DERIVABLE BENEFITS ALONG VALUE ADDITION NODES AMONG RICE PROCESSORS IN NORTH-CENTRAL NIGERIA

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CERTIFICATION

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DEDICATION

This work is dedicated firstly to Almighty Allah, (The Cherisher and Sustainer of the Universe) for seeing me through this programme against all odds, secondly to my mother for her devotedness to Allah, thirdly to my wife for believing in me and lastly to my late daughter, Aliyyah Adeoye Ishola, who saw the beginning of this programme but did not witness the completion. May her soul rest in peace, Ameen.

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ABSTRACT

Processors add value to agricultural produce to compete favourably in open markets and derive maximum benefits. Value Addition (VA) towards enhancing derivable benefits in locally produced rice is particularly important in Nigeria. However, there is low patronage and acceptability despite the current government efforts in promoting local rice production. The VA along the rice value chain has been examined in past studies while data on derivable benefits within processing nodes are scanty. Therefore, benefits derived by processors in rice VA in North-central Nigeria were investigated.

A four-stage sampling procedure was used. Two North-central states, Kwara and Niger were purposively selected due to their prominence in rice production. Ten per cent of the 16 and 25 Local Government Areas in Kwara and Niger states were selected, respectively. Thereafter, 10% of rice-growing communities and 10% of registered processors in each community were randomly selected to give 186 processors. An interview schedule was used to obtain data on processors' characteristics (sex, marital status, primary occupation, source of labour and age); Activities that add Value to Rice-AVR (timely drying and threshing with the use of the mechanical device); attitude towards VA; accessibility to agricultural support services; Derivable Benefits-DB from Threshing and Winnowing-TW, drying, Parboiling, Cleaning and Dehusking-PCD, transportation, storage and constraints encountered. Indices of involvement in VA activities (low: 0.0-49.0, high: 50.0-59.0), attitude (unfavourable: 40.0-59.0, favourable: 60.0-85.0), accessibility to agricultural support services (low: 4.0-13.0, high: 14.0-22.0), DB (low: 21.0-46.0, high: 47.0-72.0): TW (low: 25.0-47.0, high: 48.0-66.0), drying (low: 22.0-48.0, high: 49.0-72.0), PCD (low: 30.0-51.0, high: 52.0-69.0), transportation (low: 35.0-50.0, high: 51.0-72.0) and storage (low: 22.0-40.0, high: 41.0-67.0) were generated. Data were analysed using descriptive statistics, Pearson product-moment correlation, t-test and linear regression at $\alpha_{0.05.}$

Most processors were female (70.4%), married (81.7%), practised farming as a primary occupation (54.3%), utilised family labour (35.5%) and aged 39.6±9.3 years. Involvement in the AVR was low (52.2%). Timely drying (13.7±2.63) and threshing using a mechanical device (13.6±2.71) were the most important AVR. Processors (52.1%) had an unfavourable attitude towards VA. Sixty-four per cent had low access to agricultural support services with agricultural thrift and cooperative society being the most accessed. Effective separation of rice and impurities (1.45±0.63), reduction of processing period (1.40±0.63), prolonged shelf life (1.39±0.62) and acceptability by users (1.50±0.61) were the most important DB from TW, drying, PCD and storage, respectively. Overall DB from VA was low (53.8%), while TW, PCD and transportation were low for 57.0%, 55.4% and 50.5% of the processors, respectively. However, 54.8% and 52.2% of the processors had high DB from drying and storage, respectively. Inadequate means of transporting the paddy was the major constraint (58.6%) in VA. Constraints (r=0.280) and attitude (r=0.546) significantly correlated with DB. Processors with high VA (48.31±8.42) had higher DB than processors with low VA (43.06±8.79). Parboiling (β = 0.180) and dehusking (β= 0.316) significantly predicted DB.

Derivable benefits in value addition to rice in North-central Nigeria was low. Parboiling and dehusking enhanced derivable benefits, while the acceptability of grains by end-users is the most important derivable benefit.

Keywords: Paddy processors, Rice value chain, Threshing and winnowing, Parboiling of rice

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CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Rice play one of the most important roles in the dietary needs of man as it is one of the most important staple foods in the world and undoubtedly the only major cereal crop that is consumed almost exclusively by humans. It is mainly cultivated in America, Asia, Africa and Europe (Bapari, 2016). Not less than 80% of the people in Asia live on rice, (Noonari *et al*., 2015). Also its production is of great importance in Agriculture and National economy of countries like Bangladesh (Hassan *et al*., 2017).

Rice employs over 80% of the population in the major producing areas (Kamai *et al.,* 2020). West Africa sub-region is a major producer of rice in the world. The total rice production and consumption estimated to be 64.2 per cent and 61.9 per cent respectively in sub-Saharan Africa is gotten from West Africa (Akinbile (2007). Also, the Sub-Saharan Africa (SSA) accounts for 6% and 26% of global total rice production and harvested area, respectively (FAOSTAT, 2022). Nigeria is currently the highest rice producer in West Africa, and now inches closer to rice sufficiency.(Okojie, 2023)

Tang *et al*., (2022) reported that rice production has increase globally over the years. In 2019, 501 megatons of rice was produced in the world and the mean consumption was around 179g per capital per day. This amounted to 19.3% higher than that of year 2000. The world production of milled rice was projected to rise to 508.4 megatons in 2020. This could not be realised, and as such 828 millions people were affected by hunger in 2021. This is because rice is the main staple food of more than 100 countries of the world. This make rice to be very important in ending hunger. Fashola *et al*., (2007) also pointed out that rice is the fourth largest cereal crop produced in Nigeria after sorghum, millet and maize. Therefore, since the 1960s, there is increase in production of rice both in area cultivated and output. Despite this arithmetic increase in rice production in the country, the rice consumption rate is on the geometric increase in Nigeria when compared with other countries of the West African sub-region, with the growing demand amounting to 4.1 million tons of rice in 2002, with only about half of that demand met by domestic production. Nigeria imported 1.9 million tons of rice in 2002, valued at approximately 500 million USA dollars (USDA FAS, 2014). Similarly, according to the former Minister of Agriculture and Rural Development, Dr Akinwunmi Adeshina, Nigeria spent N365billion on imported rice in 2010 alone. (Adesina, 2012). In addition, Abbas, *et al*., (2018) also pointed out that Nigeria spends billions of naira annually on rice importation. This undoubtedly leads to unwarranted depletion of the foreign reserves. It therefore, implies that a substantial amount of money is spent on importation. Less than one-quarter of this amount would be enough to make Nigeria rice to be worthwhile with value addition, increased production and creation of lots of opportunities in the rice industry. This will not only help the country to achieve self-sufficiency in rice, but also transform the country from a net importer to an exporter of rice while ensuring market acceptability locally and internationally.

Furthermore, Shabu, *et al*., (2011) reported that in 2002, the Nigeria government recognized that one of the problems facing rice production in Nigeria is lack of competitiveness resulting from low and uneconomic production, poor access to expensive inputs (especially fertilizers and credit facilities), low capacity to meet quality standards (lack of value addition) and little or no encouragement for private sector participation. To reverse this trend, the government of Nigeria encouraged farmer-friendly policies with the presidential initiative to improve rice production. Taking advantage of this government policy to reduce high import tariffs on milled rice, Olam Nigeria Limited, a major rice importer, decided to test a new business approach by investing in the local production of high-quality rice for Nigeria's domestic market. In 2005, Olam began processing locally produced rice from a government rice mill located in Makurdi, Benue State. However, the company was faced with the challenge of insufficient supply of high-quality rice to meet their 18,000 metric tonnes capacity per year target. In 2006, the United States government, through United States Agency for International Development (USAID), entered into a partnership with

Olam. The goal of this partnership was to promote demand-driven production by developing a supply chain model that encourages the use of improved technologies, building farmer's capacity, commercial linkages to credible market outlets and strategic public-private partnership (USAID, 2009). The organization's intended development impact includes continued direct benefits to rural populations and a demonstrable impact on sustainability given its ability to enhance the efficiency and transparency of agricultural business logistics and provide knowledge transfer in the primary processing of products.

Odozi (2014) noted that by 2008 Nigeria rice development falls under the broader National food security policy as contained in the National Food Security Programme (NFSP) document released in 2008. The objective is to ensure sustainable access, availability and affordability of quality food to all Nigerians and for Nigeria to become a significant net provider of food to the global community. Rice is listed as the second food security strategic commodity. In 2009, National Rice Development Strategy (NRDS) was set up with the same self-sufficiency goal. It is expected to boost rice production from 3.4 million tonnes to 12.8 million tonnes in 2018. The three priority areas of focus include (i) improving post-harvest processing and treatment (value addition); (ii) developing irrigation and extending cultivated lands; and (iii) making seeds, fertilizers and farming equipment more readily available. Other key measures include subsidies for inputs (50% for seed and 25% for fertilizer) and reduced custom tariffs on imports of agricultural machinery such as tractors and processing equipment. (NRDS/FGN, 2009).

Singh *et al*., (1997), submitted that despite these various government policies and programmes, domestic rice production has not kept pace with consumption. Subsequently, increased high demand for domestic rice by the Nigerian populace consequently generated the need for continuous importation of rice. This alone has led to a serious drain on the country's foreign reserves. The necessity to increase and improve the overall aspect of the rice production chain in the country, therefore, becomes imperative; hence value addition to various nodes of rice production culminating in derivable benefits among rice value chain actors. Eventually, large number of actors have thus evolved and developed around the overall activities of rice production that involve the production of paddy, its conversion to processed rice, and its delivery to consumers. They (the actors) thus are expectedly contributing to the availability of improved and acceptable rice in Nigeria for which value must continuously be added. These actors include input dealers, transporters, processors, standardization agents, packager/baggage agents, marketers/traders, extension agents, finance providers, etc.

1.2 Statement of the research problem

Rice is one food item whose consumption does not follow cultural, ethnic, religious or geographical considerations (Ibitoye, *et al*, 2014). Harold and Tabo (2015) also noted that rice is the single most important source of dietary energy in West Africa and third most important for Africa as a whole. For about 30 years, research has indicated that global rice consumption has increased at an annualized rate of 1.5%, while global milled production has grown at only 1.4%. At current levels of rice production in 2022 in Nigeria, the quantity of milled rice stand at 5.4 million metric tons. Although there is increase in the production of rice between 2010 and 2021, the shortfall between production and consumption is still glaring in the country (Sasu, 2022). The noticeable shortfall is worst in other Sub-Saharan Africa country. This has made the Sub-Saharan Africa which is one of the poorest regions of the world to be import dependence. The region derives 45.7% of its rice consumption from imports, leaving it second only to the Middle East in that index. Before the increase in production mentioned by Sasu, (2022), Nigeria ranks highest in rice importation. It should be noted that Sub-Saharan Africa accounts for only 2% of global production, but 3.9% of global consumption. This imbalance is offset by imports, where the region represents 28.7% of the global trade in rice (Harold and Tabo 2015).

In the submission of Akinbile (2002); Amaza and Olayemi (2002), an aggregate of rice production in Nigeria over the years show a growth of about 2.5% per annum. However, this growth is yet to meet the food need of the Nigerian population. Amaza and Olayemi (2002) estimated that the annual supply of food crops (rice inclusive) would have to increase at an average annual rate of 5.9% to meet the food demand and ultimately reduce or even eliminate importation of food. The report of Federal Ministry of Agriculture and Rural Development also pointed out that the demand of rice is 6.3tons compare to supply which is only 2.3tons lately. This is obvious insufficiency of rice in the country.(FMARD, 2016).

Furthermore, the problem of weeds, pests and diseases are serious factors militating against increased rice production.

Various researchers (Osagie, 2014, FAO, 2016 and Samson, 2018) have shown that much of the rice produced in West Africa have not been able to favourably compete with the quality of average Asian rice. Nigerian rice is less competitive in the international and urban elite markets. In addition, local rice has a higher cost price but it is of better nutritional quality. In most cases efforts to improve agricultural productivity, products and productions have largely resulted in much more increased physical inputs that are more than monetary value for producers. Consequently, the higher price of local rice can therefore be attributed to various efforts that have been put into the production, while, the better quality can be attributed to the genetic constitution of the local species. These ultimately make imported rice to be highly demanded, hence having better acceptability. It is therefore important to bring about the addition of value to locally produced rice. It must be pointed out that various efforts have been put in place by the government in terms of value addition to make Nigeria rice have higher acceptability. However, these efforts are yet to attain the expected level mainly due to inefficiency in the value chain, which has perpetuated expending of the high bill on importation.

The fact that the population of Nigeria is continuously on the increase, and presently with over 200 million people in the country, the need for an increase in rice production which is the most important staple food is sine qua non to meeting the present and future demand for rice. Earlier attempts to make Nigeria self-sufficient in rice production were partly frustrated by foreign large mills that took advantage of policy lapses to focus on brown rice importation rather than encourage paddy production by farmers. Rice also suffers from another factor of not being a raw material for any industry unlike other staple food crops like sorghum, millet, maize, cassava and cotton. Emphatically, the breweries drive sorghum and millet, the pharmaceuticals drive cassava, the food industries drive maize, and the textiles drive cotton production. Rice consumption was 5 million metric tons in 2010 and is expected to reach 36 million metric tons by 2050 with 5.1% annual growth. This means a wide gap exists between the demand and supply of rice to the ever-increasing Nigerian population. As such something must be done to ameliorate the situation.

As of 2014, Nigeria was the world number 2 importer of rice, importing 2 Million metric tons of milled rice which account for about 40-45% of total rice consumed at the cost of about 1.5 billion US dollars annually (Osagie, 2014). The high importation is however linked to the increasing population being witnessed in Nigeria and also the increasing share of rice in the diet of Nigerians. Similarly, Ayibiowu (2010), had also estimated annual rice consumption to be 5 million metric tons in the country in 2008, when per capita consumption was then 32 kg per annum with per capita consumption in urban areas higher, averaging 47 kg per annum. In addition, Gain Report (2013), estimated that the local production of rice in 2010 was 2.85 million tons and this only amounted to about half of the total consumption of 6.0 million tons, creating a wide margin of rice consumption demand gap. In an analytical submission, IFAD (2004) pointed out that necessary infrastructure and agri-support services to complement farmers' efforts were far from being evident and even if they exist, may not be operated reliably. Moreover, Armando (2009) also pointed out that smallholder farmers in developing countries are largely left without necessary support arrangements in infrastructure, extension services, local processing capacity, basic health care and education. These conditions lead farmers to sell their agricultural resources raw or semi-processed (Awua, 2000 and Serge *et al*., 2020). Overcoming this situation requires the introduction of new agricultural strategies. This is agreed on by the submission of World Bank, (2008) as cited in Kanagawa & Nakata, (2008). According to Ngore, *et al*., (2011), the addition of value in the production, harvesting, primary and secondary processing, packaging and export of agricultural produce form a value chain that has strong linkages either directly or indirectly to livelihoods and derivable benefits.

On final analysis, the demand-supply gap in rice can only be filled by promoting vigorous value addition in all stages of rice production across all the six geopolitical zones of Nigeria. It must be mentioned at this juncture that pertinent review of literature has it that elaborate works has been carried out in value chain analysis such as Ndidi, *et al*., (2013), Odoemena, *et al*. (2008), Amolegbe and Adewumi, (2016) etc. However, very little research work has been done on value addition, particularly as it relates to its consequential derivable benefits. This study, therefore, intends to focus on the contributions of derivable benefits along value addition nodes which will lead us to what processors ought to gain from their effort. It is against this background that this study will attempt to address the following research questions:

1. What are the personal characteristics of processors in the study area?
2. What are the activities that add value to rice processing in the study area?
3. What are the attitudes of processors towards value addition to rice in the study area?
4. How accessible are agricultural support services towards value addition in the study area?
5. What are the derivable benefits by processors from value additions?
6. What are the constraints encountered in the addition of value in the study area?

1.3 Objectives of the Study

The general objective of this study is to find out the derivable benefits along value addition nodes among rice processors in North-Central Nigeria.

The specific objectives of the study are to:

1. determine the personal characteristics of processors in the study area,
2. ascertain the activities that add value to rice processing in the study area,
3. examine the attitudes of processors towards value addition to rice in the study area,
4. ascertain the accessibility of agricultural support services towards value addition in the study area,
5. ascertain the derivable benefits by processors from value additions, and
6. identify the constraints encountered in the addition of value in the study area.

1.4 Hypotheses of the study

The hypotheses of the study stated in null form are as follows:

Ho_1: There is no significant relationship between rice processors' selected personal characteristics and the derivable benefits from value addition in the rice industry.

Ho_2: There is no significant relationship between the attitudes of processors towards value addition and derivable benefits from value addition.

Ho_3: There is no significant relationship between constraints encountered in the addition of value and the derivable benefits from value addition in the rice industry.

Ho_4: There is no significant difference in the derivable benefits by processors with different levels (low and high) of value addition across the states.

Ho_5: There is no significant difference in the derivable benefits by respondents involved in value addition across the states.

Ho_6: There is no significant contribution of value addition to derivable benefits in the rice industry.

1.5 Significance of the study

Rice is the most important household food item in more than 60% of homes in Nigeria. (Ogunsumi, *et al.* 2013) The importance of rice production can therefore never be over emphasized as it is a major supply of daily energy for both young and old, as such this study is significant. The effort of different governments in making sure that Nigeria is self-sufficient in rice for local consumption and also for export is yet to be fully realized. This is mainly due to low value of rice output. The reduced derivable benefits may also account for the low value addition. This study will therefore answer the question of what Nigeria rice processors need or require to benefit from the value addition activites adopted in Rice processing nodes and most importantly establish the need for increase value addition to Nigerians' rice toward acceptability in the local as well as international markets.

In addition, among other several purposes, this study will explain the attitude of processors value addition and also help to ascertain the level of accessibility to agricultural support services for value addition towards acceptability of Nigerians' rice in both the local and international markets. The study will also bring to bear the constraints militating against the value addition to rice and the attendant benefits derivable by processors. Moreover, over the years Nigerian government have battled with how increased agricultural production will bring food sufficiency, serve as a major source of foreign exchange and ultimately become a virile alternative to plummeting oil prices and therefore serve as a buffer for the economy. This study will assist the government in ensuring actualization of laudable economic achievement through the formulation of policies, presentation of bills that will translate to development.

At the end of this study, the essence of rice value addition will be brought to the limelight and will be established if truly improve value can stimulate derivable benefits and among rice processors.

1.6 Definition of terms

Rice (*Oryza sativa or Oryza glaberrima*): This refers to a cereal crop belonging to the *poaceae* family whose seeds are used as food by man.

Innovation: An innovation is an idea, practice, or object that is perceived to be new by an individual or other unit of adoption.

Stakeholder(s): An individual or group of individuals or organisations that is/are involved in a particular project or system whose role performance is relevant and contributory to the system output.

Value addition This refers to the various innovative activities which stem from producers and/or processors' creativity leading to changes, modifications and improvements in processing, marketing and even utilization and hence enhancements of production for actualizing derivable benefits.

Input dealer(s): This refers to an individual(s) that are involved in the procurement, marketing and distribution of agricultural inputs.

Processor(s): This refers to the individual(s) that are involved in the processing of rice.

Financial institution(s): This refers to institutions that collect funds from the public to place them in financial assets, such as deposits, loans, and bonds, rather than tangible property.

Product Value: Simply refers to an assessment of the worth of a good or service as seen by the utilizer. The product value assessed by a business when setting a price for a particular product usually depends on its production costs, its overall market value and the value of the product as perceived by a targeted group of consumers.

Extension Services: This refers to the help or assistance rendered to farmers to improve their agricultural production and hence their living conditions.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 General overview of major concepts

2.1.1 Concept of rice production

Rice, *Oryza sativa* (Asian rice) or *Oryza glaberrima* (African rice) is one of the world's most important cereals, Rice has become a staple food for over 50% of every household; as both the rich and the poor consume it (Godwin, 2012). Rice is indispensable in the strategy for food security because it provides 27% of the energy and 20% of protein needs in developing countries, including African countries (Tollens, 2007, Harold and Tabo 2015). Rice is among the three leading food crops of the world, with maize and wheat being the other two. All three directly provide no less than 42% of the world's required caloric intake. In 2009, human consumption was responsible for 78% of the total usage of produced rice.

Nigeria's fertile land and rich agro-climatic conditions could easily produce rice to feed the entire country and generate a surplus. However, Nigeria has continued to depend on importation from countries like China and Thailand to meet the increasing demand for rice by households. A combination of various factors seems to have triggered the structural increase in rice consumption over the years with consumption broadening across all socioeconomic classes, including the poor. In a bid to achieve rice self-sufficiency in Nigeria, a rice transformation action plan was set up in 2011 under the umbrella of the Agricultural Transformation Agenda (ATA). Frederic *et al*., (2003) observed that, with rice now being the structural component of the Nigerian diet, and rice imports making up an important share of Nigeria's agricultural imports, there is considerable political interest in increasing the consumption of local rice. This has made rice a highly political commodity.

IRRI, (2020) maintained that a comprehensive and up to date picture of the rice sector in Nigeria in general and rice production, processing and consumption, in particular, is lacking. It can be seemingly noticed that, despite its agricultural potentials, Nigeria is yet to harness its vast land resources suitable for agriculture, but even to cater for its domestic consumption which will invariably serve for sufficient food security. This is evident from the fact that rice consumption in Nigeria increases over decades and at alarming rates. Achieving self-sufficiency in rice production and processing is not a function of only planting large hectares of land with rice nor does it end at producing millions of tonnes of paddy rice. The quality and quantity of processed Nigerian rice available in the market and having the quality desired by consumers closes the rice import gap in the demand for imported rice brands to meet the shortfalls in domestic demand and to meet consumers demand in the urban areas.

The cost of rice imports represents a significant amount of lost earnings for the country in terms of jobs and income (Bamba *et al*., 2010). The quality of imported rice is far better than the Nigerian produced rice as households are dissatisfied with Nigerian rice bought in the market and are weary of picking stones from the rice as well as having to wash it several times. Out of the thirty-six states in Nigeria, the states that can produce rice on a large scale include Anambra, Nassarawa, Ebonyi, Kaduna, Niger, Kano Kaduna and Benue. Other states that have large production of rice include Kwara, Kebbi, Ekiti and Ogun (Sasu, 2022). According to the Nigeria rice production statistics, Nigerian rice importations have made up 50% of the local consumption rates. Currently, Nasarawa State is the leader when it comes to rice production in Nigeria. It has over 10,000 fully irrigated rice hectares. Rice consumption has risen tremendously at about 10% per annum due to changing consumer preferences.

However, most Nigerians prefer to consume imported rice brands. (Futakuchi *et al.*, 2013). The reason is that most Nigerian rice processors lack adequate technology for rice processing to meet international standards. Nigeria use to be one of the largest importers of rice in the world. The high importation of rice in Nigeria can be traced to a rapid increase in population and also the demand for it by many Nigerians in their diets. The Nigerian population is expected to be growing annually which implies that there will be an increase in demand for rice. Milled rice is widely consumed in Nigeria as a household food item and it is also being used by industries to produce other rice-based food and pharmaceutical products. Thus, the major industrial rice consumers in Nigeria are food and drink industries (for example, pasta and bread industries, beer and other liquor distilleries), and pharmaceutical companies.

The importation of rice is detrimental to Nigeria's economy because it portends danger in terms of foreign exchange (forex) earnings and its depletion of the nation's foreign reserves. To bridge the gap between supply and the ever-growing demand; the federal government of Nigeria, at one time or the other, has initiated policies and incentives for farmers to increase rice production locally. One of such policies is the 2006 presidential initiative on accelerated rice production, which was targeted at, reducing the import and development of the local rice industry and putting a 50 per cent duty on parboiled rice. In addition, a levy of ten per cent was imposed on rice imports to create a dedicated fund for the development of the local rice industry, including processing and marketing. Considering the importance of rice as a popular menu on the table of many Nigerians and the income it generates for those who cultivate it, there is need to critically assess the impact of continuous rice importation on Nigeria's economy. Also on how this negative trend can be reversed through the various opportunities that are available in the rice sub-sector.

Nigeria's rice sub-sector is dominated by weak and inefficient producer-market linkages due to lack of production and technical know-how, poor infrastructure including lack of improved processing facilities, low rice productivity, poor post-harvest handling and storage, expensive and poor access to inputs (high-quality seed, fertilizer, and crop protection product). The majority of rice production and processing in Nigeria is in the hands of resource-poor subsistent farmers who lack the economic and social power to fully adopt technologies. Availability of a sustainable rice processing technology for Nigerian resource-poor rice farmers is important if the country's effort at achieving self-sufficiency in rice production must be achieved. However, generating agricultural technologies is meaningful only when they are adopted at the farm level (Nwaobiala and Adesope, 2015).

Research institutes (IITA and NCRI) introduced varieties that will produce a higher yield to boost food security. Some improved high yielding rice varieties released for utilization in Nigeria are FARO 35 and ITA (212) which are all lowland varieties. Nigeria is ecologically endowed to attain self-sufficiency in paddy rice production with potential land area for rice production. However, despite the immense untapped potential in rice production in Nigeria and very favourable ecologies for rice production in Nigeria, the production of paddy rice remains low. Over 90 per cent of domestic rice production comes from resource-poor and weakly organized smallholders. These smallholders apply a low-input strategy to agriculture, with minimum input requirements and low output (International Fund for Agricultural Development [IFAD], 2009). The livelihood of these smallholder farmers has been constrained by a host of challenges such as low productivity, paucity of opportunities for value addition, limited access to productive assets and inputs, inadequate support services (extension and research), inadequate market and rural infrastructure, post-harvest losses and a constrained enabling environments. More so, a huge proportion of domestic rice in Nigeria is not tailored to meet market needs. This has also limited the market share of the domestic rice producer. (Oyekanmi, 2022).

Although rice is cultivated in almost all the ecological zones of Nigeria, yet its avaiability to the teaming population of Nigerians remains small. In 2000, out of about 25 million hectares of land cultivated for various food crops, about 6.37% was allocated to rice production. Rice was grown on approximately a 3.7million hectares of land in Nigeria. Rice production in Nigeria is dominated by smallholder farmers who use traditional methods that are characterized by problems of low productivity (Ishola *et al*., 2022). Productivity increase in the four decades is centred on increasing the number of new varieties and a positive and increasing trend in the rate of adoption of modern varieties (Simtowe *et al*., 2012). Though, the increase may not wholly be attributed to varietal improvement, their steady increase in rice production in the past four decades provide further evidence that there is potential for further productivity improvement (Simtowe *et al*., 2012). It is believed that the access to and adoption of improved rice seed varieties would go a long way in raising the productivity of small–scale rice farmers and consequently improve their livelihood. According to Adekambi *et al*., (2009), productivity increase in agriculture has the capability of reducing poverty through an increase in farmers' income and reduction in using local farm tools. Nigeria has four rice production systems namely: upland rice, lowland rice, irrigated rice and mangrove/deep water rice production systems.

The international rice market is highly stratified by type and quality thus leaving little room for substitution. There are many varieties of rice and the different varieties are not considered interchangeable, either in processing or in production, with the result that each variety commands a separate market from other varieties. It is common for one variety of rice to rise in price while another one drops in price (USDA/FAS, 2014). The four main types of rice; Indica, Japonica, aromatic, and glutinous, has individual stratified levels of quality. This stratification further adds to the thinness, price volatility, and uncertainty since due to numerous rice varieties and standards of quality, there is no generally accepted world market price for rice (Pesticide Action Network Asia & the Pacific, 2008).

Many Sub-Saharan African (SSA) countries have made significant strides towards increasing their rice production by encouraging the adoption of new and improved varieties but mostly through area expansion and extensification. Initiatives currently underway in several countries most significantly in Nigeria- are contributing to what is likely to become a trend of increasing production in SSA. Sustained high prices for rice in the international markets will bolster these initiatives. West Africa remains the hub of rice production in Sub-Saharan Africa but the shortfall in rice production has increased significantly, as consumption rises at a rate well above that of production growth (Africa Rice, 2007).

In addition to the gap in farming system technology and knowledge, many rice grain-producing countries have significant post-harvest losses at the farm. This is because of poor roads, inadequate storage technologies, inefficient supply chains and farmers' inability to bring the product into retail markets. A World Bank – FAO study claims 8% to 26% of rice is lost in developing nations on the average every year, because of post-harvest problems and poor infrastructure (World Bank, 2011a). Basavara *et al.,* (2007) claim the post-harvest losses exceed 40%.

In Nigeria, rice can be grown in different environments, depending on water availability. Different rice production systems in Nigeria depend on the ecology and vary in terms of yield per cropped area. The difference between potential and actual yields is very high. However, there is conflicting information on average yields from different sources. (Africa Rice, 2007) reports that in 2008 Nigeria had an increase in rice production of 31.2%. In 2012, Africa Rice conducted a diagnostic and yield gap survey to identify the causes of yield gaps and challenges in rice production. A diagnostic survey involves interviews with individual farmers or other actors such as input suppliers and extension workers, and group discussion to understand farmers' current practices, knowledge, challenges and constraints. A yield-gap survey involves interviewing farmers, a series of field observations from sowing to harvesting, soil and plant sampling, and yield measurement (Africa Rice, 2013).

These two surveys enable the measurement of on-farm yields obtained by farmers and potential yields, which can be determined by crop simulation models and their causes. The major challenges identified from the survey include; weed infestation, lack of availability of purified seeds of new and improved varieties as well as lack of mechanization. Others include; sub-optimal crop and nutrient management, including the timing of interventions in irrigated systems, sub-optimal land preparation and water management in rain fed lowlands, droughts and soil problems in uplands (Africa Rice, 2013). Causes of yield gaps in farmers' fields vary among rice production systems and agro-ecological zones (Africa Rice, 2013). However, typical causes include sub-optimal crop management, yield-limiting (e.g. poor soils) and yield-reducing (e.g. pests), factors, socio-economic constraints (e.g. finance, labour shortage) and institutional/ political arrangements (e.g. land availability, rice and fertilizer prices).

2.1.2 History of rice production in Nigeria

The origin of rice has long been a source of debate for a very long time. However, rice has certainly been traced back to about 5000 BC, while systematic cultivation is believed to have originated in areas of China and Southern and Eastern Asia in about 2000BC. Globally, there are only two domesticated species of rice out of the over 20 known species of the genus *Oryza*. One of these cultivated species, *O. sativa* is indigenous to Asia, while the other, *O. glaberrima* is indigenous to Africa. The latter was reported to be distributed mainly in the Savannah along the southern fringes of the Sahara Desert (Jones, 1995). The species was first grown as a crop in the central Niger Delta and Sokoto basins among other places, but later the cultivation spread into bush fallow upland farming systems of the western forest zones. Today it is still being cultivated as a lowland crop in Kebbi and Sokoto States of Nigeria in the Rima River flood plains and as an upland crop in the Zuru Local Government Areas in Kebbi State. The species can also be found in mixtures and sometimes almost replace the Asian species varieties in the farmers' fields both in the shallow swamps and the inland valleys and flood plains of the Niger and Benue valley and also in the dry land rice fields of the southern parts of the country.

However, as a cultivated species, *O. glaberrima* is almost being replaced by its Asian counterpart, O. sativa. The existence of *O. glaberrima* to date as a volunteer crop can be attributed to its high level of adaptation to different African rice ecologies. It was reported that up to the 1960s the yield of *O. glaberrima* in the Sokoto rain-fed flood plains was still superior to those of adopted floating O. sativa cultivars (Carpenter, 1978). Although there is no clear information on the route of O. sativa into Nigeria, nevertheless, several theories were speculated. One of these theories believed that the Asian rice arrived in Africa through Madagascar from Java. Many African countries including Nigeria might likely have received the Asian rice through this route. The second theory was based on the report by Poteres, 1950, that Asian rice was introduced to West Africa through Senegal, Guinea-Bissau and Sera León by the Portuguese about 1500 AD, and Nigeria could have also received the Asian rice through the same route.

It should however be noted that Nigeria, like many other African countries, established contact with the Arab traders and later Arab Islamic scholars and missionaries through North Africa much earlier than the coming of the European Christian missionaries. These Arabs were also already in contact with the Asians and could also have introduced Asian rice into the country. Following the introduction of *O. sativa* and its wide adoption by the farmers, it gradually pushed the cultivation of *O. glaberrima* to marginal areas such as deep flooded plains and highly drought susceptible upland areas, where the productivity of the new sativa varieties are limited. The major reasons for this shift were the superior yield potential under ideal production conditions and higher grain quality including the non-shattering ability of the *sativa* varieties.

Consequently, the cultivation of *sativa* cultivars, mostly from Ceylon and Guyana, began to spread to the shallow swamps of the flood plains of the major rivers like Niger, Benue and Kaduna among others at the central and northern parts of the country. It also spread to the inland valleys and valley bottoms of the hinterlands. Although the adoption of Asian rice cultivars by Nigerian rice farmers was total, the farmers did not adopt the Asian rice production practices, hence the production remained up to date, predominantly rain-fed. It was at a later development, with the introduction of improved semi-dwarf cultivars that farmers, researchers and in fact governments began to think of irrigation facilities to boost paddy yield. However, the provision of irrigation water for rice production is still in its infancy in Nigeria, only about 30% of irrigable rice fields are currently under irrigation (Musa, 1993), this fact has not changed significantly today.

Rice growing ecologies in Nigeria is vast and grossly underutilized. The potentials for expansion exists in upland which currently accounts for 35% of the paddy fields, rainfed lowland (45%), irrigated rice fields (15%), deep water (8%) and mangrove ecology (< 1%).

With the changing climate resulting in frequent drought, upland rice cultivation was becoming less attractive and attention was shifted to valley bottoms in the southern and eastern parts of the country where though the land mass is limited, the unit land output is much better than the upland crop. Fortunately, however, with the advent of early maturing varieties pioneered by FAROs 45 and 46, reaching the farmers from researchers and of recent the introduction of yet earlier NERICAs even the northern parts of the country such as Kano, Kaduna, Zamfara and other states are now moving rice cultivation to the upland. The mangrove ecology remains grossly underutilized with less than 1% of available mangrove land being put to rice cultivation (Imolehin and Wada, 2000). The full exploitation of the Nigerian cultivable land to rice crop will strongly depend on the suitable high yielding, disease and pest resistant and good grain quality varieties in addition to the provision of irrigation facilities to mitigate current climate change challenges (Tajudeen *et al.,2022*).

2.1.3 Rice sector researches and recent developments in Nigeria

- **Rice sector development in Nigeria**

The Nigerian government is not left out as it has pursued and implemented various agricultural policies at the State and Federal levels on the rice transformation agenda to boost Nigeria's rice production over the years. Among these is the Agricultural transformation agenda (ATA) with the success recorded in local rice production of 4.8 million tonnes per annum (FAO, 2017). Harold and Tabo (2015) further noted that similar rice-sector promotion programmes have been embarked upon in other African countries like Ghana and Côte d'Ivoire. These align with the ECOWAS Agricultural Policy-ECOWAP (Olayiwola *et al.*, 2015). Given the rise in food consumption (rice inclusive), some have argued that the production of rice in large quantities (that is, large-scale) should be considered as one of the major ways of ensuring food security for the teaming population in Nigeria (Herrmann, *et al*, 2017; Osabuohien, *et al*, 2017).

Others hold contrary view, stressing the need to empower small-holder farmers. Against that backdrop, the importance of rice over other crops, in terms of its total production in the developing countries and the number of consumers that are dependent on it as a staple food has been stated by Juliano, (2016). This has also been stressed by Gyimah-Brempong, *et al.* (2016). While Umeh, *et al.* (1992) discussed that a holistic, broadly based, multidisciplinary pest-management research approach is required due to the immense benefits that integrated pest management (IPM) can provide. Another important aspect of rice production that requires attention is the issue of technological advancement in rice processing since it has be observed that most of the processes utilised by the rural rice farmers are mostly traditional that are both labour intensive and time consuming.

With higher level of technology, the farmers will be able to achieve a higher volume of yield with the best quality of products that will enhance consumer preference for locally produced rice. Technological advancement in the production and harvesting will promote commercialization and profitability of the rice production. Application of modern technology in the production and processing will further guarantee a better packaging of local rice to make it more appealing to consumers and will attract more buyers of the product. The use of modern harvesters suitable to our own ecology will further enhance the standard of the rice production process by reducing the rate of breaking and eliminating contamination by stone and shafts. Kareem (2016) has pointed out that the major obstacle facing the attainment of the potential benefits of agricultural production in many African countries is inadequate science and technological advancement.

Adewumi, *et al.* (2009) observed that rice production and processing are profitable ventures in Nigeria and what is required is to encourage investment in rice processing activities. Aside the nutritional value of rice and high inclination of people towards its consumption, the by-product of rice could serve as a source of energy generation for domestic purposes. This could serve as a source of biofuel for cooking especially in rural settings where most of the rural dwellers could not readily afford the cost of kerosene or gas for cooking and heating purposes. Yan, *et al.* (2016) in their study stressed that rice generates large amount of by-products that could be used to produce energy and reduce the amount of firewood required to meet the daily cooking needs. This is crucial in Nigeria where rural dwellers use local means of cooking such as firewood and charcoal. The connotation of the above is that modern processing of rice at the milling centres could help in preserving the rice hub which serves as firewood to the locality thereby reducing the cost of buying kerosene for cooking.

For optimum output to be attained in rice production, it is necessary that ecological consideration be factored in the production process, especially in the choice of land as well as the typological components of the area. In this respect, the method of land preparation plays a significant role in the rice production process. In relation to this, Amb and Ahluwalia (2016) observed that zero tillage in rice-wheat cropping system could have major benefits, such as: improved water usage efficiency, reduced investment cost, higher yield, reduced weed population and a positive environmental effect. In production system with no-tillage or conservation tillage, the crop residues are buried in the soil and thus, the release of *allelochemicals* from both the growing plants and residue decomposition might act synergistically. This is because rice fields have versatile *ecotones* that comprise aquatic habitats as well as dry lands and a large group of biodiversity. Other significant factors that affect rice production include: weeds and pests and diseases infestations. Thus, the control method employed in the rice farm and the timing of the weeding is of essence to prevent its devastating effects in the rice farm development.

2.1.4 Constraints to rice production in Nigeria

Over the years, various factors had contributed to the non-self-sufficiency in rice production in Nigeria some of these factors are perused below with possible solution(s) suggested. Reviewing the production and postharvest constraints affecting rice self-sufficiency in Nigeria is an important step in providing a way forward to achieving this goal in no distant future.

i. Policy gap and instability: Each presiding government in Nigeria formulates policies without cause other than political considerations and some intangible reasons. In the democratic setting, states are autonomous and their policies can even be at variance with the Federal government. Every government has its interest and resources are allocated to meet them. This makes most government of the day jettison laudable policies of previous administrations without recourse to their aims and attendant benefits on improving agricultural productivity and rice sufficiency. The issue of fertiliser subsidy best illustrates this; Fertilizer use is promoted mainly by the fertilizer subsidy policy in Nigeria. In spite of economic reforms in Nigeria, fertilizer subsidies have remained. Input subsidies were widely practiced in the 1960s through 1990s. The costs of subsidies became high and unsustainable. Due to diversion of fertilizer subsidy to unintended beneficiaries and persistent economic woes, government can no longer bear it. These have placed a high budgetary burden on the government of Nigeria. Government policies have been very inconsistent.

ii. Land acquisition and tenure constraints: FAO (2017) affirmed that land tenure and barriers related to land availability are major constraints to agricultural intensification in Nigeria. The importance of land to agriculture cannot be over emphasized; land is the most primary natural resource for any nation to sustain agriculture. The land tenure situation in Africa as confusing and conflict-ridden. The land tenure decree of 1978 did not alter the Northern region traditional tenure system but changed the system that operate in the Eastern and Western regions. Ownership of land in each state is vested in the state government. This encouraged highly placed individuals and government officials to acquire lands from rightful owners at little or no cost thereby dispossessing peasant farmers of their land (Wily, 2018). These constraints have continued to discourage Africans from making needed agricultural investments. However, accessibility, availability, conflict, poor fertility, topography and land fragmentation also affect land acquisition for rice production (CAPRI, 2005). For instance, Sawah development needs a secured land on which structures such as bund, canals and dykes should be constructed if not permanently but for a reasonable number of years. Wakatsuki (2008). This becomes apparently impossible under land tenure system.

iii. Infrastructure: Inadequate infrastructures such as road network, irrigation, processing and storage facilities, etc. play a key role in the under-productivity of rice in Nigeria. There are no good transport media from farms to market/city centers. Improved transportation is also associated with diffusion of technology, better use of inputs and better prices for farmers (ATAI 2011). Inadequate irrigation facilities do not make the farming all-year round in the country; likewise, the non-availability of appropriate technologies for post-harvest processing and packaging facilities these lead to wastage and underpricing of the commodity. Significant post-harvest losses ranging between 15-40 per cent are reported on rice fields due to the use of rudimentary technologies and poor practices. This constrains has reduced possible income small holder farmers could have made from rice cultivation (Adesina and Baidu - Forson, 1995).

iv. Climate change: This is caused by the release of greenhouse gases, carbon dioxide, water vapours and nitrous oxide into the atmosphere due to human activities, such as fossil fuel burning, gas flaring and deforestation (World Bank, 2010). Climate change is one of the most critical challenges ever to face humanity; it can cause the worst forms of economic and food security problems for humanity (Kuta, 2011). World Bank (2010), reported that developing countries are expected to be hit the hardest with climate change which Nigeria is not excluded. The 2012 floods which occurred in Nigeria was one of the most devastating in the country which affected states like Kogi, Edo, Cross Rivers, Rivers, Benue, Delta and Bayelsa. Washing away vast farm lands and rice plantations. The effects of climate change are higher temperatures, changes in precipitation patterns, rising sea levels, and more frequent weather-related disasters such as flood, drought, etc all pose risks for agriculture, food, and water supplies (Nwalieji and Uzuegbunam, 2012).

v. Poor Funding and Coordination of Agricultural Extension: The Nigerian extension service is bedevilled by several problems, these include inadequacy and instability of funding, poor logistic support for field staff, use of poorly trained personnel at local level, ineffective agricultural research extension linkages, insufficient and inappropriate agricultural technologies for farmers, disproportionate Extension Agent: Farm Family ratio and lack of clientele participation in program development (Agbamu, 2005). Others are poor input supply, irregular evaluation of extension programmes and policy, institutional and programme instabilities of National agricultural extension systems. Lack of synergy with the donor-supported projects domiciled within the ADP and target groups (Izuogu and Atasie, 2015). These challenges have made the diffusion of aids and technologies to local rice farmers difficult and impede rice-sufficiency.

vi. Low and Unstable Investment in Agricultural Research: Funding of agricultural research institutes have largely been left in the hands of government. This has made funding to the Institute very limited. Therefore, research work on key agricultural crops like rice is suffering badly. For instance, the National Cereals Research Institute (NCRI), the only government funded rice research institute in the country suffers from attaining its full potential due to funding problems and shortage of staff (Longtau, 2003).There are only a handful of multinational corporations such as the International Institute for Tropical Agriculture (IITA), International Rice Research Institute (IRRI), and West Africa Rice Development Association (WARDA) and NGOs that are directly involved in the dissemination and research of rice technologies.

2.1.5 Rice production system in Nigeria

Rice is grown in approximately on 3.7 million hectares of land in Nigeria, covering 10.6 per cent of the 35 million hectares of land under cultivation, out of a total arable land area of 70 million hectares. (Hassan et al 2017). About 77 per cent of the farmed area of rice is rain-fed, of which 47 per cent is lowland and 30 per cent upland. The range of grown varieties is diverse and includes both local (such as Dias, Santana, Ashawa, Yarsawaba, and Yarkuwa) and enhanced varieties of traditional African rice (such as NERICA) (Bayou 2009). Rice grows in all the agro-ecological zones (AEZ) as diverse as the Sahel of Borno state and the coastal swamps of the southwest and south-south. It is clear that a classification of rice production systems according to the six vegetation zones of lowland forest, derived savannah, Southern Guinea Savannah, Northern Guinea Savannah, Sudan and Sahel will not be realistic. (Longtau, 2013).

Much of the natural vegetation has been altered or even destroyed by human interference and an agro-climatic classification has been adopted by some (WARDA, 1980; Singh *et al*., 1997 and Moses, 2007). The differences in soil-water regime reflect either the topographic position of the land or the distance from the source of seepage or interflow (Moormann *et al*., 1986).

In the rest of this section the classification system found in (Jones, 1995) is used given its practical value. Six rice growing environments (RGEs) have been identified for the purpose of this description. These are: Upland, Hydromorphic, Rainfed Lowland, Irrigated Lowland, Deep Inland Water and Mangrove Swamp. Rain-fed agriculture is the main production systems used, while irrigated rice is the best performing in terms of yields

(3.5tons/ha), followed by rain-fed lowland (2.2 tons/ha) and mangrove swamp (2tons/ha) (Ezedinma, 2008).

i. Upland rice

Upland rice is grown on free-draining soils where the water table is permanently below the roots of the rice plant. The ecological conditions under which upland rice grows in Nigeria are diverse. However, to obtain a successful crop, adequate and assured soil moisture reserves and fertility during key periods of plant growth are essential (Ezedinma, 2008). The upland rice environments are defined on the basis of soils, climate, water resources, water regime at the micro level (Rashid-Noah, 1995) and topography. Two types of Upland Rice Systems (URS) are found in Nigeria. These are Rainfed Upland and Irrigated Upland.

a. Rainfed upland rice

It is found in all agro-ecological zones of Nigeria. The crop depends entirely on rainfall. Heavy rainfall can lead to soil erosion, leaching of plant nutrients and possible flooding. The risk of poor grain filling due to drought is also high. The system is found from Abeokuta, Ado-Ekiti, Abakaliki, Ogoja in the south right up to Yauri, Zamfara River, Gombe, Southern Borno and Yola. In some places it is cultivated on hills;this is due to pressure on arable land. Hill cultivation of rice is becoming increasingly important in parts of Osun (Ilesha) and Ekiti (Effun-Alaye, Ekiti-West, Igbemo-Irepodun-IfelodunAyedire LGAs) states South-western Nigeriaand Obudu Hills of Cross River state of South-South Nigeria (Longtau, 2013). The land is prepared by hoe and the seeds planted directly with an intercrop spacing of about 20cm. The plants germinate quickly and provide good soil cover before the rains become heavy to cause severe erosion. The rice crop is harvested in the month of July during the short dry spell. In this zone apart from rice other crops grown on the hills include cassava and maize. At the foothills, rice is intercropped with cocoyam and never with maize because of the unfounded belief that the pollen grain of the tassel is harmful to the rice crop (Akande, 2014). The crop is harvested in October/November ahead of deep fadama rice. This timing arrangement gives farmers better price for their produce.

b. Irrigated upland rice

In some places where the length of growing period (LGP) is short, some form of supplementary irrigation may be required to ameliorate drought conditions during critical stages of growth in the rice crop. This system is found in the southern region of Jigawa state as Birnin Kudu Local Government Area; also in places where rainfall is between 150-500mm and LGP of 0 to 90 days. These abound in Borno, Jigawa, Kano and Katsina states. The growing season in the flatlands of the Sudan-Sahel is only 90 days (Dugje, 2000). The soils are generally sandy and have low water-holding capacities.

ii. Hydromorphic rice

Jones (1995) reported that hydromorphic conditions occur when water is supplied to the rice crop by a shallow ground water table, within the rooting zone of the plants. Hydromorphic rice is found either on lower slopes in the topo-sequence or in situations where impermeable soil layer reduces water percolation. In Tarok land of Plateau state, central Nigeria, this impermeable layer has a vernacular term “alam”. It is considered as marginal land some twenty years ago. However, today rice is cultivated even on alam. Another situation which can give rise to hydromorphic conditions is the slow flow of water in a grassed waterway or even a simple ditch by a highway. It is now common to see rice in this environment all over the Northern and Southern Guinea Savannah. In Tarok land some twenty years ago such ditches were left fallow but today they are usually lush rice patches due to great demand for land (Ezedinma, 2008).

Hydromorphic land occurs as a transition zone or fringe on a continuum of the topo-sequence from the bottom of an inland valley to upland or a mere depression on a flat plain or topography whose soils have good water holding capacities (Singh *et al*, 1997). Fringes of streams or rivulets are areas for this system of rice production. Wet uplands will also be an appropriate terminology for this system. The area sown to hydromorphic rice fluctuates from season to season depending on the amount and distribution of rainfall. Hydromorphic rice generally gives higher and more stable yields than upland rice (Ezedinma, 2008). Figures are not available on the size of land under this system in Nigeria.

iii. Rainfed lowland rice

An estimated 25 per cent of Nigeria's rice area is under rainfed lowland rice cultivation. This ecology is said to contribute between 43 and 45 per cent of national rice production (Singh *et al*., 1997; Imolehin and Wada, 2000). However, hydromorphic rice might have been included in that category. Two sub-types are set up here for lowland ecologies: shallow fadama and deep fadama or deep inlands valleys or so called wetlands. A distinguishing feature of this system and hydromorphic rice is that the soil must be covered completely by water at some stage in the growth cycle. In deep fadamas the land is flooded all the time or during the major part of the cropping season. Farmers generally adjust their date of planting or transplanting in order to avoid flooding during the early stage of growth (Moormann *et al*., 1986).

This is the dominant system in the floodplains of the rivers Niger, Benue, Katsina Ala, Kaduna, Yobe and their tributaries. Shallow fadamas are seldom flooded. Excessive flooding, iron toxicity and lack of water control structures have been the bane of lowland swamp rice production in the Abakaliki area for instance: Farmers make giant mounds at the end of raining season or onset of rain. Yam is planted at the top of the mound. With early rains, groundnuts is planted lower down the mound. By May, rice is raised in a nursery for 4 weeks. The yams and groundnuts are harvested and the mound broken down and puddled by hand and the crop residues incorporated into the soil. At this stage the fields are flooded and rice is transplanted. The giant mounds prevent the yams and groundnuts from being waterlogged. This system started some 30 years ago and has become a remarkable innovation and technology. Jigawa state has one of the highest network of wetlands for rice cultivation in the country.

iv. Irrigated lowland rice

The establishment of River Basin Development Authorities (RBDAs) in the 1980s gave a boost to Rice Schemes and irrigated lowland rice. Irrigation is supplied from rivers, dams, wells, boreholes, wash bores, and other sources to supplement rainfall for full rice crop growth (Imolehin and Wada, 2000). This system accounts for 18 per cent of cultivated rice land and 10-12 per cent of national rice supply. In parts of Ogoja, irrigation is by gravity. It is a system developed entirely by the farmers. They have incorporated the use of rice bran as organic fertilizers in the farming system. Apart from the Adani Scheme in Enugu state and Bida Scheme in Niger state, most of irrigated rice is in the Northern Guinea Savannah, Sudan Savannah and Sahel.

v. Deep inland water rice

This is the floating rice system. Just before rain sets in, much of the water in the river course has receded. The land is prepared and planted with rice by direct seeding or transplanting of seedlings which had been raised in a nursery. The plants grow in not too moist conditions for 4 weeks and the water level of the river begins to rise and overflow its banks. The rice fields become flooded but the plants send down deep roots and the vegetative parts float on top of the water. The plant has the ability not to be submerged. It matures in this flooded condition and may be harvested from a canoe as may be seen in Sokoto. This system has been known there for hundreds of years. According to Imolehin and Wada (2000), it constitutes 5 to 12 per cent of the national rice production area and 10 to 14 per cent of the national rice output. This system is plagued by the problem of low yield because of the use of unimproved varieties of the traditional rice *Oryza glaberrima*. The average yield in deep water areas is around 1.2 t/ha, with a yield potential of up to 3 t/ha (Singh *et al*., 1997). The Sokoto-Rima valley is the home of floating rice in Nigeria.

vi. Mangrove swamp rice

This is also called Tidal Wetland rice system (Singh *et al*., 1997). The coastal swamp areas in Delta, Ondo, Lagos, Rivers, Bayelsa, Akwa-Ibom and Cross River states are suitable for swamp rice production. This covers a potential 1 million ha of land, but at present not up to 1000 ha is cultivated (Imolehin& Wada, 2000). This vast potential lies waste due to neglect given the cheap harvest of petro-dollar in these oil producing states. Mangrove rice is produced only in Warri and on Shell Company farms in Bayelsa state. According to Moormann *et al*. (1986), the development of unused mangrove swamps for rice cultivation is a long-term endeavour that must be based on hydrologic, soil and socio-economic surveys and of course appropriate technology (Singh *et al*., 1997). Mangrove

Swamp Rice is no longer a core ecosystem under WARDA's mandate its huge potentials in Nigeria notwithstanding (WARDA, 1999b).

2.1.7 Rice cultivars and harvesting in Nigeria

Rice cultivars are often classified by their grain shapes and texture. High-yield cultivars of rice suitable for cultivation in Africa and other dry ecosystems have been developed. It is hoped that their cultivation will improve food security in West Africa. A wide variety of improved seeds are available in Nigeria, produced by the National Cereals Research Institute, often in conjunction with the West Africa Rice Development Association (WARDA). The varieties are widely known, from NERICA (the New Rice for Africa, developed in the 1990s) to Nigerian varieties that offer a range of characteristics around length of growing season, size of the grain, water requirements, etc. Farmers generally use a seed that is adapted to their conditions (USAID, 2009).

The biggest challenge is to get farmers to purchase new seeds on a regular basis, reinvigorating their productive potential, rather than planting old seeds that have lower yields. The use of mechanized soil preparation is limited primarily to farms that are larger than 2 hectares, or are part of a larger production system conducive to mechanized plowing (such as most of the irrigation schemes). Smaller farms tend to be fragmented and difficult to plow mechanically. Additionally, the high cost of tractor services makes it just as economical for small farms to prepare the land by hand. There is strong potential to increase productivity if the right conditions are in place. The process of collecting the mature rice crop from the field is called harvesting this can be done manually or mechanically.

Similarly, it all depending on variety, a rice crop usually matures between 115 and 120 days after establishment (activities include cutting, stacking, handling, threshing, cleaning and hauling). Good harvesting methods help maximize yield and minimize damage and deterioration. Manual harvesting is common in Africa and Asia and involves cutting the rice crop with simple hand tools like sickles and knives: this requires between 40 and 80 person-hours per hectare plus additional labour to manually collect and haul the crop. Mechanical harvesting using reapers or combine harvesters is not so common due to the unavailability and high cost of machinery.

Rice production processes

The key steps involved in rice production (IRRI 2012) are:

Seed selection: Choosing a variety suitable to the environment it will be grown in and ensuring the seed of that variety is of the highest quality is the first essential step in rice production.

Land preparation: The aim of land preparation (ploughing and harrowing) is to get the soil in the best physical condition for crop growth and to ensure the surface is level to reduce water wastage.

Crop establishment: The two main practices of establishing plants are transplanting and direct seeding.

Water management; Rice is extremely sensitive to water shortages, so sound management practices are needed to use water wisely and maximize yields.

Nutrient management: Good management of the soil nutrient is needed for optimal yield.

Crop Health: Rice has a wide array of 'enemies' that must be managed including rodents, harmful insects, viruses, diseases and weeds with the last being controlled by the hoe or chemicals.

Threshing: Following harvesting, rice must be threshed (to separate the grain from the stalk) and cleaned (this can be done by hand or machine).

Postharvest: After harvest, the rice grain (paddy) undergoes a number of processes include drying, storing, milling and processing: Drying is the process that reduces the grain moisture content to between 18 and 22 per cent, which makes it safe for storage. Drying is outside on mats, making use of sunshine or artificially heated air. Drying is the most critical step after harvesting. For a rice crop; delays, incomplete or ineffective drying reduce grain quality and quantity. Milling is a crucial step in the postharvest process, the basic objective being to remove the husk and the bran layers and produce an edible, white kernel that is free from impurities.

Rice Processing

Paddy rice is harvested when the grains have a moisture content of around 25%. In Nigeria where rice is almost entirely the product of smallholder agriculture, harvesting is carried out manually, although there is a growing interest in mechanical harvesting.

Harvesting can be carried out by the farmers themselves or by hired labour. Harvesting is followed by threshing, either immediately or within a day or two. Subsequently, paddy needs to be dried to bring down the moisture content to no more than 20% before threshing and milling. In some cases, the paddy rice is parboiled before milling. Parboiling is the hydrothermal treatment of paddy before milling. It involves soaking the paddy in water for about 30 minutes, heat treating the wet paddy by steam, and drying the paddy to safe moisture content (Lantin, 1999).

In Ebonyi State, the parboiling process is carried out manually using drums. Parboiled rice is dried on mats by roadside. Milling involves the removing the edible, white rice kernel that is sufficiently milled and free of impurities. The milled can further be processed by picking out the stones manually or using destoner (a machine that separates the rice grain from the stones). Other processing activities include polishing, sorting, grading, packaging and branding. All these activities add value to final product.

Consumer demand

The demand for rice in Nigeria has been soaring at a very fast rate over the years. A combination of various factors seems to have triggered the increase in rice consumption. According to (WARDA, 2015), rising demand was partly the result of increasing population growth. Also increased income levels following the discovery of crude oil led to a rise in the demand for the commodity. The most important factor contributing to the shift in consumer preferences away from traditional staples and toward rice is rapid urbanization and associated changes in family occupational structures.

As women enter the work force, the opportunity cost of their time increases and convenience foods such as rice, which can be prepared quickly, rice is importance similarly, as men work at greater distances from their homes in the urban setting, more meals are consumed from the market where the ease of rice preparation has given it a distinct advantage. These trends have meant that rice is no longer a luxury food but has become a major source of calories for the urban poor. Average Nigeria now consumes 34.8kg of rice per year, representing 9% of total caloric intake (Prescott, 2001).

Rice marketing

Rice marketing includes all the business activities in the flow of paddy and milled rice from the point of initial production until it reaches the ultimate consumers at the right time, in the right place and as conveniently as possible, with enough of a profit margin to cover the costs of the various operations along the chain (Iheme, 1996, Twine *et al.,* 2022). Rice marketing is a major source of income for those involved in this sub-sector. Rice marketing in Nigeria can be classified into two broad systems based on the original source of the rice supply, namely (i) marketing of locally produced rice and (ii) marketing of imported rice (United Nations Environment Programme (UNDP), 2006).

Aderibigbe (1997) divided the marketing of local rice into four stages with a change of product ownership occurring between each stage. The stages in successive order are;

(i) production through harvesting,

(ii) movement from the farms to processing mills,

(iii) movement of the milled rice from processing areas to urban consumption centres, and finally

(iv) the wholesaling and retailing in urban areas. UNEP (2005) reports that in Nigeria, the main marketing channel for imported rice is from importers to wholesalers and retailers, and then from retailers to final consumers. Paddy rice flows mainly from the farmers to the assemblers, who are commissioned agents that purchase rice paddy from individual farmers and deliver it to the millers or processors. The processors dispatch the milled rice to the wholesalers for onward distribution to retailers who sell to the final consumers.

2.1.7 Rice production and processing constraints in Nigeria

According to Damola (2010), rice production constraints include; lack of rice development policies, inadequate irrigation, low level of farming technologies, inadequate agricultural input supply system, delay in disseminating improved seeds, inadequate and weak agricultural extension, and poor accessibility to institutional credits, among others. However, processing constraints include; use of traditional methods of processing, low farmers' awareness of quality control, poor parboiling techniques, use of obsolete milling machines, low milling efficiency due to frequent power failures, among others. According to Ismaila, Gana, Tswanya and Dogara (2010), factors militating against the level of rice production in Nigeria includes; climate factors (rainfall, temperature and and solar radiation), edaphic factors, migration, government policies, use of local varieties, predominance of weeds, pest and diseases. with regards to this, Ogunwole and Owonubi (1998) stated that water, solar radiation and temperature determine crop species, type of cultivars and management method that are suitable for cereal production in any area.

As a result of the high solar radiation in the Savanna, air temperature are generally uniformly high with a slight drop in December and January. Temperature affect rice production by controlling the rate of physio-chemical reaction and that of evaporation of water from the crops and soil surfaces. More so, temperature affects the rate at which the products of photosynthesis are used for growth respiration and accumulation of food reserves. Alarima, *et al* (2011) enumerated land acquisition and tenure economics, information, communication and training technical and mechanical factors to be the production constraints in Nigeria. However, the problems were found to be interwoven and influence each other. As constraints of land tenure persist, farmers are bound to be confronted with production, inputs and technology constraints. Lack of adequate information was found to be related to economic, input and production constraints of the farmers (Alarima *et al*, 2011). Therefore, addressing these problems will lead to increase in the rate of adoption of rice production technology and ultimately rice productivity in Nigeria.

According to Ekeleme *et al* (2008) constraints to rice production are drought, poor soil fertility and pest attack. Drought is major constraints to rice production because it requires a lot of water for optimum growth and yield. Rice requires about 1200mm to 1600mm of rainfall evenly distributed throughout its growing period. Pests, especially birds and striga attacks are the major constraints militating against rice production in Nigeria. In the light of above, the constraints to rice production are as follows: insufficient fund, poor service delivering by extension agents, poor soil fertility, government policies, cost of inputs, use of local varieties, poor policy implementation, infrastructural deficiencies, limited area under irrigation and low investment in agricultural research. Marketing is being attributed to be one of the key challenges to rice production in Nigeria (Lenis *et al* 2009). The major reason for this problem seems to be the low quality of the local rice produced by most small farmers, which most times face low market prices despite the production cost incurred.

However, when different rice varieties are brought and advertised to farmers without proper education about the appropriate input application and management strategy associated with the various crops farmers who are averse to risk taking, accept the different varieties, planting all of them on small sections of their already small plots of land without adequate training on the separation of the various varieties. Thus, during harvesting, rice varieties are often mixed, reducing the aesthetic value of the local rice compared with the consistence of imported rice and thus lowering the price received from rice millers, if they are even willing to buy it (Lenis *et al* 2009). Deterioration of quality at parboiling stage occurs when efforts are made to parboil different rice types which require different temperatures and duration of boiling. Another challenge facing rice production in Nigeria is the large presence of stone in local rice. Presence of stones in local rice can occure when farmers are using the process of drying which involves laying the rice on the road to be sun dried. As a result of the lower quality attained by the process, market price of such rice tend to be very low and this may, however, lead to future investments on imported rice. Poor extension service is another challenge facing rice production in Nigeria.

2.1.8 Rice production and consumption trends in Nigeria

Rice production in Nigeria started about 1500BC with the low yield indigenous red grain species *"Oryza glaberima* stued" that was widely grown in the Niger Delta (Ogundele and Okoruwa, 2006). While *Oryza sativa* that has higher yield was introduced in 1980s. Today, rice is grown in almost all the agro-ecological zones in Nigeria but on a relative small scale. Imolehin and Wada (2000) revealed that paddy rice production had increased from 13,400 to 344,000 tonnes in 1970, and area cultivated was 15,6000 to 25,5000ha. The tremendous increase in area planted, output and productivity in paddy rice production were achieved over the last two decades, and now stand at 66,6000ha, 1.09 million tones and 2.07 tonnes/ha respectively. Nigeria was the largest rice producing country in West Africa and the third largest in Africa after Egypt and Madagasca in 1980 (West Africa Rice Development Association (WARDA) 1996).

In 1990, the country produced 3.4 million tonnes of rice from about 1.2 million ha, this normal production trend would have been sustained if government has steady policy on rice import (Imolehin and Wada 2000). In 1985, rice production was increased and this may be attributed to the ban imposed on rice import and if this is maintained, Nigeria rice farmers would have risen to the challenges of meeting the domestic demand for the commodity. FMARD (2001), showcased the disparity among the states of the federation in rice production in terms of both output and yield. In 2000, Kaduna State was the largest rice producer, accounting for about 22% of the country's rice output. This was followed by Niger state (16%), Benue state (10%) and Taraba state (7%). Great variations also exist in terms of yield. The average national rice yield during the dry season (3.05 tons/ha) was higher than that of the wet season (1.85 ton/ha).

Nigeria is currently the highest rice producer in West Africa, producing an average of 3.2 million tons of paddy rice or 2.0 million tons of milled rice per annum (Damola 2010). Nevertheless, there is a wide gap between local supply and the ever increasing demand for rice in Nigeria. Lenis, Gbolagede and Oyeleke (2009) opined that most of the rice grown in the middle belt comes from Benue, Kaduna, Kano, Niger and Taraba States, while that grown in the east typically comes from Enugu, Cross River and Ebonyi States. Ekiti and Ogun states are the major rice producing areas in Western Nigeria (Lenis *et al* 2009). However, Anambra and Ebonyi States have the largest contribution in terms of rice production because they are the major rice producing areas in the east. Rice production in Nigeria is still predominantly rain fed with an emphasis on low lands. However, there is a clear gender division of labour in rice production and processing in Nigeria.

Oyeleke (2009) opined that rice production is clearly the work of men, whereas rice post harvest activities are clearly the domain of women. Still, participation rates over the various rice production and processing activities vary. Land preparation is mostly male dominated activity. Other field activities such as crop establishment, weeding, fertilization and harvesting are substantial contribution of women. Although men are involved in these operations, women are also involved. Similarly, men are also involved in post harvest activities (Lenis *et al* 2009). Several efforts have been made to improve rice production in Nigeria. One key player was the presidential initiative on rice (2004 – 2007) with the objective of addressing the widening demand – supply gap in rice production and attaining self-sufficiency, as well as reducing the huge import bill on rice. The presidential initiative proposed a national rice project with the following highlights; private sector led, based on an intensification policy, NERICA varieties to be used for upland areas while other varieties adaptable to all agricultural zones of the country would also be used and the provision of certified rice seeds by the government.

In pursuance of rice self-sufficiency policy, federal government released N1.5 billion for multiplication and distribution of certified rice seeds (Lenis *et al* 2009). Irrespective of these efforts and goals, Nigeria's rice production did not meet its target of food sufficiency in 2007. Responding to the increasing importance of rice production in Nigeria and other sub-Saharan Africa, the coalition for African Rice Development (CARD) initiative was launched at the Tokyo International Conference on African Development (TICAD IV) in 2008 and spearheaded by Japan International Cooperation Agency (JICA), New Partnership for Africa's Development (NEPAD) and Alliance for Green Revolution in Africa (AGRA). The objectives of the CARD is to double rice production in sub-Saharan Africa from N14 to N28 million tons in 10 years, building on the existing structures, policies and programmes such as the Africa Rice Centre (WARDA); the comprehensive Africa Agriculture Development Programme (CAADP) and the Africa Rice initiative (ARI).

Nigeria is among the first group of pilot countries selected for programme implementation and the country had designed its National Rice Development Strategies (NRDS) (Damola 2010). The overall goal of the NRDS is to increase rice production in Nigeria from 3.4 million tons in 2007 to 12.85 million tones by the year 2018. Other efforts to stimulate the Nigeria rice sub sector include the organization of workshops to sensitize rice farmers to form more cooperative group as to enable them participate effectively in the rice initiatives zonal mobilization of farmers to produce selected rice varieties to feed large scale processing mills (Lenis *et al*, 2009). The demand for rice in Nigeria has been increasing, even at a more faster rate than in other West African countries. During the 1960s Nigeria had the lowest per-capital annual consumption of rice in the sub-region (average of 3kg). Since then, Nigeria per – capita consumption levels have grown significantly at 7.3 per cent per annum. Damola (2010) attributed the structural increase in rice consumption in Nigeria to various reasons which include urbanization that has shifted consumer preference towards rice.

Thus, per – capita consumption during the 1980s averaged 18kg and reached 22kg in 1995 – 1999. Based on an estimated annual rice consumption of 5 million MT in Nigeria, per capita consumption is 32kg per annum with per capita consumption in the urban area higher, averaging 47kg per annum (2008 estimates). With the arrival of the drought tolerant and high yielding rice variety, “NERICA” (new Rice for Africa) and other initiatives by the government of Nigeria has the potential to increase its domestic rice production, thus reducing its import bill and becoming self-sufficient in rice. Table 2.2 shows rice production trend in Nigeria between 1961and 2011.

Table 2.1: Rice production trends in Nigeria (1961 – 2011)

Period	Average area cultivated (hectare)	Average output (tons)	Average yield (tonnes/hectare)
1961 – 1965	179,200	207,200	1.147
1966 – 1970	234,000	321,000	1.360
1971 – 1975	288,800	470,200	1.670
1976 – 1980	332,00	596,200	1.710
1981 – 1985	630,00	1,300,200	2.063
1986 – 1990	1,060,200	2,216,064	2.090
1991 – 1995	1,678,000	2,979,600	1.783
1996 – 2000	1,743,582	3,011,028	1.733
2001	1,770,000	2,752,000	1.555
2002	1,699,000	3,192,000	1.878
2003	NA	3,520,000	-
2004	2,2888,100	3,713,900	1.623
2005	2,707,900	3,929,400	1.451
2006	2,823,000	4,372,000	1.675
2007	2,629,000	4,367,000	1.835
2008	3,120,000	5,272,000	1.915
2009	2,220,000	3,378,100	2.346
2010	3,520,000	5,380,000	4.201
2011	3,703,000	6,270,700	4.575

Source: PCU, FMARD, Nigeria (2002) in Longtau (2003)
PCU, FMARD – Nigeria 2001; FAO 2003 in Moses and Adebayo (2007).
CBN – 2005 PCU = Project Coordinating Unit
Unit – FMARD = Federal Ministry of Agriculture and rural development. NA = not available
FAO statistics (2010). http://faostat.fao.org/

2.1.9 Technology Package for FARO-44 Rice Variety

Lowland rice accounts for 50% of the total rice produced in Nigeria (West Africa Rice Development Association (WARDA)(2006). In recent years WARDA has introduced rice varieties, together with efficient natural resources crop management and pest disease management technologies to rice farmers in Nigeria and other west and central African countries. Typical examples are the high yielding rice varieties: FARO-44 (SIPI) FARO 51 (CISADANE) FARO 52 (WITA), FARO 57 (TOX 40043-1-2-1) and the lowland varieties of the new Rice for Africa (NERICA) that are currently being evaluated in several parts of Nigeria before full release. The majority of these introduced technologies have been accepted and become wide spread in some states of Nigeria.

However, these technologies came to the farmer without an accompanying handbook on how to plant/grow the varieties, quality of seed to plant per hectare, how to apply fertilizers and herbicides etc According to United State Agency for International Development (USAID) (2010), technology packages associated with FARO – 44 are as follows:

Site selection: Choose fertile land with a moderately high water holding capacity. Heavy soil characteristics of river Valley and Fadamas are preferred. Irrigated schemes and in other areas where water supply and distribution are controlled.

Soil Type: FARO – 44 rice varieties is preferably grown from sandy loam to heavy clay soils, but the most suitable is clayed loam. However, the soil should contain a moderate amount of organic matter, with good but not excessive drainage, to reduce water loss. Soil with high clay content and free uncontrolled flooding should be used for high yield.

Land Preparation: For lowland rain-fed and irrigated rice. Plough the field after the first rain that is from January to March to mix the stubble and expose the soil to the weathering action of the sun, use mechanized plough. Harrow and puddle the field thoroughly to kill weeds. Herbicide like Glyphosate can be used if the height of weeds is not more than 60cm above ground level to exterminate the weeds. Glyphosate must be used before preparation and it is best for zero tillage for economic reasons. Make bunds to retain water in the field. Bunds provides easy access to the field, control water inlet and outlet and enable the efficient use of water. Create drainage outlets to control flood when applicable.

Selection of Seed: Since the variety has been choosen, make sure that the seed is of good quality. Poor quality seed will not produce a good crop and may definitely cause inputs wastage. Seed with a good quality seed has: uniform shape, uniform size and uniform colour Select plump viable seeds that will grow into vigorous seedlings in the nursery. Carry out a germination test by planting 100 grains to ascertain the per centage of germination. Use seed with more than 80% germination rate.

Seed Preparation: Separate the heavier seeds from the lighter ones by soaking the paddy rice in common salt solution (i.e. 2 milk cans full of salt in 18 litres of water in a bucket) or muddy water for about two minutes. Those that sink to the bottom of the solution are heavier and healthier seeds. Discard the lighter seeds that float on the salt solution. Wash the heavier seeds free of salt before sowing. Before sowing, mix the seeds with acceptable insecticide such as meta laxy (e.g. Apron star or seed plus) to protect them from pest attack.

Transplanting Method: Nursery operation should be sited near the cultivated area. Select and locate the seed bed on a fertile area. Prepare seed beds in May to early June in the rainforest belt and June to early June in semi or derived Guinea Savanah belt. Plough the land to a fine texture and construct bed 1.2 meters wide and of any convenient length. Raise the beds at a convenient height to control water level. A mixture of 60 gm of urea and 42.6 gm of single super phosphate per square meter of the nursery bed should be worked into the soil before sowing the seed. On the average, about 2 to 3 handfuls (100gm) of seeds per square metre can be used and cover lightly. Cover the nursery with grass mulch or rice husks to prevent birds from picking them. Use one hectare of rice nursery to plant 10 hectares of rice field. Seedlings should be ready for transplanting between 3-4 weeks after planning. Spacing for FARO – 44, a transplanting distance of 20cm x 20cm is desirable with two vigorous seedlings per stand (20cm is approximately the distance between the tip of the thumb and that of the longest finger when spread wide apart).

Seed Rate: Direct sowing requires 55 – 65kg/ha of seed rice. Raising seedling for transplanting requires 45 – 50 kg/ha of seed.

Broadcasting Method: This method is practicable under irrigated but could be risky under rain-fed lowland conditions where the rain water could dislodge the seed. In such circumstances, transplanting is the best. Soak at rate of 60 – 80kg of seed per hectare for 24 hours in water. Incubate the seed for 48 hours and broadcast pre germinated seeds.

Fertilizer Application: First application broadcast, 200kg (4 bags) of NPK 15: 15: 15 2 weeks after transplanting. Second application, broadcast 100kg/ha (12 bags) of urea 6 weeks after planting or transplanting during panicle initiation.

Weed Control: Weed at least 2 times at 2-3 weeks and 5-6 weeks after transplanting. Use of herbicides, apply Glyphosate (e.g. Round up, fitscosate, sarosate) one or two weeks before dibbling or transplanting at 4 – 6 litres of water for land clearing. Apply propanil plus 2,4.D (e.g. Oryzo plus) 3 to 4 weeks after dibbling or transplanting or at 3 to 4 leaf stage of weeds at the rate of 4 liters per hectare for farm maintenance.

Insects/Disease Pest Control: Use cultural practices such as field puling and destroying infested plants and destroy all alternative hosts. Early planting helps to control some of the hazards.

Bird Control: Control of the birds is done manually by the use of bird scares and spoilt video tapes which make noise whenever the wind blows.

Harvesting: this is the process of cutting and collecting of mature rice panicles when the rice ripens into a golden brown colour. Before harvesting, drain the field and allow it to dry for about four days, if the rice is under swamp cultivation. After harvesting, dry the rice properly and thresh as soon as possible. Harvesting period for FARO 44 is from 110 - 20 days after planting. Cut the stems with sickle or harvesting machine about 10 – 15 cm about ground and lay harvested rice crop in upright position for drying before threshing.

Threshing: Thresh immediately after harvesting and drying to avoid losses. Use mechanical devices, but avoid threshing on bare floor to prevent the introduction of sand, pebbles and other foreign matters. Thresh on a mat or tarpaulins over concrete floor by beating rice against the floor or against a stick.

Winnowing: Winnow to separate the chaff and empty grains from the well-filled matured grains.

Drying: Dry paddy properly to a safe moisture content of 13 -14% by spreading in a thin layer (2-3 cm thick) on clean concrete floors, mats or tarpaulins and turning over periodically. Sun-dry slowly for 2-3 days to reduce breakage during milling. On a clear bright day, sundry for one day (about 9-10hrs) only by spreading paddy. Thinly on clean concrete floors, mates or tarpaulin. Use a mechanical drier if available. Shouldn't dry on bare floors or roadside, the main source of contamination with sand, pebbles, stones, and other foreign matter that can reduce the quality of rice.

Parboiling: Soak paddy in hot water at 70oC (hot enough for your fingers to withstand the heat for about two seconds) for 5 to 6 hours. Discard all floating empty grains. Parboil rice by steaming soaked paddy in a drum, stop parboiling when rice husks start to split open. Chalky grains or white centers indicate incomplete parboiling which may cause breakage of grains during milling.

Milling: Is the process of removing the husk or hull from the grain and the bran (pericarp, testa and aleurone layer) from the kernel (brown rice). Milling can be done with the aid of milling machine or manual approach.

Storage: Cleaned and dried paddy can be bagged in 200kg or 100kg or 300kg bags. Bagged rice grains should be packed in cool dry and aerated conditions. There must be proper aeration in the packing space/store.

2.1.10 Historical development of value chain

The concept of the Value Chain was made popular by Harvard University's Professor Michael Porter. The Porter Value Chain has been widely adopted by the business community as a mechanism to understand and comprehend complexity in business environments, with the ultimate goal of structuring the business to maximize its competitive advantage (Van Rensburg, 2006). The early analysis emphasized local economic multiplier effects of input output relations between firms and focused on efficiency gains. The later work gave the modern version of analysis an additional political economy dimension (Schmitz, 2005). A value chain is an alliance or strategic network between independent enterprises, within a (vertical) chain of activities that compete on a specific market (defined by consumers and retail outlets) and to satisfy market demands. In more practical terms, an agricultural value chain covers all activities from input supply, production, processing, wholesale and retail to the final consumers. An organization's competitive advantage is based on their product's value chain.

The goal of the company is to deliver maximum value to the end user for the least possible total cost to the company, thereby maximizing profit (Porter, 1985). KIT *et al.*, (2006) defined value chain as, specific type of supply chain where the actors actively seek to support each other so they can increase their efficiency and competitiveness. They invest time, effort and money, and build relationships with other actors to reach a common goal of satisfying consumer needs so they can increase their profits. According to Kaplisnky and Morris (2001), a value chain describes the full range of activities that are required to bring a product or service from conception, through the intermediary 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. Dempsey *et al.*, (2006) defined value chain approach as "a value chain is a supply chain "consisting of the input suppliers, producers, processors and buyers that bring a product from its conception to its end use.

Moreso, an effective value chain approach to development seeks to address the major constraints at each level of the supply chain rather than concentrating on just one group (e.g. producers) or on one geographical location. Hoobs *et al*., (2000) defined value chain as a vertical alliance or strategic network between a number of independent business organizations within a supply chain. The supply chain refers to the entire vertical chain of activities: from production of farm, through processing, distribution, and retailing to the consumer. ILO (2006) defined value chain as a sequence of target oriented combinations of production factors that create a marketable product or service from its conception to the final consumption. This includes activities as design, production marketing distribution and support services up to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms, as well as a single geographical location or spread over wider areas.

2.1.11 Approaches to value creation and value chain

- **Value Creation**

Adding value is a transformation process that results into changing a product to a more valuable state from its original state (Mike, 2009). Value also refers to, the perception of what a product is worth versus the possible alternatives (Gautam (2016). The customer must feel the benefit of the paid sum in acquiring the product. The customer pays not only the price but also non price terms such as effort, energy, inconvenience and time, (Gautam, 2016). The value the consumer perceives in the utilization of the product does influence the evaluation and perception of the decision maker or customer. According to Adrian (2001), value creation process has key elements such as the value provided by the firm to its customers, value the firm receives from its clients and the value exchange. The total package of benefits exploited from added value which enhances the basic features of the product and the primary product is referred to as the total value derived by the customer from the supplier organisation.

Adrian (2001) also posits that, competition exists between what companies add to their factory output in terms of delivery arrangement, financing, advertising services, packaging, warehousing and other things that people value but not what they produce in their factories. In order to create superior product and customer value, the firm must evaluate the most profitable and suitable market segment in order to identify opportunities and (limitations) in each market segment. Where the offer made is technically identical to the competitor's product, differentiation of the total package in terms of market segment, price benefit opportunities as well as the customer must be evaluated. According to Mckinsey framework and company (2010), a firm must choose the value, provide and then communicate the value. The component of choosing the value involves understanding the customer economics, forces driving the demand, how well the competition serves customer needs particularly in terms of their product, price charged and the buying prices (Adrian, 2001).

To develop a product that provides clear and superior value, the firm must focus on manufacturing cost and flexibility, channel structure and performance, product quality and performance, price structure as well as service cost and responsiveness. In persuading the customers that the value offered is better than the competitor's, the firm must engage in advertising, sales force and sales promotion but provide outstanding service in a way that is recognised and remembered by the target audience (Mckinsey, 2010). Many raw commodities have intrinsic value in their original state (Mike, 2009). The process must be economically viable to produce a product either by changing the characteristics from one set to another, current place and time preferred by the market place. Oftenly, it may involve building processing plants in the producers' geographical regions to process locally produced agri-products wherever it is most feasible and profitable, such as closer to where the final products will be marketed. Customer value will be realized from the relationship between the price customers pay for the product and the benefits they receive (David and Charles, 2001).

The value will be higher if benefits are more relative to price. This does not necessarily mean that, high value emanates from a low price. If associated benefits of a product are high in addition to its price, the customer will still perceive the value of the product. This interaction creates an opportunity to add value to the product and hence enhancing customer value. To build a profitable and substantial business, creating customer value is of utmost requirement. However, it is good to note that, producers will is not very critical compared to the customers perception of value. This perception of value will mainly emanate from the customer's expectation of quality, functionality for the customer's need, the useful form, location, ease of possession as well as the right place at the right time (David and Charles, 2001).

- **Concept of value chain**

Value chain consists of activities necessary to develop a product from its conception, intermediate inputs, design, raw material sourcing, marketing and distribution to the final consumer (Kaplinsky and Morris, 2000). According to Dagmar (2001), value chain describes value adding activities interconnecting company's supply side (production processes, raw materials, and inbound logistics) with its demand side (sales and marketing, outbound logistics). Porter, (1980) also defined value chain as a representation of a firm's value adding activities based on its cost structure and pricing strategy. He argued that, firms have their own model chains instilled in their own value network which individually they have different roles within the sector or industry in which they have an influence or are impacted by other value actors in the network. Value chain concept therefore, incorporates production, sourcing, distribution, and beyond recycling or disposal of a given product. Various levels have different actors who play a number of roles in meeting the consumer demand. These levels can either have internal or external linkages.

The internal linkage incorporates either the intra-unit, inter-firm or intra-firm relationship while external has mainly inter-firm or network relationships (Prescott, 2001). The firm's ability to innovatively integrate the activities in the value chain greatly determines its competitive advantage and hence sustained shareholders' wealth. In analyzing the value chain, a firm can assess the information on constraints that are currently present within the chain and the profitability of actors (Karl *et al*., 2009). This also helps in identifying arrangement of institutions for targeting in enhancing capacity distribution of remedy for distortions and increase in value added (Karl *et al*, 2009). Moreover, the analysis also evaluates the points of upgrading and improvements needed within the chain. This improvement can be in diversification, access to new markets, quality and product design. Further upgrading also enhances the actors' innovation capacity hence ensuring continuous improvement in product and process.

Similarly, value chain refers to the set of actors (private, public, and including service providers) and the sequence of value-adding activities involved in bringing a product from production to the final consumer. In agriculture they can be thought of as a 'farm to fork' set of processes and flows (Miller & da Silva, 2007). A value chain describes the entire range of activities undertaken to bring a product from the initial input-supply stage, through various phases of processing, to its final market destination, and it includes its disposal after use (United Nations Industrial Development Organization (UNIDO), 2009). It is a chain of activities where products pass through all activities of the chain in sequence, and at each activity, the product gains some value (Russell & Hanoomanjee, 2012). For instance, rice value chains encompass activities that take place at the farm or rural level, including input supply, and continue through handling, processing, storage, packaging, and distribution. As products move successively through the various stages, transactions take place between multiple chain stakeholders, money changes hands, information is exchanged and value is progressively added. Macroeconomic conditions, policies, laws, standards, regulations and institutional support services (communications, research, innovation, finance, etc.) which form the chain environment – are also important elements affecting the performance of value chains.

- **Factors influencing innovative value creation**

Process and product innovations are key manifestation of innovativeness by an organization. Even though process innovations refer to new procedures, knowledge, tools, devices in throughput technology which intermediate between output and inputs, product innovations relate more with the output usually introduced in order to benefit the customer

(George, 2003). A number of factors do influence innovative value creation of products and processes within the value chain. These are either internal or external factors or a combination of both and may fall within the framework of organization demographics, power configuration and resource availability, product market orientation and demand as well as technology availability, culture and business environment.

However, there are various factors influence firms' incentive and ability to innovatively carry out various product value creation activities (Ebrd, 2014). Some of these factors are internal reflecting either characteristics of the firm (its size or age for instance) or the decisions made by the firm (for example, decision to compete in a regional market or to hire skilled workforce). Other factors are external which shape the general business environment in which the firm operates (such as customs and trade regulations).

- **Firm's age or maturity**

Companies compete as per their product differentiation and strongly invest in product innovation soon after the birth of new industries (Aberinthy, 2000). They then shift the focus of competition to economies of investing more in a range of business processes and expenses in order to make them more effective and efficient as market matures. This happens as customer needs become more defined in a better way. Klepper (1996) argues that, there is more focus on processes innovation than product innovations for mature companies. The development level and innovation model assist the managers to understand innovation category and measures for consideration at different times of their development and different competitive surrounding.

However according to Christensen (2003), disruptive innovations may alter this hence forcing the company to start afresh since different aptitudes will be needed altogether. According to EBRD (2014), innovative startups that grow very fast may run out of funding and exit the market. Moreover, not all young small firms may be innovative value creators. Value creation may be high amongst large established firms compared to young ones due to financial capability, affordability to research and development as well as market promotion budgets (EBRD, 2014).

- **Firm's size and stakeholder attributes**

Upon the increase in size of an organization, it may lose its enthusiasm to innovate and hence require a more elaborate control mechanism (Miller *et al*., 1988). This Often turns them from product innovation to process innovation (Gopalakrishnan *et al*., 1999). The stakeholder attribute becomes more pronounced in such a case hence affecting the management action which may lower the quest for product innovation in a complex and unpredictable business environment (George, 2003). However, large firms may put increased resources for value creation efforts. They may also venture in more elaborate research and development due to their financial capability hence promoting their level of value created products.

- **Customer needs and expectation**

Firms with customer orientation are able to measure their customer satisfaction level through being responsive to their needs (Nebojsa *et al*., 2008). According to Hippel's (1988), the leading product users face the needs that will appear in the market months and years after others. They also have an aptitude to express future needs as the function of their experience (Hippel's, 1988). This aids the firms to consolidate important information that help them explore latent needs. However, Christensen (2002) argued that, company's aptitude to innovate can be limited by consistent focus on existing customers hence managers deviating from being keen to serve new customers. Market oriented companies should focus on potential customers beside existing ones in addition to their latent needs. This is done by collecting market information anticipatively.

- **Resource availability**

Resource availability in terms of finances, Information, and expertise usually determine how a firm will react to various forces influencing it in creating value through innovative products. Centralized and systematically controlled budget, with clear defined job and technology exclusion contributes negatively to innovation and value creation (Hardy and Dougherty, 1997). If information is made available with intimate sharing and contributors to innovations being well rewarded, the firm's employees will be more than willing to add value to the firm's product and processes.

- **Product attractiveness**

Product attractiveness to investors will pull support from investors depending on whether they will recoup returns on the investment or not (Nebojsa *et al*., 2008). This influences the type of innovation to adopt in order to guarantee market acceptability and sustainable income generation. Investors will be wary of making huge investments to process innovations, information technology, organization structuring, training programmes and consultancy services to avoid disappointments and failures' hence necessitating risk assessment before resource commitment is done.

- **Product demand**

Product demand is also a key determinant of value creation. It determines the rate and activities of an invention because each rational company that intends to make profit margin is responsive to economic stimuli (Nebojsa *et al*., 2008). The demand characteristics such as; selling potential, demand growth, demand duration, indefiniteness and elasticity are very core in demand consideration. Customer needs and demand usually determines the variety of innovation to be adopted. The benefits that innovation brings are proportionate to market size (Cohen, 1995). A company can influence a great deal of innovation decision if it estimates that, sale potential will be small and a considerable growth rate cannot be expected.

- **Market of the value created product**

According Guerzone (2007), companies find it profitable to invest in process innovation when mass markets are in question. This can be mass market for consumer goods or standardized products. Due to low level of product sophistication, they find it better to carry out process innovation and use the market size than follow the much complicated strategies of product differentiation (Nebojsa, 2008). Innovation is also oriented towards creation of varieties especially in niche markets. The smallness in size for such markets do not allow process innovation due to its costly nature and inability to recover fixed costs involved to process products. Value created products users are conscious of their needs and frequently assists the processors with feedback on designs which results to innovative solutions. This also increasingly leads to increamental radical innovations within the responsible firms. Firms must collect regular market information with the anticipation of analyzing probable market sources, current customer requirement and future customer orientation.

- **Technology availability**

Schumpeter (1934) argued that, entrepreneurs are led by technological opportunities. However, the direction and the rate of technology change due to technology push is defined by appropriateness of technology in special industry usage but not by demand (Cohen, 1995; Goldenberg *et al*, 2001). The dimension of technological opportunity are; technological importance, technological performances and technically feasibility. The latter is technological correctness and completeness on an invention as well as technology indefiniteness that present research and development future planned actions in solving the current problem (Astebro and Dahlin, 2005). Technology drives scientific knowledge which influences research and innovation. Importance and performance of these dimensions may lead to disruptive radical innovations usually a very high return area for entrepreneurs (Scott, 2015). Technology can also be critical, enabling and strategic Research and development drives technology which in turn drives innovative measures within a company.

- **Corporate culture and environment**

Business climate and culture determines the leadership style, typical behavior, values and norms which drives or limits the performance of value added products (Scott, 2015). The major setback is ensuring a balance between judgment and flexibility, focus and discipline and managing cross functional teams while driving the project to successful completion (for example; gaps in required skills and experience, inadequate professional project leaders and turnover of staff). The Belief structures, culture and nature of specialization may affect top managers in carrying environmental business intelligence that may have an implication on test marketing its products. According to Hambrick and Finkelstein (1987), the nature of business environment in which the organization operate is perceived to restrict or constrain choices available to top managers' discretion hence affecting how a firm treats its innovativeness.

2.1.12 Analytical framework to value chain

Value chain analysis is an assessment of the actors and factors affecting the performance of an industry, and relationships among participants to identify the driving constraints to increased efficiency, productivity and competitiveness of an industry and how these constraints can be overcome (Fries, 2007). Kaplinsky and Morris (2001) defines Value Chain Analysis (VCA) as study of 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), delivery to final consumers, and final disposal after use". The concept stresses the importance of value addition at each stage, thereby treating production as just one of several value-adding components of the chain.

Value Chain Analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships; determining the chain governance, or leadership, to facilitate chain formation and strengthening; and identifying value adding activities in the chain and assigning costs and added value to each of those activities (UNIDO, 2009). The flows of goods, information and finance through the various stages of the chain are evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain. The study of value chains comprises of two key concepts: value and chain. According to Hawkes and Ruel (2011), the term value is synonymous to "value added" in the Value Chain Analysis (VCA) as it characterizes the incremental value of a resultant product produced from processing of a product.

For agricultural products, value addition can also take place through differentiation of a product based on food safety and food functionality. Price of the resultant product shows its incremental value. At production level of an agricultural produce, value addition will involve enhancements or additions to a product that result in higher returns to the commodity seller, who is often the farmer. For instance, technological enhancements, labour-saving steps, or any other innovation that allows the producer to offer more of a commodity is a form of "input value-added" enhancements that reduce costs of production, thus returning value to the farmer. However, if the farmer grows specialty crops, engage in strategic marketing of commodities or she/he sells the product for a premium, this constitutes "output value-added" enhancements. The term chain refers to a supply chain indicating the process and the actors involved in the life cycle (from conception to disposal) of a product (Hawkes & Ruel, 2011).

- **Value chain actors**

Value Chain actors are the people at each link along the chain required to move a product from the farm to the consumer (McGregor & Stice, 2014). Value chain actors are those involved in supplying inputs, producing, processing, marketing, and consuming the products (Getnet, 2009). They can be those that are directly involved in the value chain (rural and urban farmers, cooperatives, processors, traders, consumers etc) or indirect actors who provide financial or non-financial support services, such as credit agencies, government, researchers and extension agents. Usually they own the product for a certain time as it travels along the chain (CYE Consult, 2009). Roduner (2005) distinguishes between different participants in the value chain and groups them into micro, macro and meso levels respectively.

Firstly, those participants who are directly involved with the primary product are referred to as 'value chain players' and are grouped in the micro level. They include input suppliers, farmers, dealers and traders, until the final consumers, whether the product is consumed locally or exported. Clearly, the micro level includes only those participants who are directly involved with the product.

The second level is the macro level where the participants are referred to as 'value chain influencers' (Roduner, 2005). They are those participants who, as indicated by their name, influence the value chain. The value chain influencers include those participants responsible for the regulatory and administrative conditions as well as for international competition (Spies, 2011). Moreso, these conditions include, amongst others, food law and regulations, food control and company inspection, customs and taxes, incentives and free trade agreements. The third level is the meso level and the participants are referred to as 'value chain supporters'. The value chain players at this level are responsible for providing information, training and promotions. Their activities includes; business advice, trade promotion, research and development, quality management advice/certification, etc.

More importantly, it could be perceived in this direction as those involved in major producing, processing, trading or consuming a particular agricultural product. They include direct chain actors which are commercially in the chain (producers, traders, retailers, consumers) and in direct actors which provide financial or onfinancial support service, such as bank and credit agencies, business service providers, government, researchers, and extensions (KIT *et al.*, 2006). According to GTZ (2007), the term value chain actor summarizes all individuals, enterprises and public agencies related to a value chain, in particular the value chain operators, providers of operational services and the providers of support services.

In a wider sense, certain government agencies at the macro level can also be seen as value chain actors if they perform crucial functions in the business environment of the value chain in question. According to Getnet (2009) value chain actors are those involved in supplying inputs, producing, marketing, and consuming agricultural products. They can be those that directly involved in the value chain (rural and urban farmers, cooperatives, processors, traders, retailers, cafes and consumers) or indirect actors who provide financial or non-financial support services, such as credit agencies, business service and government, researchers and extension agents. Ponte (2002) also used a value chain analysis to examine the impact of deregulation, new consumption patterns and evolving corporate strategies in the global coffee chain on the coffee exporting countries in the developing world. The study concluded that the coffee chain was increasingly becoming buyer-driven and the coffee farmers and the producing countries facing a crisis relating to changes in the governance structure and the institutional framework of the coffee value chain.

A value chain approach was used in Kenya to identify strengths and weaknesses of the cotton textile supply chain and formulate a strategy to improve the cottonapparel sub-sector (RATES, 2003). The study identified lack of coordination among the actors in the cotton industry in Kenya as one of the major factors limiting the competitiveness of the cotton industry. Institutional innovations and harmonization of trade policies were proposed to solve the problems of institutional and policy failure. Dereje (2007) used value chain approach to study the competitiveness of Ethiopian coffee in the international market. The study indicates that Ethiopian farmers have low level of education, large family size with small farmland and get only 3% of the retail price in the German market. Thus, policy intervention was suggested to improve farmers' performance.

Further, a value chain study conducted on mango by Dendena *et al.,* (2009) indicated that the subsector is facing some challenges. Among others: highly disorganized and fragmented industry with weak value chain linkages, long and inefficient supply chains, inadequate information flows and lack of appropriate production are explained as the major problems. Moreover, a study conducted by Biruhalem (2010) on rice value chain revealed that there were multiple public and non-public actors involved along the rice value chain, upstream from input supply to downstream consumers, playing different roles. However, there is no mechanism to coordinate multiple actors together for effective and efficient functioning of the value chain. There is public sector actors' domination with limited private sector involvement in the value chain. A long tradition of limited responsiveness, top-down, hierarchical, non-participatory/ exclusiveness and less risk taking type of organizational culture, habits and practices lead to have weak interaction, knowledge and information sharing with the various actors along the value chain.

As to the linkage, weak and informal market linkage between chain actors characterizes the rice value chain. Lack of post harvest processing technology, limited access to supply of inputs, severe termite attack, non-availability of well developed rice market, high labor demand for crop management, absence of responsible body who works on actors interaction were some of the challenges identified for innovation at various stages of rice value chain. The study recommended partnership to be created among value chain actors to create an enabling environment for sharing information, knowledge and solve existing problems and as extension service should be strengthened to solve the existing problems and to increase competitive advantage of the rice production. Mebrat 2014, work in tomato value chain analysis shows that cooperative is predominantly helpful in terms of agricultural inputs, and promotes use of quality/improved seeds increase the quantity of the product to be supplied to wholesalers.

2.1.13 Agricultural value chain

The concept of 'agricultural value chain' includes the full range of activities and participants involved in moving agricultural products from input suppliers to farmers' fields, and ultimately, to consumers' tables (Miller & Jones, 2010). Value is added by some additional transformation or enhancement made to the product. This may be simply moving the product from one point of manufacture to the market or to complex processing and packaging. At each stage of the chain, the value of the product goes up because the product becomes more available or attractive to the consumer. Costs also accumulate at each stage of the chain (KIT, Agri-ProFocus & IIRR, 2012). The ‘farm to table’ integration of a chain can increase efficiency and value through reduction of wastage, ensuring food safety, preserving freshness, decreasing consumer prices, and improving farmer prices and incomes. Efficient value chains normally reduce the use of intermediaries in the chain, and strengthen value-added activities because of better technology and inputs, farm gate procurement, upgraded infrastructure, improved price opportunities through demand-driven production.

Value chain participants sometimes cooperate to improve the overall competitiveness of the final product, but may also be completely unaware of the linkages between their operation and other upstream or downstream participants (Keyser, 2006). Value chains therefore encompass all of the factors of production including land, labour, capital, technology, and inputs as well as all economic activities including input supply, production, transformation, handling, transport, marketing, and distribution necessary to create, sell, and deliver a product to a certain destination. Keyser (2006) identified the various stages of value chain for agricultural commodities (Fig. 2.1).

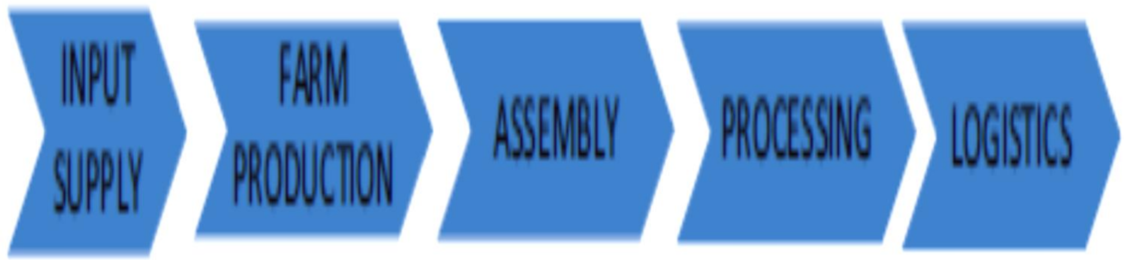

Figure 2.1: Stages of the Value Chain

• **Input supply.** This stage is concerned with the sourcing of raw materials required for agriculture production, processing, and trade. Inputs may either be procured locally or imported. The final value of an input at its place of use includes all manufacturing costs, transportation costs, customs duty and tax, and unofficial payments incurred up to that point. The efficiency of a country's input supply system therefore has a major bearing on the performance of the entire value chain.

• **Farm production**. This stage is concerned with primary agriculture production and ends with the sale of a raw commodity at the farm gate. These transactions may occur literally at the farm gate or at some other point where the farmer hands over ownership of the product to the next value chain participant. Depending on the crop, some type of primary processing (such as the shelling or bagging of dry grain) may take place at the farm level.

• **Assembly**. This stage involves the collection of agricultural produce from many farmers and delivery of the raw material to a factory for industrial processing or packaging. In the case of livestock operations, assembly is defined in a broader sense to include the feedlot process for delivery of fattened animals to an abattoir. Bagging and simple grading of crops can also occur at this stage depending on arrangements made at the first point of sale.

• **Processing.** The processing stage involves the transformation of agriculture raw materials into one or more finished internationally traded goods. Raw commodities, of course, are also traded and this stage may not apply to every crop.

• **Domestic and international logistics**. The logistics stage is concerned with the delivery of traded commodities to their final market destination. This may either be a foreign market in the case of exports, or a local market for import substitutes. For import substitutes, the logistics stage ends at the domestic level, but the analysis is still concerned with the cost of importing a like product from the nearest or most competitive country.

Price build-up from stage to stage

In value chain analysis, all inputs and outputs carry forward their inherited value from the previous stage. This point may seem obvious enough, but it is important to stress in value chain analysis where the focus is on cost levels at different stages as a key determinant of international competitiveness. By looking at the cost composition at each stage of the value chain and comparing these costs with world standards, value chain analysis not only shows if the country is internationally competitive, but also helps to identify key stages where costs can most effectively be reduced.

2.1.14 Approaches in value chain analysis

Value chain analysis consists of two major steps (Brown, Perez, Garces, Ragaza, Bassig & Zaragoza, 2010). The first involves the assessment of existing market(s) to put the chain analysis within the proper context. The second step is value chain mapping aimed at answering six key questions: (a) Who are the key customers and what are their product requirements in terms of species, volume, quality, packaging, delivery schedules, as well as grades and standards? (b) Who are the key players in the chains and what are their respective roles? (c) What are the activities and processes along the chain? (d) What is the flow of product, information and payment along the chain? (e) What are the logistic issues? (f) What are the external influences (e.g., ordinances, regulatory requirements, policies, etc.)? For rice, the functions of each link in the chain involve sourcing inputs, collecting, processing and delivering/selling product to the next link in the chain.

- **Value chain mapping**

Value chain analysis often starts with linear mapping of activities in the chain from the initial input suppliers at the very beginning of the production process to the final consumption of products or services (Stamm & Drachenfels, 2011). It facilitates a clear understanding of the sequence of activities and the key actors and relationships involved in the value chain. This exercise is carried out in qualitative and quantitative terms through graphs presenting the various actors of the chain, their linkages and all operations of the chain from pre-production (supply of inputs) to industrial processing and marketing (UNIDO, 2009). Depending on the level of detail needed, this exercise may focus also on factors such as the size and scale of main actors; production volume; number of jobs; sales and export destinations and concentration, etc.

- **Global value chain approach**

The Global Value Chain (GVC) approach cut through all kind of economic realities and specify constraints surrounding a specific product. This approach combines two important analytical tools. Firstly, it applies a business management approach by identifying constraints of individual firms (stakeholders), and secondly it uses power analysis to expose different types of governance within the firm. A combination of an analysis of constraints and governance type provide the right basis to compose upgrading strategies that have the ability to improve the value chain. However, the approach is limited in providing insight into the heterogeneity in outcomes for different types of producers (Laven, 2010). The first shortcoming, lack of inclusion of institutions in the analysis is corrected by making use of literature on institutions, transactions costs, and social capital. The second shortcoming of GVC is its effects of upgrading at different scale levels and with different stakeholder groups. According to Gilbert (2006), the term global value chains appears to be originally due to Hopkins and Wallerstein who proposed to analyze a sequence of processes culminating in the production of the final product.

This endeavour in part motivated by the realization that many industrial goods are processed in multiple countries prior to final sale, and that trade in intermediate products has become a major component of all international trade. Industrial products typically combine a number of different raw materials and other inputs. Global value chain analysis looks at the value contribution of each of these to the final product without a well structured market. Value chain analysis suggests a number of strategies for adding value. In particular, it emphasizes the opportunities for adding value through increasing buyer service elements of the total product package delivered to buyers. Particularly in fresh produce value chains, value can be added through reliability of delivery, speed of delivery, and product innovation. In other words, adding value need not involve physical transformation of the product. Global buyers such as supermarkets and large processors are not solely buying a physical product. They are buying a product that is bundled with a set of value-adding services. Moreover, GVC linkages offer the prospect of private sector knowledge transfers that should provide up to date and relevant information for producers, processors and exporters in developing countries. This knowledge transfer is not automatic (Humphrey, 2006).

2.1.15 Agriculture value chain analysis approach

The approach use concepts and analytical tools for analyzing the functioning of agricultural value chains are, therefore, important to understand the impact of chain development interventions on smallholders and the rural poor. Similar to the agricultural innovation systems perspective, value chain approaches help orient agricultural development thinking more towards a systems perspective (Rich *et al*., 2008). Value chain has been used to analyze the dynamics of markets and to investigate the interactions and relationships between the chain actors. The agricultural value chain approach is utilized by many development interventions that intend to engage smallholders either individually or collectively into the production of market oriented high value crops (Anandajayasekeram and Berhanu, 2009).

It is a dynamic approach that examines how markets and industries respond to changes in the domestic and international demand and supply for a commodity, technological change in production and marketing, and developments in organizational models, institutional arrangements or management techniques. The analysis looks at the value chain as a set of institutions and rules; a set of activities involved in producing, processing, and distributing commodities; and as a set of actors involved in performing the value adding activities. Value chain analysis focuses on changes over time in the structure, conduct and performance of value chains, particularly in response to changes in market conditions, technologies and policies (Kaplinisky and Morris, 2001).

- **Cooperative-based approach to food value chain development**

Cooperatives are economic entities depending on the relevant legal system, which may combine commercial and not-for-profit features, and play a major role in the economic and rural development of many countries around the world. In certain geographical areas and for particular commodities, agricultural cooperatives gather very large numbers of producers and manage most of the production. They take several forms depending on their membership, object and activities. Cooperatives may vary considerably in size as well as in technical and economic capacities. An agricultural cooperative perform different tasks. It may market the production of its members or even organize the production process itself. Moreover, cooperatives sometimes provide services (such as planning, technical assistance, access to equipment, supply of inputs and quality control).

As the cooperative acquires more business and financial strength, activities and services to members could expand to include, for example, group certification or obtaining third-party certification, developing specialized products and labels, and engaging in downstream activities (such as pre-processing, transformation and packaging). These activities may often be undertaken through commercial subsidiaries (vertical integration) or based on contract alliances and networks (horizontal integration). Cooperatives may also gather associations of producers rather than just individual ones. Cooperatives are regulated by a special legal regime, and particular rules are applied to those engaged in agriculture or the production of specific commodities (UNIDROIT, 2015). Cooperatives serve dualistic goals of organizing smallholders into larger, productive entities and facilitation the formation of the state. In many situations cooperatives were utilized as instruments of control by governments, through which national interests had dominance over individuals. Economic benefits are distributed according to the members' level of economic activity in the cooperative not according to his capital equity (IFAD, 2007). Cooperatives have difficulties in raising investment capital, as members have equal ownership and voting rights, there is little motivation to invest in the cooperative. Furthermore, cooperatives establish a lot of rules and regulations which can make them inflexible (Oxfam, 2007).

- **Agro-food markets and smallholder farmers**

With the increasing commercialization of agriculture and food systems worldwide, the food industry is increasingly dominated by large agribusiness firms whilst the influence of farmers declining (Reardon & Berdegué, 2002). International experience has shown that smallholder farmers produce low-value commodities, which face declining real prices and increasing competition from medium- to large-scale producers, and they are excluded from high-value markets. As mentioned above, small-scale farmers find it difficult to make the transition to more commercial food system because they struggle to meet the private standards set by food processors, etc. and are also constrained by limited government support (Bienabe *et al*., 2004).

Experience with contract farming has shown that in both developed and developing countries, agribusiness integrators prefer to deal with commercial farmers in order to reduce transaction costs and also due to the need for greater consistency of quality and supply (Key & Runsten, 1999). However, Louw, Chikazunga, Jordan and Bienabe (2007) discovered that many commercial farmers are not interested in contracts or in supplying to supermarkets, as they are of the opinion that their 'profits are squeezed' and they cannot afford the additional capital outlays to comply with the stringent quality standards. Consequently, this may offer smallholder farmers a major opportunity to engage in contract farming if they are supported along the value chain. For smallholder farmers to supply processors or wholesalers they need a certain size of production, high-quality products, a certain size and type of product, and consistency in quality and supply – requirements they find difficult to meet consistently.

Smallholder farmers can only have market power if they form co-operatives, which should be established with the help of the government. Groups have the potential to secure better terms of trade such as better sourcing prices, lower transaction costs, and greater access to training and other services. The expansion of agro-processors, fresh produce markets and supermarkets is posing a major challenge to smallholder farmers in their efforts to position themselves as business driven competitors. The buying practices of supermarkets and large processors, such as quality and safety standards, packaging and volumes, seriously challenge small producers, who are threatened with expulsion from the agricultural supply chain if they cannot take part in this new type of market. The chains thus require assurances from suppliers that all safety and health standards are being met and surpassed, and small-scale farmers must not be excluded from complying with these standards if they are to compete successfully in the agricultural value chain.

Farmers are now faced with new challenges that include the consistent supply of products of consistently high quality, knowledge of acceptable agricultural practices, capacity to comply with market and regulatory requirements, new issues of conformity assessment, and traceability. This setup poses major challenges for producers, more especially smallholder farmers. As a result, smallholder farmers are still excluded from participating fully in the agricultural supply chain and are not linked to high-value markets. According to Louw, Vermeulen and Madevu (2006), dominant supermarkets and processors have tended to favour suppliers who can ensure consistent volumes and quality, and they have thus engaged in long-term production arrangements (informal contracts) with such suppliers. These criteria tend to favor more capitalized commercial producers and processors over the emerging sector (Louw *et al*., 2006). The participation of smallholder farmers in high value markets is constrained by the many challenges they must face.

A range of impediments to market participation has been identified, including lack of access to finance, on-farm infrastructure, market information and training. The situation is worsened by the fact that farmers are located far away from the markets and have poor access to infrastructure**.** Moreover, market access is facilitated through the exploitation of economies of scale, which depends on the extent of member participation. Shiferaw *et al.,* (2009) identified low volumes as one of the major limiting factors for the success of smallholder marketing groups in Kenya. Hence, understanding the factors that contribute to high or low participation in collective marketing and other group activities is important to predict and enhance group performance. Collective action is defined as voluntary action taken by a group of individuals, who invest time and energy to pursue shared objectives (Markelova *et al.,* 2009).

It plays an important role in the context of family farms and agricultural production. For example, cooperative organization has helped to maintain the dominance of family farms in developed countries by offsetting some of their disadvantages related to size and bargaining power (Valentino 2007). In developing countries, the disadvantages of family farms are further exacerbated by various forms of market failure, which are particularly severe in areas with poor infrastructure and communication networks. As a result, smallholders face high transaction costs that significantly reduce their incentives for market participation (Poulton *et al.,* 2010). Through achieving economies of scale, farmer groups can countervail some of these disadvantages, particularly those related to high external transaction costs and market power. But the success depends on member commitment. Commitment can be described as acting towards fulfilling mutual, self-imposed or explicitly stated obligations. It has received much attention in the social sciences, particularly in the literature strands of organizational behavior and rational choice (Robertson and Tang 1995).

Organizational behavior focuses on the factors influencing the quality of an individual's involvement and performance in organizations. It includes attitudes, identification with the group, its objectives and values, as well as loyalty and affection. Rational choice theory focuses on how an individual's decision to engage in collective action depends on a comparison of the expected benefits and costs. Rational, self-interested individuals will act to achieve their personal rather than group interests, and have an incentive to free-ride if they can (Olson, 1971).

Therefore, groups have to implement mechanisms that punish. An example of a collective action in the Kenyan banana sector provides an interesting example to analyze the intensity of participation in farmer collective action. Bananas provide an important source of food and income for millions of smallholders in East Africa and other developing countries (Arias *et al.,* 2003). However, over the past decades, there has been a decrease in banana yields of African farmers, which is largely due to pests and diseases and threatens household food security. At the same time, due to urbanization processes, demand for high quality bananas is growing.

Hence, many smallholder producers have become more reliant on the cash income generated from banana sales, especially in areas that were negatively affected by declining incomes from traditional cash crops such as coffee (Wambugu and Kiome 2001). This trend of declining yields has been reversed more recently in Kenya, especially in regions where development initiatives were implemented to distribute improved banana planting material and support good agronomic practices. Recognizing the problem of low banana yields and the opportunities of rising demand, Africa Harvest and TechnoServe two international nongovernmental organizations (NGOs) launched a joint initiative to improve banana production and marketing in Kenya. The project overall goal was to improve the welfare of smallholder banana-producing households.

As a central part of the initiative, the formation of farmer groups dedicated to the production and marketing of fresh dessert banana was encouraged. Many of the new groups build on existing local networks and social ties. Members agreed on a group constitution, membership fees, and they also elected their own leadership. The groups had to be legally registered as a pre-condition for further support by the two NGOs, such as provision of improved banana planting material and training on issues of banana production, marketing, and related business skills. In the initial stages of group formation, member farmers were trained by NGO representatives in group organization, leadership, and group dynamics, in order to build a solid foundation of social capital for future joint efforts. To plan joint activities and handle routine group business, groups hold regular group meetings, usually once a month. Participation in these meetings is voluntary, although the attendance of members is recorded.

The actual group services can broadly be subdivided into production-related and marketing-related types. Production-related services focus on improved access to information, inputs, and innovation for the banana crop. For instance, NGOs carry out special technical training sessions for proper plantation establishment, maintenance, and pest control. In addition, group members were introduced to improved tissue culture (TC) planting material. Traditionally, bananas in Kenya are propagated by suckers from old plantations, a procedure through which pathogens are spread. TC banana plantlets are propagated in the lab, so that plantlets are free from pests and diseases. Farmer groups are linked to TC labs, nurseries, and markets for complementary farm inputs through NGO support; some of the groups have even established small-scale TC banana nurseries themselves. Market-related services are mostly in the form of organized group market days.

To participate in these market days, members have to deliver their bananas to designated collection centers, where they are weighed, graded, bulked, and sold to wholesale traders. Farmers keep individual accounts and sales revenues from market days are distributed according to actual delivery. They only have to pay a small tax per kilogram of collectively marketed banana. Beyond the membership fee, this tax revenue is an important source of revenue for the groups to finance its service activities. But members are not formally required to market collectively; they are also allowed to sell bananas individually. Traditionally, most small-scale banana producers in Kenya have sold their marketable surplus to itinerant traders at the farm gate. The expected advantage of collective marketing is a higher sales price, because economies of scales can be realized and transaction costs reduced (Ouma *et al.*, 2010).

However, effective price differences and individual benefits depend on a number of additional factors. In addition to the extra transport and time costs incurred, a disadvantage of collective marketing is also that group payments are often delayed. Smallholder farmers are still faced with low incomes and food insecurity. In order to overcome these challenges, several efforts have been made to organize smallholder farmers into groups and to take advantage effect of synergy-building. Smallholder farmers are organized into cooperative societies. The organization of the farmers into cooperatives is need-targeted. Some are organized into cooperatives to access micro credit finance. Others are targeted at market, for better price bargain and risk reduction. These approaches have witnessed certain improvement in the income and productivity of smallholder farmers.

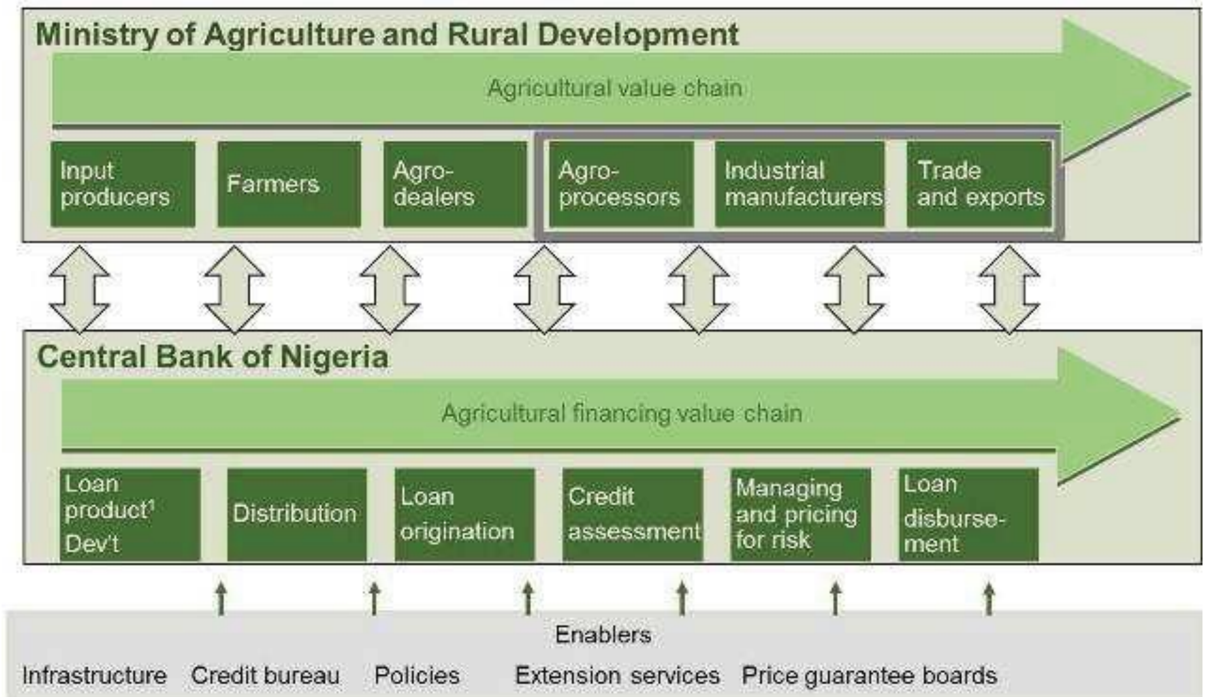

Figure 2.2 Agricultural Financing Value Chain

Source: FMARD, 2012.

2.1.16 Rice Value Chain in Nigeria and Constraints

The main actors in the rice value chain in Nigeria are farmers, paddy traders, millers, rice traders and retailers as shown in Fig 2.3. The main value adding activities include; production, harvesting, storage and paddy aggregation at traders' level, parboiling, milling, wholesaling, and retailing (Cadoni & Angelucci, 2013). Rice farmers can be categorized in three main typologies: (1) smallholders applying a low-input strategy (this represents majority of producers in the country) with low-yield and average of 2.0 hectares; production is less than 2 tonnes/ha (2) larger-scale commercial farmers (20+ ha), often providing first processing; and (3) smallholder contract/outgrower farmers adopting enhanced production technologies (USAID, 2009).

The value chain for domestically produced rice in Nigeria is currently dominated by a largely fragmented production and milling industry, with limited new investment in either production or processing (USAID, 2009). While, the returns are quite high at each stage of the traditional value chain channel, there are so many participants in the channel that the benefits are spread very thin and few have any incentive to invest. With very high prices, a protected market and ever-increasing imports, the potential is high to promote a strong supply response under the right conditions. USAID (2009) reports that new investments in heavier milling capacity in new channels offers good private-sector driven models that can compete with imports for the high-end urban market, offer lower prices to consumers, yield high profit margins to both the producers and the millers and contribute to a more efficient value chain that improves food security in Nigeria.

The rice value chain (processing and distribution sector) faces a number of key constraints in Nigeria. Milling technology is often outdated, resulting to high levels of broken rice. Millers are fundamentally constrained by lack of working capital that limits their ability to purchase paddy from farmers and update machinery. This contributes to the unofficial export of paddy to regional markets which prevents the country from capturing the value-adding from rice milling. The lack of capital also perpetuates the low levels of technology implicit in the sector. High costs in the provision of credit dampen private investment by farmers and millers, forcing farmers to seek unofficial sources of credit from money lenders, often at usury interest rates, and millers to delay or reduce investments. Institutional and infrastructural constraints also impede the sector. Poor infrastructure, in the form of roads and irrigation dampen production incentives and reduce market access. These unnecessarily raise the costs of rice for consumers and lower the competitiveness for an export market. The primary objective of Nigeria's initiative on rice is to enhance household food security and income, eliminate import and generate exportable surplus.

The environmental and socio-economic conditions of rice production vary greatly from region to region. The diverse environmental and socio-economic conditions have affected the performance of rice production in the past. They also influence the opportunities for increasing rice production in the future. Environmentally, rice is grown under different climates including temperate, sub-tropical and tropical. Consequently, immediate concern to those directly involved in rice production and research is to develop new technologies that will suit the different agro-ecology in the country. The emerging issues related to the impact of rice production on the environment are emerging methods of land preparation, weed/pest control using chemicals, fertilizer application and method of rice processing in the region.

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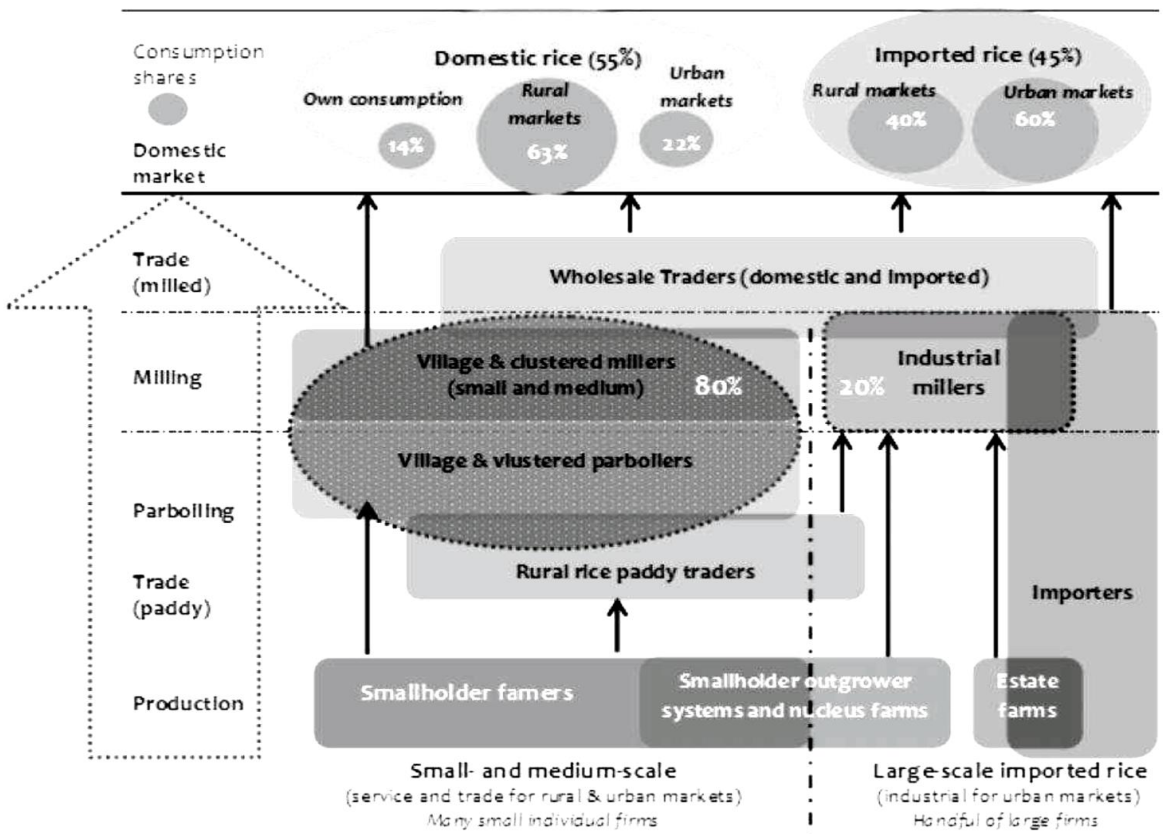

Figure 2.3: Rice value chain in Nigeria.

Source: Johnson, Takeshima and Gyimah-Brempong, 2013.

2.1.17 The concept of value addition

The concept of value addition has been derived out from the very manufacturing process in which a firm's raw materials are converted into finished goods. A company can add value by efficient use of the resources available to it. These resources can be in the form of manual skills, technical skills, know-how etc.

Value addition takes place when enhancement is added to a product or service by a company before the product is offered to customers. The reasons for adding value to a product is to:

1. Increase sales by creating product diversity
2. Stabilize income by allowing income creation during off season
3. Make use of excess produce
4. Increase the profitability of the product
5. Enhance the suitability and functioning of a product etc.

   (MBA Knowledge Base, 2021)

According to Garikaib, 2019; Value addition also refers to the enhancement of a products value usually through the manufacturing process. The benefits of value addition include the following:

1. Creates employment opportunities
2. Increases a business profit prospect
3. Increases the local economic contribution of raw materials
4. Leads to development of related industry around the main industry
5. It distinguishes one's business product from those of competitors

2.1.18 Value addition in agriculture and rice production

According to USDA, value addition in Agriculture refers to the production of a product in a manner that enhances its values. It can be a change in the physical state or form of the product (such as milling rice, wheat into flour or making strawberries into Jam).

As a result of the change in the physical state or the manner in which the agricultural commodity or product is produced and segregated, the customer base for the commodity or product is expanded and a greater portion of revenue derived from the marketing, processing or physical segregation is made available to the producer of the commodity or product.

According to Kaplinsky 2010; value addition means adding value to a raw product by taking it to at least the next stage of production.

Value addition in the production and processing of rice implies all the activities, processes or strategies and distribution of rice which in one way or the other contribute to benefit /utility maximization (Owoh, 2008).

Rice sector being a critical sub-sector of agricultural sector can serve as a means of conserving foreign exchange and improve the nation's economy. Micro-enterprises, especially those involving pre and post harvest handling activities of agricultural materials have become major component of the economies of developing countries such as Nigeria (Isaac *et al*; 2016). Based on this assertion, development of food processing industries in Nigeria will not only improve food supplies but also reduce imports. Such move will contribute to increase self-reliance by reducing food losses, adding value to the raw materials, increase export earnings, raising employment levels and improving incomes (Ige *et al*; 2016).

Value implies worth, benefits price or measure of importance. It is a factor of utility. Value can also be seen as the monetary term in which the utility of a product or an item can be explained (Ugwu *et al*; 2014). Therefore, value addition in the production of rice implies all the activities, processes or strategies and distribution of rice which in one way or the other contribute to benefit/utility maximization.

Nigeria's local production of rice increased from 2 million tons in 2015 to 9 million tons in 2021 (vanguardngr.com, 2021). Hence, rice farmers have keen interest in adding value to their rice production and processing so as to enhance the product. Rice is an important staple food in Nigeria. Many Nigerians have developed tastes for polished and size-sorted medium to long-grained rice. Besides offering a higher return, value addition on rice production and processing can:

- open new markets,
- create recognition for a farm,
- expand the market season, and
- make positive contribution to the community

2.1.19 Policies on rice production in Nigeria

The Nigerian government had at various times enacted policies aimed at increasing rice production, make the nation self-sufficient and meet domestic demand for rice in Nigeria. A number of key policies and investment strategies had been introduced to reduce imports and increase the competitiveness of local rice. This is being done through a combination of import restrictions, input policy and institutional reforms, and investments across the rice value chain (Johnson, *et al*., 2013). However, the country's policy on rice has been inconsistent and has oscillated between import tariffs and import restrictions including outright ban (Emodi & Madukwe, 2012). According to Coulter and Havrland (2005), seeking to eliminate imports over a short-time span is very unrealistic with consumption outstripping production. Growth in rice demand as a preferred staple, is so strong that production intensification and higher yields per ha has not been sufficient to fill the gap and meet rice demand (Tollens, 2007). Extensification or a rapid increase in the area under rice cultivation (irrigated and rain fed) was recommended. From historical perspective, rice policies and acts in Nigeria can be discussed under three periods (Akande, 2003). These are:

I. Pre-ban period (1971-1985)

This can be classified into pre-crisis (1971- 1980) and the crisis period (1981-1985). The Pre-Crisis period was largely characterized by liberal policies (agricultural policies, programmes, projects and institutions) on rice imports. Ad-hoc policies were put in place during times of interim shortages. It corresponded to the launching of various programmes and projects aiming at developing rice production. During the crisis period, more stringent policies (Input Supply and Distribution Policy, Agricultural Input Subsidy Policy, Water Resources and Irrigation Policy, Agricultural Cooperatives Policy) were put in place. Government policies artificially lowered domestic rice and fertilizer prices relative to the world price level, through massive importation of rice resulting in low price of locally produced rice. Government was involved in rice importation, distribution, and its marketing with non transfer of actual costs to consumers.

II. Ban period (1986-1995)

The ban placed on rice import was reinforced by the introduction of Structural Adjustment Programme (SAP) in 1986. Under SAP, various trade policies (tariff, import restrictions, and outright ban on rice import at various times) were put in place. It was illegal to import rice into the country, though importation of the commodity through the country's porous borders thrived during this period.

III. Post-ban period (1995-2011)

During these period restrictions on rice importation were lifted, with more liberal trade policy put in place. The decline in domestic rice production cannot all be blamed on increasing rice imports. A number of reasons led to the lifting of the ban. There was extended pressure from the international financial organizations, such as the World Bank, World Trade Organization, and the International Monetary Fund (IMF) who argued that the ban on rice was not in consonance with the liberalization position of the government. On the domestic scene, the government failed in the implementation of the ban on the commodity. This is evidence by the major markets in Nigeria flooded with imported rice despite restrictions. There was also pressure on the government by those who had vested interest in rice importation and the urban elites who had a preference for the consumption of imported rice (Ladebo, 1999).

- **Government's policies, acts and initiatives on rice production**

Akande (2014), affirmed that the Nigerian government has actively interfered with the rice economy over the last thirty years. The country's policy on rice has been inconsistent and has oscillated between import tariffs and import restrictions including outright ban. The specific policy measures and initiatives below have an impact on the rice sector, and include a mixture of input and price support.

i. Presidential initiative on increased rice production (2002-2007)

The Presidential Initiative on increased Rice Production (2002) specifically aimed at reversing the import bill meeting domestic demand by 2006 and reach export capacity by 2007. Main targets were to increase rice production, improve milling quality, and promote marketing to provide domestic rice for consumption and to ultimately reduce national rice importation. The ambitious goal of the Initiative was to produce 15 million Tonne of rice from 3 million ha of consolidated farm land by 2007.

The main activities included: (1) increase production, inputs and crop protection, by increasing yields, enhancing agronomic practices, providing credit to farmers, providing inputs, applying agricultural good practices such as minimum tillage; (2) enhance irrigation and land development schemes through rehabilitation and construction of current endowments; (3) improve processing, marketing and storage; (4) enhance farmers' groups; and (5) seed production (mainly NERICA and *Oryza sativa*) (Adejumo-Ayibiowu, 2010.

Although the initiative did not reach its final goal, there was a 31 per cent increase in rice production between 2002 and 2007. Among the results of the Initiative's application, there were 81 505 supply packages (known as R-Boxes, containing seeds and agro-chemical supplies) distributed in 36 states, the National Seeds Service (NSS) produced 58 tonne of foundation seed, 4.92 tonne of breeder seeds and 25.23 tonne of foundation seed Stage 1 of NERICA and 12.6 tonne of lowland varieties were produced by the National Cereal Research Institute and West African Rice Development Association, while capacity building was enhanced through Management Training Plots (MTP) in 25 states (Odoemena, 2008).

ii. Nigerian national rice development strategy (NRDS) (2009-2018):

Similarly, to the 2002 Presidential Initiative, the NRDS (initiated in 2009) goal is to increase rice production. The target set by NRDS is to raise paddy output from 3.4 million tonnes in 2007 to 12.8 million tonnes in 2018. There are three priorities areas set for enhancement by the Strategy, they are: (1) post-harvest processing and treatment; (2) irrigation development; and (3) input availability, mainly focusing on seeds, fertilizer and farming equipment. NRDS includes a mixture of input supply promotion (such as 50% subsidy for seeds and 25% for fertilizer) and reduced custom tariff on imports of specific agricultural machineries (such as tractors and processing equipment). The high cost of seeds is currently a constraint on increased production. The National Agriculture Seed Council is in charge of seed production and certification, while the National Cereals Research Institute (NCRI) and the Africa Rice Centre regulate their delivery to producers (Diagne *et al*, 2011).

iii. Presidential transformation agenda (2011)

The overall goal of the Agenda is to define agriculture as a business, promote private sector investment in agriculture, along with the development of private sector driven marketing organizations and the promotion of Incentive-based Risk Sharing for Agricultural Lending (NIRSAL). Rice is among the commodities (together with cassava, sorghum, cocoa, and cotton) for which a country-wide commodity-specific transformation plan is envisaged. The final goal of the rice transformation agenda is to reduce the import bill, and make Nigeria self-sufficient within a 5 years' timeframe. To achieve the goal, the strategy aims at improving rice quality offering a viable alternative to the current imports, aiming for a significant portion of demand in the domestic rice market will shift from parboiled rice to milled rice. Consequently, policies will especially focus on milled rice but also on parboiled rice as a supply side target. Activities focus on enhanced irrigation and mechanization systems, through private sector involvement. For example, incentivize the private sector to invest in large parboiling and de-husking facilities in regions of high current production, such as Niger State and Cross River State.

iv. Cross-commodity input support: fertilizer policy

Aside from rice-specific input support policies, there are initiatives that influence rice production, although their specific impact cannot be quantified. Both State and Federal Government can provide fertilizer to farmers as input support. However, contribution varies consistently between one state to the other, and from one year to the other. The Federal Market Stabilization Programme (FMSP) allows companies to produce and import fertilizer and allocate it to state governments with a 25 per cent subsidy. Additionally, State Governments can further add to the subsidy.

v. The national investment plan (NAIP)

This policy sets a target of a 30 per cent increase in fertilizer use in the period 2010-2015, with an overall demand expected to grow from 2.6 to 3.4 million tonnes per year by 2015. There are three main initiatives within the NAIP actively targeted towards the increase in fertilizer use: (1) the Organic Fertilizer Development Programme (OFDP) promotes the use of organic fertilizer though a Public Private Partnership (PPP) approach; (2) the Fertilizer

Quality Control (FQC) project aims at increasing the quality of fertilizer used and distributed; and (3) the National Foundation Seed Multiplication aims at releasing high quality foundation seeds to certified producers. (Cadoni and Angelucci, 2013).

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vi. Cross-commodity price support measures

Guaranteed Minimum Price. The Guaranteed Minimum Price Programme is the follow-up to the Buyer of Last Resort Grain Programme, formerly run by the Food Reserve Agency. The Buyer of Last Resort Grain Programme's main goal was to develop a buffer stock to respond to shortages of cereals, as well as to influence prices by purchasing cereals when markets prices are below an intervention threshold (WTO Review, 2011). In 2008, in response to the high food prices crises, the Government encouraged producers by indicating that they would prevent prices from falling below a minimum by purchasing excess produce (FAO, 2008).

vii. Trade policy measures

Nigerian has only partially implemented the 2005 ECOWAS Common External Tariff Regime (CET). The country issued in 2008 a CET Book to harmonize its tariffs within the CET, including a five tariff bans systems and the reduction of import duties on a number of items including rice. The ECOWAS CET was modified in 2009 to include a fifth higher band of 35%, in addition to the four tariff bands (from 0 to 20%) which the ECOWAS member states originally agreed upon, to meet Nigeria's request to protect its nascent industries and sub-sectors. Nigeria is currently applying the 35 per cent tariff line on 167 tariff line items. None of these items has non-zero import value (World Bank, 2010).

The country's average MFN (Most Favourite Nation) tariff stands at 12 per cent, while the average tariff for agricultural products is 16.5 per cent. Building on its restrictive regional trade policy approach, Nigeria adopted a protectionist stand with its other international counterparts. Although the adoption of the CET shows the political will to adopt trade and investment reform to harmonize policies within the region, there is still resistance in embarking on further reform. Importing in Nigeria is still subject to multiple difficulties, such as frequent policy changes in tariffs, duties and procedures, along with often unclear and inconsistent interpretation of rules by the Nigerian Customs Service (NCS) (USTR, 2009).

- **Nigerian economy and rice production since 2015-2021**

On arrival to office, Buhari's administration began a process of revolutionizing the agricultural sector. His principal target is to boost rice production. According to Bolaji Odumade, between 2005 and 2015, Nigeria monthly import bill rose from N148 billion to N917 billion and most of them imported food items can be produced in Nigeria (Odumad, 2016b:16). Just before the institutionalization of the Central Bank of Nigeria "Anchor Borrowers" programme to enhance rice production, available records show that in 2006 alone in the space of 5 months, a total of 24,992 metric tons of rice valued at N2,335,131,093 were imported through the land borders ("Protecting Local, 2018). Furthermore, the report noted a total of S5bn worth of different goods including rice are smuggled into Nigeria annually through Benin Republic alone. ("Protecting Local," 2018).

The Federal Government on November 17, 2015 introduced the Anchor Borrowers Programme to enhance rice production (Olafioye, 2019). The economic implication of this policy is that within 2 years in late 2017, rice importation from Thailand fell from 644,131 metric tons in September 2015 to 20,000 metric tons in September 2017, a drop of over 90% was witnessed (Olafioye, 2019).

The Federal Government has encouraged the introduction of various varieties of rice. As of 2018, available species include R8, CP, 308, Max, and Apia (Odogwu, 2018). The price of rice in 2018 is as follows: "R8 was sold N5000 or N5200, CP or 308 is N5,600, and Max was sold for N6000." (Revolutions, 2019). With recent improvement in de-stoning and milling of rice, the consumption rate of local rice has gone high. Unfortunately, many people still believe that locally made rice are full of sands and stone. Nigerians are not very patriotic when it comes to patronizing indigenous made food.

In 2017, Ebonyi State Government got N3 billion from the Federal Government of Nigeria and it was distributed to 14,642 farmers (Paulinus, 2018). This is an improved outcome compared with the development in the rice sector in 2016. About 150 hectares of land was mapped out by the state government for rice cultivation in 2016 while in 2017 about 250 hectares of land was developed for rice cultivation (Odogwu, 2018). By 2018, rice farmers increased to 35,636 and tons of new breeds of rice was procured (Odogwu, 2018). For example, FARO 44 and other breeds of rice were shared to farmers. In addition, the Ebonyi Fertilizer Company has been reactivated as NPK 12:12:17 and NPK 20:10:10 was shared to farmers to boost production (Odogwu, 2018).

The Federal Government on its own has encouraged so many states in Nigeria for the purpose of boosting rice production. In Cross Rivers State, the federal government in June 2018 commissioned rice seedling factory with the hope that the factory will produce rice resistant seedling capable of improving rice production from three tons per hectare to nine tons per hectare (Dailysun, 2019). In the first quarter of 2019, Edo state got N5 billion from the Central Bank of Nigeria under the Commercial Agric Credit Scheme for rice and maize production. The government target is to harvest 17,000 tons of rice from about 4,400 hectares of land in Iguoriakhi, Iguomon, Illushi, Warraki and Agenebode. An estimate of N1.2 billion will go for rice cultivation, N2.2 billion for crop production, and N2.3 billion for land allocation (Edo Government, 2019).

In spite of so many successes recorded by President Buhari’s administration in rice production, sufficiency is yet to be attained. A lot of factors still militate against the government diversification programmes especially with emphasis on rice production. For example, a good number of rice farmers are yet to have access to reliable supply of high-quality local paddy, as dry season production is yet to be practicable in Abakaliki (Revolutions, 2019). Furthermore, flooding and other natural factors like birds also militate against rice farming. It is important to state that rice production should be treated as private agro business. Rice farmers must be identified, given subsidy like fertilizers and loans irrespective of their party affiliations. The Central Bank of Nigeria must work with farmers as cooperatives and not necessarily disbursing funds to state governors who pay counter pact funds and more less use the money given to them to finance political activities and elections.

Unlike previous political dispensations, rice farmers within the period of 2015 to 2019, now have sign of relief in terms of patronage. One of the rice farmers attests as follows: Nigeria and rice farmers have not had it so good like this. Today, there are organized market for rice farmers to sell their paddy rice directly to the companies and making profits not through their agents again who have been making money and subjecting us to debts (Olafloye, 2019). In addition, rice smugglers have not given up and their activities undermine federal government effort to boost local rice production. In 2018, 5 billion USD worth of goods including rice was smuggled into Nigeria ("Protecting Local," 2018). An estimated volume of over 2 million metric tonnes of parboiled rice was smuggled into Nigeria (Odogwu, 2018).

Following the closure of land borders in August 2019 to December 2020 by the Federal government of Nigeria with the hope to boost local rice production, the impact was captured in a report as follows: Since Nigeria closed its land borders, the price of rice, a major staple in the country has been on the rise. According to a report by Business Day Newspaper, the price of a 50kg bag of imported rice, which was selling at N14,500 before the closure of the border, now sells for N27,000. Locally produced rice has not been left out of the party as the price of Lake rice (a product of an alliance between Lagos State and Kebbi State) has increased 22% to N16,500 from N13,500 before the closure of the border (Border Closure Hitting The Price of Rice, 2021)

The closure of the border against rice importation and the increase in tariff of rice coming into Nigeria by 70% was in the interest of the nation's economy. Regrettably, the corruption virus that has eaten deep into the nations fabrics also contributed in the inflation of the prices of local rice. There was relatively not adequate supply because the funds released to farmers by stake holders was not sufficient to engage in mechanized farming as expected. The road networks leading to rice

The Federal Government on its own has encouraged so many states in Nigeria for the purpose of boosting rice production. In Cross Rivers State, the federal government in June 2018 commissioned rice seedling factory with the hope that the factory will produce rice resistant seedling capable of improving rice production from three tons per hectare to nine tons per hectare (Dailysun, 2019). In the first quarter of 2019, Edo state got N5 billion from the Central Bank of Nigeria under the Commercial Agric Credit Scheme for rice and maize production. The government target is to harvest 17,000 tons of rice from about 4,400 hectares of land in Iguoriakhi, Iguomon, Illushi, Warraki and Agenebode. An estimate of N1.2 billion will go for rice cultivation, N2.2 billion for crop production, and N2.3 billion for land allocation (Edo Government, 2019).

Farms have not been constructed and hoarding of rice by farmers to create artificial scarcity also contributes to this setback. The storage facilities built in Abakaliki areas are now like relics of artifacts for future museum. There is no renewed efforts to establish a kind of cooperative that will provide the needs of the rice farmers at the grass root. The Buhari administration's dream of self sufficiency in rice production could still be fully realized if the grass root farmers are identified and their needs provided directly.

2.2 Theoretical framework

Various theories and framework that serves as guide to this study are presented in this section.

2.2.1 Social Cognitive Theory

The Social Cognitive Theory postulates that people operate cognitively on their social experience which eventually influences their behavior and development. (Bandura, 1986). This theory opened up the fact that human behavior is dynamic and of correlated interaction between a person and his environment. The influences of individual, personal or individual cognitive and factors of the environment determine how people interact and learn from each other. This theory also explains the effects of background characteristics such as age, sex, years of experience, marital status educational qualification, occupation, etc, on believe system of individuals. It is therefore important to note that in understanding farmer's behavior, one must take into account both the farmer's life history of learning and experiences as well as the environment which include the stimuli that the person is aware of and responding to. The farmer's individual characteristics as well as his/her environment are thus important in the study of how farmers utilize value chain in rice production.

2.2.2 Theory of Reasoned Action (TRA)

This theory states that an individual's intention to adopt an innovation is influenced by his attitude toward the behaviour and subjective norm (Tooraj and Sahel 2011). A person's behaviour is determined by his intention to perform the behaviour. The attitude towards performing the behaviour is an individual's positive or negative belief about performing the specific behaviour. Therefore, attitudes are the beliefs a person accumulates over his lifetime. This theory also opines that the intention to perform behaviour depends upon the product of the measures of attitude and subjective norms (Hillmer, 2009). If a person perceived that the outcome of behaviour is positive, he will have a positive attitude towards performing that behaviour and vice versa (figure 2.4). Subjective norm is beliefs about what others will think about the behaviour; in other words, the perceived influences of social pressure on an individual to perform or not perform the behaviour. The person believes that specific individual or groups think he should or should not perform the behaviour and his motivation to comply with the specific references (Tooraj and Sahel, 2011). Therefore, if societies see behaviour as positive, individual will be motivated to meet up with the expectation of the societies, then a positive subjective norms is expected.

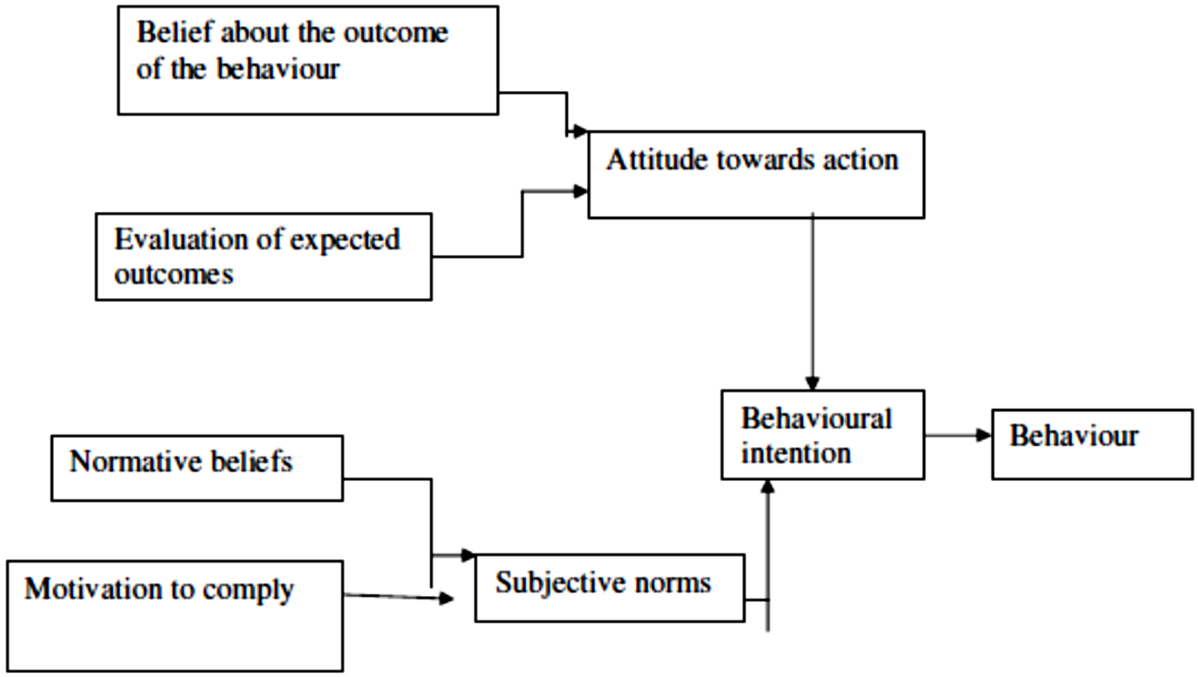

Figure 2.4: Theory of Reasoned Action (TRA) Model

Source: Tooraj and Sahel (2011).

2.2.3 Theory of Planned Behaviour (TPB)

TPB is one of the most widely used models in explaining and predicting individual behavioural intention and acceptance of technology. TPB is an attitude intention-behaviour model, which says that an individual's behaviour is determined by perceived behavioural control and intention. An attitude, subjective norm, and perceived behavioural control, in turn determine intention (Tooraj and Sahel, 2011). The TPB proposed that an individual's intention to perform an act is affected by his attitude towards the act, subjective norms and perceived behavioural control (Ozdemir and Trott 2009).

According to theory of planned behaviour (TPB), an individual's behaviour is determined by behavioural intention and perceived behavioural control, and behavioural intention is determined by attitude towards behaviour, subjective norm and perceived behaviour control. Attitudes towards behaviour reflect one's favourable or unfavourable feeling of performing behaviour. Subjective norm reflects one's perception of others relevant opinions on whether or not he or she should perform a particular behaviour. Therefore, perceived behavioural control reflects one's perception of the availability of resources or opportunities necessary to perform behaviour (Haghighinasab, 2009). In line with the above, it is observed that the difference between this theory and TRA is the addition of behavioural intention and perceived behavioural control therein. However, Kathryn (2010) employed the behavioural approach to understand rice farmers' technology adoption decisions in Nigeria.

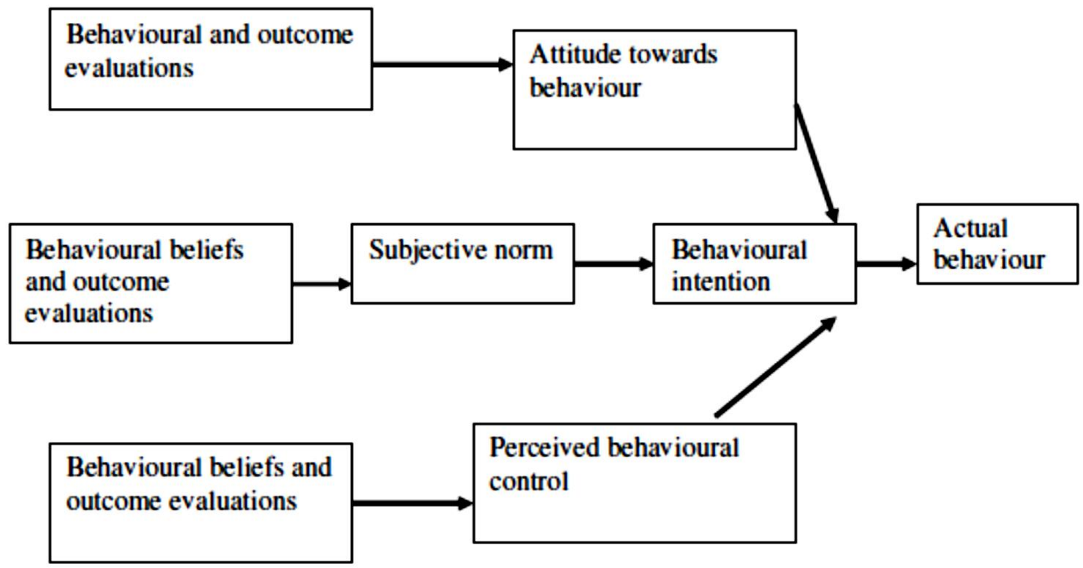

Figure 2.5: Theory of planned behaviour (TPB) model

Source: Tooraj and Sahel (2011).

2.2.4 Technology Acceptance Model (TAM)

This model states that an individual's perceived usefulness and perceived ease of use of a particular information system influences his attitude towards using that system, which affects the intention to use the system and in turn their actual use of the information system (Hillmer, 2009). According to Tooraj and Sahel (2011) the goal of TAM is to explain what determines acceptance and behaviour across a broad range of end-users (figure 11). However, TAM employed the TRA model to the domain of user acceptance of information technology and replaced the TRA model's attitudinal determinants with two beliefs; (a) perceived ease of use – means the degree to which a person believes that using a particular system would be free of effort. (b) Perceived usefulness – means the degree to which a person believes that using a particular system would enhance his or her performance (Yahyapour, 2008). However, TAM was found to be a simpler, easier to use and more powerful model to uncover what determines user acceptance of information technology (IT) while both models satisfactorily predicted an individual's attitude (satisfaction) and behavioural intention. TAM is popularly used in business management literature to interpret the adoption of computers, internet use, e-commerce and other technologies.

Study of Huang, Lin and Chuang (2007) disclosed that TAM model worked very well in determining adoption of mobile learning by students. The study further shows that perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of user perception of m-learning; however, the usefulness of mobile technology was a vital characteristic of adoption.

2.2.5 Value chain theory as proposed by porter (1985)

Porter's (1985) theory is used to explore firm's competitive advantages through differentiation or cost leadership strategy. He breaks company's value chain down into individual activities with the aim of allowing the firm conceptualize which parts of its operation creates and doesn't create value (Ketchen and Hult, 2007). According to Herget and Morris (1989), goods and services will improve their worth as they go through the vertical streams of firm's production process. The profit or margin will be generated if improved value exceeds the costs. Porter (1985) distinguished the firm's support activities and primary activities. Those involved in physical creation of the product, distribution and sales as well as after sales service were referred to as primary activities. They mainly consist of sales and after sales service, market interrelations, outbound logistics, marketing, inbound logistics, operations and product interrelations (Ireland *et al*. 2009; Mowen and Hansen, 2011).

Moreover, primary activities are involved in value adding activities which are seen by customers as improving utility to the product which they purchase (Lanen *et al*. 2008). Support activities provide assistance necessary for primary activities. This mainly involves the technology interrelations (technology development), procurement interrelations (procurement) as well as infrastructure interrelations such as firms' infrastructure and human resource management (Lanen *et al*., 2008). The relationship of this model with the proposed study is that, value chain is maximized with minimal costs while all the activities of the company are linked efficiently together. This has always been the ultimate target of a well-planned value chain (Lynch, 2003). The result of adding together the total value and the cost of creating value is according to Porter, (1985) the margin. Total value is referred to as the price the customer is willing to pay (Macmillan and Tampoe, 2000). The organisation culture according to Johnson *et al*. (2008) has a great impact in creating value since culture is the way people perform their activities and should be difficult to copy especially by competitors. This model however, according to Morden, (1999), excluded certain key aspects such as market creation, strategy, customer service and distribution from the main service. The service can also not be stored as per Porter, (1985) recommendation.

2.2.6 Theory of perceived attribute

The perceived attribute theory posited five attribute upon which an innovation is judged: 1. Triability- that it can be tried, 2. Observability- that the result can be observed, 3. Relative advantage- that it has an advantage over other innovations or the present system, 4. Complexity- that it is not complex to learn or use, 5. Compatibility- that it fit in or compatible with the existing system under which it will be adopted.

The theory also holds that an innovation will witness an increased rate of adoption if potential adopters perceive that the innovation; can be tried on (a) limited basis before adoption (b) offers observable result; (c) has an advantage relative to other innovation; (d) is not complex and (e) is compatible with existing practices and values (Surry 1997, Hillmer

2009). With reference to the above, it is vital to know that perception is attitudinal and changes with individual adopters, therefore, it is unfair to classify some individuals as low adopters since what one perceive as important may be less important to the other. In other words, what farmer A perceives as important may be perceived less important by farmer B in the social system.

2.2.7 Theory of social judgement

Folarin, (1998) adjudged that this theory emanates from the socio-cultural model of persuasion. The theory explains that attitude is continuum and that a person's persuasible tendency on any given issue, or component depends on where the component falls in his attitude continuum.

2.2.8 Theory of symmetry

This theory is also a persuasion theory. It explains that when two dissimilar individuals hold divergent views, there is internal consistency for both of them and also *a pull towards symmetry,* the strength of the pull depends on the degree of likeness and consequent liking. It therefore pre-dispose the tendency of people to change their behavior so as to be in agreement with the value source. This theory can be adapted to explain the fact that there is pull toward symmetry between government policy and rice farmers with the assumption that the farmers could see something valuable that appeal to them in the rice initiative policy and in addition the government in turn see the potentialities in achieving their goal in the rice farmers.

2.3 Conceptual framework

The conceptual frame work depicts a schematic representation of the inter-relationship of key factors or variables. It shows how the dependent, independent and the intervening variables affects each other. The conceptual framework is structured from a set of theories that help the researcher to understand the problem being looked at. It therefore defines the orientation of the study. The independent variables of this study are selected personal characteristics of the respondents which include age, sex, year of experience, marital status, educational qualification, occupation and family size. All these variables are expected to influence the activities that add value to rice which include threshing, winnowing, drying, parboiling, cleaning, dehusking, transportation and storage. The independent variable will also influence the attitude of processors to value addition. The activities that add value to rice will also be affected by constraints encountered in rice processing. Similarly, activities that add value to rice will also be affected by accessibility to agricultural support services. The intervening variables of this study include government policy on importation as well as agro-chemicals.

The dependent variable of this study is derivable benefit from addition of value to rice. This is influenced by the selected personal characteristics of the respondents, accessibility to agricultural support services, attitude and constraints encountered as well as government policy on importation as well as agro-chemicals. For instance, the higher the level of accessibility to agricultural support services, the better the derivable benefits in the addition of value to rice and hence derivable benefit.

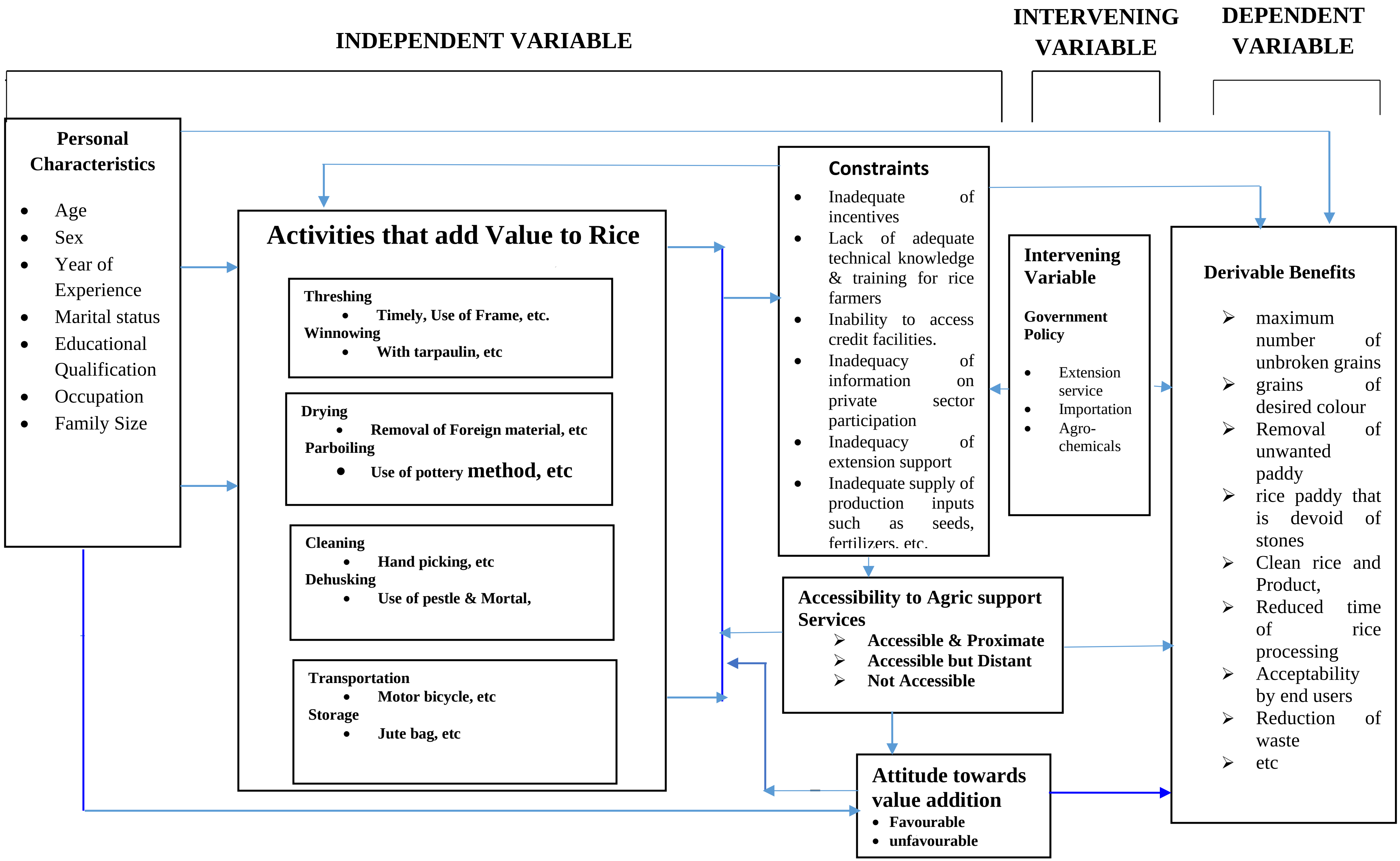

FIG. 2.6 CONCEPTUAL FRAMEWORK ON DERIVABLE BENEFITS ALONG VALUE ADDITION NODES AMONG RICE PROCESSORS IN NORTH-CENTRAL, NIGERIA

CHAPTER THREE

METHODOLOGY

This chapter examines the various research methods that are employed to solicit for information from respondents as well as the statistical tools that are used to analyse obtained data.

3.1 Study area

The study was conducted in North-Central Nigeria which comprises of the Federal Capital Territory (FCT) and six other states which are Benue, Niger, Kwara, Nasarawa, Kogi and Plateau States. North Central Nigeria occupies a strategic agricultural zone with a population of 20.4 million people with an average population density of 47persons/km^2 (NPC 2006). The rural population of North Central Nigeria constitutes up to 77% of the population and their primary occupation is farming (Tologbonse, 2004).

3.2 Population of the study

The population of the study consists of all processors registered with the Agricultural development programme in North Central Nigeria.

3.3 Sampling procedure and sample size

A multi-stage sampling procedure was used to select respondents for the study.

Stage 1- Two North-Central states of Nigeria; Kwara and Niger were purposively selected based on their high production of rice.

Stage 2-Ten per cent (10%) of the sixteen (16) Local Government areas in Kwara State that have large scale involvement in rice production were purposively selected. Similarly, ten per cent (10%) of the twenty-five (25) Local Government Areas of Niger State that have large scale involvement in rice production were also purposively selected.

Stage 3- Ten per cent (10%) of rice growing communities were also purposively selected.

Stage 4- Lastly Ten per cent (10%) of the population of registered processors in each of the selected rice growing communities in the selected Local Government areas were systematically selected as the sample for the study.

Table 3.1: Sampling of respondents

Selected States	No. of Local Governments	Ten (10%) of Local Government	10% of Selected rice growing communities in the selected Local Government Areas	Population of Registered processors	Ten (10%) of Population of Registered processors. (Sampled processors)
Kwara		2			
	16	Edu	Lafiagi	335	34
			Edogi	175	18
		Patigi	Lade	186	19
			Lalagi	107	11
Niger		3			
	25	Lavun	Shesi	127	13
			Doko	106	11
		Katcha	Badegi	422	42
			Kambari	115	12
		Wushishi	Maito	147	15
			Kanko	112	11
Grand Total				1832	186

3.4 Instrument for data collection

Both quantitative and qualitative data were collected for the study. Structured interview schedule was used to collect quantitative data for the study while Focus Group Discussion was used to collect qualitative data. Ten (10) FGDs were conducted in all. Five (5) each from each state of Kwara and Niger. About ten participants were selected for each FGD to collect qualitative data that are related to:

1. personal characteristics of processors in the study area,
2. the activities that add value to rice in the study area,
3. the attitudes of farmers towards value addition to rice in the study area,
4. the accessibility of agricultural support services towards value addition in the study area,
5. the derivable benefits by processors from value additions along the value chain, and
6. the constraints encountered in the addition of value in the study area

3.5 Pre-testing of instrument

The instruments developed for data collection were pre-tested among rice processors in Ogun State.

3.6 Validation of instrument

The instrument for data collection were subjected to content and face validity with the help of the project supervisor, experts from the Department of Agricultural Extension and Rural Development, University of Ibadan, Ibadan, Nigeria, and extension officers in Agricultural Development Programme offices in the two states.

3.7 Test of reliability of instrument

The reliability of the instrument was tested using the split-half method. A reliability co-efficient of 0.75 was obtained and considered appropriate for the study.

3.8 Administration of the instrument for data collection

Enumerators were trained to assist in administering the instrument on the respondents.

3.9 Measurement of variables

3.9.1 Independent variables

Section A: Selected Socio-economic Characteristics

1. Age: Respondents' age was measured in years at interval level.
2. Sex: Respondents' sex was stated as whether they are male or female.
3. Years of experience: Respondents' actual years of experience were obtained in years, hence measured at interval level.
4. Marital status: Respondents indicated whether they were single, married, divorced and widowed. This was measured at nominal level.
5. Educational Qualification: Respondents stated their highest educational qualification from options such as: No formal education, Primary school, Secondary school, Tertiary institution and others to be specified. Scores of 0,1,2,3 and 4, hence measured at ordinal level.
6. Primary Occupation of the respondents: Respondents stated their major occupation whether Farming, Fishing, Trading, Artisan, Civil service or any others one specified. This was measured at nominal level.
7. Family Size: Respondents stated the size of household, hence measured at interval level.
8. Source of Labour: This was measured at nominal level as respondents stated their source of labour from a list consisting of; Family, Hired, Friends, Family and Hired, Family and Friends, Self and Hired.

Section B: Operationalization of other variables

1. Activities that add value in rice value chain.

Respondents were asked to identify the various activities that lead to addition of value in rice industry in terms of time value, place value, product value and price value on the basis of different nodes of rice value addition that include threshing, winnowing, drying, parboiling, cleaning, de-husking, transportation and storage. This was measured on a scale of 1-5 to determine the extent of value added, where score of 1 is for low value, 2 is for fair value, 3 for moderate value, 4 for very great value and 5 for excellent value. The scores were pulled/aggregated together to get a total score of 20, mean scores were calculated and determined. A mean and above mean score therefore represented high level of value while below mean score indicated low level of value.

2. Attitude of actors towards value addition in rice value chain in the study area

In measuring respondents' attitude towards value addition, respondents were asked to appropriately responds to sets of attitudinal statements using a five (5) point's likert-type scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree, Strongly Disagree (SD). In operationalizing this variable, positive statements attract scores of 5 for strongly agree (SA), 4 for agree (A), 3 for undecided (U), 2 for disagree (D) and 1 for strongly disagree (SD) respectively. For negative statements, scores 1 for strongly agree (SA), 2 for agree (A), 3 for undecided (U), 4 for disagree (D) and 5 for strongly disagree (SD) respectively. The highest score was 100 while the lowest score was 20. A high score means high level of attitude and low score means low level of attitude.

3. Accessibility of agricultural support services towards rice value addition in the study area

Respondents were asked state how accessible are the various support services in rice value addition from a list that include; finance provider, extension/advisory services, government support, non-governmental organization (input supply, transportation, processing, marketing, etc) and farmers' association. A three (3) points scale of: accessible and proximate (AP), accessible but distant/far (AF), and not accessible (NA) was used to operationalize this variable. Scores of 2 were assigned for accessible and proximate (AP), 1 for accessible but distant/far (AF), and 0 for not accessible (NA). Responses were obtained to determine access to the support services. Minimum and maximum scores were aggregated and mean score of accessibility were calculated. A mean and above mean score therefore represented high level of accessibility while below mean score will indicated low level of accessibility.

4. **Derivable benefits by processors from value addition**

Respondents were asked to indicate derivable benefits from value addition. This was measured on a three (3) point scale of no benefit, low benefit and high benefit. Score of 0 was assigned to no benefit, 1 to low benefit and 2 to high benefit.

Some of the items used in the measurement include; actualization of maximum number of unbroken grains, actualization of grains of desired colour, realization of Removal of unwanted paddy, realization of rice paddy that is devoid of stones, prevention of ineffective separation of rice and foreign materials and impurities, etc

The respondents' scores were summed up and mean were obtained. Respondents with a score below the mean were categorized as having low benefit, while those with mean scores and above (≥) were categorized as having high benefit.

5. **Constraints encountered in the various rice value addition among farmers in the study area**

Respondents were asked to indicate the constraints encountered in rice in the addition of value to rice. These constraints encountered were measured on a three (3) point scale of no constraint, low constraint and high constraint. Score of 0 was assigned to no constraint, 1 to low constraint and 2 to high constraint. The respondents' scores were summed up and mean was obtained. Respondents with scores below the mean were categorized as having low constraints, while those with mean scores and above (≥) were categorized as having high constraints. The constraints were also ranked to determine how severe the constraints were rated by the respondents.

3.10 Analysis of data

The quantitative data for the study was determined by using the statistical packages for social science (SPSS). Using the software, data were described with the use of descriptive statistics such as means, frequency distributions and per centages. Stated hypotheses were tested using appropriate statistical tool as follows:

Hypotheses of the study

Ho_1: There is no significant relationship between rice processors' selected personal characteristics and the derivable benefits from value addition in rice industry. (Chi square was used for characteristics at nominal level and PPMC was used for characteristics at interval level)

Ho_2: There is no significant relationship between the attitudes of processors towards value addition and derivable benefits from value addition. (PPMC)

Ho_3: There is no significant relationship between constraints encountered in the addition of value and the derivable benefits from value addition in rice industry. (PPMC)

Ho_4: There is no significant difference in the derivable benefits by processors with different level (low and high) of value addition across the states. (T-Test)

Ho_5: There is no significant difference in the derivable benefits by respondents involved in value addition across the states. (T-Test)

Ho_6: There is no significant contribution of value addition to derivable benefits in rice industry. (Multiple regression)

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Chapter overview

This chapter deals with the analysis of data generated during and after the administration of research instruments to the respondents, results presentation, interpretation and discussion of findings. The results presentation covers personal characteristics which include age, sex, years of experience, marital status, educational qualification, primary occupation, family size, religion and source of labour. Other results of discourse in this chapter include that of rice value addition activities, attitudes of processors towards value addition to rice, accessibility of agricultural support services towards value addition, derivable benefits by processors from value additions, as well as the constraints encountered in the addition of value in the study area.

4.1 Personal characteristics of the respondents

The results and discussion of the personal characteristics of the respondents were presented to show some important and basic information of the respondents as it affects the issue of value addition in rice production.

4.1.1 Age of respondents (years)

Table 4.1 shows the personal characteristics of the respondents. In Kwara, more of the respondents (31.7%) were between 40-49 years of age with a mean age of 40.0±9.8 years. In Niger, the result on age distribution shows that more of the respondents (46.2%) were between 30-39 years of age with a mean age of 39.3±8.9 years. On the overall, more of the respondents (38.7%) fall within the age bracket of 30-39years of age with overall mean age of 39.6±9.3years. Results on age imply that most of the respondents are still very much in their active age. This is in line with the findings of Abolagba and Osifo (2004) who pointed out that economic activities especially processing are energy sapping and are dominated by active the age group.

4.1.2 Sex of respondents

The sex of respondents is presented in Table 4.1. The female folk were the dominant sex in both Kwara and Niger States with a percentage of 68.3% and 72.1%, respectively. On the overall, 70.4% female were involved in rice value addition activities in the study area. This shows a significant majority of the female folks. This implies that in most cases, the aspects of carrying out activities that improve and add value to agricultural products are mostly done by the female. This is supported by the assertions of Danyo (2013), Ofosu-Budu and Sarpong (2013) and Osei-Amposah (2013) that value addition activities particularly processing is women’s industry. Similarly, Ugwuanyi, Balogun, Akinyemi, Balogun and Zungum (2008) also supported the result of this research by reporting that female has higher percentage involvement in processing of locally milled rice and marketing in Enugu State of Nigeria.

4.1.3 Years of experience in rice processing

The result on years of experience is also presented in Table 4.1. In Kwara, 34.2% were found to have less than 11 years of experience, while in Niger 41.4% of the respondents had between 11-15 years of experience. On the overall, it was found that more of the respondents (36.6%) also had between 11-15 years of experience with an overall mean years of experience of 14.0±7.0 years. This implies that most of them are very conversant with the activities of adding value to rice and as such are favourably disposed to the various responsibilities involved in the addition of value. It can then be deduced that their years of experience on the value addition activities will contribute to their dispositional dexterity. This is in line with the submission of Tijani, *et al.* (2010) who reported that Nigeria farmers and processors have reasonable experience in their various activities.

4.1.4 Marital status

The married ones were very much more in population than their unmarried counterparts in the distribution on Table 4.1 for both states. In Kwara, 4.9% of the respondents were single, 79.3% were married, 3.7% were divorcees and 12.2% were widows. In Niger, 5.8% of the respondents were single, 83.7% were married, 3.8% were divorcees and 6.7% were widows. On the overall, 81.7% of the respondents were married while only 5.4%, 3.8% and 9.1% were single, divorced and widowed, respectively. This shows that substantial population of the respondents were responsible. This is rightly supported by Achoja (2016) who opined that married people have tendencies for settled business life and take advantage of family labour.

4.1.5 Educational qualification

Table 4.1 also reveals the educational qualification of respondents and it was found that more of the respondents in the study area had primary school leaving certificate as their highest qualification. In Kwara, 15.9% of the respondents do not have formal education, 43.9% had primary school certificate, and 31.7% were secondary school certificate holders, while only 8.5% of them had tertiary education. In Niger, 5.8% had no formal education, 45.2% were holders of primary school certificate, and 41.3% had secondary school education while 14.0% of the respondents had tertiary education. It must be pointed out that only 1.0% of the respondents had other certificate that was not listed. On the overall, 10.2% had no formal education, 44.6% had primary school certificate, 37.1% had secondary school certificate, while tertiary institutions and other certificate holders were 7.5% and 0.5%, respectively in the distribution. This implies that substantial population of the respondents still needs to be lettered. The low level of education may predispose them to low access to information. This situation might affect their value addition activities as their level of education which is currently low greatly determines their knowledge and influence their access to education. It should be noted that despite the fact that most of the respondents had low educational status, they still have one form of education or the other. This can be substantiated by the submission of some of the FGD participants who reiterated that:

> *"We use to attend Islamic school in the evening under the tutelage of an Islamic scholar. This is better for us than the formal school system"* (FGD, Edogi community, Edu L.G.A Kwara)

4.1.6. Primary occupation

Farming is the primary occupation of most of the respondents in both states as reported in Table 4.1. In Kwara, 51.2% of the respondents had farming as their primary occupation. Other respondents in Kwara engaged in fishing (13.4%), trading (19.5%), and being artisans (9.8%) and in civil service (6.1%). In Niger, those that were primarily engaged in farming were 56.7% of the distribution, 6.7% engaged in fishing and 26.9% were traders. It was also found that those involved in trading were into businesses that are related to agriculture. This implies that farmers are mainly responsible for the addition of value to rice. The finding substantiates the assertion of Ozor, *et al.* (2012) who believed that respondents that were primarily farmers will devote more time to pre and post planting operations.

4.1.7 Family size

The family sizes of the respondents is presented in Table 4.1. In Kwara, 35.4% of the respondents had between 1 and 5 members in their family, 56.1% of them had between 6 and 10 members, while 8.5% had between 11 and 15 members. In Niger, 35.6% of the respondents had less than 6 members, 56.7% of them had between 6 and 10 members, 5.8% of them had between 11 and 15 members while 1.9% had more than 15 members in their family. On the overall, 35.5% of the respondents had less than 6 members in their family, 56.5% of them had between 6 and 10 members, 7.0% of them had between 11 and 15 members while 1.1% of the respondents had more than 15 members. This result clearly shows that most of the respondents in both States had between 6-10 members in their family with mean family size of 6, 7 and 6 persons for Kwara, Niger and on the overall, respectively. This therefore substantiates the fact that most of them were married and had more individuals in the family that can support value addition. This is in line with the position of Olajide, (2015) who submitted that large household size do provide the required labour in crop production.

4.1.8 Religion

People’s belief and mode of worship in a heterogeneous society cannot be underestimated as it plays some major roles in the way of life of the concerned individuals. Islam is mostly practiced than Christianity in both states of the study area. Specifically, in

Kwara, 86.6% of the respondents were Muslims while 13.4% were Christians. In Niger, 87.5% were Muslims, while 12.5% were adherents of the Christian faith. On the overall, adherents of Islamic faith constitute 87.1% of the population, while their Christian counterparts were 12.9%. This aligns with Hassan *et al.* (2017) assertion that home based processing activities were mostly carried out by Muslim women in Mozambique. It is not far-fetched to conclude that Muslim women were found to be much more in this study due to the fact the Islamic religion give high credence to women working at home than outside.

4.1.9 Source of labour

The various sources of labour identified in this study were family, friends, family and hired, family and friends and self and hired. In Kwara, 36.6% of the respondents used family as their major source of labour, 12.2% used friends, 17.1% used the combination of family and hired, 11.0% used the combination of family and friends, while 23.2% used a combination of self and hired. On the other hand, in Niger, 34.6% of the respondents used family as their major source of labour, 4.8% used friends, 25.0% used the combination of family and hired, 13.5% used the combination of family and friends, while 22.1% used a combination of self and hired. On the overall, the most utilised source of labour was the family (35.5%). 8.1% of the total respondents used friends, 21.5% used family and hired, 12.4% used family and friends and 22.6% used self and hired as their various sources of labour. This is in line with findings of Ejiogu and Okoli (2012) who posited that farm family especially children and women usually spend hours on daily basis from 7am-6pm scaring birds during the milk stage and during processing in rice production.

Table 4.1: Distribution of respondents' personal characteristics

	Kwara (n = 82)		Niger State (n=104)		Total n=186	
Variables	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Age(Years)						
Less than 30	16	19.5	11	10.6	27	14.5
30 – 39	24	29.3	48	46.2	72	38.7
40 – 49	26	31.7	34	32.7	60	32.3
50-59	16	19.5	7	6.7	23	17.4
60 – 69	0	0.0	4	3.8	4	2.1
$\overline{X}$±SD	40.0±9.8		39.3±8.9		39.6±9.3	
Sex						
Male	26	31.7	29	27.9	55	29.6
Female	56	68.3	75	72.1	131	70.4
Years of experience in rice processing						
Less than 11 years	28	34.2	39	37..5	67	36.0
11 – 15years	25	30.5	43	41.4	68	36.6
16 – 20years	7	8.5	12	11.5	19	10.2
21 – 25years	12	14.6	5	4.8	17	9.1
More than 25 years	10	12.2	5	4.8	15	8.1
$\overline{X}$±SD	15.0±7.3		13.3±6.8		14.0±7.0	
Marital status						
Single	4	4.9	6	5.8	10	5.4
Married	65	79.3	87	83.7	152	81.7
Divorced	3	3.7	4	3.8	7	3.8
Widowed	10	12.2	7	6.7	17	9.1
Educational qualification						
No formal education	13	15.9	6	5.8	19	10.2
Primary school	36	43.9	47	45.2	83	44.6
Secondary school	26	31.7	43	41.3	69	37.1
Tertiary institution	7	8.5	7	6.7	14	7.5
Others	0	0.0	1	1.0	1	0.5

	Kwara (n = 82)		Niger State (n=104)		Total n=186	
Variables	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Primary occupation						
Farming	42	51..2	59	56.7	101	54.3
Fishing	11	13..4	7	6.7	18	9.7
Trading	16	19.5	28	26.9	44	23.7
Artisan	8	9.8	4	3.8	12	6.5
Civil service	5	6.1	6	5.8	11	5.9
Family size						
1-5	29	35.4	37	35.6	66	35.5
6-10	46	56.1	59	56.7	105	56.5
11-15	07	8.5	6	5.8	13	07.0
16-20	0	0.0	2	1.9	2	1.1
$\overline{X}$±SD	6.3±2.5		6.5±2.8		6.4±2.6	
Religion						
Islam	71	86.6	91	87.5	162	87.1
Christianity	11	13.4	13	12.5	24	12.9
Source of labour						
Family	30	36.6	36	34.6	66	35.5
Friends	10	12.2	5	4.8	15	8.1
Family andhired	14	17.1	26	25.0	40	21.5
Family and friends	9	11.0	14	13.5	23	12.4
Self and hired	19	23.2	23	22.1	42	22.6

Source: Field survey, 2016

4.2 Activities of the respondents that add value to rice production

This research work established that in the study area there are various activities in rice production that add value to final output of rice before it gets to the final consumers. These activities include timely threshing after harvest, threshing with the use of whacking frame, threshing with the use of mechanical device, threshing with the use of spread tarpaulin or mat, threshing with the use of pavement or floor, winnowing with the use of tray, winnowing with the use of basket/calabash/head pan, winnowing with the use of mechanical device, timely drying, drying for removal of foreign materials, sun drying on mat or tarpaulin, sun drying on concrete floor and drying with mechanical device. Other activities include parboiling using pottery method, steaming in metal drum, or mechanical device; cleaning using traditional handpicking method, or mechanical device; de-husking with the use of pestle and mortal, or mechanical device, transportation with the use of bicycle, cart, tractor, or motorized vehicle; storage by using jute bags or sacs and by using locally constructed silo.

4.2.1 Threshing activities of the respondents that add value to rice production

Table 4.2 shows the value addition on threshing activities. In Kwara, it was revealed that on timely threshing after harvest, respondents with scores of between 8 and 14 were 84.2%, while those with score of between 15 and 20 were 15.9%. In Niger, 78.9% had between 8 and 14 while 20.2% had between 15 and 20. On the overall, 81.2% had between 8 and 14, while 18.3% had scores of between 15 and 20. It is noteworthy that the results on value addition of timely threshing after harvest is higher in Niger than in Kwara with mean scores of 13.0 and 12.2, respectively. On the overall, a score of 12.6 was obtained as the mean for both States. The implication of this is that timeliness is directly proportional to effectiveness in agricultural production. This is corroborated by Salako, *et al.,* (2018), who asserted that agricultural activities are time bound and successes are positively affected by correct timing. On the aspect of threshing with the use of whacking frame in Kwara, it was found that 90.2% had scores of between 8 and 14 while only 8.5% of respondents had scores of between 15 and 20. On the other hand in Niger, 89.4% had scores of between 8 and 14 while 10.6% of them had scores of between 15 and 20. On the overall, 0.5% of the population had score of between 1 and 7, 89.8% had scores of between 8 and 14 while 9.7% had scores of

15 and 20. It should be noted that higher value addition score were obtained in Niger ($\bar{\boldsymbol{X}}$ =12.3) for threshing with the use of whacking frame than their Kwara counterpart ($\bar{\boldsymbol{X}}$ =11.5). Threshing with the use of mechanical device is another threshing activity that add value to the final output of rice, Table 5.2 shows that majority of the respondents had scores of between 8 and 14 in the 2 states. These amounted to 73.2% and 62.5% of the respondents in both Kwara and Niger, respectively. On the overall, 67.2% of the total number of respondents had scores of between 8 and 14.

In addition, primitive threshing with the use of spread tarpaulin or mat is another activity that leads to value addition in rice production. Majority of the respondents had score of between 8 and 14 in both Kwara (85.4%) and Niger (89.4%). In Kwara, respondents with scores between 15 and 20 were 13.4% as against 10.6% in Niger. On the overall, respondents with scores of between 8 and 14, and those with scores of between 15 and 20 were 87.6% and 11.83%, respectively with a mean value of $\bar{\boldsymbol{X}}$ =12.3.
Furthermore, primitive threshing on pavement or floor in Kwara were carried out by those with scores of between 8 and 14 were 92.7%, and those with scores of between 15 and 20 were 6.10%. In Niger, 85.6% and 14.4% were obtained for respondents with scores of between 8 and 14, and those with scores of between 15 and 20, respectively. On the overall, 88.7% and 10.8% were obtained for respondents with scores of between 8 and 14 and those with 15 and 20, respectively with an overall mean value of 12.2. It can therefore be deduced from these results that threshing with the use of mechanical device add more values to final output of rice as losses are lesser, time is well managed, products/outputs are better among others. This is supported by Appiah, *et al.* (2011) who pointed out that with mechanized threshing better output are obtained in terms of quantity, quality and timeliness when compared with other methods of threshing. Similarly, Olumuyiwa, *et al.* (2014) who stated that mechanized thresher thresh ton of rice in less than 4 days while the manual thresher takes more than a week to thresh the same quantity of rice. It is important to note that Niger has the higher mean values ($\bar{X} = 13.0, 12.3, 13.9, 12.4$ and 12.5) for all the segregated modalities of threshing discussed in this study compared to Kwara ($\bar{X} = 12.2, 11.5, 13.2, 12.0$ and 11.7) respectively.

Table 4.2: Distribution of respondents' threshing activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Threshing	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Timely Threshing after harvest									
1-7	0	0.0	12.2	1	1.0	13.0	1	0.5	12.6
8-14	69	84.2		82	78.9		151	81.2	
15-20	13	15.9		21	20.2		34	18.3	
Threshing with the use of whacking frame									
1-7	1	1.2	11.5	0	0.0	12.3	1	0.54	11.9
8-14	74	90.2		93	89.4		167	89.8	
15-20	7	8.5		11	10.6		18	9.7	
Threshing with the use of mechanical device									
1-7	0	0.0	13.2	0	0.0	13.9	0	0.0	13.6
8-14	60	73.2		65	62.5		125	67.2	
15-20	22	26.8		39	37.5		61	32.8	
Primitive threshing with the use of spread tarpaulin or mat									
1-7	1	1.2	12.0	0	0.0	12.4	1	0.5	12.3
8-14	70	85.4		93	89.4		163	87.6	
15-20	11	13.4		11	10.6		22	11.8	
Primitive threshing with the use of pavement or floor									
1-7	1	1.2	11.7	0	0.0	12.5	1	0.5	12.2
8-14	76	92.7		89	85.6		165	88.7	
15-20	5	6.1		15	14.4		20	10.8	

Source: Field survey, 2016

4.2.2 Winnowing activities of the respondents that add value to rice production

Results of the winnowing activities of the respondents that add value to rice production is presented in Table 4.3. For winnowing with the use of tray, 22.0%, 70.7% and 7.3% of the respondents had scores of between 1-7, 8-14, and 15-20, respectively in Kwara, and 23.1%, 72.1% and 4.8%, respectively for Niger. A mean value of 7.7 was obtained for Kwara for winnowing with the use of tray ($\bar{X} = 7.7$) while in Niger a mean value of 7.9 was obtained**.** On the overall, 22.6%, 71.5% and 5.9% of the respondents had scores of between 1-7, 8-14 and 15-20, respectively with a mean of 7.8 for primitive winnowing with the use of tray**.**

Table 4.3 also shows that in Kwara, 24.4% of the respondents had scores of between 1 and 7, while 72.0% had scores of between 8 and 14 for primitive winnowing with the use of basket/calabash. In Niger, 24.0% of the respondents had scores of between 1-7, whie 69.2% had scores of between 8-14, for extent of value addition with the use of basket/calabash. With an obtained higher mean value ($\bar{X}$=8.2) for Niger than Kwara ($\bar{X}$=7.9), it can be deduced that more individuals use basket/calabash for winnowing in Niger. This may be attributed to availability of basket/calabash more in Niger than in Kwara as well as preference in the respective states

For winnowing with the use of mechanical device, result of this study found out that 93.9% of respondents had scores of between 8 and 14 in Kwara. In Niger, 83.7% of the respondents had scores of between 8-14. On the overall, 88.2% of the respondents had scores of between 8-14 with a mean value of 11.1. A higher mean value for winnowing with the use of mechanical device ws obtained in Niger ($\bar{X} = 11.2$) than in Kwara ($\bar{X}$= 10.8). It further reiterates the fact that winnowing with the use of mechanical device in Niger is much more prominent than in Kwara.

It is worthy of note to state that winnowing helps to ensure the separation of grains from chaff as well as stones and other impurities. It therefore implies that with the removal of more chaff and other impurities from rice as it is being winnowed, more value is added. However, with the obtained lower mean value, it means a lot still needs to be done to adequately make Nigeria rice soar high in a global competitive market.

Table 4.3: Distribution of respondents' winnowing activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Winnowing	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Winnowing with the use of tray									
1-7	18	22.0	7.7	24	23.1	7.9	42	22.6	7.8
7-14	58	70.7		75	72.1		133	71.5	
15-20	6	7.3		5	4.8		11	5.9	
Winnowing with the use of basket/calabash/head pan									
1-7	20	24.4	7.9	25	24.0	8.2	45	24.2	8.1
8-14	59	72.0		72	69.2		131	70.4	
15-20	3	3.7		7	6.7		10	5.4	
Winnowing with the use of mechanical device									
1-7	3	3.7	10.8	10	9.6	11.2	13	7.0	11.1
8-14	77	93.9		87	83.7		164	88.2	
15-20	2	2.4		7	6.7		9	4.8	

Source: Field survey, 2016

4.2.3 Drying activities of the respondents that add value to rice production

Drying is an essential aspect of value addition. It is necessary to ensure that rice store well since freshly harvested rice do not store properly particularly when room temperature is averagely on the high side. Table 4.4 presents the results of respondents' drying activities that add value to rice production. In Kwara, majority (87.8%) had scores of between 8 and 14, while respondents with scores of between 15 and 20 were 9.8%. In Niger, 50.0% of the respondents had scores of between 8 and 14 and the remaining 50.0% were those with scores of between 15 and 20 for timely drying after harvest. On the overall, timely drying of the rice paddy had a high mean value of 13.7, while mean value for Kwara was12. 4 and Niger was14.6.

Also, in Table 4.4, majority of the respondents in both Kwara (100%) and Niger (98.1%) had value addition scores of between 8 and 14 for drying activity to eliminate foreign materials from rice. On the overall, 98.9% of respondents had scores of between 8 and 14 for drying to remove foreign materials from rice output while 1.1% of the respondents had scores of between 15 and 20.

Furthermore, Table 4.4 shows the results of value addition activity for sun drying on mat or tarpaulin. In Kwara, 87.8% was recorded for scores between 8 and 14, with a mean value of 11.5. In Niger, 81.7% and 17.3% were consequently recorded for scores between 8 and 14 and those of 15 and 20, respectively with a mean value of 12.5. On the overall, a mean value of 12.1 shows that Niger had more individuals adding value to the final output of rice through sun drying on mat or tarpaulin (12.5) than Kwara (11.5).

Moreover, Table 4.4 shows similar results on sun drying on concrete floor with that of sun drying on mat or tarpaulin. In Kwara, 91.5% was obtained for respondents' scores between 8 and 14 with a mean value of 11.1. In Niger, 89.4% of respondents had scores of between 8 and 14, while 10.6% of respondents had scores of between 15 and 20 with a mean value of 11.8. The overall result on sun drying on concrete floor shows that 90.3% of respondents had scores between 8 and 14 with a mean value of 11.5.

Finally, addition of value to rice is also achieved when drying is done by using mechanical device, 76.8% of respondents had scores of between 8 and 14, while 18.3% of respondents had scores between 15 and 20 for Kwara with a mean value of 12.2. In Niger, 81.7% and

18.3% of respondents had scores between 8 and 14 and scores of 15 and 20 with mean value of 12.6. On the overall, a total mean scoreof 12.4 was obtained for drying with the use of mechanical device in this study. It should be noted that Niger had higher mean score relative to Kwara for all the segregated modalities of drying activities that add value to rice production. This may be due to the advantage that Niger has agro-climatologically for rice processing when compared to Kwara.

It is important to state here that drying is the most critical value addition strategy in rice processing. Immediately after harvest, rice contains not less than 25% moisture. This can predispose rice growing mould, discolouration, increase the likelihood of pest attack and reduce the viability of rice seeds for germination. With a relatively higher mean value in the distribution for timely drying, it can be deduced that the contributions of timeliness of drying is possibly a great notch to rice output. This submission is supported by Daudu, *et al.*, (2014), who emphasized that drying rice on time to between 12 and 14% moisture content gives rice longer shelf live and better quality.

Table 4.4: Distribution of respondents' drying activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Drying	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Timely drying									
1-7	2	2.4	12.4	0	0.0	14.6	2	1.1	13.7
8-14	72	87.8		52	50		124	66.7	
15-20	8	9.8		52	50		60	32.3	
Drying for removal of foreign materials									
1-7	0	0.0	10.4	0	0.0	11.8	0	0.0	11.2
8-14	82	100		102	98.1		184	98.9	
15-20	0	0.0		2	1.9		2	1.1	
Sun drying on mat or tarpaulin									
1-7	3	3.7	11.5	1	1.0	12.5	4	2.2	12.1
8-14	72	87.8		85	81.7		157	84.4	
15-20	7	8.5		18	17.3		25	13.4	
Sun drying on concrete floor									
1-7	3	3.7	11.1	0	0.0	11.8	3	1.6	11.5
8-14	75	91.5		93	89.4		168	90.3	
15-20	4	4.9		11	10.6		15	8.1	
Drying with mechanical device									
1-7	4	4.9	12.2	0	0.0	12.6	4	2.2	12.4
8-14	63	76.8		85	81.7		148	79.6	
15-20	15	18.3		19	18.3		34	18.3	

Source: Field survey, 2016

4.2.4 Parboiling activities of the respondents that add value to rice production

Parboiling is another activity that adds value to final output in rice production, although it was adjudged to be an ancient method of rice processing by Daudu *et al.,* (2014). However, this study found that it was still very much in use in Kwara and Niger as major activity of value addition. Table 4.5 shows that in Kwara, 95.1% of them had scores of between 8 and 14 with a mean value of 10.9 for parboiling with the use of pottery method. In Niger, parboiling by using pottery method had a mean value of 12.9 with majority (83.7%) of the respondents having scores between 8 and 14, while 9.7% had scores between 15 and 20. With overall mean value of 12.0 for both states, parboiling by using pottery method can be adjudged as being more prominently used to add value to rice in Niger.

The results on parboiling with the use of steaming in metal drum were also presented in Table 4.5. Findings show that 93.9% had scores between 8 and 14, On the other hand in Niger, 90.4% had scores between 8 and 14. With a mean value of 10.6 on the overall, and a higher mean value in Kwara ($\overline{X}$=10.7) compared to Niger ($\overline{X}$=10.5), it can be deduced that the respondents in Kwara prominently favours the use of steaming in metal drum for parboiling to add value to rice than their Niger counterpart.

Furthermore, Table 4.5 also shows the results of parboiling with the use of mechanical device. It was discovered that in Kwara (90.2%) and Niger (92.3%), majority of the respondents had scores between 8 and 14. On the overall, a mean value of 11.9 was obtained for both states with a higher mean value of 12.1 in Niger relative to mean value of 11.7 in Kwara. In one of the FGDs, it was reported that

> *"When rice is properly parboiled it swells better when cooked and more quantity is obtained for utilization"* (FGD female participant at Kanko community, Wushishi, Niger).

It should be noted that parboiled rice has the ability of timely digestion of sugar content of rice and as such gets the carbohydrate converted to energy which in turn becomes obtainable to the consumers. This is in line with Daudu *et al.,* (2014) that pointed out that parboiled rice is rich in Vitamin B thaiamine and niacin which help to digest sugar and convert carbohydrate to energy. This may account for why rice is also consumed as "Tuwo Shinkafa" mostly in Niger. This can also be linked to be one of the reasons why Niger has higher mean score for parboiling relative to Kwara. In addition, this finding is also substantiated by Ayodeji and Baiyegunhi (2019) who posited that well parboiled ofada rice commands better market value and hence higher acceptability by households.

Table 4.5: Distribution of respondents' parboiling activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Parboiling	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Parboiling by using pottery method									
1-7	2	2.4	10.9	1	01.0	12.9	3	1.6	12.0
8-14	78	95.1		87	83.7		165	88.7	
15-20	2	2.4		16	15.4		18	9.7	
Parboiling by using steaming in metal drum									
1-7	4	4.9	10.7	9	8.7	10.5	13	7.0	10.6
8-14	77	93.9		94	90.4		171	91.94	
15-20	1	1.2		1	1.0		2	1.1	
Parboiling with the use of mechanical device									
1-7	0	0.0	11.7	1	1.0	12.1	1	0.5	11.9
8-14	74	90.2		96	92.3		170	91.4	
15-20	8	9.8		7	6.7		15	8.1	

Source: Field survey, 2016

4.2.5 Cleaning activities of the respondents that add value to rice production

Cleaning usually takes place after parboiling to remove contaminants and other foreign materials that may be present in the rice. In this study, Table 4.6 shows that cleaning by using the traditional handpicking method has a very low value addition with mean value of 2.7. With Kwara having higher mean value ($\overline{X}$=3.1) than Niger ($\overline{X}$=2.4), it can be deduced that more of the respondents in Kwara engaged in this aspect of addition of value than in Niger. It must be noted that this handpicking method of cleaning is not only time consuming but also ineffective in making sure that stones and other foreign materials are gotten rid of, hence the remarkably low mean value.

In addition, result of cleaning with the use of mechanical device is also presented in Table 4.6. It was found that value is added to rice when effective cleaning is achieved. Most (95.1%) of the respondents had scores between 8 and 14, with a mean value of 11.4 in Kwara. In Niger, 92.3% had scores of between 8 and 14 with a mean value of 11.1. On the overall, the mean value for both states was 11.2. This was supported by Ogunsumi *et al.*, (2013) who laid credence to the fact that Nigerian rice was characterized by lots of dirt that makes it not well acceptable in the market.

Table 4.6: Distribution of respondents' cleaning activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Cleaning	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Cleaning by the traditional handpicking method									
1-7	82	100	3.1	104	100	2.4	186	100	2.7
8-14	0	0.0		0	0.0		0	0.0	
15-20	0	0.0		0	0.0		0	0.0	
Cleaning with the use of mechanical device									
1-7	2	2.4	11.4	3	2.9	11.1	5	2.7	11.2
8-14	78	95.1		96	92.3		174	93.5	
15-20	2	2.4		5	4.8		7	3.8	

Source: Field survey, 2016

4.2.6 De-husking activities of the respondents that add value to rice production

The process of removal of husk for the purpose of adding value to the final output of rice is known as de-husking. Table 4.7 presents the results of de-husking with the use of pestle. Findings show that majority of the respondents (90.2%) in Kwara had value addition scores of between 1 and 7 with a mean value of 4.9. In Niger, 65.3% of the respondents had scores of between 1 and 7, while 34.6% had score of between 8 and 14 with a mean value of 6.6. On the overall, a mean score of 5.8 was obtained for both states. Result of de-husking with the use of mechanical device is also presented in Table 4.7, 92.7% of the respondents had scores of 8 and 14, in Kwara with a mean value of 10.7. In Niger, a mean value of 12.7 was recorded, while 77.9% and 21.2% of the respondents had scores of between 8 and 14, and between 15 and 20, respectively. With overall mean value of 11.8, it shows that Niger is more prominent in the use of mechanical device for de-husking to add value to rice relative to Kwara. The low mean value obtained implies that dehusking activities in the study area needed to be upgraded to improve final rice output and also minimize the quantity of rice that are loss in these activities and as well as ensure better management of rice husk waste generated in the process which can be problematic and may lead to environmental and health related problems as posited by Pode, (2016) in a study on potential applications of rice husk ash waste from rice husk biomass power plant.

Table 4.7: Distribution of respondents' de-husking activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Variables	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
De-husking by using pestle and mortal									
1-7	74	90.2	4.9	68	65.3	6.6	142	76.3	5.8
8-14	8	9.8		36	34.6		44	23.7	
15-20	0	0.0		0	0.00		0	0.0	
De-husking with the use of mechanical device									
1-7	4	4.9	10.7	1	1.0	12.7	5	2.7	11.8
8-14	76	92.7		81	77.9		157	84.4	
15-20	2	2.4		22	21.2		24	12.9	

Source: Field survey, 2016

4.2.7 Transportation activities of the respondents that add value to rice

Furthermore, value is also added to rice in the aspect of effective transportation of rice to where they are needed. This study ascertained that processors in the study areas used different means in transporting rice from the point of harvest to points of processing and then to the points of need. These means of transportation include transportation with the use motor bicycle/bicycle, cart, tractor and motorized vehicle. Table 4.8 therefore shows that a value addition mean of 13.7 for the use of motor bicycle/bicycle was recorded for Kwara with 67.1% and 32.9% of respondents having scores of between 8 and 14 and between 15 and 20, respectively. In Niger, similar per centages of 67.3% and 32.7% of the respondents had scores of between 8 and 14 and between 15 and 20, respectively with a mean value of 13.6. On the overall, a mean value of 13.6 was obtained. This shows that substantial portion of the respondents effectively use bicycle for transportation of rice to points of need.

The result for the value addition to rice when transportation is done with the use of cart is also presented in Table 4.8. It was found that 90.2% of the respondents had scores of between 8 and 14 in Kwara, while 92.3% of the respondents had scores of between 8 and 14 in Niger. With an overall mean value of 11.7, it shows that Kwara that had mean of 11.8 is prominent in the use of cart for transportation of rice as an avenue to addition of value in rice than Niger that had a mean of 11.7. With an overall mean value of 11.9 as reported in Table 4.8 the use of tractor to convey rice to various destinations is more prominent in Kwara ($\overline{X}$=12.4) than in Niger ($\overline{X}$=11.5). In Kwara, 87.8% and 12.2% of the respondents had scores of between 8 and 14 and between 15 and 20, respectively, while in Niger respondents with scores of between 8 and 14 and between 15 and 20 were 92.3% and 7.7% of the respondents, respectively.

Finally in Table 4.8, transportation with the use of motorised vehicle in Kwara also had higher mean value ($\overline{X}$=10.9) compared to Niger ($\overline{X}$=9.4). Overall, 16.7% and 82.3% had value addition scores of between 1 and 7 and 8 and 14 respectively with a mean value of 10.1.

Table 4.8: Distribution of respondents' transportation activities that add value to rice production

Transportation	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
	F	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Transportation with motor bicycle/bicycle									
1-7	0	0.0	13.7	0	0.0	13.6	0	0.0	13.6
8-14	55	67.1		70	67.3		125	67.2	
15-20	27	32.9		34	32.7		61	32.8	
Transportation with cart									
1-7	0	0.0	11.8	0	0.0	11.7	0	0.0	11.7
8-14	74	90.2		96	92.3		170	91.4	
15-20	8	9.8		8	7.7		16	8.6	
Transportation with tractor									
1-7	0	0.0	12.4	0	0.0	11.5	0	0.0	11.9
8-14	72	87.8		96	92.3		168	90.3	
15-20	10	12.2		8	7.7		18	9.7	
Transportation with motorised vehicle									
1-7	4	4.9	10.9	27	26.0	9.4	31	16.7	10.1
8-14	77	93.9		76	73.0		153	82.3	
15-20	1	1.2		1	1.0		2	1.1	

Source: Field survey, 2016

4.2.8 Storage activities of the respondents that add value to rice production

Storage is an intrinsic value that is being added to rice. Effective storage of rice ensures that rice is available at off season periods and also preserves the shelf life of rice. This study found that storage of rice had a comparatively low extent of value addition with an overall mean value of 10.8 when rice is stored in jute bags or sacs. Table 4.9 shows that 93.9% of the respondents had scores of between 8 and 14 in Kwara with mean value of 10.4. It should however be noted that storage in jute bag for Niger had a higher mean value of 11.2. This implies that the extent of value addition on storage with the use of jute bag is better in Niger than in Kwara. Table 4.9 also shows the results of storage by using locally constructed silo. It was found that 96.3% of the respondents had scores of between 8 and 14 for Kwara, while 97.1% of the respondents had scores of between 8 and 14 in Niger for extent of value addition score on storage in locally constructed silo with a mean value of 11.2. Overall, a mean value of 11.3 was obtained. It must be noted that rice stored in jute bags does not have better storage quality when compared to those stored in locally constructed silos, hence most processors prefer to store in locally constructed silos. (Daudu *et al.,* 2014)

However, its availability becomes a major hinderance. This finding is supported by Saikrishna et al., (2018) and Mapiemfu *et al.,* (2017) who found that aged rice has higher consumer preference in terms of cooked rice texture, flavor and associated parameters. Similarly, Rose *et al.,* (2018) also reported that African rice varieties stored in local silos have good organoleptic and nutritional attributes that meet urban consumers' preference if properly processed and branded.

Table 4.9: Distribution of respondents' storage activities that add value to rice production

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Storage	**F**	**%**	**Mean**	**F**	**%**	**Mean**	**F**	**%**	**Mean**
Storage by using jute bag or sacs									
1-7	5	6.1	10.4	1	1.0	11.2	6	3.2	10.8
8-14	77	93.9		101	97.1		178	95.7	
15-20	0	0.0		2	1.9		2	1.1	
Storage by using locally constructed silo									
1-7	0	0.0	11.5	1	1.0	11.2	1	0.5	11.3
8-14	79	96.3		101	97.1		180	96.8	
15-20	3	3.6		2	1.9		5	2.7	

Source: Field survey, 2016

4.2.9 Categorisation of respondents based on the extent of value addition

The extent of value addition was categorised in Table 4.10. The result shows that 48.8% of the processors in Kwara had low extent of value addition, while processors with high extent of value addition were 51.2% of the population sampled. In Niger, 47.1% of the processors had low extent of value addition, while 52.9% of the processors had high extent of value addition. The implication of this is that Niger has higher extent of value addition with a mean value of 299.9±13.7 than Kwara that has a mean value of 287.4±13.7. This may be connected to the geographical and climatic advantage of Niger for rice production when compared with Kwara. On the overall, processors with low extent of value addition were 47.8% of the population sampled, while 52.2% of them had high extent of value addition with a mean value of 294.4±15.03

Table 4.10: Categorisation of respondents based on their extent of value addition

	Kwara (n = 82)			Niger (n = 104)			Total (n=186)		
Extent of Value Addition	**F**	**%**	**Mean/±S.D**	**F**	**%**	**Mean/±S.D**	**F**	**%**	**Mean/±S.D**
Low	40	48.8	287.4/±13.7	49	47.1	299.9/±13.7	89	47.8	294.4/±15.03
High	42	51.2		55	52.9		97	52.2	
Total	82	100.0		104	100.0		186	100.0	

Source: Field survey, 2016

4.3. Attitude of processors towards value addition in rice production

The attitudes of processors to value addition in the study area were measured. Statements such as value addition activities usually improve the qualities of rice outputs, value addition reduces the complications in the post-harvest activities in rice, among others were attitudinally measured. On a general perspective, the attitudes of processors towards value addition were adjudged negative by the findings of this study.

4.3.1. Attitude of processors towards value addition in rice production in Kwara

The result in Table 4.11 shows that more of the respondents in Kwara (43.9%) agreed to the fact that value addition activities usually improve the qualities of rice outputs, while few (4.9%) strongly disagreed ($\overline{X} = 3.59 \pm 1.14$). Also, 35.4% agreed that value addition reduces the resultant complications in the post-harvest activities in rice production, while only 9.8% of respondents strongly disagreed ($\overline{X} = 3.18 \pm 1.20$). More of the respondents (40.2%) disagreed that rice value addition activities were time wasting activities, while a few (6.1%) strongly agreed with a mean value of 3.42±1.4.

Furthermore, 25.6% of the respondents strongly agreed that it was difficult to get improved technology when attempting to add value to rice production, 41.5% agreed to this statement, while 14.6% could not decide whether it was difficult to get improved technology in an attempt to add value to rice production or not. It was also observed that 45.1% of the respondents in Kwara disagreed that it was difficult to get improved technology in an attempt to add value to rice production, while 23.2% strongly disagreed with mean and standard deviation value of 2.32±1.20. The fact that farmers can really rely on rice value addition for improvement in rice output was strongly agreed and agreed upon by 12.2% of respondents, 23.2% could not decide, 29.3% of the respondents disagreed while 23.2% strongly disagreed ($\overline{X} = 3.39 \pm 1.30$). The fact that rice value addition activities were panacea for increased income generation was strongly agreed upon by 13.4% of respondents while few (6.1%) could not decide whether rice value addition activities could be panacea for increased income generation or not. Results shows that 41.5% and 25.6% of the respondents disagreed and strongly disagreed respectively that value addition activities are panacea for increased income generation ($\overline{X} = 3.52 \pm 1.36$). Also, the statement that rice value addition activities lack fidelity and clarity was strongly agreed with by 3.7% of the respondents, 24.4% of them agreed with the statement, while 28.0% disagreed that rice value addition activities lack fidelity and clarity. In addition, most of the respondents indicated in the per centage were against the opinion that rice value addition cannot be successful unless governments completely take over the process, and as such 29.3% therefore disagreed that rice value addition cannot be successful unless governments completely take over the process in Kwara with a mean and standard deviation value of 3.05±1.30.

With different ethical background from different culture, it is imperative that cultural preference could be a barrier in rice value addition activities. Few of the respondents agreed to this opinion while 22.0% disagreed with a mean and standard deviation value of 3.02±1.38. Furthermore, the fact that rice value addition technology utilisation had been limited with unsteady power supply was strongly agreed upon by majority (56.1%) of the respondents, 2.44% disagreed, while only 1.2% strongly disagreed with a mean and standard deviation value of 3.90±1.04. Similarly, the statement that adoption of improved rice production practice complements benefits from rice value addition in the rice industry was strongly agreed upon by majority (43.9%) of the respondents in Kwara, 25.6% agreed to this statement, 9.8% disagreed while only 6.1% strongly disagreed with a mean and standard deviation value of 3.35±1.30. This result is coroborated by the submission of some of a female FGD participants who reiterated that:

> *"We use to face problem of supply of electricity always. Sometimes, we may not have power supply for up to or more. This make it practically impossible to be able to use electric power for some of our value addition activities"* (FGD, Lalagi community, Patigi L.G.A Kwara)

Table 4.11: Distribution of respondents' attitude towards value addition in rice production in Kwara

S/N	Attitudinal Statements	SA		A		U		D		SD		Mean
		F	%	F	%	F	%	F	%	F	%	
1.	Value addition activities usually improve the qualities of rice outputs .	17	20.7	36	43.9	11	13.4	14	17.1	4	4.9	3.59±1.14
2.	Value addition reduces the complications in the post-harvest activities in rice	10	12.2	29	35.4	17	20.7	18	22.0	8	9.8	3.18±1.20
3.	Rice value addition activities are time wasting activities.	5	6.1	15	18.3	16	19.5	33	40.2	13	15.9	3.42±1.14
4.	There are better utilisations of labour leading to specialisation in the rice value addition activities.	5	6.1	18	22.0	18	22.0	28	34.1	13	15.9	3.32±1.16
5.	**Rice value addition does not need special farm land for optimum result.**	**7**	**8.5**	**7**	**8.5**	**12**	**14.6**	**37**	**45.1**	**19**	**23.2**	**3.66±1.18**
6.	It is difficult to get improve technology in an attempt to add value to rice production.	21	25.6	34	41.5	12	14.6	37	45.1	19	23.2	2.32±1.20
7.	Farmers can really rely on rice value addition for improvement in rice output.	10	12.2	10	12.2	19	23.2	24	29.3	19	23.2	3.39±1.30
8	Rice value addition does not require special training/knowledge of the various process of value addition.	11	13.4	15	18.3	13	15.9	24	29.3	19	23.2	3.31±1.37
9.	Value addition may not be actualised when rice production is on small plot of land	14	17.1	23	28.0	8	9.8	21	26.6	16	19.5	3.02±1.42
10.	**Sufficiency of rice can be attained through value addition to rice production.**	**3**	**3.7**	**10**	**12.2**	**16**	**19.6**	**34**	**41.5**	**19**	**23.2**	**3.68±1.10**
11.	Rice value addition activities are a panacea for increased income generation.	11	13.4	11	13.4	5	6.1	34	41.5	21	25.6	3.52±1.36
12.	Rice value addition does not bring classical difference to other rice intervention programme of government.	9	11.0	26	31.7	20	20.4	20	20.4	7	8.5	2.88±1.16

13.	**The implementation and commitment to addition of value to chains of rice production can lead to exportation of rice.**	**4**	**4.9**	**6**	**7.3**	**14**	**17.1**	**34**	**41.5**	**24**	**29.3**	**3.81±1.10**
14.	**Socio Economic Status of value addition actors can increase with value addition to rice production.**	**1**	**1.2**	**15**	**18.3**	**15**	**18.3**	**32**	**39.0**	**19**	**23..2**	**3.65±1.10**
15.	Rice value addition activities lack fidelity and clarity.	3	3.7	20	24.4	18	22.0	23	28.0	18	22.0	3.38±1.18
16.	Rice value addition cannot be successful unless governments completely take over the process.	13	15.9	16	19.5	18	22.0	24	29.3	11	13.4	3.05±1.30
17.	Cultural preference could be a barrier in rice value addition activities.	12	14.6	24	29.3	12	14.6	18	22.0	16	19.5	3.02±1.38
18.	Intensive management is highly necessary for rice value addition to succeed.	15	18.3	21	25.6	17	20.7	19	23.2	10	12.2	2.85±1.31
19.	**Rice value addition technology utilisation have been limited with unsteady power supply**	**46**	**56.1**	**32**	**39.0**	**1**	**1.2**	**2**	**2.44**	**1**	**1.2**	**3.90±1.04**
20.	Adoption of improved rice production practice complements benefits from rice value addition in the rice industry.	36	43.9	21	25.6	12	14.6	8	9.8	5	6.1	3.35±1.30

Source: Field Survey, 2016

4.3.2. Categorisation of processors' attitude towards value addition in rice production in Kwara

The level of attitude of processors towards value addition in rice production in Kwara was categorised into unfavourable and favourable attitude using the mean value. Table 4.12 reveals that most of the respondents in Kwara had an unfavourable attitude (52.4%) towards value addition, while 47.6% had favourable attitude towards value addition. This implies that most of them had a kind negative disposition towards the value addition activities. The reason for this is due to the fact that most of the processors are not in tandem with drudgery associated with rice value addition. The non-use of improved value addition activities may affect their attitude towards it and thus the eventual value addition. (Ezedinma, 2008).

Table 4.12: Categorisation of processors based on their attitude towards value addition in rice production in Kwara

Level of attitude of processors towards value addition in rice	Scores	Frequency	Per centage	Minimum	Maximum	Mean	Standard deviation
Unfavourable	43- 65	43	52.4	43.00	85.00	64.77	8.73
Favourable	66-85	39	47.6				
Total		82	100				

Source: Field Survey, 2016

4.3.3 Attitude of processors towards value addition in rice production in Niger

Table 4.13 shows the result on attitude of the processors towards value addition in Niger. It was observed that 14.4% and 13.5%, respectively strongly agreed and agreed to the fact that value addition activities usually improve the qualities of rice outputs, while 32.7% and 16.3% disagreed and strongly disagreed, respectively ($\overline{X} =$ 2.77±1.14). The fact that value addition reduces the complications in the post-harvest activities in rice was agreed upon by 34.6% of the respondents while only 9.6% strongly disagreed that value addition reduces the resultant complications in the post-harvest activities in rice production ($\overline{X}$ =3.10±1.21). The statement that encapsulates the fact that rice value addition activities are time wasting activities was agreed upon by majority of the respondents (51.0%), while only 4.8% strongly disagreed to the statement ($\overline{X} =$ 2.40±1.10).

Furthermore, with a mean value and standard deviation of 2.53±1.00, 33.7% of the respondents in Niger agreed that it was difficult to get improved technology in an attempt to add value to rice. Also, with a mean value and standard deviation of 3.00±1.17, 34.6% of the respondents agreed to the statement that farmers can really rely on rice value addition for improvement in rice output. Although, a few respondents (8.7%) strongly agreed that rice value addition activities are a panacea for increased income generation in Niger, 27.9% could not take a decisive decision.

Moreover, the belief that rice value addition activities lack fidelity and clarity was held by 41.3% of the respondents. With mean and standard deviation of 2.46±1.21, only 8.7% of the respondents strongly disagreed that rice value addition activities lack fidelity and clarity. In addition, majority of the respondents (55.8%) agreed to the fact that rice value addition cannot be successful unless governments completely take over the process, while only 6.7% of the respondents strongly disagreed, with a mean value and standard deviation of 2.52±1.03. That cultural preference could be a barrier in rice value addition activities was agreed to by 55.8% of the respondents, while only 4.8% disagreed with a mean and standard deviation value of 2.34±1.00.

Undoubtedly, the position that epileptic power supply had led to limited utilisation of technology in rice value addition was agreed upon by 51.9% of the respondents while 4.8% of the respondents disagreed with a mean value of 2.36±1.10. It should be noted that adoption of improved rice production practice complements benefits from rice value addition in the rice industry was agreed upon by 28.8% and strongly disagreed upon by 13.5% of the respondents in Niger with a mean and standard deviation value of 3.00±1.22.

Table 4.13: Distribution of respondents' attitude towards value addition in rice production in Niger

S/N	**Attitudinal Statements**	**SA**		**A**		**U**		**D**		**SD**		**Mean**
		F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	
1.	Value addition activities usually improve the qualities of rice outputs.	15	14.4	14	13.5	24	23.1	34	32.7	17	16.3	2.77±1.29
2	**Value addition reduces the complications in the post-harvest activities in rice**	**11**	**10.6**	**36**	**34.6**	**15**	**14.4**	**32**	**30.8**	**10**	**9.6**	**3.10±1.21**
3.	Rice value addition activities are time wasting activities.	17	16.3	53	51.0	14	13.5	15	14.4	5	4.8	2.40±1.10
4	**There are better utilisations of labour leading to specialization in the rice value addition activities.**	**6**	**5.6**	**26.0**	**25.0**	**20**	**19.2**	**42**	**40.04**	**10**	**9.6**	**3.23±1.11**
5.	**Rice value addition does not need special farm land for optimum result.**	**4**	**3.8**	**38**	**36.5**	**30**	**28.9**	**27**	**26.0**	**5**	**4.8**	**3.66±1.18**
6.	It is difficult to get improve technology in an attempt to add value to rice production.	4	3.8	35	33.7	33	31.7	27	26.0	5	4.8	2.53±1.00
7.	Farmers can really rely on rice value addition for improvement in rice output.	7	6.7	36	34.6	20	19.2	29	27.9	12	11.5	3.00±1.17
8	Rice value addition does not require special training/knowledge of the various process of value addition.	12	11.5	36	34.6	22	21.2	25	24.0	9	8.7	2.84±1.18
9	Value addition may not be actualized when rice production is on small plot of land	23	22.1	45	43.3	20	19.2	12	11.5	4	3.8	2.32±1.10
10.	Sufficiency of rice can be attained through value addition to rice production.	11	10	29	27.9	22	21.2	33	31.7	9	8.9	3.00±1.17
11.	**Rice value addition activities are a panacea for increased income generation.**	**9**	**8.7**	**27**	**26.0**	**29**	**27.9**	**26**	**25.0**	**13**	**12.5**	**3.10±1.17**

12.	Rice value addition does not bring classical difference to other rice intervention programme of government.	10	9.6	51	49.0	21	20.2	12	11.5	10	9.6	2.63±1.12
13.	**The implementation and commitment to addition of value to chains of rice production can lead to exportation of rice.**	**8**	**7.7**	**21**	**20.2**	**21**	**20.2**	**32**	**30.8**	**22**	**21.2**	**3.38±1.24**
14.	Socio Economic Status of value addition actors can increase with value addition to rice production.	9	8.7	34	32.7	25	24.0	21	20.2	15	14.4	3.00±1.21
15.	Rice value addition activities lack fidelity and clarity.	22	21.2	43	41.3	17	16.3	13	12.5	9	8.7	2.46±1.21
16	Rice value addition cannot be successful unless governments completely take over the process.	9	8.7	58	55.8	18	17.3	12	11.5	7	6.7	2.52±1.03
17.	Cultural preference could be a barrier in rice value addition activities.	15	14.4	57	54.8	19	18.3	8	7.70	5	4.8	2.34±1.00
18.	Intensive management is highly necessary for rice value addition to succeed.	10	9.6	43	41.3	26	25.0	21	20.2	4	3.8	2.67±1.03
19	Rice value addition technology utilization have been limited with unsteady power supply	18	17.3	54	51.9	14	13.5	13	12.5	5	4.8	2.36±1.10
20.	Adoption of improved rice production practice complements benefits from rice value addition in the rice industry.	11	10.6	30	28.8	26	25.0	23	22.1	14	13.5	3.00±1.22

Source: Field Survey, 2016

4.3.4 Categorisation of the processors' attitude towards value addition in rice production in Niger

Table 4.14 presents the results of analysis on the level of attitude of processors towards value addition in Niger. It was revealed that 56.7%of the respondents had an unfavourable attitude towards rice value addition activities. This implies that the processors had poor disposition towards the various value addition activities in Niger. The extent of use of improved value addition activities may affect their attitudes towards it which may affect their eventual level of value addition. This result is supported by the outburst of one of the female participant during the FGD held in Lavun Local Government.

> *"Processing of rice is very tedious. If we have alternative and less tedious work to this activities we will prefer to do that" (FGD, Doko Community Lavun L.G.A. Niger).*

Table 4.14: Categorisation of processors based on their attitude towards value addition in rice production in Niger

Level of attitude of processors towards value addition in rice	Scores	Frequency	Per centage	Minimum	Maximum	Mean	Standard deviation
Unfavourable	40-55	59	56.7	40	84	55.08	8.12
Favourable	55-84	45	43.3				
Total		104	100				

Source: Field Survey, 2016

4.3.5 Attitude of processors towards value addition in rice production in Kwara and Niger

The result for the attitude of processors toward value addition for both Kwara and Niger is shown in Table 4.15. On the overall, this study found that 12.4% and 37.6% of respondents strongly agreed and agreed respectively to the fact that there are better utilizations of labour leading to specialization in rice value addition activities while 20.4%, 23.7% and 5.9% choose to be undecisive, disagreed and strongly disagreed, respectively (3.27±1.13). Also, the fact that rice value addition does not need special farm land for optimum result was strongly agreed and agreed upon by 12.9% and 34.4% of respondents, while 22.6% and 5.9% disagreed and strongly disagreed, respectively (3.26±1.12). In addition, among other findings, the fact that cultural preference could be a barrier in rice value addition activities was strongly agreed and agreed upon by 24.7% and 35.5% of the respondents, while 18.8%, 14.5% and 6.5% of them were undecisive, disagreed and strongly disagreed, respectively to this statement with mean and standard deviation of 3.58±1.19.

Moreover, 18.3%, 28.5%, 21.5%, 18.8%, 14.5% and 6.5% of respondents strongly agreed, agreed, undecisive, disagreed and strongly disagreed, respectively with the statement that rice value addition cannot be successful unless governments completely take over the process with mean and standard deviation of 3.27±1.13. This shows the level of how rice processors rely on the government for support.

Table 4.15: Distribution of respondents' attitude towards value addition in rice production in Kwara and Niger

S/N	**Attitudinal Statements**	**SA**		**A**		**U**		**D**		**SD**		**Mean**
		F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	
1.	Value addition activities usually improve the qualities of rice outputs.	32	17.2	50	26.9	35	18.8	48	25.8	21	11.3	3.13±1.23
2.	value addition reduces the complications in the post-harvest activities in rice.	21	11.3	65	34.9	32	17.2	50	26.9	18	9.7	3.11±1.21
3.	Rice value addition activities are time wasting activities.	22	11.8	68	36..6	30	16..1	48	258	18	9.7	2.85±1.21
4.	**There are better utilizations of labour leading to specialization in the rice value addition activities.**	**23**	**12.4**	**70**	**37.6**	**38**	**20.4**	**44**	**23.7**	**11**	**5.9**	**3.27±1.13**
5.	**Rice value addition does not need special farm land for optimum result.**	**24**	**12.9**	**64**	**34.4**	**45**	**24.2**	**42**	**22.6**	**11**	**5.9**	**3.26±1.12**
6.	It is difficult to get improve technology in an attempt to add value to rice production.	30	16.1	90	48.4	34	18.3	19	10.2	13	7.0	2.44±1.10
7.	Farmers can really rely on rice value addition for improvement in rice output.	31	16.7	53	28.5	39	21.0	46	24.7	17	9.1	3.19±1.25
8	Rice value addition does not require special training/knowledge of the various process of value addition.	28	15.1	49	26.3	35	18.8	51	27.4	23	12.4	3.10±1.28
9.	Value addition may not be actualized when rice production is on small plot of land	37	19.9	68	36.6	28	15.1	33	17.7	20	10.8	2.63±1.28
10.	**Sufficiency of rice can be attained through value addition to rice production.**	**28**	**15.1**	**67**	**36.0**	**38**	**20.4**	**39**	**21.0**	**14**	**7.5**	**3.30±1.18**
11.	**Rice value addition activities are a panacea for increased income generation.**	**34**	**18.3**	**60**	**32.3**	**34**	**18.3**	**38**	**20.4**	**20**	**10.8**	**3.26±1.27**
12.	Rice value addition does not bring classical difference to other rice intervention programme of government.	19	10.2	77	41.4	41	22.0	32	17.2	17	9.1	2.74±1.14

13.	The implementation and commitment to addition of value to chains of rice production can lead to exportation of rice.	27	14.5	81	43.5	31	16.7	26	14.0	21	11.3	2.64±1.22
14.	Socio Economic Status of value addition actors can increase with value addition to rice production.	22	11.8	74	39.8	36	19.4	36	19.4	18	9.7	2.75±1.18
15.	Rice value addition activities lack fidelity and clarity.	25	13.4	63	33.9	35	18.8	36	19.4	27	14.5	2.86±1.28
16.	Rice value addition cannot be successful unless governments completely take over the process.	34	18.3	53	28.5	40	21.5	49	26.3	10	5.4	3.30±1.19
17.	**Cultural preference could be a barrier in rice value addition activities.**	**46**	**24.7**	**66**	**35.5**	**35**	**18.8**	**27**	**14.5**	**12**	**6.5**	**3.58±1.19**
18.	Intensive management is highly necessary for rice value addition to succeed.	25	13.4	64	34.4	43	23.1	40	21.5	14	7.5	2.75±1.16
19.	Rice value addition technology utilization have been limited with unsteady power supply	34	18.3	86	46.2	22	11.8	28	15.1	16	8.6	2.49±1.20
20.	**Adoption of improved rice production practice complements benefits from rice value addition in the rice industry.**	**17**	**9.1**	**51**	**27.4**	**38**	**20.4**	**47**	**25.3**	**33**	**17.7**	**3.15±1.26**

Source: Field Survey, 2016

4.3.6 Categorisation of respondents' attitude toward value addition in Kwara and Niger

Table 4.16 shows the result of the categorisation of respondents' attitude towards value addition. The study found that majority of the respondents had unfavourable attitude towards value addition with 85 as maximum score and 40 as minimum score. More than half (52.1%) of the respondents had unfavourable attitude, while 47.9% had favourable attitude. This implies that most of the respondents believed that adding value to the final output of rice does not bring about continuous patronage of rice products by the consumers. The finding is refuted by Hussaini, (2021) who was of the opinion that processors have favourable attitude towards activities that help imrove the quality of their output.

Table 4.16: Categorisation of respondents' attitude toward value addition in Kwara and Niger

Level of attitude of processors towards value addition in rice	Scores	Frequency	Percent age	Minimum	Maximum	Mean	Standard deviation
Unfavourable	40-59	82	52.1	40	85	59.4	9.7
Favourable	60-85	104	47.9				
Total		186	100				

Source: Field Survey, 2016

4.4 Accessibility to agricultural support services towards value addition in rice production

In the course of this research work, it was apparently established that there are various agricultural support services in the study area that were utilised by rice processors to complement their activities that add value to final output in rice production before it gets to the final consumers. These agricultural support services include those from commercial banks, extension/advisory services, government support, non-governmental organisation, farmers' association, anchor borrowers scheme, micro finance bank, bank of industry, agricultural thrift and cooperative society, mortgage bank, Bank of Agriculture (BOA) and professional money lenders.

4.4.1 Accessibility to agricultural support services towards value addition in rice production in Kwara

Processors in Kwara were able to garner a remarkable level of agricultural support services as shown in the result presented in Table 4.17. It was observed that majority (51.2%) of the respondents usually have proximate access to support from agricultural thrift and cooperative society which ranked first with a mean value of 1.50±0.53. The agricultural support accrued from Bank of Agriculture (BOA) ranked second with a mean and standard deviation value of 1.46±0.55. The support from the professional money lender ranked third with 45.1% of the respondents having proximate access to the support services with a mean value of 1.24±0.78. The support from farmers' association had a mean value of 1.23±0.81 and it ranked fourth, while that of extension and advisory services had a mean value of 1.20±0.80 with a rank of 5. Microfinance banks, non-governmental organisation, bank of industry as well as governmental support ranked 6th,7th, 8th and 9th, respectively with a mean and standard deviation value of 1.09±0.55, 0.94±0.85, 0.89±0.86 and 0.83±0.64.

Table 4.17: Distribution of respondents' accessibility to agricultural support services towards value addition in rice production in Kwara

S/N	Accessibility of agricultural support services	Not accessible		Accessible but distant		Accessible and proximate		Mean	Rank
		F	%	F	%	F	%		
1.	Commercial banks	33	40.2	37	45.1	12	14.6	0.74±0.70	10th
2.	Extension/advisory services	19	23.2	28	34.1	35	42.7	1.20±0.80	5th
3.	Government support	25	30.5	46	56.1	11	13.4	0.83±0.64	9th
4.	Non-Governmental Organisation Support e.g. in marketing	32	39	23	28	27	32.9	0.94±0.85	7th
5.	Farmers association support	19	23.2	25	30.5	38	46.3	1.23±0.81	4th
6.	Anchor borrowers scheme	35	42.7	39	47.6	8	9.8	0.67±0.65	11th
7.	Micro finance banks	9	11	57	69.5	16	19.50	1.09±0.55	6th
8	Bank of Industry	35	42.7	21	25.6	26	31.7	0.89±0.86	8th
9.	**Agricultural Thrift and cooperative society:**	**1**	**1.2**	**39**	**47.6**	**42**	**51.2**	**1.50±0.53**	**1st**
10.	Mortgage bank.	54	65.9	23	28.0	5	6.1	0.40±0.61	12th
11.	**Bank of Agriculture (BOA)**	**2**	**2.4**	**40**	**48.8**	**40**	**48.8**	**1.46±0.55**	**2nd**
12.	**Professional money lenders**	**17**	**20.7**	**28**	**34.1**	**37**	**45.1**	**1.24±0.78**	**3rd**

Source: Field Survey, 2016

4.4.2.: Categorisation of respondents' accessibility to agricultural support services towards value addition in rice production in Kwara

The result of categorisation of the level of respondents' accessibility to agricultural support services towards value addition in rice production in Kwara is presented in Table 4.18. The Table revealed that majority of the respondents (51.2%) had low level of accessibility to agricultural support services towards value addition in rice production, while 48.8% of the respondents had high level of accessibility to agricultural support services towards value addition in rice production. This implies that substantial number of the processors could not proximately access agricultural support services in Kwara.

Table 4.18.: Categorisation of respondents' accessibility to agricultural support services towards value addition in rice production in Kwara

Level of Accessibility to Agricultural Support services	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	5-12	42	51.2	05	22	12.15	3.95
High	13-22	40	48.8				
Total		82	100				

Source: Field Survey, 2016

4.4.3 Accessibility to agricultural support services towards value addition in rice production in Niger

The findings on the support services towards value addition in rice in Niger were presented in Table 4.19. It was revealed that commercial bank rendered the most recognised agricultural support to the processors in Niger as it ranked first with a mean value of 1.22±0.72. Unlike that of Kwara, the support from agricultural thrift and cooperative society ranked second in Niger with a mean value of 1.14±0.70. Farmers' association support ranked third in the distribution with a mean and standard deviation value of 1.08±0.73. This was closely followed by the support from anchor borrowers' scheme at the forth rung of the distribution with a mean value of 1.06±0.74. Agricultural support services from nongovernmental organisation, Bank of Agriculture (BOA) and government, ranked fifth, sixth and seventh, respectively with mean values of 1.05±0.70, 0.98±0.62 and 0.97±0.70 respectively in the distribution. Supports from extension/advisory services, professional money lender, bank of industry and micro finance bank were at the lower rung of the distribution in Niger as these ranked eighth, ninth, tenth and eleventh, respectively with a mean and standard deviation value of 0.95±0.67, 0.94±0.59, 0.93±0.71 and 0.87±0.62, respectively in the distribution. In Kwara, mortgage bank ranked least and at the bottom of the rung of the distribution with a mean value of 0.86±0.73.

Table 4.19: Distribution of respondents' accessibility to agricultural support services towards value addition in rice production in Niger

S/N	Accessibility to agricultural support services	Not accessible		Accessible but distant		Accessible and proximate		Mean	Rank
		F	**%**	**F**	**%**	**F**	**%**		
1.	**Commercial banks**	**18**	**17.3**	**45**	**43.3**	**41**	**39.4**	**1.22±0.72**	**1st**
2.	Extension/Advisory services	26	25.0	57	54.8	21	20.2	0.95±0.67	8th
3.	Government Support	27	26.0	53	51.0	24	23.1	0.97±0.70	7th
4.	Non-Governmental Organisation Support e.g., in marketing	15	14.4	69	66.3	20	19.2	1.05±0.58	5th
5.	**Farmers Association support**	**24**	**23.1**	**48**	**46.2**	**32**	**30.8**	**1.08±0.73**	**3rd**
6.	Anchor borrowers scheme	25	24	48	46.2	31	29.8	1.06±0.73	4th
7.	Micro finance Banks	28	26.9	62	59.6	14	13.5	0.87±0.62	11th
8	Bank of Industry	30	28.8	51	49.0	23	22.1	0.93±0.71	10th
9.	**Agricultural Thrift and cooperative society**	**19**	**18.3**	**52**	**50.0**	**33**	**31.7**	**1.14±0.70**	**2nd**
10.	Mortgage Bank.	36	34.6	47	45.2	21	20.2	0.86±0.73	12th
11.	Bank of Agriculture (BOA)	21	20.2	64	61.5	19	18.3	0.98±0.62	6th
12.	Professional Money Lenders	21	20.2	68	65.4	15	14.4	0.94±0.59	9th

Source: Field Survey, 2016

4.4.4 Categorisation of respondents' accessibility to agricultural support services towards value addition in rice production in Niger

Using the mean value of 12.03±3.26 obtained from analysis of result in categorising accessibility to agricultural support services into high and low, it was found that respondents in Niger had a fairly high level of access to agricultural support services (51.0%) as presented in Table 5.20. This is reflected in some of the responses during the FGD where one of the processors recounted that:

> *"People from ministry use to come to assist us on how to form cooperative society group which has helped us in many ways. We were also assisted on how to access activities of Anchor Borrowers' Scheme"* (FGD male participant at Maito, Wushishi L.G.A., Niger)

Table 4.20 Categorisation of respondents' accessibility to agricultural support services towards value addition in rice production in Niger

Level of Accessibility to Agricultural Support services	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	4-12	51	49.0	4	18	12.03	3.26
High	13-18	53	51.0				
Total		104	100				

Source: Field Survey, 2016

4.4.5 Accessibility to agricultural support services towards value addition in rice production in Kwara and Niger

Emphasis must be made here that agricultural support services had been of tremendous assistance to making sure that value is added to rice. Table 4.21 therefore shows the distribution of how respondents get access to these agricultural support services in the study area. On the overall, it was gathered that accessibility to agricultural thrift and cooperative societies among farmers ranked first with a mean and standard deviation value of 1.30±0.65. The reason for this is not far-fetched, since there are different empirical evidences that support the fact that farmers now have substantial benefits in being together in thrift and cooperative societies. This is in line with International Cooperative Alliance - ICA (2010) who believed that rural farmers earn more when they engage in agricultural cooperative societies which make it possible for them to pull their resources together in order to raise their farm income and sustainably improve their living condition. Also, access to Bank of Agriculture (BOA) ranked second in the distribution with a mean and standard deviation value of 1.19±0.64, while accessibility to support services from farmers' association ranked third in the distribution with a mean and standard deviation value of 1.15±0.77. Support services from professional money lenders ranked fourth in the distribution with a mean and standard deviation value of 1.08±0.69. In addition; agricultural support services were accessed by processors from extension/advisory services, commercial banks and nongovernmental organisations. These were ranked fifth, sixth and seventh with mean and standard deviation values of 1.06±0.74, 1.01±0.75and 1.00±0.71, respectively. At the bottom of the rung of distribution were micro finance banks, bank of industry, government support, anchor borrowers scheme and mortgage bank with mean value of 0.96±0.60, 0.91±0.78, 0.91±0.68, 0.89±0.72 and 0.66±0.71, respectively. The implication of this is that there is need for these sets of stakeholders to ensure that their services get to processors to justify their existence.

Table 4.21: Distribution of respondents' accessibility to agricultural support services towards value addition in rice production in Kwara and Niger

S/N	Accessibility of agricultural support services	Not accessible		Accessible but distant		Accessible and proximate		Mean	Rank
		F	%	F	%	F	%		
1.	Commercial banks	51	27.4	82	44.1	53	28.5	1.01±0.75	6th
2.	Extension/advisory services	45	24.2	85	45.7	56	30.1	1.06±0.74	5th
3.	Government support	52	28.0	99	53.2	35	18.8	0.91±0.68	9th
4.	Non-Governmental Organisation Support e.g. in marketing	47	25.3	92	49.5	47	25.3	1.00±0.71	7th
5.	**Farmers association support**	**43**	**23.1**	**73**	**39.2**	**70**	**37.6**	**1.15±0.77**	**3rd**
6.	Anchor borrowers scheme	60	32.3	87	46.8	39	21.0	0.89±0.72	11th
7.	Micro finance banks	37	19.9	119	64.0	30	16.1	0.96±0.60	8th
8	Bank of Industry	65	34.9	72	38.7	49	26.3	0.91±0.78	9th
9.	**Agricultural thrift and cooperative society**	**20**	**10.8**	**91**	**48.9**	**75**	**40.3**	**1.30±0.65**	**1st**
10.	Mortgage bank.	90	48.4	70	37.6	26	14.0	0.66±0.71	12th
11.	**Bank of Agriculture (BOA)**	**23**	**12.4**	**104**	**55.9**	**59**	**31.7**	**1.19±0.64**	**2nd**
12.	Professional money lenders	38	20.4	96	51.6	52	28.0	1.08±0.69	4th

Source: Field Survey, 2016

4.4.6 Categorisation of respondents based on their accessibility to agricultural support services towards value addition in rice production in Kwara and Niger

Table 4.22 shows the categorised level of accessibility to agricultural support services towards value addition in the study area. The result revealed that with a mean value of 12.08±3.57 most of the respondents had low level of accessibility to agricultural support services (64.0%), while few of the respondents had high level of accessibility to agricultural support services (36.0%). This implies that value addition activities could be much more enhanced if processors can be provided with better accessibility to agricultural support services that are available. This assertion is substantiated by a male FGD participant that lamented that…

> *"the politicians and political actors are not making it easy for us to have access to some support services because they use to hijack from individual that needed them" (FGD male participant at Lade community, Patigi L.G.A. Kwara State)*

Table 4.22: Categorisation of respondents' accessibility to agricultural support services towards value addition in rice production in Kwara and Niger

Level of Accessibility to Agricultural Support services	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	4-13	119	64.0	04	22	12.08	3.57
High	14-22	67	36.0				
Total		186	100				

4.5. Derivable benefits by respondents from value addition in rice production

The section discusses the result obtained on the derivable benefits in the addition of value to rice. The derivable benefits are hereby presented from the focal points of five group processing nodes which include the derivable benefits from threshing and winnowing; drying; parboiling, cleaning and dehusking; transportation effectiveness and storage.

4.5.1. Derivable benefits by respondents from value addition in rice production in Kwara

In Kwara, derivable benefits from threshing and winnowing recorded (Table 4.23) high benefits with majority of the respondents accruing benefits on the basis of prevention of ineffective separation of rice and foreign materials and impurities (72.0%); actualisation of maximum number of unbroken grains (59.8%) and realisation of removal of unwanted paddy (56.1%). It must be noted that derivable benefits on the basis of preventing ineffective separation of rice and foreign materials and impurities ranked first in the distribution with a mean value of 1.70±0.51. Being able to sell at a very good price was ranked second, while realisation of rice paddy that is devoid of stones was ranked third with mean and values of 1.68±0.49 and 1.59±0.52, respectively.

Derivable benefits of value addition on the basis of drying had reduction of total time of rice processing ranking first, prevention of diseases infestation ranked second, while prevention of grains from growing moulds ranked third in the distribution with mean n values of 1.63±0.49, 1.51±0.61 and 1.48±0.55, respectively. It is worthy of note that derivable benefits on drying is also accrued on the area of reduction of wastage of grains. This was ranked fourth in the distribution with a mean value of 1.34±0.50.

Furthermore, in Kwara, derivable benefits on parboiling, cleaning and dehusking were also determined by the findings of this study. It was found that actualisation of rice with prolong shelf life was the most revered derivable benefit as it ranked first with a mean and standard deviation value of 1.66±0.48. This was followed by benefits owing to better acceptability of the grain by end users which ranked second with a mean and standard deviation value of 1.57±0.50. Actualisation of grains of desired colour ranked third, while realisation of rice paddy that is devoid of stone ranked fourth with mean and standard deviation values of 1.55±0.50 and 1.54±0.53, respectively.

Also in Kwara, some derivable benefits on the basis of transportation effectiveness were established. It was found that effective transportation of rice paddy lead to realisation of maximum productivity of human resources, prompt and responsive transport at affordable cost and realisation of increased output, and hence increased income with mean and standard deviation values of 1.49±0.50, 1.45±0.57 and 1.43±0.53, respectively.

In Kwara, derivable benefits on the basis of storage leads to actualisation of rice with prolong shelf life, actualisation of grains of desired colour and acceptability of grains by end users among other benefits with mean and standard deviation values of 1.66±0.48, 1.65±0.51 and 1.60±0.52, respectively.

Table 4.23: Distribution of respondents' derivable benefits in Kwara

	Derivable benefits from:	Not a benefit		Low benefit		High benefit		Mean	Rank
		F	%	F	%	F	%		
A.	**Threshing and winnowing**								
1.	Actualization of maximum number of unbroken grains	2	2.4	31	37.8	49	59.8	1.57±0.55	4th
2.	Actualization of grains of desired colour	6	7.3	37	45.1	39	47.6	1.40±0.63	7th
3.	Realization of Removal of unwanted paddy	0	0.0	36	43.9	46	56.1	1.56±0.50	6th
4.	**Realization of rice paddy that is devoid of stones.**	**1**	**1.2**	**32**	**39.0**	**49**	**59.8**	**1.59±0.52**	**3rd**
5.	**Prevention of ineffective separation of rice and foreign materials and impurities**	**2**	**2.4**	**21**	**25.6**	**59**	**72.0**	**1.70±0.51**	**1st**
6.	Reduction of total time of rice processing	0	0.0	35	42.7	47	57.3	1.57±0.50	4th
7.	**Being able to sell at a very good price**	**1**	**1.2**	**24**	**29.3**	**57**	**49.0**	**1.68±0.49**	**2nd**
8.	Acceptability by end users	0	0.0	49	59.8	33	40.2	1.40±0.49	7th
B	**Drying**								
1.	Avoiding localization of heating spots on rice.	10	12.2	51	52.2	21	25.6	1.13±0.60	7th
2.	Actualization of grains of desired colour	15	18.3	35	42.7	32	39.0	1.21±0.73	5th
3.	Prevention of ineffective separation of rice and foreign materials and impurities	4	4.9	59	72.0	19	23.2	1.18±0.50	6th
4.	**Reduction of total time of rice processing**			**30**	**36.0**	**52**	**63.4**	**1.63±0.49**	**1st**
5.	Prevention of grains from insects attack.	15	16.3	42	51.2	25	30.5	1.12±0.69	8th
6.	**Prevention of grains from growing moulds**	**2**	**2.4**	**39**	**47.6**	**41**	**50.0**	**1.48±0.55**	**3rd**
7.	**Prevention of diseases infestation**	**5**	**6.1**	**30**	**36.6**	**47**	**57.3**	**1.51±0.61**	**2nd**
8	Reduction of wastage of grains	1	1.2	52	63.4	29	35.4	1.34±0.50	4th
C.	**Parboiling, cleaning and dehusking**								

1.	**Actualisation of rice with prolong shelf life**			**28**	**34.1**	**54**	**65.9**	**1.66±0.48**	**1st**
2.	**Actualization of grains of desired colour**			**37**	**45.1**	**45**	**54.9**	**1.55±0.50**	**3rd**
3.	Realisation of rice paddy that is devoid of stones.	1	1.2	36	43.9	45	54.9	1.54±0.53	4th
4.	Prevention of ineffective separation of rice and foreign materials and impurities	4	4.9	40	48.8	38	46.3	1.42±0.59	6th
5.	Realisation of Removal of unwanted paddy	5	6.1	45	54.9	32	39.0	1.33±0.59	7th
6.	Realisation of increased output hence increased income			42	51.2	40	48.8	1.49±0.50	5th
7.	**Grains are better accepted by end users.**			**35**	**42.7**	**47**	**57.3**	**1.57±0.50**	**2nd**
D.	**Transportation effectiveness**								
1.	**Realisation of maximum productivity of human resources.**			**42**	**51.2**	**40**	**48.8**	**1.49±0.50**	**1st**
2.	**Actualisation of prompt and responsive transport at affordable cost**	**3**	**3.7**	**39**	**47.6**	**40**	**48.8**	**1.45±0.57**	**2nd**
3.	Realisation of removal of unwanted paddy	4	4.9	40	48.8	38	46.3	1.42±0.59	4th
4.	**Realisation of increased output hence increased income**			**47**	**57.3**	**35**	**42.7**	**1.43±0.50**	**3rd**
5.	Prevention/reduction of injury during processing	6	7.3	45	54.9	31	37.8	1.31±0.60	5th
E.	**Storage**								
1.	**Actualisation of rice with prolong shelf life**			**28**	**34.1**	**54**	**65.9**	**1.66±0.48**	**1st**
2.	**Actualisation of grains of desired colour**	**1**	**1.2**	**27**	**32.9**	**54**	**65.9**	**1.65±0.51**	**2nd**
3.	Realisation of removal of unwanted paddy			39	47.6	43	52.4	1.52±0.50	5th
4.	Realisation of increased output hence increased income	1	1.2	32	39.0	49	59.8	1.59±0.52	4th
5.	Availability of quality rice at the periods of scarcity.	2	2.4	36	43.9	44	53.7	1.51±0.55	6th
6.	**Acceptability of grains by end users.**	**1**	**1.2**	**31**	**37.8**	**50**	**61.0**	**1.60±0.52**	**3rd**

Source: Field Survey, 2016

4.5.2 Categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Kwara

The result of the disaggregated categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Kwara is shown in Table 4.24. It was revealed that derivable benefits through threshing and winnowing was low in Kwara with mean and standard deviation value of 44.8±5.69. This means that effort in threshing and winnowing does not lead to remarkable derivable benefits.

Table 4.24 Categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Kwara

Level of derivable benefits from value addition through threshing and winnowing	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	25-41	48	58.5	25	60	44.8	5.69
High	42-60	34	41.5				
Total		82	100				

4.5.3. Categorisation of respondents' derivable benefits from rice value addition through drying in Kwara

In drying, a disaggregated categorisation of respondents' derivable benefits from rice value addition in Kwara was high with mean and standard deviation value of 50.29±4.98. This implies that the respondents usually get what they crave for when they dry their rice produce. This result corroborates the assertion of one of the women in Kwara FGD that…

> *"effective drying makes processing less labourious. If drying is appropriately done, quality is enhanced and guaranteed to a large extent" (FGD female participant at Lade community, Patigi L.G.A. Kwara State)*

Table 4.25 Categorisation of respondents' derivable benefits from rice value addition through drying in Kwara

Level of derivable benefits from value addition through drying	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	27-56	39	47.6	27	72	50.29	4.98
High	57-72	43	52.4				
Total		82	100				

4.5.4 Categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Kwara

The result of categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Kwara revealed low derivable benefits with mean and standard deviation value of 49.32±5.02. This means that efforts put into parboiling, cleaning and dehusking does not commensurately lead to derivable benefits among the processors. This finding supports the lamentation during one of the FGDs when he recalled…

> *"We usually spend so much time in cleaning and even at that the rice are not totally devoid of stones as such series of challenges are faced during marketing". (FGD female participant at Lade community, Patigi L.G.A. .Kwara State)*

Table 4.26 Categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Kwara

Level of derivable benefits from value addition through parboiling, cleaning and dehusking	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	30-52	47	57.3	30	69	49.32	5.02
High	53-69	35	42.7				
Total		82	100				

4.5.5 Categorisation of respondents' derivable benefits from rice value addition through transportation effectiveness in Kwara

The result of disaggregated categorization of derivable benefits from value addition through transportation effectiveness is presented in Table 4.27. It was revealed that derivable benefit was low with a mean and standard deviation of 49.31±5.33. This means respondents were not at ease with means through which their produce was transported in Kwara. This result is complemented by the remark of one of the women during the FGD.

> *"The fact that there were less effective means of transportation, we usually experience shortage. Some of our rice paddies get wasted before getting to the point of processing since transportation is a challenge" (FGD male participant at Edogi community, Edu L.G.A. Kwara State)*

Table 4.27 Categorisation of respondents' derivable benefits from rice value addition through transportation effectiveness in Kwara

Level of derivable benefits from value addition through transportation effectiveness	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	35-52	45	54.9	35	71	49.31	5.33
High	53-71	37	45.1				
Total		82	100				

4.5.6 Categorisation of respondents' derivable benefits from rice value addition through storage in Kwara

Table 4.28 also shows a low categorized result of disaggregated derivable benefits through storage in Kwara with a mean and standard deviation value of 47.8±6.98. This means lack of effective storage system does not give the respondents the result benefit they crave for in value addition. This is in line with the assertion of Salako, Ishola and Balogun (2018) that processors cannot always guarantee the value of their farm produce and products due to inadequacy of essential storage systems and/or facilities.

Table 4.28 Categorisation of respondents' derivable benefits from rice value addition in Kwara through storage

Level of derivable benefits from value addition through storage	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	25-44	49	59.8	25	62	47.8	6.98
High	45-62	33	40.2				
Total		82	100				

4.5.7 General Categorisation of respondents' derivable benefits from rice value addition in Kwara

With a mean and standard deviation value of 50.59±5.86, analysis of results in Table 4.24 shows that respondents in Kwara had low derivable benefits in rice value addition. This implies that efforts do not seem to yield advantageous outcome for many respondents since 43.9% had high level of derivable benefits, while majority (56.1%) had low derivable benefit in value addition. This may be due to the unsatisfactory interest that processors have towards rice value addition as expressed by a woman processor in one of the FGDs in Kwara.

> *"We are just doing this work because we don't have other work to do. As I am, I am a Nigeria Certificate in Education (NCE) graduate. Am just doing this to keep live together, in fact there is nothing in it" (FGD, female participant at Lafiagi community, Edu L.G.A.Kwara State.*)

Table 4.29 General Categorisation of respondents' derivable benefits from rice value addition in Kwara

Level of derivable benefits from value addition	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	37-51	46	56.1	37.00	72.00	50.59	5.86
High	52-72	36	43.9				
Total		82	100				

Source: Field Survey, 2016

4.5.8 Derivable benefits by respondents from value addition in rice production in Niger

The result on the derivable benefit accrued from value addition in Niger is presented in Table 4.25. From the derivable benefits from threshing and winnowing, it was found that realisation of rice paddy that is devoid of stones was the most revered benefit and it ranked first with a mean and standard deviation value of 1.31±0.70. Benefit of actualisation of grains of desired colour ranked second with a mean and standard deviation value of 1.28±0.66. At the third rung of the distribution was the benefit accrued in preventing ineffective separation of rice and foreign materials and impurities (1.25±0.65).

The result on derivable benefits from drying shows that reduction of total time of rice processing had the highest mean value (1.21±0.66) and it was ranked first in the distribution. This is closely followed by the benefits on the prevention of ineffective separation of rice and foreign materials and impurities (1.20±0.64). Similarly, the benefit accrued due to actualisation of grains of desired colour and reduction of wastage of grains were ranked third and fourth in the distribution with mean and standard deviation values of 1.17±0.66, and 1.13±0.66, respectively.

Moreover, in Niger, it was also found that prevention of ineffective separation of rice and foreign materials and impurities, realisation of increased output hence increased income and realisation of rice paddy that is devoid of stone(s) were the most important accrued benefits from parboiling, cleaning and dehusking with ranks of 1, 2 and 3 respectively. On the basis of derivable benefits from transportation effectiveness, realisation of increased output hence increased income, realisation of maximum productivity of human resources and realisation of removal of unwanted paddy were the most important benefits accrued through transportation effectiveness with mean and standard deviation values of 1.30±0.61, 1.28±0.57 and 1.24±0.68, respectively.

Storage is usually the last aspect of the processors' value addition activities in rice production. It was found that acceptability of grains by end users is the most important benefit accrued through effective storage with mean and standard deviation values of 1.42±0.66. Also, realisation of grain with desired coloured ranked second in the distribution with mean and standard deviation value of 1.39±0.64. Realisation of removal of unwanted paddy, realisation of increased output hence increased income and actualisation of rice with prolong shelf life ranked third and fourth with mean and standard deviation values of 1.38±0.58, 1.32±0.64 and 1.32±0.70, respectively.

Table 4.30: Distribution of respondents' derivable benefits in Niger

	Derivable benefits from	Not a benefit		Low benefit		High benefit		Mean	Rank
		F	%	F	%	F	%	$\overline{X}$	
A.	**threshing and winnowing**								
1.	Actualization of maximum number of number of unbroken grains	15	14.4	57	54.8	32	30.8	1.16±0.66	5th
2.	**Actualization of grains of desired colour**	**11**	**10.6**	**53**	**51.0**	**40**	**38.5**	**1.28±0.66**	**2nd**
3.	Realization of Removal of unwanted paddy	21	20.2	59	56.7	24	23.1	1.03±0.66	8th
4.	**Realization of rice paddy that is devoid of stones.**	**14**	**13.5**	**44**	**42.3**	**46**	**44.2**	**1.31±0.70**	**1st**
5.	**Prevention of ineffective separation of rice and foreign materials and impurities**	**12**	**11.5**	**54**	**51.9**	**38**	**36.5**	**1.25±0.65**	**3rd**
6.	Reduction of total time of rice processing	18	17.3	52	50.0	34	32.7	1.15±0.69	6th
7.	Being able to sell at a very good price	16	15.4	51	49.0	37	35.6	1.20±0.69	4th
8.	Acceptability by end users	17	16.3	65	62.3	22	21.2	1.05±0.61	7th
B	**Drying**								
1.	Avoiding localization of heating spots on rice.	14	13.5	66	63.5	24	23.1	1.10±0.60	6th
2.	**Actualization of grains of desired colour**	**15**	**14.4**	**56**	**53.8**	**33**	**31.7**	**1.17±0.66**	**3rd**
3.	**Prevention of ineffective separation of rice and foreign materials and impurities**	**13**	**12.5**	**57**	**54.8**	**34**	**32.7**	**1.20±0.64**	**2nd**
4.	**Reduction of total time of rice processing**	**14**	**13.5**	**54**	**51.9**	**36**	**34.6**	**1.21±0.66**	**1st**
5.	Prevention of grains from insects attack.	12	11.5	68	65.4	24	23.1	1.12±0.58	5th
6.	Prevention of grains from growing moulds	20	19.2	59	56.7	25	24.0	1.05±0.66	8th
7.	Prevention of diseases infestation	20	19.2	55	52.9	29	27.9	1.09±0.68	7th
8	Reduction of wastage of grains	16	15.4	58	55.8	30	28.8	1.13±0.66	4th
C.	**Parboiling, cleaning and dehusking**								
1.	Actualisation of rice with prolong shelf life	14	13.5	58	55.8	32	30.8	1.17±0.65	6th
2.	Actualization of grains of desired colour	22	21.2	48	46.2	34	32.7	1.15±0.73	7th
3.	**Realization of rice paddy that is devoid of stones.**	**7**	**6.7**	**66**	**63.5**	**31**	**29.8**	**1.23±0.56**	**3rd**
4.	**Prevention of ineffective separation of rice and foreign materials and impurities**	**4**	**3.8**	**58**	**55.8**	**42**	**40.4**	**1.37±0.56**	**1st**
5.	Realization of Removal of unwanted paddy	8	7.7	68	65.4	28	26.9	1.19±0.56	5th

6.	**Realization of increased output hence increased income**	**7**	**6.7**	**62**	**59.6**	**34**	**32.7**	**1.27±0.58**	**2nd**
7.	Grains are better accepted by end users.	11	10.6	59	56.7	34	32.7	1.22±0.62	4th
D.	**Transportation effectiveness**								
1.	**Realization of maximum productivity of human resources.**	**6**	**5.8**	**63**	**60.6**	**35**	**33.7**	**1.28±0.57**	**2nd**
2.	Actualization of prompt and responsive transport at affordable cost	11	10.6	58	55.8	35	33.7	1.23±0.63	4th
3.	**Realization of Removal of unwanted paddy**	**14**	**13.5**	**51**	**49.0**	**39**	**37.5**	**1.24±0.68**	**3rd**
4.	**Realization of increased output hence increased income**	**8**	**7.7**	**59**	**56.7**	**37**	**35.6**	**1.30±0.61**	**1st**
5.	Prevention/reduction of injury during processing	10	9.6	62	59.6	32	30.8	1.21±0.60	5th
E.	**Storage**								
1.	Actualisation of rice with prolong shelf life	14	13.5	43	41.3	47	45.2	1.32±0.70	4th
2.	**Actualization of grains of desired colour**	**9**	**8.7**	**46**	**44.2**	**49**	**47.1**	**1.39±0.64**	**2nd**
3.	**Realization of Removal of unwanted paddy**	**5**	**4.8**	**55**	**52.4**	**44**	**42.3**	**1.38±0.58**	**3rd**
4.	Realization of increased output hence increased income	10	9.6	51	49.0	43	41.3	1.32±0.64	4th
5.	Availability of quality rice at the periods of scarcity.	14	13.6	49	47.1	41	39.4	1.26±0.69	6th
6.	**Acceptability of grains by end users.**	**10**	**9.6**	**40**	**38.5**	**54**	**51.9**	**1.42±0.66**	**1st**

Source: Field Survey, 2016

4.5.9 Categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Niger

The result of disaggregated categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Niger is revealed in Table 4.31. It was found that there were low derivable benefits in Niger with mean and standard deviation value of 46.7±5.29. This means the threshing and winnowing activities have not given remarkable derivable benefits to the rice processors.

Table 4.31 Categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Niger

Level of derivable benefits from value addition through threshing and winnowing	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	28-49	58	55.8	28	66	46.7	5.29
High	50-66	46	44.2				
Total		104	100				

4.5.10 Categorisation of respondents' derivable benefits from rice value addition through drying in Niger

Table 4.32 shows the result of disaggregated **c**ategorisation of respondents' derivable benefits from rice value addition through drying in Niger. It was found that there was high derivable benefit derivable benefits from rice value addition through drying in Niger with a mean and standard deviation value of 53.3±5.93. This means that drying yield advantageous derivable benefits in the addition of value to rice. This is in line with the study of Pode, (2016) who pointed out that drying to an appropriate moisture level always improve the quality and shelve life of rice.

Table 4.32 Categorisation of respondents' derivable benefits from rice value addition through drying in Niger

Level of derivable benefits from value addition through drying	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	22-55	45	43.3	22	72	53.3	5.93
High	56-72	59	56.7				
Total		104	100				

4.5.11 Categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Niger

The result disaggregated categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Niger is given in Table 4.33. it was found that derivable benefit was low with a mean and standard deviation value of 50.1±5.34. This means the combination of parboiling, cleaning and dehusking as a focal point in value addition does not lead to high significant benefit in Niger. This is supported by one of the participant at the FGDs who said

> *"Our efforts do not really make people patronise us, some of our neighbours will go and buy foreign rice in the local markets. They only come to us when they want to buy on credit". (FGD, female participant at Kambari community, Katcha L.G.A. Niger)*

This result is in contrast with Kehinde and Aboaba, (2016) who posited that more benefit are generated by farmers from value addition.

Table 4.33 Categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Niger

Level of derivable benefits from value addition through parboiling, cleaning and dehusking	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	32-54	56	53.8	32	70	50.1	5.34
High	55-70	48	46.2				
Total		104	100				

4.5.12 Categorisation of respondents' derivable benefits from rice value addition through transportation effectiveness in Niger

Table 4.34 show the categorisation of respondents' derivable benefits from rice value addition through transportation It was found that the derivable benefit was high. This indicated that transportation in Niger contributed substantially to the value added to rice. This is in line with the assertion of Ofosu-Budu and Sarpong, (2013) who pointed out that timely transportation of farm produces usually bring worthy return on farm investment.

Table 4.34 Categorisation of respondents' derivable benefits from rice value addition through transportation effectiveness in Niger

Level of derivable benefits from value addition through transportation effectiveness	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	33-50	49	47.1	33	72	51.1	6.32
High	51-72	55	52.9				
Total		104	100				

4.5.13 Categorisation of respondents'derivable benefits from rice value addition through storage in Niger

The result of disaggregated categorization of respondents' derivable benefits from rice value addition through storage in Niger was found to be high with a mean and standard deviation of 54.8±783 as given in Table 4.35. This implies that to a large extent derivable benefits through storage give higher beneficial return in rice value addition. This result supports the statement of one the participant at the FGD in Niger that…

> *"…we have various means of storing our rice locally to prevent weevil and spoilage. This makes it possible for us to have rice all year round. At least we usually have stored rice for our use after harvest through the dry season before another harvest." (FGD Male participant in Badegi Community, Katcha L.G.A., Niger State).*

Table 4.35 Categorisation of respondents'derivable benefits from rice value addition through storage in Niger

Level of derivable benefits from value addition through storage	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	22-40	40	44.5	22	67	54.8	7.83
High	41-67	64	56.5				
Total		104	100				

4.5.14 General Categorisation of respondents'derivable benefits from rice value addition in Niger

A dissimilar outcome was obtained in Niger when compared with that of Kwara. The analysis of results on general categorisation of respondents' derivable benefits from rice value addition in Niger shows that with a mean and standard deviation value of 51.52±9.03, majority (53.9%) of the respondents in Niger had high derivable benefits from the addition of value to rice as presented in Table 4.37. This implies that processing efforts is yielding commensurate dividends in rice value addition by processors. This finding is in line with the asertion of Kehinde and Aboaba, (2016) who posited that more benefit are generated by farmers from value addition. Similarly, this findings is also supported by the comment of one of the processors who recounted that:

> *"We have been in this business for some time now and we are grateful to God that we have benefitted a lot from this engagement in a several ways"*
> *FGD Male participant in Badegi Community, Katcha L.G.A., Niger State).*

Table 4.36: General Categorisation of respondents based on their derivable benefits from rice value addition in Niger

Level of derivable benefits from value addition	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	21- 42	56	46.2	21.00	62.00	51.52	9.03
High	43- 62	48	53.9				
Total		104	100				

Source: Field Survey, 2016

4.5.15 Derivable benefits by respondents from value addition in rice production in Kwara and Niger

Table 4.37 shows the overall results of derivable benefits in value addition in both Kwara amd Niger. It was revealed that prevention of ineffective separation of rice and foreign materials and impurities; realisation of rice paddy that is devoid of stones and being able to sell at a very good price ranked first, second and third with mean and standard deviation values of 1.45±0.63, 1.43±0.64 and 1.41±0.65, respectively as derivable benefits from threshing and winnowing. Also, reduction of total time of rice processing and actualisation of maximum number of unbroken grains ranked fourth in the distribution with weighted mean and standard deviation value of 1.34±0.65. This implies that getting a cleaner output, commanding good sales as well as timeliness of operation were of utmost benefits of threshing and winnowing. Furthermore, drying in rice value addition is of tremendous advantage to the entire value addition process. This study therefore revealed that reduction of total time of rice processing is the most important derivable benefit of drying as this was ranked first with a mean and standard deviation value of 1.40±0.63 in the distribution. This was followed by prevention of diseases infestation and prevention of grains from growing moulds with mean and standard deviation values of 1.27±0.69 and 1.24±0.65, respectively.

Result of derivable benefits from parboiling, cleaning and dehusking revealed that actualisation of rice with prolong shelf life and prevention of ineffective separation of rice and foreign materials and impurities were the most important derivable benefit of parboiling, cleaning and dehusking in the addition of value to rice with mean and standard deviation values of 1.39±0.62 and 1.39±0.57, respectively. The fact that grains are better accepted by end users is next in order of importance in terms of derivable benefits of parboiling, cleaning and dehusking with a mean and standard deviation value of 1.38±0.60. In terms of derivable benefits from transportation effectiveness, this study revealed that realisation of maximum productivity of human resources, realisation of increased output hence increased income and actualisation of prompt and responsive transport at affordable cost were of utmost importance with mean and standard deviation values of 1.37±0.55, 1.33±0.57 and 1.33±0.61, respectively. This implies that efficient transport service is *sine qua none* to maximisation of the benefits of total output of production. It is noteworthy that storage of agricultural products has always give room to constant and prolong availability of products, as such efficient storage will not only bring about products availability but also products with desired quality. This study therefore found out that actualisation of grains of desired colour and acceptability of grains by end users ranked highest in the derivable benefits from storage in the study area with mean and standard deviation value of 1.50±0.60 and 1.50±0.61.

Table 4.37: Distribution of respondents' derivable benefits from value addition in rice production in Kwara and Niger

	Derivable benefits	No benefit		Low benefit		High benefit		Mean	Rank
		F	%	F	%	F	%		
A.	**Threshing and winnowing**								
1.	Actualization of maximum number of number of unbroken grains	17	9.1	88	47.3	81	43.5	1.34±0.64	4th
2.	Actualization of grains of desired colour	17	9.1	90	48.4	79	42.5	1.33±0.64	6th
3.	Realization of Removal of unwanted paddy	21	11.3	95	51.1	70	37.6	1.26±0.65	7th
4.	**Realization of rice paddy that is devoid of stones**	**15**	**8.1**	**76**	**40.9**	**95**	**51.1**	**1.43±0.64**	**2nd**
5.	**Prevention of ineffective separation of rice and foreign materials and impurities**	**14**	**7.5**	**75**	**40.3**	**97**	**52.2**	**1.45±0.63**	**1st**
6.	Reduction of total time of rice processing	18	9.7	87	46.8	81	43.5	1.34±0.65	4th
7.	**Being able to sell at a very good price**	**17**	**9.1**	**75**	**40.3**	**94**	**50.5**	**1.41±0.65**	**3rd**
8.	Acceptability by end users	17	9.1	114	61.3	55	29.6	1.20±0.59	8th
B	**Drying**								
1.	Avoiding localization of heating spots on rice.	24	12.9	117	62.6	45	24.2	1.11±0.60	8th
2.	Actualization of grains of desired colour	30	16.1	91	48.9	65	34.9	1.19±0.69	5th
3.	Prevention of ineffective separation of rice and foreign materials and impurities	17	9.1	116	62.4	53	28.5	1.19±0.58	5th
4.	**Reduction of total time of rice processing**	**14**	**7.5**	**84**	**45.2**	**88**	**47.3**	**1.40±0.63**	**1st**
5.	Prevention of grains from insects attack.	27	14.5	110	59.1	49	26.3	1.12±0.63	7th
6.	**Prevention of grains from growing moulds**	**22**	**11.8**	**98**	**52.7**	**66**	**35.5**	**1.24±0.65**	**3rd**
7.	**Prevention of diseases infestation**	**25**	**13.4**	**85**	**45.7**	**76**	**40.9**	**1.27±0.69**	**2nd**
8	Reduction of wastage of grains	17	9.1	110	59.1	59	31.7	1.23±0.60	4th

C.	**Parboiling, cleaning and dehusking**								
1.	**Actualisation of rice with prolong shelf life**	**14**	**7.5**	**86**	**46.2**	**86**	**46.2**	**1.39±0.62**	**1st**
2.	Actualization of grains of desired colour	22	11.8	85	45.7	79	42.5	1.31±0.67	6th
3.	Realization of rice paddy that is devoid of stones.	8	4.3	102	54.8	76	40.9	1.37±0.57	4th
4.	**Prevention of ineffective separation of rice and foreign materials and impurities**	**8**	**4.3**	**98**	**52.7**	**80**	**43.0**	**1.39±0.57**	**1st**
5.	Realization of Removal of unwanted paddy	13	7.0	113	60.8	60	32.3	1.25±0.58	7th
6.	Realization of increased output hence increased income	7	3.8	104	55.9	75	40.3	1.37±0.56	4th
7.	**Grains are better accepted by end users.**	**11**	**5.9**	**94**	**50.5**	**81**	**43.5**	**1.38±0.60**	**3rd**
D.	**Transportation effectiveness**								
1.	**Realization of maximum productivity of human resources.**	**6**	**3.2**	**105**	**56.5**	**75**	**40.3**	**1.37±0.55**	**1st**
2.	**Actualization of prompt and responsive transport at affordable cost**	**14**	**7.5**	**97**	**52.2**	**75**	**40.3**	**1.33±0.61**	**2nd**
3.	Realization of Removal of unwanted paddy	18	9.7	91	48.9	77	41.4	1.32±0.64	4th
4.	**Realization of increased output hence increased income**	**9**	**4.8**	**106**	**57.0**	**71**	**38.2**	**1.33±0.57**	**2nd**
5.	Prevention/reduction of injury during processing	16	8.6	107	57.5	63	33.9	1.25±0.60	5th
E.	**Storage**								
1.	**Actualisation of rice with prolongshelf life**	**14**	**7.5**	**71**	**38.2**	**101**	**54.3**	**1.47±0.63**	**3rd**
2.	**Actualization of grains of desired colour**	**10**	**5.4**	**73**	**39.2**	**103**	**55.4**	**1.50±0.60**	**1st**
3.	Realization of Removal of unwanted paddy	5	2.7	94	50.5	87	46.8	1.44±0.55	4th
4.	Realization of increased output hence increased income	11	5.9	83	44.6	92	49.5	1.44±061.	4th
5.	Availability of quality rice at the periods of scarcity.	16	8.6	85	45.7	85	45.7	1.37±064	5th
6.	**Acceptability of grains by end users.**	**11**	**5.9**	**71**	**38.2**	**104**	**55.9**	**1.50±0.61**	**1st**

Source: Field Survey, 2016

4.5.16 Categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Kwara and Niger

Table 4.38 show the result of the disaggregated categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in both Kwara and Niger. It was found that derivable benefits through threshing and winnowing were low in both Kwara and Niger with mean and standard deviation value of 45.8±5.49. This means that threshing and winnowing activities in both Kwara and Niger does not bring about a positive result oriented outcome of derivable benefits.

Table 4.38 Categorisation of respondents' derivable benefits from rice value addition through threshing and winnowing in Kwara and Niger

Level of derivable benefits from value addition through threshing and winnowing	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	25-47	106	57.0	25	66	45.8	5.49
High	48-66	80	43.0				
Total		186	100				

4.5.17 Categorisation of respondents' derivable benefits from rice value addition through drying in Kwara and Niger

Drying forms an important integral processing activity and a means of adding value to final output. The disaggregated categorisation of respondents' derivable benefits from rice value addition in both Kwara and Niger was found to be high with mean and standard deviation value of 51.8±5.46. The implication of this is that the respondents positively benefited when they dry their rice produce. This result corroborates the assertion of one of the women in Kwara FGD that:

> *"effective drying makes processing less labourious. If drying is appropriately done, quality is enhanced and guaranteed to a large extent" (FGD female participant at Lade community, Patigi L.G.A. Kwara State)*

Table 4.39 Categorisation of respondents' derivable benefits from rice value addition through drying in Kwara and Niger

Level of derivable benefits from value addition through drying	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	22-48	84	45.2	22	72	51.8	5.46
High	49-72	102	54.8				
Total		186	100				

4.5.18 Categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Kwara and Niger

The disaggregated result of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking activities were found to be low with a mean and standard deviation of 49.71±5.18. This implies that respondents were not satisfied with the results of what they get from their efforts in parboiling, cleaning and dehusking in both Kwara and Niger. This finding is complemented with the statement of one of the processors during one of the FGDs when he recalled…

> *"We usually spend so much time in cleaning and even at that, the rice were not totally devoid of stones as such series of challenges are faced during marketing". (FGD female participant at Lalagi community, Patigi L.G.A. Kwara State)*

Table 4.40 Categorisation of respondents' derivable benefits from rice value addition through parboiling, cleaning and dehusking in Kwara and Niger

Level of derivable benefits from value addition through parboiling, cleaning and dehusking	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	30-51	103	55.4	30	69	49.71	5.18
High	52-69	83	44.6				
Total		186	100				

4.5.19 Categorisation of respondents' derivable benefits from rice value addition through transportation effectiveness in Kwara and Niger

Respondents' derivable benefits from rice value addition through transportation effectiveness was found to be low in both Kwara and Niger with mean and standard deviation value of 50.12±5.16 as stated in Table 4.41. This means that transportation of rice produce/and products by respondents does not lead to a substantial addition of value in both Kwara and Niger combined. This result is complemented by the remark of one of the women during the FGD.

> *"The fact that there were less effective means transportation usually lead to shortage for us. Some of our rice paddies get wasted before getting to the point of processing since transportation is a challenge" (FGD female participant at Lade community, Patigi L.G.A. Kwara State)*

Table 4.41 Categorisation of respondents' derivable benefits from rice value addition through transportation effectiveness in Kwara and Niger

Level of derivable benefits from value addition through transportation effectiveness	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	35-50	94	50.5	35	72	50.21	5.16
High	51-72	92	49.5				
Total		186	100				

4.5.20 Categorisation of respondents' derivable benefits from rice value addition through storage in Kwara and Niger

The disaggregated result of respondents' derivable benefits from rice value addition through storage in both Kwara and Niger is given in Table 4.42 and it was fond that to be high with a mean and standard deviation of 51.3±7.41. This means that processors were able to benefit from storage of their produce/and products. This result is complemented by the statement of one the participant at the FGD in Niger that…

> *"…we have various means of storing our rice locally to prevent weevil and spoilage. This makes it possible for us to have rice all year round. At least we usually have stored rice for our use after harvest through the dry season before another harvest." (FGD male participant at Shesi community, Lavun L.G.A. Nigre State).*

Table 4.42 Categorisation of respondents' derivable benefits from rice value addition through storage in Kwara and Niger

Level of derivable benefits from value addition through storage	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	22-40	89	47.8	22	67	51.3	7.41
High	41-67	97	52.2				
Total		186	100				

4.5.21 Overall general Categorisation of respondents derivable benefits from rice value addition in Kwara and Niger

The result of the overall general categorisation of respondents' derivable benefits from rice value addition in both Kwara and Niger is presented in the Table 4.43, and it revealed that respondents in the study area had cumulative low level of derivable benefits in value addition. More than half (53.8%) of the respondents had low level of derivable benefits while 46.2% had high level of derivable benefit with a mean and standard deviation value of 45.52±8.99. This implies that the processing activities in rice production are not without attendants' purposive beneficial focal points for which they were carried out but cumulatively the whole of these activities pointed out that lot of effort put into value addition activities in rice production does not really worth the realized outcome. This is contrary to the assertion of Omoare and Oyediran, (2017) and Chidiebere-Mark (2017) that believed that the more the value added the better the beneficial outcome.

Table 4.43: Overall general categorisation of respondents derivable benefits from rice value addition in Kwara and Niger

Level of derivable benefits	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	21- 46	100	53.8	21	72	45.52	8.99
High	47- 72	86	46.2				
Total		186	100				

Source: Field Survey, 2016

4.6. Constraints encountered by respondents in rice value addition

It is apparent that the need to establish impediments becomes necessary wherever there is ineptitude in perfection of procedural activities of particular process or processes. This is why this study sought to ascertain the constraints that were being encountered by processors in attempting to add value to rice. These constraints includes lack or inadequate of incentives for rice value addition; lack of technical knowledge and training for processors; inability to access credit facilities; inadequacy of information on private sector participation; inadequacy of extension support; inadequate supply of paddy to processors; poor infrastructure such as bad road to the interiors; difficulties in assessing some value addition actors; inadequate market information on demand and supply of rice; drought and insufficient rain for upland rice leading to persistent crop failure and inadequate paddy for value addition; inefficiency in the control of rodents infestation; inefficiency in the control of birds infestation; poor and unsteady power supply for adequate utilisation of technology for value addition; unavailability and insufficient storage and other facilities for value addition and unreliable means of transportation of paddy for value addition.

4.6.1. Constraints encountered by respondents in rice value addition in Kwara

Table 4.44 reveals that unavailability and insufficient storage and other facilities for value addition was found to be the most severe constraint in Kwara with mean value of 1.45±0.62. This was closely followed by lack or inadequate incentives for rice value addition and inabilities to access credit facilities with mean values of 1.44±0.65 and 1.44±0.63, respectively. Unreliable means of transportation of paddy for value addition and inadequate information on private sector participation are other important constraints in the addition of value to rice with mean values of 1.38±0.62 and 1.37±0.64, respectively. Results shows that inadequate supply of paddy to processors was more or less not considered as a constraint as this has a low mean value of 0.87±0.73. This implies that there are more than enough rice paddies for which value need to be added in Kwara.

Table 4.44: Distribution of respondents based on the constraints encountered in rice value addition in Kwara

	Constraints encountered in rice value addition	No constraint		Low constraint		High constraint		Mean	Rank
		F	%	F	%	F	%		
1.	**Lack or inadequate of incentives for rice value addition.**	**7**	**8.5**	**32**	**39**	**43**	**52.4**	**1.44±0.65**	**2nd**
2.	Lack of adequate technical knowledge & training for actors	14	17.1	39	47.6	29	35.4	1.18±0.70	10th
3.	**Inability to access credit facilities.**	**6**	**7.3**	**34**	**41.5**	**42**	**51.2**	**1.44±0.63**	**2nd**
4.	Inadequacy of information on private sector participation	7	8.5	38	46.3	37	45.1	1.37±0.64	5th
5.	Inadequacy of extension support	14	17.1	44	53.7	24	29.3	1.12±0.67	13th
6.	Inadequate supply of paddy to value addition processors	28	34.1	37	45.1	17	20.7	0.87±0.73	15th
7.	Poor infrastructure such as bad road to the interiors	9	11	38	46.3	35	42.7	1.32±0.66	7th
8.	Difficulties in accessing some value addition processors.	11	13.4	45	54.9	26	31.7	1.18±0.65	10th
9.	Inadequate market information on demand and supply of rice.	17	20.7	44	53.7	21	25.6	1.05±0.68	14th
10.	Drought and insufficient rain for upland rice leading to persistent crop failure and inadequate paddy for value addition.	10	12.2	34	41.5	38	46.3	1.34±0.69	6th
11.	Inefficiency in the control of rodents infestation	10	12.2	51	62.2	21	25.6	1.13±0.60	12th
12	Inefficiency in the control of birds infestation	12	14.6	34	41.5	36	43.9	1.29±0.71	8th
13.	Poor and unsteady power supply for adequate utilization of technology for value addition.	15	18.3	35	42.7	32	39.0	1.21±0.73	9th
14.	**Unavailability and insufficient storage and others facilities for value addition.**	**38**	**3.7**	**39**	**47.6**	**40**	**48.**	**1.45±0.57**	**1st**
15.	Inadequate means of transportation of paddy for value addition	6	7.3	39	47.6	37	45.1	1.38±0.62	4th

Source: Field Survey, 2016

4.6.2: Categorisation of constraints encountered by respondents in rice value addition in Kwara

Table 4.45 reveals the level of constraints encountered by respondents in the addition of value to rice in Kwara. Analysis of results shows that with a mean value of 18.72±4.22, most of the respondents encountered low level of constraints (54.9%), while 45.1% had high level of constraints. This implies that since the processors had some years of experience in value addition activities, they seem not to focus on the various impediments in rice processing hence the low level of constraints.

Table 4.45: Categorisation of constraints encountered by respondents in rice value addition in Kwara

Level of constraints encountered in value addition	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	8- 19	45	54.9	8	26	18.72	4.22
High	9- 26	37	45.1				
Total		82	100				

Source: Field Survey, 2016

4.6.3. Constraints encountered by respondents in rice value addition in Niger

The constraints encountered in rice value addition in Niger were presented in Table 4.46. It was found that inadequate market information on demand and supply of rice is regarded as the most severe constraint in value addition with mean valu of 1.43±0.65. Similarly, difficulties encountered in assessing value addition processors form another major constraint in Niger with a mean and standard deviation value of 1.42±0.55. In addition, inadequate infrastructural such as bad road network was also regarded as an important constraint militating against value addition in Niger with a mean value of 1.41±0.58. Furthermore, extension support inadequacy and information on private sector participation were other constraints that were indicated by respondents with mean values of 1.41±0.55 and 1.39±0.55, respectively. It is worthy of note that in Niger, unreliable means of transportation of paddy for value addition also constitutes to substantial negative effects on the improvement expected in the addition of value to rice with mean and standard deviation values of 1.39±0.64. The epileptic supply of power and sometimes total lack of power supply also affect value addition in Niger with mean value of 1.36±0.56. At the bottom rung of the distribution are the constraints bordering on inadequacy of incentives for rice value addition by the appropriate agencies.

Table 4.46.: Distribution of respondents based on the constraints encountered in rice value addition in Niger

	Constraints encountered in rice value addition	**No constraint**		**Low constraint**		**High constraint**		**Mean**	**Rank**
		F	**%**	**F**	**%**	**F**	**%**		
1.	Lack or inadequate of incentives for rice value addition.	13	12.5	57	54.8	34	32.7	1.20±0.64	15th
2.	Lack of adequate technical knowledge & training for actors	12	11.5	45	43.3	47	45.2	1.34±0.68	9th
3.	Inability to access credit facilities.	10	9.6	53	51.0	41	39.4	1.30±0.64	12th
4.	Inadequacy of information on private sector participation	3	2.9	57	54.8	44	42.3	1.39±0.55	5th
5.	**Inadequacy of extension support**	**3**	**2.9**	**55**	**52.9**	**46**	**44.2**	**1.41±0.55**	**3rd**
6.	Inadequate supply of paddy to value addition processors	8	7.7	55	52.9	41	39.4	1.32±0.61	11th
7.	**Poor infrastructure such as bad road to the interiors**	**4**	**3.8**	**53**	**51.0**	**47**	**45.2**	**1.41±0.58**	**3rd**
8.	**Difficulties in accessing some value addition processors.**	**3**	**2.9**	**54**	**51.9**	**47**	**45.2**	**1.42±0.55**	**2nd**
9.	**Inadequate market information on demand and supply of rice.**	**9**	**8.7**	**41**	**39.4**	**54**	**51.9**	**1.43±0.65**	**1st**
10.	Drought and insufficient rain for upland rice leading to persistent crop failure and inadequate paddy for value addition.	8	7.7	53	51.0	43	41.3	1.34±0.62	9th
11.	Inefficiency in the control of rodents infestation	10	9.6	57	54.6	37	35.6	1.26±0.62	14th
12	Inefficiency in the control of birds infestation	5	4.8	58	55.8	41	39.4	1.35±0.57	8th
13.	Poor and unsteady power supply for adequate utilization of technology for value addition.	04	3.8	50	56.7	41	39.4	1.36±0.56	7th
14.	Unavailability and insufficient storage and others facilities for value addition.	11	10.6	52	50	41	39.4	1.29±0.65	13th
15.	Inadequate means of transportation of paddy for value addition	029	8.7	47	45.2	48	46.	1.38±0.64	6th

Source: Field Survey, 2016

4.6.4 Categorisation of constraints encountered by respondents in rice value addition in Niger

Table 4.47 shows the categorisation of constraints encountered by respondents in rice value addition in Niger. Using the obtained mean and standard deviation value of 20.20±3.58, it can be deduced that most respondents in Niger also had low level of constraints like their Kwara counterpart. About half (51.9%) of the respondents had low level of constraints while only 48.1% had high level of constraints encountered in the addition of value to rice. This implies that despite the fact that the benefits accrued in value addition were low, processors complained less due to the fact that they do not seem to have ready alternative to the various activities in the value addition chain.

Table 4.47: Table of Categorisation of constraints encountered by respondents in rice value addition in Niger

Level of constraints encountered by respondents in	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	12-20	54	51.9	12	27	20.20	3.58
High	21-27	50	48.1				
Total		104	100				

Source: Field Survey, 2016

4.6.5. Constraints encountered by respondents in rice value addition in Kwara and Niger

The overall results on constraints encountered in rice value addition are shown in Table 4.48. This study revealed that inadequacy of information on private sector participation as well as unreliable means of transportation of paddy for value addition were the most severe constraint encountered in rice value addition in the study area with weighted mean and standard deviation values of 1.38±0.59 and 1.38±0.63, respectively. This was closely followed by problem of poor infrastructure such as bad road to the interiors, inability to access credit facilities as well as unavailability and insufficient storage and other facilities for value addition with weighted mean and standard deviation values of 1.37±0.61,1.36±0.64 and 1.36±0.62, respectively. Also on the constraint list were drought and insufficient rain for upland rice leading to persistent crop failure and inadequate paddy for value addition, difficulties in assessing some value addition actors, inefficiency in the control of birds' infestation and lack or inadequate of incentives for rice value addition with weighted mean and standard deviation values of 1.34±0.65,1.32±0.61, 1.32±0.64 and 1.31±0.66, respectively. At the bottom of the ranking of constraints was inadequate supply of rice paddy which ranked last with a mean and standard deviation value of 1.12±0.70. This implies that unavailability of paddy for processing is more or less not any serious impediment in rice value addition among processors in the study area.

Table 4.48: Distribution of respondents' constraints encountered in rice value addition in Kwara and Niger

	Constraints encountered in rice value addition	No constraint		Low constraint		High constraint		Mean	Rank
		F	%	F	%	F	%		
1.	Lack or inadequate of incentives for rice value addition.	20	10.8	89	47.8	77	41.4	1.31±0.66	9th
2.	Lack of adequate technical knowledge & training for actors	26	14.0	84	45.2	76	40.9	1.27±0.69	12th
3.	Inability to access credit facilities.	16	8.6	87	46.8	83	44.6	1.36±0.64	4th
4.	**Inadequacy of information on private sector participation**	**10**	**5.4**	**95**	**51.1**	**81**	**43.5**	**1.38±0.59**	**1st**
5.	Inadequacy of extension support	17	9.1	99	53.2	70	37.6	1.28±0.62	11th
6.	Inadequate supply of paddy to value addition processors	36	19.4	92	49.5	58	31.2	1.12±0.70	15th
7.	**Poor infrastructure such as bad road to the interiors**	**13**	**7.0**	**91**	**48.9**	**82**	**44.1**	**1.37±0.61**	**3rd**
8.	Difficulties in assessing some value addition processors	14	7.5	99	53.2	73	39.2	1.32±0.61	7th
9.	Inadequate market information on demand and supply of rice.	26	14.0	85	45.7	75	40.3	1.26±0.69	13th
10.	Drought and insufficient rain for upland rice leading to persistent crop failure and inadequate paddy for value addition.	18	9.7	87	46.8	81	43.5	1.34±0.65	6th
11.	Inefficiency in the control of rodents infestation	20	10.8	108	58.1	58	31.2	1.20±0.62	14th
12	Inefficiency in the control of birds infestation	17	9.1	92	49.. 5	77	41.4	1.32±0.64	7th
13.	Poor and unsteady power supply for adequate utilization of technology for value addition.	19	10.2	94	50.5	73	39.2	1.29±0.64	10th
14.	Unavailability and insufficient storage and others facilities for value addition.	14	7.5	91	48.9	81	43.5	1.36±0.62	4th
15.	**Inadequate means of transportation of paddy for value addition**	**15**	**8.1**	**86**	**46.2**	**85**	**45.7**	**1.38±0.63**	**1st**

Source: Field Survey, 2016

4.6.6 Categorisation of constraints encountered by respondents in rice value addition in Kwara and Niger

Table 4.49 shows the level of constraints encountered by respondents in rice value addition in both Kwara and Niger. On the overall, with a mean and standard deviation value of 19.55±3.93, majority of the respondents (58.60%) had high level of constraints, while 41.40% had low level of constraints. Factors that could be responsible for this include the drudgery experienced by the processors in the addition of value to rice

Table 4.49: Categorisation of constraints encountered by respondents in rice value addition in Kwara and Niger

Level of constraints encountered in value addition	Scores	Frequency	Percentage	Minimum	Maximum	Mean	Standard deviation
Low	8 – 20	109	41.40	8	27	19.55	3.93
High	21-27	77	58.60				
Total		186	100				

Source: Field Survey, 2016

4.7 Hypotheses testing

This section presents the results of the hypotheses that were postulated in this study, the findings that were arrived at and the implications that were deduced.

4.7.1 Hypothesis one

There is no significant relationship between rice processors' selected personal characteristics and the derivable benefits from value addition in rice industry.

Across states, the results of the test of relationship between the rice processors' selected personal characteristics and the derivable benefits from value addition in the study area revealed in Table 4.50 that sex, (x^2=0.045, p=0.831) was not significantly related to the derivable benefit from value addition. The marital status of respondents (x^2=2.601, p=0.457), educational qualification (x^2=7.658, p=0.105), primary occupation (x^2=1.684, p=0.794), religion (x^2=0.549, p=0.459), were not significantly related to derivable benefit from value addition. This implies that sex, marital status, educational qualification, primary occupation, and religion do not have any effects on the derivable benefits of the respondents. This can be deduced from some assertions that were made during the FGDs such as:

> *"We use to do everything together with our husbands without any discrimination. Our people that are doing government work (civil servant) and those going to school use to do their own bit after their daily work and school and also during weekends" (FGD, female participant at Lafiagi community of Edu Local Government Area, Kwara)*

It should however be noted that source of labour (x^2=12.420, p=0.014) was significant. This implies that source of labour had significant effects on derivable benefits.

The results of the findings of the test of relationship between rice processors selected personal characteristics and derivable benefits from value addition in both Kwara and Niger is shown in Table 4.36. The result revealed that sex (Kwara x^2=0.662, p=0.416; Niger x^2=0.411, p=0.521) of the respondents, marital status (Kwara x^2=3.128, p=0.372; Niger x^2=4.089, p=0.252), educational qualification (Kwara x^2=5.933, p=0.115; Niger x^2=7.073, p=0.132), primary occupation (Kwara x^2=1.278, p=0.865; Niger x^2=2.401, p=0.662) and religion (Kwara x^2=0.50, p=0.823; Niger x^2=1.662, p=0.197) were not significantly related to derivable benefit from value addition. It is worthy of note here that source of labour, (x^2=18.561, p=0.001) was significantly related to derivable benefits in Niger and on the overall.

Table 4.50 Table of Test of relationship between rice processors selected personal characteristics and derivable benefits from value addition

Variables	x^2	df	p-value	Decision
Sex	0.045	1	0.831	Not significant
Marital status	2.601	3	0.457	Not significant
Educational qualification	7.658	4	0.105	Not significant
Primary occupation	1.684	4	0.794	Not significant
Religion	0.549	1	0.459	Not significant
Source of labour	12.420^*	4	0.014	Significant

df= Degree of freedom
x^2= chi square
p= probability level
*= chi square is significant at <0.05

Table 4.51 Test of relationship between rice processors selected personal characteristics and derivable benefits from value addition in Kwara and Niger

Variables	State	x^2	df	p-value	Decision
Sex	Kwara	0.662	1	0.416	Not significant
	Niger	0.411	1	0.521	Not significant
Marital status	Kwara	3.128	3	0.372	Not significant
	Niger	4.089	3	0.252	Not significant
Educational qualification	Kwara	5.933	3	0.115	Not significant
	Niger	7.073	4	0.132	Not significant
Primary occupation	Kwara	1.278	4	0.865	Not significant
	Niger	2.401	4	0.662	Not significant
Religion	Kwara	0.50	1	0.823	Not significant
	Niger	1.662	1	0.197	Not significant
Source of labour	Kwara	7.304	4	0.121	Not significant
	Niger	18.561*	4	0.001	Significant

df= Degree of freedom
x^2= chi square
p= probability level
*= chi square is significant at $p < 0.05$

4.7.2 Hypothesis two

There is no significant relationship between the attitudes of processors towards value addition and the derivable benefits from value addition.

The result of analysis of the test of relationship between attitude of rice processors in Table 4.52 shows that on the overall there was a significant correlation (r=0.546, p=0.000) between attitude of rice processors and derivable benefits from value addition. This implies that the attitude of processors significantly affects the extent and level of derivable benefits accruable from value addition.

Table 4.53 revealed that in Kwara and there was no significant correlation (r=0.108, p=0.334) between attitude of rice processors and derivable benefits from value addition. On the other hand, in Niger, there was a significant correlation (r=0.569, p=0.000) between attitude of rice processors and derivable benefits from value addition.

Table 4.52 Test of relationship between attitudes of rice processors rice value addition

Variables	N	r-value	p-value	Decision
Attitude of processors toward value addition	186	0.546**	0.000	Significant

p= probability level
**= correlation was significant at the 0.01 level (2-tailed)

Table 4.53 Test of relationship between attitudes of rice processors rice value addition in Kwara and Niger

Variables	State	N	r-value	p-value	Decision
Attitude of processors toward value addition	Kwara	82	0.108	0.334	Not significant
	Niger	104	0.569**	0.000	Significant

p= probability level

**= correlation was significant at the 0.01 level (2-tailed)

4.7.3 Hypothesis three

There is no significant relationship between constraints encountered in the addition of value and the derivable benefits from value addition in rice industry.

Table 4.54 shows the overall results of test of relationship between constraints encountered in the addition of value and the derivable benefits from value addition and it was found that there was a significant relationship (r=0.280, p=0.000) between the constraints and the derivable benefits in rice value addition across states. Similarly, in each states of the study area as revealed in Table 4.55, there was also a significant relationship (Kwara: r=0.398, p=0.000 and Niger: r=0.497, p=0.000) between the constraints encountered and the derivable benefits in rice value addition. This implies that the various constraints encountered affect the derivable benefits in one way or the other.

Table 4.54 Test of relationship between derivable benefits of rice processors and constraints encountered in rice value addition

Variables	N	r-value	p-value	Decision
Derivable benefits vs constraints encountered	186	0.280**	0.000	Significant

p= probability level

**= correlation is significant at the 0.01 level (2-tailed)

Table 4.55 Table of Test of relationship between derivable benefits of rice processors and constraints encountered in rice value addition

Variables	State	N	r-value	p-value	Decision
Derivable benefits vs constraints encountered	Kwara	82	0.398**	0.000	Significant
	Niger	104	0.497**	0.000	Significant

p= probability level

**= correlation is significant at the 0.01 level (2-tailed)

4.7.4 Hypothesis four

There is no significant difference in the derivable benefits by processors with different level (low and high) level of value addition across the states.

The test of difference between the derivable benefits of processors with low level of value addition and high level of value addition revealed in Table 4.56 shows that there exists a significant difference between the derivable benefits accrued by processors with low level of value addition and those with high level of value addition in the study area ($t=4.144$, $p=0.000$) with a mean difference of 5.25. The fact that most processors in Niger are in their middle age, (30-39years) can also be justification of significant difference. At the state level, Table 4.57 revealed that there was no significant difference between the derivable benefits of processors with low level of value addition and high level of value addition in both Kwara ($t= -0.565$, $p= 0.573$) and Niger ($t= 1.716$, $p= 0.089$,). This may be due to the fact that in both Kwara and Niger similar cultural practices exist in the processors ways of adding value to rice.

Table 4.56: Test of difference between the derivable benefits of processors with low level of value addition and those with high level of value addition

Variables	level	Mean	Std	Mean difference	t-value	p-value	Decision
Derivable benefits	Low	48.31	8.42	5.25	4.144	0.000*	Significant
	High	43.06	8.79				

Significant at p<0.05

Table 4.57: Test of difference between the derivable benefits of processors with low level of value addition and those with high level of value addition in Kwara and Niger

Variables	State	Level	Mean	Std	Mean difference	t-value	p-value	Decision
Derivable benefits	Kwara	Low	50.36	6.29	-0.82	-0.565	0.573	Not Significant
		High	51.17	4.65				
	Niger	Low	44.00	10.61	3.39	1.716	0.089	Not Significant
		High	40.61	8.27				

Significant at p<0.05

4.7.5 Hypothesis five

There is no significant difference in the derivable benefits between respondents in Kwara and Niger.

The test of difference on the derivable benefits by processors in Kwara and Niger at different stages of value addition is shown in Table 4.58. The Table revealed that there exists a conspicuous level of significant differece between derivable benefits by processors at different stages of value addition in the study area, (t= -6.898, p=0.000). With a mean difference of 13.64, it shows that there are more processors deriving benefits at different stages of value addition. The results of these study support the outburst made by some of the discussants during the FGD in both Kwara and Niger that

> *"We are always happy that the more effort we put in adding value to rice the better the outcome" (FGD male and female participant at different community, Kwara and Niger States)*

The findings of this hypothesis is also in line with that of Hussaini *et al.*, (2019) who stressed the acruable benefits that are enjoyed by farmers in value adition

Table 4.58: Test of difference between the derivable benefits by processors involved at difference stages of value addition

Variables	State	Mean	Std	Mean difference	t-value	p-value	Decision
Derivable benefits	Kwara	286.95	13.69	-13.64	-6.898	0.000	Significant
	Niger	300.59	13.22				

Significant at $p<0.05$

4.7.6 Hypothesis six

There is no significant contribution of value addition to derivable benefits in rice industry.

The various value addition variables were regressed with the derivable benefits to determine the contribution of the independent variables to the dependent variable. Table 4.59 shows the result of the regression analysis. On the overall, it was revealed that main determinants contributing significantly to derivable benefits were; timely drying ($\beta = -0.259$), parboiling using pottery method ($\beta = -0.172$), parboiling using mechanical device ($\beta = -0.180$) and dehusking by using mechanical device ($\beta = -0.316$).

Table 4.60 reveals that none of the independent variables significantly contribute to the derivable benefits in Kwara. However, in Niger, threshing with the use of spread tarpaulin ($\beta = 0.185$), parboiling using pottery method ($\beta = -0.192$), parboiling using mechanical device, ($\beta = -0.325$) and dehusking using mechanical device ($\beta = -0.250$) significantly contributed to the derivable benefits in value addition.

Considering the total score of the predictors, Table 4.61 reveals that threshing ($\beta = 0.222$), drying ($\beta = -0.145$), parboiling ($\beta = -0.221$) and dehusking ($\beta = -0.327$) significantly contributed to the derivable benefits in value addition on a general perspective. As revealed in Table 4.62 in Kwara, threshing ($\beta = 0.281$) and drying ($\beta = -0.223$) were significant contributors to derivable benefit in value addition. Also, threshing ($\beta = 0.339$), parboiling ($\beta = -0.330$) and dehusking ($\beta = -0.212$) contributed significantly to derivable benefits in rice value addition in Niger.

These results indicated that the timeliness of drying is very important in rice production. The more the consciousness of processors in terms of drying of rice to time, the better the eventual outcome, and hence the better the derivable benefits. Also, the resultant benefits and advantages in parboiled rice as against those that are not parboiled can also be attributed to the reason why parboiled rice is a contributing factor to derivable benefits. This is in line with findings of Amolegbe, (2016) that parboiling, drying and milling operations along the value chain were of great important benefits in the addition of value to rice.

Table 4.59 Contributions of value addition to derivable benefits in both states

Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		B	Std. Error	Beta		
1	(Constant)	77.624	14.356		5.407	0.000
	VALUE ADDITION - threshing (timely threshing after harvest)	-0.129	0.253	-0.033	-0.511	0.610
	Threshing (Use of whacking Frame)	0.264	0.282	0.062	0.935	0.351
	Threshing (Use of Mechanical device)	0.465	0.263	0.122	1.771	0.079
	Threshing (Use of Spread Tarpaulin)	0.331	0.261	0.084	1.271	0.206
	Threshing (Use of Pavement or floor	0.396	0.264	0.100	1.499	0.136
	Winnowing (Use of flat Tray)	-0.333	0.291	-0.072	-1.142	0.255
	Winnowing (Use of Basket/Calabash/head pan	-0.116	0.288	-0.026	-0.402	0.688
	Winnowing (Use of Mechanical Device)	0.162	0.277	0.038	0.583	0.561
	Timely Drying	-1.039*	0.290	-0.259*	-3.581	0.000
	Drying for Removal of Foreign Material to Avoid localized heating	-0.577	0.367	-0.102	-1.573	0.118
	Sun drying on Tarpaulin	0.234	0.258	0.061	0.905	0.367
	Sun drying on Concrete floor	0.149	0.251	0.038	0.595	0.553
	Drying with Mechanical Device	0.110	0.229	0.031	0.481	0.632
	Parboiling Using Pottery Method	-0.663*	0.264	-0.172*	-2.507	0.013
	Parboiling Using Single and Steaming in Metal drum	0.269	0.320	0.057	0.840	0.402
	Parboiling by Using Mechanical Device	-0.872*	0.319	-0.180*	-2.730	0.007
	Cleaning by Hand picking Method	0.403	0.482	0.055	0.835	0.405
	Cleaning with Mechanical Device	-0.117	0.311	-0.024	-0.377	0.707
	De-husking by Using Pestle and mortal	-0.157	0.220	-0.049	-0.711	0.478
	De-husking by Using Mechanical Device	-1.174*	0.245	-0.316*	-4.790	0.000

Transportation with Bicycle	0.016	0.265	0.004	0.062	0.951
Transportation with Cart	-0.235	0.300	-0.048	-0.782	0.435
Transportation with Tractor	0.271	0.319	0.058	0.848	0.398
Transportation with Motorized Vehicle/Okada	0.285	0.235	0.079	1.215	0.226
Storage (using Jute bags or sacs	-0.422	0.319	-0.085	-1.324	0.188
Storage (Using locally Constructed Silo)	0.063	0.348	0.011	0.182	0.856

R=0.68, R^2 =0.46, Adjusted R= 0.37 S.E. of estimate= 7.11
*Significant at p≤0.05

Table 4.60 Table of Contributions of Value addition to derivable benefits by States

State	Model		Unstandardized Coefficients β	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	p-value
Kwara	1	(Constant)	38.097	19.920		1.913	.061
		VALUE ADDITION - threshing (timely threshing after harvest)	0.049	0.306	0.021	0.161	0.873
		Threshing (Use of whacking Frame)	-0.028	0.309	-0.011	-0.090	0.929
		Threshing (Use of Mechanical device)	-0.003	0.335	-0.001	-0.009	0.993
		Threshing (Use of Spread Tarpaulin)	0.193	0.337	0.083	0.573	0.569
		Threshing (Use of Pavement or floor	0.460	0.389	0.179	1.183	0.242
		Winnowing (Use of flat Tray)	-0.283	0.374	-0.093	-0.755	0.453
		Winnowing (Use of Basket/Calabash/head pan	0.322	0.383	0.121	0.842	0.403
		Winnowing (Use of Mechanical Device)	0.813	0.441	0.227	1.844	0.070
		Timely Drying	-0.791	0.436	-0.251	-1.814	0.075
		Drying for Removal of Foreign Material to Avoid localized heating	0.676	0.486	0.172	1.392	.169
		Sun drying on Tarpaulin	-0.244	0.306	-0.100	-0.799	0.428
		Sun drying on Concrete floor	-0.590	0.349	-0.212	-1.691	0.096
		Drying with Mechanical Device	-0.197	0.271	-0.098	-0.726	0.471
		Parboiling Using Pottery Method	-0.234	0.420	-0.076	-0.558	0.579
		Parboiling Using Single and Steaming in Metal drum	0.450	0.436	0.145	1.032	.306
		Parboiling by Using Mechanical Device	0.218	0.361	0.078	0.603	.549
		Cleaning by Hand picking Method	-0.695	0.578	-0.150	-1.202	0.234
		Cleaning with Mechanical Device	0.563	0.453	0.167	1.243	0.219
		De-husking by Using Pestle and mortal	-0.303	0.385	-0.106	-0.786	0.435
		De-husking by Using Mechanical Device	-0.054	0.390	-0.018	-0.137	0.891

		Transportation with Bicycle	-0.462	0.344	-0.176	-1.341	0.185
		Transportation with Cart	0.113	0.367	0.037	0.308	0.759
		Transportation with Tractor	-0.053	0.441	-0.014	-0.120	0.905
		Transportation with Motorized Vehicle/Okada	0.265	0.355	0.093	0.745	0.459
		Storage (using Jute bags or sacs	0.058	0.370	0.019	0.157	0.876
		Storage (Using locally Constructed Silo)	0 .361	0.461	0.096	0.784	0.437
Niger	1	(Constant)	71.108	23.842		2.982	0.004
		VALUE ADDITION - threshing (timely threshing after harvest)	0.514	0.400	0.115	1.285	0.203
		Threshing (Use of whacking Frame)	0.450	0.440	0.090	1.022	0.310
		Threshing (Use of Mechanical device)	0.491	.398	.122	1.233	0.222
		Threshing (Use of Spread Tarpaulin)	.785	.390	.185*	2.012	.048
		Threshing (Use of Pavement or floor	.640	.368	.156	1.740	0.086
		Winnowing (Use of flat Tray)	-0.238	0.412	-0.053	-0.579	0.564
		Winnowing (Use of Basket/Calabash/head pan	0.074	0.405	0.015	0.183	0.855
		Winnowing (Use of Mechanical Device)	0.174	0.346	0.047	0.503	0.616
		Timely Drying	-0.554	0.420	-0.131	-1.317	0.192
		Drying for Removal of Foreign Material to Avoid localized heating	-0.858	0.597	-0.131	-1.438	0.155
		Sun drying on Tarpaulin	0.596	0.382	0.153	1.560	0.123
		Sun drying on Concrete floor	0.122	0.357	0.033	0.341	0.734
		Drying with Mechanical Device	0.463	0.378	0.111	1.226	.224
		Parboiling Using Pottery Method	-0.773	0.366	-.192*	-2.112	.038
		Parboiling Using Single and Steaming in Metal drum	0.016	0.487	0.003	0.033	0.974

	Parboiling by Using Mechanical Device	-1.779	0.528	-0.325*	-3.368	0.001
	Cleaning by Hand picking Method	0.557	0.727	0.068	0.767	0.446
	Cleaning with Mechanical Device	-0.431	0.417	-0.096	-1.035	0.304
	De-husking by Using Pestle and mortal	-0.228	0.302	-0.076	-0.754	0.453
	De-husking by Using Mechanical Device	-0.960	0.360	-0.250*	-2.670	0.009
	Transportation with Bicycle	0.209	0.423	0.053	0.494	0.622
	Transportation with Cart	-0.504	0.465	-0.102	-1.083	0.282
	Transportation with Tractor	-0.003	0.491	-0.001	-0.007	0.995
	Transportation with Motorized Vehicle/Okada	-0.172	0.326	-0.050	-0.528	0.599
	Storage (using Jute bags or sacs	-1.268	0.486	-0.232*	-2.610	0.011
	Storage (Using locally Constructed Silo)	0.373	0.466	0.069	0.800	0.427

Kwara -R=0.63, R^2 =0.39, Adjusted R= 0.12 S.E. of estimated= 5.42, F= 1.447, p= 0.122
Niger - R=0.76, R^2 =0.57, Adjusted R= 0.42 S.E. of estimated= 6.84, F= 3.795, p= 0.000
*Significant at p≤0.05

Table 4.61: Contributions of each value addition stage to derivable benefits

Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		B	Std. Error	Beta		
1	(Constant)	87.121	13.460		6.473	0.000
	Threshing	0.213	0.060	0.222*	3.522	0.001
	Winnowing	-0.160	0.180	-0.058	-0.891	0.374
	Drying	-0.227	0.105	-0.145*	-2.169	0.031
	Parboiling	-0.457	0.137	-0.221*	-3.332	0.001
	Cleaning	0.007	0.268	0.002	0.026	0.980
	Dehusking	-0.745	0.159	-0.327*	-4.684	0.000
	Transport	-0.032	0.105	-0.020	-0.301	0.764
	Storage	-0.231	0.243	-0.060	-0.951	0.343

$R=0.57$, $R^2=0.32$, Adjusted R= 0.29 S.E. of estimated= 7.56

*Significant at $p \le 0.05$

Table 4.62 Contributions of each value addition stage to derivable benefits by States

State	Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	p-value
Kwara	1	(Constant)	54.288	16.215		3.348	0.001
		Threshing	0.148	0.058	0.281*	2.581	0.012
		Winnowing	0.037	0.230	0.019	0.162	0.872
		Drying	-0.281	0.138	-0.223*	-2.038	0.045
		Parboiling	0.095	0.146	0.071	0.654	0.515
		Cleaning	0.216	0.308	0.077	0.702	0.485
		Dehusking	-0.076	0.201	-0.043	-0.378	0.707
		Transport	-0.054	0.103	-0.059	-0.524	0.602
		Storage	-0.016	0.264	-0.007	-0.061	0.952
Niger	1	(Constant)	61.909	21.039		2.943	0.004
		Threshing	0.397	0.104	0.339*	3.797	0.000
		Winnowing	0.075	0.233	0.028	0.323	0.748
		Drying	0.090	0.144	0.055	0.626	0.533
		Parboiling	-0.746	0.211	-0.330*	-3.529	0.001
		Cleaning	-0.482	0.360	-0.118	-1.338	0.184
		Dehusking	-0.556	0.234	-0.212*	-2.377	0.020
		Transport	-0.105	0.173	-0.054	-0.608	0.545
		Storage	-0.247	0.338	-0.063	-0.730	0.467

Kwara -R=0.42, R^2 =0.177, Adjusted R= 0.090, S.E. of estimated= 5.51, F= 2. 043, p= 0.052
Niger - R=5.76, R^2 =0.33, Adjusted R= 0.27, S.E. of estimated= 7.66, F= 5.720, p= 0.000
*Significant at $p \leq 0.05$

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the derivable benefits along value addition nodes among rice processors in North Central Nigeria. This was predicated on the basis of the fact that rice is about the most important household food item in majority of homes in every part of Nigeria. Also the fact that rice is a major supply of daily energy for both young and old makes this study a worthwhile endeavour. In addition, the agronomic characteristics as well as climatic and ecological adaptability makes rice grows well in all the six geo-political zones of Nigeria, and with the availability of abundant arable land in every nook and cranny of the country, there is virtually no reason that can necessitate importation of rice. It is noteworthy to categorically state that the efforts of different government in making sure that Nigeria is self-sufficient in rice production and availability for local consumption and also for export had not yet been fully realized. This study will therefore answer the question of what contribution had been made into Nigeria rice processing in terms of value additions and how have processors been able to increase accessibility to derivable benefits of value addition in rice production. Moreover, different successful government in Nigeria had battled with how increased agricultural production will bring about food availability, accessibility and sufficiency, and also serve as a major source of foreign exchange and ultimately become a virile alternative to plummeting oil prices and therefore serves as a buffer for the economy. This study will definitely also assist universities and research institutes in initiating and accomplishing developmental studies and researches that will bring about new frontier of achievement. The study will also help the non-governmental organisation identify areas of opportunities and challenges particularly in rice value addition.

Specifically, the study established the various activities through which value addition activities were carried out in rice production in the study area, the attitudes of processors towards value addition to rice was also examined, the accessibility of processors to agricultural support services towards value addition were ascertained, the derivable benefits by processors from value additions was also ascertained as well as the constraints encountered in the addition of value in the study area.

Literatures and theoretical models from different sources were reviewed and conceptual framework was developed. The theories which this study hinges upon include theory of symmetry, social cognitive theory, perceived attributes theory, theory of reasoned action, value chain theory, etc. The contribution of derivable benefits in value addition among rice processors draws heavily from the value chain theory since the underlying perspective of value chain theory is to alleviate or even eliminate poverty among small scale industries and smallholder farmers participating directly or indirectly in global trade.

The independent variables of the study were the selected personal characteristics of the farmers such as age, sex, year of experience, marital status educational qualification, occupation, among, others. All these variables are expected influence the various activities that lead to addition of value in rice production. These various activities that lead to addition of value in rice production will in turn influence the attitudes, then the constraints encountered towards the rice value chain and also farmers' accessibility to agricultural support services. The attitude is also expected to influence the derivable benefits by processors in the rice value addition. The intervening variables are variables which though not empirically considered in the study but still affect the way independent variables influence the dependent variable. The intervening variables in this study include government policy on rice production and importation, policy on agrochemical among others. All these interplays had influence on contribution of value addition to derivable benefits. The dependent variable of this study which is derivable benefits was expected to be influenced by personal characteristics of rice processors in the study area.

5.2 Summary of major findings

The main purpose underlining this study is to establish the contribution of value addition to derivable benefits among rice processors in North-Central Nigeria. On the basis of age distribution of respondents in the study area, more of the respondents (38.7%) fall within the age bracket of 30-39years of age. It was discovered that most of respondents were females (70.4%). It was also discovered that the married ones were very much more prominent than their unmarried counterparts in both states. In Kwara, 79.3% were married, while in Niger, 83.7% were married. Cumulatively, 81.7% of the respondents were married while only 5.4%, 3.8% and 9.1% were single, divorced and widowed, respectively.

On educational qualification of respondent, the study revealed that more of the respondents in the study area had primary school leaving certificate as their highest qualification. In Kwara, 43.9% had primary school certificate, while there were 45.2% of primary school certificate holder in Niger. On the overall, 44.6% were primary school certificate holder in the study area.

The primary occupation of respondents in the study area was also determined. It was revealed that farming was the primary occupation of most of the respondents in both states as 51.2% of the respondents had farming as their primary occupation in Kwara. In Niger, those that were primarily engaged in farming were 56.7% of the distribution. Other primary occupations that respondents engaged in include fishing, trading, being artisans and civil service. It was also found that those involved in trading were into businesses that are related to agriculture. The study also revealed that respondents that are primarily farmers do devote more time to value addition operations.

The family sizes of the respondents were determined in this study. In Kwara, most of the respondents (56.1%) had between 6 and 10 members in their family. Similarly, in Niger, 56.7% of them had between 6 and 10 members in their family. On the overall, this study established that 56.5% of them had between 6 and 10 members in their family. This therefore substantiates the fact that most of them were married.

Islam is mostly practiced than Christianity in both states of the study area. Specifically, in Kwara, 86.6% of the respondents were Muslims while 13.4% were Christians. In Niger, 87.5% were Muslims, while 12.5% were adherents to the Christian faith. On the overall, adherents to Islamic faith constitute 87.1% of the population, while their Christian counterparts were 12.9%. It is therefore not far-fetched to conclude that Muslim women were found to be much more in this study due to the fact the Islamic religion give high credence to women working at home than outside the home.

The various sources of labour identified in this study were family, friends, family and hired, family and friends and self and hired. It was found out that family is the most used source of labour. In Kwara, 36.6% of the respondents used family as their major source of labour, while in Niger, 34.6% of the respondents used family as their major source of labour. On the overall, 35.5% of the respondents used family as source of labour.

There was a high extent of value addition in rice processing in the study area by more than half (51.2%) in Kwara with a mean value of 287.4±13.7, and 52.2% in Niger 299.9±13.7. On the overall, the study shows high extent of value addition with 52.2% with a mean score of 294.4±15.0. It was discovered that most of the respondents had unfavourable attitude toward value addition with mean attitudinal score of 59.4±9.7. This may not be unconnected to the fact that addition of value does not bring about continuous patronage of rice products by consumers. The most accessible Agricultural support service towards value addition in rice production in this study was the support from Agricultural Thrift and Cooperative society with accessibility mean score of 1.30/±0.65. It should however be noted that the level of accessibility to agricultural support services was low (64%) with accessibility mean score of 12.08±3.6.

The study established that there is a low level of derivable benefits (53.8%) from rice value addition with a mean score of 45.5±8.99. Subsequently the level of constraints encountered in rice value addition was high (58.6%) with a mean score of 19.55±3.9. The test of hypothesis revealed that sex, marital status, educational qualification, primary occupation and religion were not significantly related to derivable benefits from value addition. There was a significant correlation between attitude of processors ($r=0.546$, $p=0.000$) and derivable benefits. Similarly, there was a significant relationship between the constraints encountered ($r=0.280$, $p=0.000$) and the derivable benefits in value addition. In addition, there exist a significant different between benefit accrued by processors ($t=4.144$, $p=0.000$) with low level of value addition and those with high level of value addition. It was also established that there was a conspicuous level of significant difference between derivable benefits by processors ($t = -6.898$, $p = 0.000$) at different stages of value addition. The contribution of independent variables to the dependent variables revealed that; timely drying ($\beta = -0.259$), parboiling using pottery method ($\beta = -0.172$), parboiling using mechanical device ($\beta = -0.180$) and dehusking by using mechanical device ($\beta = -0.316$) were contributory determinant to derivable benefits.

5.3 Conclusion

The need for the improvement of agricultural produce is *sine qua non* to development of desirable quality that will lead to benefits in different ramifications. There is no reason for shortage of sufficient food in Nigeria and the entire Africa as a whole. This is because Africa as whole is blessed with appreciable areas of arable land that can continuously produce the needed food for her inhabitant and more for export for the ultimate benefits primarily for the farmers, processors and secondarily for the development of the economy.

Every facet of agriculture has the potential to create satisfaction and derivable benefits. As such the involvement of individuals in different aspects of agricultural production is not only important but also beneficial. Based on this, this study examined derivable benefits from the efforts of rice processors in the addition of value to rice.

The findings of this study was able to deduce that value addition actors in rice processing were mostly done by the farmers themselves. These rice farmers were engaged in the production of rice from pre-planting operation to harvesting and then processing leading to value addition.

The use of family is the major source of labour in the addition of value among the respondents in the study area. Similarly, value addition activities in the study areas were mostly carried out with improved traditional system due to the fact that technology has not fully replaced the traditional ways of addition of value. This invariably means that the use of mechanical devices to improve the quality of output was still base on availability of the device and ability to pay for them.

Timeliness in all the value addition activities has a direct proportionate relationship to actualisation of final output with recourse to derivable benefits. The earlier an activity towards value addition is done the better the output. Also, the effectiveness of transportation of rice produce and products to point of value addition was poor. This therefore affects timeliness of the value addition activities and hence the final output.

Storage of rice is still done locally. This has some negative effects on the degree of value that are being added. In addition, respondents showed unfavourable attitude toward value addition despite the fact that it is a genuine avenue to attract better patronage. As such there was a significant correlation between attitude and derivable benefits among respondents.
Agricultural Thrift and Cooperative society was the most accessed agricultural support service. This was a result of proximity of the cooperative society to the processors. Finally, the accruable benefits in value addition were low and the attendant constraints were high which ultimately affect the derivable benefits in value addition. However, processors continuous involvement depicts that their activities are means by which they are kept in the business.

5.4 Recommendations

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

1. Specialization of value addition activities in rice production should be encouraged. The farmers should be empowered and allowed to concentrate on production while value addition actors should be empowered for actualization of desirable quality.
2. Agricultural Extension workers should be empowered to disseminate knowledge and information that will assist actors to improve their knowledge of value addition.
3. Government should further strengthen farmers with necessary inputs and incentive to increase rice production to attract value addition actors
4. Multi-media means of promotion of rice production and processing should be encouraged to boost production and hence value addition, like the case of *"Massagana 99"* as reported by Yahaya (2003)
5. Government should create an enabling environment for foreign and local investors into rice production and value addition.

5.5 Contributions to knowledge

The study contributes to the body of knowledge in the following ways:

1. The study brought to bear the essentialities of value addition to locally produced rice for better rice outputs to the consumers.
2. The nexus between value addition activities carried out by processors and the derivable benefits accrued by the processors was established.
3. The value addition activities in rice production was mostly carried out by rice farmers and their farm family.
4. The study confirms that value addition activities is limited to the local method of processing.
5. The study provided emperical data on the various aspects of rice post-harvest activities to which values were added to improve the final output of rice.
6. The study also provided emperical data on the contribution of value addition activities of rice to derivable benefit thereby establishing that addition of values ensures actualisation of accruable benefits.
7. The study identified major constraints in the addition of value to the final output of rice to be inadequacy of means of transportation of rice paddy to points of value addition arena
8. The overall benefit derived by processors was low and this therefore necessitate that there is need for technical improvement into the various activities of value addition among processors.

5.6 Policy implication

The contribution of agricultural sector of Nigeria economy can never be over emphasised. The present government has continuously and consistently emphasised the need for diversification and paradigm shift of the economy from oil dependent to sustainable agriculture. This does not only show the importance of agriculture but also established the fact that agriculture is the better alternative to plummeting oil price. The generated results of this study shows that investment in rice value addition will not only be necessary but of paramount importance in attaining sustainable development. This study therefore recommends that policies that will bring about increase in rice production as well as value addition to rice should be put in place to ensure that Nigeria becomes sufficient in rice for her local population and also generate substantial income from rice export.

Furthermore, the fact that some efforts of the government on rice rarely reaches the farmers and other stakeholders in rice production also necessitate that communication aspects of Agricultural extension need to be boosted. It is therefore important that policies that will ensure that support services and other government interventions gets to the farmers, processors and other stakeholders at all levels should be given appropriate attention.

5.7 Suggested areas for further study

Further studies may be explored in the areas of:

1. Financial income in value addition among rice processors towards sustainable development.
2. Effectiveness of agricultural support service in value addition towards sustainable development
3. Sustainability of foreign and local investment in rice value addition in a demand driven economy.
4. Effects of socio-economic status of processors on value addition in rice production.
5. Contribution of communication media to value addition in rice industry.

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APPENDIX

UNIVERSITY OF IBADAN, NIGERIA

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT

Dear Respondents,

This questionnaire is designed to collect data for a research titled “Derivable benefits along value addition nodes among rice processors in North Central Nigeria” kindly provide detailed and appropriate information.

All information gathered will solely be used for research purpose and will be treated with utmost confidentiality.

Respondent No. ----------------------------------

Respondent’s Name--------------------------------

State---

Local Government Area---------------------------

Respondent’s Community------------------------

Section A

1. Age: ,,,

2. Sex: Male,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, Female,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,.

3. Years of experience: ,,,years.

4. Marital status: Single,,,,,,,,,,,,,,, Married,,,,,,,,,,,,,,,,,, Divorced,,,,,,,,,,,,,,,,,, Widowed,,,,,,,,,,,,,,,.

5. Educational Qualification: No formal education,,,,,,,,,,,,,,, Primary school,,,,,,,,,,,,,,,,, Secondary school,,,,,,,,,,,,,,, Tertiary institution,,,,,,,,,,,,,,, others specify,,,,,,,,,,,,

6. Primary Occupation Farming,,,,,,,,,,,,, Fishing,,,,,,,,,,,,,, Trading,,,,,,,,,, Artisan,,,,,,,,,,,,, Civil service,,,,,,,,,,, others specify,,,,,,,,,,,,

7. Family Size: ,,,,,,,,,,,,,,,,,,,,,,,

8. Religion,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

9. Source of Labour: Family ( ), Hired, Friends ( ), Family and Hired ( ), Family and Friends ( ), Self and Hired ( ).

Section B:

6. Activities that add value in rice value chain.

Identify and state the extent of value addition activities in rice industry.

Please provide appropriate response on a scale of 1-5 to determine the extent of value added in rice industry, Key: 1=**Low value, 2=Fair value, 3=Moderate value, 4=Great value, 5=Excellent value**.

	Value addition activities	**Time value (1-5)**	**Place value (1-5)**	**Product value (1-5)**	**Price value (1-5)**
1.	**(a) Threshing:** ➢ Timely threshing after harvest ➢ Use of whacking frame ➢ Use of mechanical device ➢ Use of spread tarpaulin or mat ➢ Use of pavement of floor				
.	**(b) Winnowing:** ➢ Use of flat trays ➢ Use of baskets/calabashes/head pan ➢ Use of mechanical device				
2. .	**Drying**: ➢ Timely drying ➢ Drying for removal of foreign materials. ➢ Sun drying on mat/tarpaulin ➢ Sun drying on concrete floor ➢ Use of mechanical device				
3.	**(a) Parboiling:** ➢ Use of pottery method ➢ Use of steaming in metal drum ➢ Use of mechanical device				
	(b) Cleaning ➢ Traditional hand picking method				

	➢ Use of mechanical device				
	(c) De-husking ➢ Use of pestle and mortal ➢ Use of mechanical device				
4.	**Transportation** ➢ Use of bicycle ➢ Use of cart ➢ Use of mechanical device eg tractor ➢ Use of motorize vehicle				
5.	**Storage** ➢ Use of jute bags & sacs ➢ Use of locally constructed silo				

7. Attitude of actors towards value addition in rice value chain in the study area

What are the attitudes of actors towards value addition to rice in the study area?

Please tick as appropriate from the following statements of Strongly Agree (SA), Agree (A), Undecided (U), Disagree, Strongly Disagree (SD).

These statements include:

S/N	Attitudinal Statements	SA	A	U	D	SD
1.	Value addition activities usually improve the qualities of rice outputs.					
2.	value addition reduces the complications in the post-harvest activities in rice.					
3.	Rice value addition activities are time wasting activities.					
4.	There arebetter utilization of labour leading to specialization in the rice value addition activities.					
5.	Rice value addition does not need special farm land for optimum result.					

6.	It is difficult to get improve technology in an attempt to add value to rice production.					
7.	Farmers can really rely on rice value addition for improvement in rice output.					
8.	Rice value addition does not require special training/knowledge of the various process of value addition.					
9.	Value addition may not be actualized when rice production is on small plot of land					
10.	Sufficiency of rice can be attained through value addition to rice production.					
11.	Rice value addition activities are a panacea for increased income generation.					
12.	Rice value addition does not bring classical difference to other rice intervention programme of government.					
13.	The implementation and commitment to addition of value to chains of rice production can lead to exportation of rice.					
14.	Socio Economic Status of value addition actors can increase with value addition to rice production.					
15.	Rice value addition activities lack fidelity and clarity.					
16.	Rice value addition cannot be successful unless governments completely take over the process.					
17.	Cultural preference could be a barrier in Rice value addition activities.					
18.	Intensive management is highly necessary for rice value addition to succeed.					
19.	Rice value addition technology utilization have been limited with unsteady power supply					
20.	Adoption of improved rice production practice complements benefits from rice value addition in the rice industry.					

8. Accessibility of agricultural support services towards rice value addition in the study area

How accessible are agricultural support services towards value addition?

Please Tick as appropriate on the table below**.**

	Accessibility of agricultural support services	**Not accessible (0)**	**Accessible but distant (1)**	**Accessible and proximate (2)**
1.	Commercial banks			
2.	Extension/Advisory services			
3.	Government Support			
4.	Non Governmental Organisation Support eg in marketing			
5.	Farmers Association support			
6.	Anchor borrowers scheme			
7.	Micro finance Banks			
8.	Bank of Industry			
9.	Agricultural Thrift and cooperative society:			
10	Mortgage Bank.			
11	Bank of Agriculture (BOA)			
12	Professional Money Lenders			
13	Others specify			

9. Derivable benefits by processors from value addition

What are the benefits derived by farmers from value additions along the value chain?

Please Tick as appropriate on the table below**.**

A.	**Derivable benefits from threshing and winnowing.**	**No benefit (0)**	**Low benefit (1)**	**High benefit (2)**
1.	Actualization of maximum number of number of unbroken grains			
2.	Actualization of grains of desired colour			

3.	Realization of Removal of unwanted paddy			
4.	Realization of rice paddy that is devoid of stones.			
5.	Prevention of ineffective separation of rice and foreign materials and impurities			
6.	Reduction of total time of rice processing			
7.	Being able to sell at a very good price			
8.	Acceptability by end users			

C.	**Derivable benefits from parboiling, cleaning and dehusking**	**No benefit (0)**	**Low benefit (1)**	**High benefit (2)**
1.	Actualisation of rice with prolong shelf life			
2.	Actualization of grains of desired colour			
3.	Realization of rice paddy that is devoid of stones.			
4.	Prevention of ineffective separation of rice and foreign materials and impurities			
5.	Realization of Removal of unwanted paddy			
6.	Realization of increased output hence increased income			
7.	Grains are better accepted by end users			

D.	**Derivable benefits from transportation**	**No benefit (0)**	**Low benefit (1)**	**High benefit (2)**
1.	Realization of maximum productivity of human resources.			
2.	Actualization of prompt and responsive transport at affordable cost			
3.	Realization of Removal of unwanted paddy			

4.	Realization of increased output hence increased income			
5.	Prevention/reduction of injury during processing			

E.	**Derivable benefits from storage**	**No benefit(0)**	**Low benefit (1)**	**High benefit (2)**
1.	Actualisation of rice with prolong shelf life			
2.	Actualization of grains of desired colour			
3.	Realization of Removal of unwanted paddy			
4..	Realization of increased output hence increased income			
5.	Availability of quality rice at the periods of scarcity.			
6.	Acceptability of grains by end users.			

10. Constraints encountered in the various rice value addition among processors in the study area

What are the constraints encountered in the addition of value?

Please Tick as appropriate on the table below**.**

	Constraints encountered in the rice value addition	**No constraint (0)**	**Low constraint (1)**	**High constraint (2)**
1.	Lack or inadequate of incentives for rice value addition.			
2.	Lack of adequate technical knowledge & training for actors			
3.	Inability to access credit facilities.			

4.	Inadequacy of information on private sector participation			
5.	Inadequacy of extension support			
6.	Inadequate supply of paddy to value addition actors			
7.	Poor infrastructure such as bad road to the interiors			
8.	Difficulties in assessing some value addition actors.			
9.	Inadequate market information on demand and supply of rice.			
10	Drought and insufficient rain for upland rice leading to persistent crop failure and inadequate paddy for value addition.			
11	Inefficiency in the control of rodents and birds infestation			
12	Inefficiency in the control of birds infestation			
13	Poor and unsteady power supply for adequate utilization of technology for value addition.			
14	Unavailability and insufficient storage and others facilities for value addition.			
15	Unreliable means of transportation of paddy for value addition			
16	Others specify			