (X2), Cost of intermediate Costs (X3), Cost of Preservative, Storage and other Operational Costs (X4), Capital inputs (X5); Production, Model; Efficiency factors; Age (Z_1) Education (Z_2), Household Size (Z_3), Expereience in Value addition (Z_4), Access to Credit (Z_5); Membership of Cooperative (z6); Extension Contact (Z_7); Distance (Z_8); Cost of Intermediate product (Z_9); Frontier, Model = E; Lists

Stochastic Production Frontier	
Marketers Sales Quantity	(Kg)
Capital inputs	
Number of observations	178
Iterations completed	297
Log likelihood function	-112.0925
Variunaces: Sigma-squared(v)=	0.8654
Sigma-squared(u)=	0.1323

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
INTERCEPT	19.0829	4.3312	4.4059	0.0112	
Rent	-0.5724	0.1526	-3.7509	0.0125	1392.41
Handling Costs	-0.4839	0.1389	-3.4838	0.0127	467.38
Cost of Intermediate Products	-0.3316	0.3006	-1.1031	0.3128	512.66
Cost of Preservatives	-0.3187	0.1168	-2.7286	0.0131	197.33
Capital inputs	-0.2914	0.0836	-3.4856	0.0116	526.47

Variance Parameters for Compound Error

Lamda	7.0312	1.4822	4.7438
Sigma	8.3904	1.5713	5.3421

Model Chi-square 63.8172

DETERMINANT OF TECHNICAL EFFICIENCY OF RICE MARKETERS

Variable	Coefficient	Standard Error	b/St.Er.
Intercept	23.0526	5.4913	4.1981
Age	-2.7603	0.8426	-3.2759
Eeducation	1.1942	0.4133	2.8894
Household size	-1.3318	1.0254	-1.2988
Experience	2.5203	0.6415	3.9288
Access to Credit	0.3912	0.1006	3.1014
Membership of Cooperative	0.4456	0.1107	4.0253
Extension	0.3908	0.3115	1.2546
Distance	-1.4216	0.4034	-3.5241
Cost of Intermediate products	-1.5922	0.5102	-3.1207

TECHNICAL EFFICIENCY OF MARKETERS

Maximum Value	0.9215
Minimum Value	0.3112
Mean Value	0.6705

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF MALE RICE PRODUCERS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	267.1034										
Std. Err of Y Est	24.0918										
R Squared	0.5836										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-13.0964	10.0017	14.1604	13.1146	10.0899	14.3713	15.0926	-11.4036	12.1942	13.663	-13.6613
Std. Err of Coef(s)	12.305	9.1038	13.5416	3.0192	2.6514	12.9919	4.1382	9.8827	3.0144	4.0965	11.4612
T-Ratio	-1.0796	1.0986	1.0457	4.3437	3.8055	1.1539	3.6471	-1.1539	4.0453	3.3349	4.0453
F-value	11.9762										

SEMI-LOG FUNCTION
Regression Output

Constant	214.096										
Std. Err of Y Est	19.1739										
R Squared	0.4155										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-3.0946	4.6617	3.5044	5.0013	5.1674	4.1155	3.8926	-3.0016	14.1526	4.2319	-3.6793

Std. Err of Coef(s)	1.9138	1.3908	2.1675	4.0029	1.3045	3.0672	2.7145	2.1799	1.3017	1.0544	2.4609
T-Ratio	-1.6169	3.3518	1.6168	1.2494	3.9612	1.3418	1.4341	-1.3769	3.1901	4.0136	-1.4951
F-value	6.0924										

DOUBLE-LOG FUNCTION
Regression Output

Constant	183.4413										
Std. Err of Y Est	0.0639										
R Squared	0.7616										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-0.0651	0.0548	0.0722	0.0912	0.0415	0.0613	0.0722	-0.0516	0.0933	0.0526	-0.0719
Std. Err of Coef(s)	0.0229	0.0116	0.0614	0.0247	0.0336	0.0239	0.0613	0.0141	0.0317	0.0139	0.0607
T-Ratio	-2.8428	4.7241	1.1759	3.6923	1.2351	2.5649	1.1778	-3.6596	2.9432	3.7842	-1.1845
F-value	27.2584										

EXPONENTIAL FUNCTION
Regression Output

Constant	105.6617										
Std. Err of Y Est	0.2154										
R Squared	0.6318										
No. Of Observations	104										
Degrees Of Freedom	94										
X coefficient (s)	-0.0067	0.0052	0.0094	0.0071	0.0056	0.0039	0.0091	-0.0076	0.0049	0.0067	-0.0087
Std. Err of Coef(s)	0.0019	0.0019	0.0036	0.0052	0.0024	0.0016	0.0079	0.0021	0.0036	0.0043	0.0026
T-Ratio	-3.5263	2.7368	1.3611	1.3654	2.3333	2.4375	1.1519	-3.6191	1.3611	1.5581	-3.3462
F-value	14.6521										

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF FEMALE RICE PRODUCERS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	237.1044										
Std. Err of Y Est	22.6193										
R Squared	0.5216										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-10.3619	14.6613	10.3906	11.0556	10.2219	14.0056	11.2219	-13.1726	13.9314	10.8826	-12.506
Std. Err of Coef(s)	9.1678	3.0826	3.1128	9.8767	9.1526	3.1065	10.4126	11.9813	4.1309	9.1162	3.6718
T-Ratio	-1.1302	4.7561	3.3381	1.1194	1.1169	4.5085	1.0777	-1.0994	3.3725	1.1938	-3.3092
F-value	9.2977										

SEMI-LOG FUNCTION
Regression Output

Constant	198.6616										
Std. Err of Y Est	19.1305										
R Squared	0.3916										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-4.0829	3.1164	5.2267	2.8216	3.1944	3.8022	4.0926	-3.4415	4.0926	3.0526	-4.1164

Std. Err of Coef(s)	1.1838	2.6539	1.4672	1.9837	2.3875	2.9146	1.1037	2.6942	3.0071	2.1046	1.3145
T-Ratio	-3.4489	1.1743	3.5624	1.4224	1.3379	1.3045	3.7081	-1.2774	1.3609	1.4504	-3.1315
F-value	5.4769										

DOUBLE-LOG FUNCTION

Regression Output

Constant	136.4419										
Std. Err of Y Est	0.0333										
R Squared	0.7115										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-0.0665	0.0922	0.0387	0.0521	0.0522	0.0617	0.0538	0.0617	0.0419	0.0952	-0.0813
Std. Err of Coef(s)	0.0222	0.0291	0.0275	0.0168	0.0413	0.0241	0.0416	0.0253	0.0135	0.0413	0.0698
T-Ratio	-2.9955	3.1684	1.4073	3.1012	1.2639	2.5602	1.2933	2.4387	3.1037	2.3051	-1.1648
F-value	20.8651										

EXPONENTIAL FUNCTION

Regression Output

Constant	105.2609										
Std. Err of Y Est	0.3107										
R Squared	0.6226										
No. Of Observations	106										
Degrees Of Freedom	94										
X coefficient (s)	-0.0071	0.0063	0.0092	0.0049	0.0055	0.0067	0.0082	-0.0049	0.0068	0.0077	-0.0085
Std. Err of Coef(s)	0.0058	0.0047	0.0028	0.0013	0.0041	0.0022	0.0025	0.0036	0.0057	0.0021	0.0029
T-Ratio	-1.2241	1.3404	3.2857	3.7692	1.3415	3.0455	3.2801	-1.3611	1.1929	3.6667	-2.9311
F-value	14.0971										

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF RICE PRODUCERS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	416.0913										
Std. Err of Y Est	27.1825										
R Squared	0.5016										
No. Of Observations	212										
Degrees Of Freedom	200										
X coefficient (s)	-11.4029	13.8913	12.7714	10.8926	15.7122	14.0619	10.8826	-14.1309	13.1922	15.1705	-14.1033
Std. Err of Coef(s)	3.1792	4.0094	10.9919	9.1033	7.1015	12.4192	9.0064	3.0619	4.0019	13.9819	13.0065
T-Ratio	-3.5867	3.4647	1.1619	1.1966	2.2125	1.1323	1.2083	-4.6151	3.2965	1.0851	-1.0843
F-value	18.3133										

SEMI-LOG FUNCTION
Regression Output

Constant	329.1083										
Std. Err of Y Est	21.4122										
R Squared	0.4138										
No. Of Observations	212										
Degrees Of Freedom	200										
X coefficient (s)	-4.0091	3.1764	2.8813	5.1764	3.1992	5.0064	4.8126	-3.1793	4.4166	3.8219	-5.0722

Std. Err of Coef(s)	3.1726	1.0043	1.9982	4.0926	2.1738	4.1926	1.0083	2.4526	3.0912	1.0067	4.1936
T-Ratio	-1.2637	3.1628	1.4419	1.2648	1.4717	1.1941	4.7729	-1.2963	1.4288	3.7965	-1.2095
F-value	12.8389										

DOUBLE-LOG FUNCTION

Regression Output

Constant	215.6033										
Std. Err of Y Est	0.4216										
R Squared	0.6592										
No. Of Observations	212										
Degrees Of Freedom	200										
X coefficient (s)	-0.0522	0.0914	0.0689	0.0713	0.0529	0.0812	0.0773	-0.0694	0.0883	0.0695	-0.0912
Std. Err of Coef(s)	0.0413	0.0219	0.0511	0.0209	0.0413	0.0251	0.0226	0.0519	0.0216	0.0516	0.0803
T-Ratio	-1.2639	4.1735	1.3483	3.4115	1.2809	3.2351	3.4204	-1.3372	4.0879	1.3469	-1.1357
F-value	35.2513										

EXPONENTIAL FUNCTION

Regression Output

Constant	183.0926										
Std. Err of Y Est	0.0142										
R Squared	0.8531										
No. Of Observations	212										
Degrees Of Freedom	200										
X coefficient (s)	-0.0048	0.0066	0.0074	0.0091	0.0093	0.0087	0.0042	-0.0073	0.0087	0.0096	-0.0083
Std. Err of Coef(s)	0.0013	0.0019	0.0029	0.0025	0.0076	0.0028	0.0029	0.0022	0.0028	0.0027	0.0069
T-Ratio	-3.6923	3.4737	2.5517	3.6401	1.2237	3.1071	1.4483	-3.3182	3.1071	3.5556	-1.2029
F-value	-3.6923										
	105.5164										

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF FEMALE RICE MARKETERS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	206.4419										
Std. Err of Y Est	20.8346										
R Squared	0.5423										
No. Of Observations	89										
Degrees Of Freedom	77										
X coefficient (s)	-10.6529	11.6822	14.3914	10.3908	15.1674	13.8026	16.1304	-14.3391	14.3819	13.1708	-10.6613
Std. Err of Coef(s)	9.1836	3.1716	13.0605	2.4133	3.3418	11.9964	14.9856	13.1409	3.4033	11.9817	3.0526
T-Ratio	-1.1599	3.6834	1.1019	4.3056	4.5387	1.1506	1.0764	-1.0912	4.2259	1.0993	-3.4925
F-value	5.9442										

SEMI-LOG FUNCTION

Regression Output

Constant	175.3914
Std. Err of Y Est	17.1845
R Squared	0.4113
No. Of Observations	89
Degrees Of Freedom	77

X coefficient (s)	-4.8019	3.1176	5.1834	3.4609	4.1157	5.1068	3.4716	-3.9006	4.1046	4.0665	-3.1792
Std. Err of Coef(s)	1.3826	2.9715	4.0719	1.0526	3.1083	4.0153	1.0811	2.8715	1.0912	3.0416	2.9615
T-Ratio	-3.4731	1.0492	1.2729	3.2897	1.3241	1.2718	3.2112	-1.3584	3.7615	1.3369	-1.0735
F-value	4.8877										

DOUBLE-LOG FUNCTION

Regression Output

Constant	139.4406
Std. Err of Y Est	0.1942
R Squared	0.6319
No. Of Observations	89
Degrees Of Freedom	77

X coefficient (s)	-0.0617	0.0447	0.0912	0.0815	0.0813	0.0593	0.0712	-0.0889	0.0665	0.0743	-0.0942
Std. Err of Coef(s)	0.0205	0.0319	0.0294	0.0708	0.0276	0.0414	0.0593	0.0297	0.0213	0.0216	0.0839
T-Ratio	-3.0098	1.4013	3.1021	1.1511	2.9457	1.4324	1.2007	-2.9933	3.1221	3.4398	-1.1228
F-value	12.0179										

EXPONENTIAL FUNCTION

Regression Output

Constant	116.0739
Std. Err of Y Est	0.0188
R Squared	0.7942
No. Of Observations	89
Degrees Of Freedom	77

X coefficient (s)	-0.0065	0.0073	0.0091	0.0094	0.0083	0.0072	0.0067	-0.0083	0.0059	0.0068	-0.0094
Std. Err of Coef(s)	0.0049	0.0026	0.0029	0.0026	0.0028	0.0027	0.0051	0.0028	0.0019	0.0023	0.0087
T-Ratio	-1.3265	2.8077	3.1379	3.6154	2.9643	2.6667	1.3137	-2.9643	3.1053	2.9565	-1.0805
F-value	26.7407										

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF MALE RICE PROCESSORS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	337.0816										
Std. Err of Y Est	22.6142										
R Squared	0.5033										
No. Of Observations	43										
Degrees Of Freedom	31										
X coefficient (s)	-14.3319	10.8604	11.1439	13.0065	12.5607	14.0965	113815	-14.3917	14.3408	16.0942	-13.1943
Std. Err of Coef(s)	13.1403	9.1446	3.2613	11.5914	3.0715	3.1247	9.9704	4.0822	4.0912	14.8917	11.5894
T-Ratio	-1.0907	1.1876	3.4171	1.1221	4.0894	4.5113	1.1415	-3.5255	3.5053	1.0807	-1.1385
F-value	2.8597										

SEMI-LOG FUNCTION
Regression Output

Constant	283.0943
Std. Err of Y Est	19.2716
R Squared	0.4219
No. Of Observations	43
Degrees Of Freedom	31

X coefficient (s)	-5.2607	3.1133	4.8702	4.0942	5.6613	4.0835	3.6715	-4.2269	3.0943	6.1137	-3.0942
Std. Err of Coef(s)	4.0719	1.0216	3.4113	3.1026	4.1704	1.1381	2.7152	3.0837	1.0064	5.0921	2.1753
T-Ratio	-1.2919	3.0475	1.4277	1.3575	1.3575	3.5879	1.3522	-1.3707	3.0746	1.2006	-1.4224
F-value	2.0565										

DOUBLE-LOG FUNCTION

Regression Output

Constant	257.1826
Std. Err of Y Est	0.0314
R Squared	0.8709
No. Of Observations	43
Degrees Of Freedom	31

X coefficient (s)	-0.0618	0.0744	0.0813	0.0912	0.0543	0.0919	0.0526	-0.0747	0.0614	0.0713	-0.0833
Std. Err of Coef(s)	0.0509	0.0213	0.0241	0.0274	0.0138	0.0287	0.0413	0.0221	0.0205	0.0209	0.0219
T-Ratio	-1.2141	3.4929	3.3734	3.3285	3.9348	3.2021	1.2736	-3.3801	2.9951	3.4115	-3.8037
F-value	207.3571										

EXPONENTIAL FUNCTION

Regression Output

Constant	203.4188
Std. Err of Y Est	0.2246
R Squared	0.6039
No. Of Observations	43
Degrees Of Freedom	31

X coefficient (s)	-0.0071	0.0069	0.0088	0.0071	0.0094	0.0061	0.0077	-0.0085	0.0073	0.0088	-0.0067
Std. Err of Coef(s)	0.0025	0.0051	0.0021	0.0053	0.0026	0.0049	0.0025	0.0069	0.0028	0.0023	0.0049
T-Ratio	-2.8401	1.3529	4.1905	1.3396	3.6154	1.2449	3.0801	-1.3673	2.6071	3.8261	-1.3673
F-value	4.2891										

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF RICE MARKETERS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	349.1083										
Std. Err of Y Est	23.4612										
R Squared	0.5509										
No. Of Observations	178										
Degrees Of Freedom	166										
X coefficient (s)	-13.0916	14.3305	10.8715	13.1146	11.8917	10.1154	14.3916	-15.3394	16.3944	14.3804	-11.0925
Std. Err of Coef(s)	12.9857	4.0925	9.1826	11.9914	3.0825	9.0615	4.0153	13.9616	4.0526	13.1914	3.1046
T-Ratio	-1.0082	3.5016	1.1839	1.0937	3.8578	1.1163	3.5842	-1.0987	4.0454	1.0901	-3.5729
F-value	18.4804										

SEMI-LOG FUNCTION

Regression Output

Constant	298.4424
Std. Err of Y Est	20.0619
R Squared	0.5227
No. Of Observations	178
Degrees Of Freedom	166

X coefficient (s)	-4.0946	3.1149	4.8703	5.4416	3.0916	2.8742	4.0985	-5.2217	3.0943	4.1045	-3.1036
Std. Err of Coef(s)	1.1045	2.5814	3.0614	1.5219	1.0047	1.6015	3.1042	1.1835	2.4708	1.094	2.0143
T-Ratio	-3.7072	1.2067	1.5909	3.5755	3.0771	1.7947	1.3203	-4.4121	1.2523	3.7515	-1.5408
F-value	16.3856										

DOUBLE-LOG FUNCTION

Regression Output

Constant	241.0094
Std. Err of Y Est	0.0217
R Squared	0.8638
No. Of Observations	178
Degrees Of Freedom	166

X coefficient (s)	-0.0677	0.0891	0.0641	0.0709	0.0813	0.0567	0.0883	-0.0942	0.0665	0.0729	-0.0895
Std. Err of Coef(s)	0.0214	0.0285	0.0526	0.0213	0.0254	0.0185	0.0714	0.0294	0.0214	0.0213	0.0714
T-Ratio	-3.1636	3.1263	1.2186	3.3286	3.2008	3.0649	1.2367	-3.2041	3.1075	3.4225	-1.2535
F-value	95.7761										

EXPONENTIAL FUNCTION

Regression Output

Constant	198.4443
Std. Err of Y Est	0.1889
R Squared	0.6703
No. Of Observations	178
Degrees Of Freedom	166

X coefficient (s)	-0.0084	0.0074	0.0067	0.0083	0.0066	0.0074	0.0067	-0.0082	0.0091	0.0084	-0.0064
Std. Err of Coef(s)	0.0027	0.0023	0.0021	0.0022	0.0051	0.0026	0.0021	0.0069	0.0029	0.0069	0.0049
T-Ratio	-3.111	3.2174	3.1905	3.7727	1.2941	2.8462	3.1905	-1.1884	3.1379	1.2174	-1.3061
F-value	30.6213										

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF MALE RICE MARKETERS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	213.0096										
Std. Err of Y Est	20.1605										
R Squared	0.5922										
No. Of Observations	89										
Degrees Of Freedom	77										
X coefficient (s)	-14.0665	13.1722	10.6035	11.5923	13.6912	14.1126	10.8213	-14.5022	14.0026	13.1309	-17.1165
Std. Err of Coef(s)	4.3519	11.6839	9.1127	9.8917	3.9802	13.0614	9.1725	5.0036	3.4907	11.9918	4.2604
T-Ratio	-3.2323	1.1274	1.1636	1.1719	3.4398	1.0805	1.1798	-2.8984	4.0114	1.0949	-4.0176
F-value	10.1578										

SEMI-LOG FUNCTION Regression Output

Constant	187.1047										
Std. Err of Y Est	18.0925										
R Squared	0.4057										
No. Of Observations	89										
Degrees Of Freedom	77										
X coefficient (s)	-3.1728	4.1165	3.0912	2.8536	4.1996	5.0064	4.1992	-3.8702	4.9617	3.1164	3.8813

Std. Err of Coef(s)	2.8265	1.1607	2.8715	2.0064	1.0897	4.1826	3.0164	2.9873	3.0744	1.0615	2.9949
T-Ratio	-1.1225	3.5466	1.0765	1.4222	3.8539	1.1969	1.3921	-1.2956	1.6139	2.9358	1.2962
F-value	4.7774										

DOUBLE-LOG FUNCTION

Regression Output

Constant	159.1186										
Std. Err of Y Est	0.2813										
R Squared	0.6426										
No. Of Observations	89										
Degrees Of Freedom	77										
X coefficient (s)	-0.0744	0.0619	0.0526	0.0421	0.0553	0.0912	0.0683	-0.0467	0.0819	0.0971	-0.0662
Std. Err of Coef(s)	0.0226	0.0205	0.0409	0.0309	0.0412	0.0306	0.0209	0.0316	0.0215	0.0316	0.0611
T-Ratio	-3.2921	3.0195	1.2861	1.3625	1.3422	2.9804	3.2679	-1.4778	3.8093	3.0728	-1.2954
F-value	12.5901										

EXPONENTIAL FUNCTION

Regression Output

Constant	106.4219									
Std. Err of Y Est	0.0227									
R Squared	0.8834									
No. Of Observations	89									
Degrees Of Freedom	77									
X coefficient (s)	-0.0059	0.0046	0.0079	0.0086	0.0083	0.0071	-0.0083	0.0074	0.0092	-0.0056
Std. Err of Coef(s)	0.0019	0.0012	0.0015	0.0029	0.0018	0.0059	0.0028	0.0025	0.0029	0.0041
T-Ratio	-3.1053	3.8333	5.2667	2.9655	3.7778	1.2034	-2.9643	2.9601	3.1724	-1.3659
F-value	53.1848									

RELATIONSHIP BETWEEN SOCIO ECONOMIC CHARACTERISTICS OF FEMALE RICE PROCESSORS AND VALUE ADDED

Value added (y), Education (x1), Education (x2), HHsize (x3), Experience (x4), Access Credit (x5), Cooperative (x6), Extension (x7), Distance (x8), Capital (x9), Information (x10), Cost of Products (x11)

Ordinary Least Squares Multiple Regression Model

Y = f (x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, e)

LINEAR FUNCTION REGRESSION OUTPUT

Constant	294.0342										
Std. Err of Y Est	22.1778										
R Squared	0.4913										
No. Of Observations	43										
Degrees Of Freedom	31										
X coefficient (s)	-13.0916	10.3317	14.0946	13.1137	10.8219	11.3717	14.2608	-13.1426	10.4417	16.1945	-13.0615
Std. Err of Coef(s)	4.1035	9.1082	3.1667	11.9813	9.1428	3.0522	13.0916	12.0142	3.0605	14.9918	11.9703
T-Ratio	-3.1903	1.1343	4.4509	1.0945	1.1837	3.7257	1.0893	-1.0939	3.4118	1.0802	-1.0912
F-value	2.7234										

SEMI-LOG FUNCTION

Regression Output

Constant	252.1146
Std. Err of Y Est	19.0315
R Squared	0.4123
No. Of Observations	43
Degrees Of Freedom	31

X coefficient (s)	-2.8713	4.1604	3.4702	2.9112	3.0615	4.1922	2.8217	-3.9422	4.1902	3.1165	-3.5814
Std. Err of Coef(s)	1.9882	1.3715	2.8413	1.8526	1.0304	3.1563	1.9942	2.8743	3.0813	1.0614	2.7134
T-Ratio	-1.4442	3.0335	1.2213	1.5714	2.9712	1.3282	1.4149	-1.3715	1.3599	2.9362	-1.3199
F-value	1.9832										

DOUBLE-LOG FUNCTION

Regression Output

Constant	213.4449
Std. Err of Y Est	0.0367
R Squared	0.8438
No. Of Observations	43
Degrees Of Freedom	31

X coefficient (s)	-0.0664	0.0713	0.0829	0.0912	0.0717	0.0883	0.0491	-0.0688	0.0654	0.0713	-0.0841
Std. Err of Coef(s)	0.0513	0.0291	0.0278	0.0306	0.0251	0.0227	0.0347	0.0216	0.0209	0.0234	0.0278
T-Ratio	-1.2943	2.4502	2.9821	2.9804	2.8566	3.8899	1.4149	-3.1852	3.1292	3.0471	-3.0252
F-value	15.2201										

EXPONENTIAL FUNCTION

Regression Output

Constant	173.0094
Std. Err of Y Est	0.1665
R Squared	0.6307
No. Of Observations	43
Degrees Of Freedom	31

X coefficient (s)	-0.0064	0.0071	0.0039	0.0082	0.0049	0.0093	0.0091	-0.0078	0.0077	0.0082	-0.0067
Std. Err of Coef(s)	0.0019	0.0023	0.0021	0.0025	0.0027	0.0026	0.0029	0.0023	0.0023	0.0067	0.0052
T-Ratio	-3.3684	3.0869	1.8571	3.2801	1.8148	3.5769	3.1379	-3.3913	3.3478	1.2239	-1.2885
F-value	4.8182										