AN ANALYSIS OF THE SPATIAL VARIATION IN AGRICULTURAL DEVELOPMENT PROGRAMMES IN KANO STATE, NIGERIA

BY

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DECLARATION

I hereby declare that this thesis entitled **"Spatial Variation in Agricultural Development Programmes in Kano State, Nigeria''** is my research work under the supervision of Dr. J. O. Adefila, Pro I. J. Musa and Dr. R. O. Yusuf. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any University.

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CERTIFICATION

This Thesis entitled **'' An Analysis of the Spatial Variation in Agricultural Development Programmes in Kano State, Nigeria''** by **ABDULKADIR Hindatu**, meets the regulations governing the award of the degree of Doctor of Philosophy (Ph.D) in Rural Dvelopment of Ahmadu Bello University and is approved for its contribution to knowledge and literary presentation.

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This thesis is dedicated to my late father, Alhaji Abdulkadir D. D. Kano and my mother, Hajia Halima Abdulkadir.

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ABSTRACT

Agriculture is an important sector in the economic development and poverty alleviation drive of many countries. The importance of this sector is more pronounced in developing countries such as Nigeria, where it is a major contributor to employment, food and foreign exchange (Adebayo and Okuneye, 2005). The persistend failure of agricultural development programmes in Nigeria has demonstrated the weakness of the policies coupled with inability of the successive administrations to resolve the fundamental problems of development. The country has not satisfactorily addressed the issue of how agricultural programmes could spread spatially so as to maintain a balanced development. The major goal of this study is to assess spatial variation in the level of agricultural development programmes in Kano State. Questionnaire survey and documented materials constituted major sources of data. Twelve Local Government Areas were purposely selected across the three Senatorial districts. A total of 384 respondents were randomly selected in the study area for the administration of the questionnaire. In addition, focus group discussion (FGD) was conducted among the farmers. The descriptive statistics method was employed involving the calculation of percentages, mean, frequency and tabulation of data to analysed th result. Also, inferential statistics were employed namely, the Location quotient (LQ), Standardized score (Z-score), and Factor analysis techniques. The location quotient result is categorized into upper, middle and bottom based on the performance of each local government area in agricultural development programmes The upper group include Tofa 0.80, Madobi 1.10, Warawa 1.20 and Kura 1.30 While the middle group include Gwarzo 1.34, Gaya 1.39, Danbatta 1.40 and Tsanyawa 1.45. The bottom group include Mingibir 1.51, Doguwa 1.71, Rano 2.20 and Rogo 2.20. For the purpose of comparison, the standardized scores (Z-scores) was employed using the three dimensions and the associated ten variables. The Z- score result showed varying degrees of the indicators of agricultural development among the sampled Local Governments Areas, such that seven areas were found to be advantaged namely Madobi, Warawa, Dambatta, Tofa, Rogo, Rano and Tsanyawa dominated the indicators while the disadvantaged areas include Kura, Doguwa .Gwarzo, Minjibir and Gaya. The Factor analysis result showed the strength of each factors responsible for the pattern of agricultural development in the study area. The study revealed that the major problem of agricultural development programme is that the farmers are not the target population in the study area. On the basis of the findings, the study recommends that there is need for the benefits from agricultural development programmes to spread across the entire state. In order to avoid spatial variation of agricultural development, government should create enabling environment where the farmers at the grassroots will be given opportunity to participate in agricultural development programmes within their locality.If this is done it could stimulate relationship between government and rural people for sustainable agricultural development.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Agriculture is an important sector in the economic development and poverty alleviation drive of many countries. The importance of this sector is more pronounced in developing countries such as Nigeria, where it is a major contributor to employment, food and foreign exchange (Adebayo and Okuneye, 2005). In most African countries, agriculture supports the survival and well-being of up to 70% of the population. Thus, for many, their livelihoods are directly affected by environmental changes, both sudden and gradual, which impact on agricultural productivity (Cleveland, 2007).

Nigeria's rich human and material resource endowments give it the potential to become Africa's largest economy and a major player in the global economy (National Planning Commission (NPC) 2004). Successive administrations since independence in 1960 have introduced a myriad of agricultural development programmess and policies aimed at enhancing agricultural productivity to feed the rapidly expanding population, provide raw materials for the agro allied industries and for export (Ingawa, 2004). Fritschel (2003) had remarked that globalization of the world's food system represents an opportunity for small scale farmers. Although most countries are now self-sufficient in basic food staples, many nations are still struggling with the problem of large numbers of mal-nourished people. The agricultural sector is thus viewed as engine of economic growth and important option for the diversification of Nigeria's economy. Therefore, fostering agricultural growth can offer a sure pathway out of poverty.

Development leads to a cumulative increase in the standard of living for an increasing proportion of people in the society. The improvement in standard of living is a combination of economic, social and political processes (Hodder, 2000). Agricultural

development encompasses the gradual shift from environmentally unsound to farming using best practices. Therefore, agricultural development can be viewed as another arm of development, which connotes improvement in the principles, and practice of agriculture given both human and material resources that will result in maximum output from a combination of minimum inputs (Olawoye and Ogunfiditimi, 1999). Agricultural policy is a statement of action and a fundamental tool employed in achieving agricultural development (FBN, 1997). A programme, on the other hand is a comprehensive plan that includes objectives to be attained, specifications of resources required and stages of work to be performed (Asiabaka, 2002). According to Olatunji (2005), a programme is a collection of coordinated activities that are mutually directed towards the attainment of a definite goal and it usually comprises of several segments or projects which can be separately pursued as a component of the whole.

With the discovery of crude oil in Nigeria and the subsequent oil boom in the 1970s, far less attention was given to agricultural sector which hitherto had been the main foreign exchange income earner for Nigeria. With the resultant decline in agricultural production, Nigeria became a net importer of both food items and agro-allied raw materials. The cumulative effect of this situation is that the agricultural sector failed to perform its traditional functions effectively. To meet up with the crisis, both the federal and state governments formulated several policies and embarked on a variety of agricultural programmes aimed at improving the capacity of the agricultural sector (Okereke, 2000).

It is generally accepted that Nigerian agriculture has suffered as a result of the resource cause effect of oil and inappropriate policies and institutions. This coupled with high handed and unpredictable government intervention programmes which have led to short term investment decisions and rent seeking behavior by programmers.It has also

created dysfunctional and disconnected benefit to the poor masses. Clearly, the persisted failures of agricultural programmes in Nigeria have revealed the basic weakness of agricultural policies in Nigeria and the inability of the several administrations in Nigeria to solve the basic and fundamental problems of agricultural development (Amalu, 1998).

A cream of authors (Amalu 1998, Ayoola 2001 and Madukwe 2008) has also laid the failure on the door-steps of governments for the absence of or weak agricultural policies. In Nigeria agricultural policies and programmes have undergone changes especially in the postcolonial era. These changes have been a mere reflection of changes in government or administration (Amalu, 1998). This is because these policies and programmes vary only in nomenclature and organizational network. They emphasize almost same objectives like: to provide food for the inhabitants of the nation (food security and sufficiency) and export excess to other countries and to provide rural dwellers and farmers with extension services, agricultural support and rural development services. Despite all the policies and laudable programmes with challenging themes, Nigeria is yet to achieve food security. Agriculture also continues to suffer from inertia associated with these policies and programme reformation that pervade Nigeria (Ayoola, 2001).

Manyong et al (2005) had highlighted some of the national agricultural development schemes and programmes in the country to include: Farm settlement schemes (FSS) for creating farmsteads of the Israeli Moshav-type agriculture intended to increase commodity output and create employment for young school leavers; River basin development authorities (RBDAs) for the purpose of harnessing water resources by farmers throughout the country; Operation Feed the Nation (OFN) embarked upon by the Obasanjo regime in 1976; Green revolution scheme (GRS) introduced by the Shagari Administration in 1979 –

to encouraged all Nigerians to go into commercial agriculture for both commerce and provision of food for home consumption; and Agricultural development projects (ADPs) that was launched in a collaborative efforts between the federal government of Nigeria and the World Bank and replecated in the states of the federation. It has in principle to help organize farmers into more productive agriculture through the provision of modern inputs and innovative techniques in agricultural practices.

This type of agricultural development programmes is exemplified by the Kano River Project in Kadawa, which was built primarily for the production of wheat in the dry season (Mortimore, 2003). This large scale irrigation scheme combined large costs for setting-up and the Kano River Project is only a fraction of the extent that was planned (Harris, 2003). Furthermore, large scale irrigation projects have recorded poor performance (Adams, 1991; Harris, 1991; Middleton, 1991).

The Kano State Fadama III operation programme supported the financing and implementation of five main components designed to transfer financial and technical resources to the beneficiary groups in: (i) institutional and social development; (ii) physical infrastructure for productive use; (iii) transfer and adoption of technology to expand productivity, improve value-added, and conserve land quality; (iv) support extension and applied research; and (v) provide matching grants to access assets for income-generation and livelihood improvements. The programme has been faced with the problem of Poor sensitization of farmers on the programme due to weak synergy between KNARDA and Fadama III officials (KASC, 2015). Despite existence of all these agricultural development programmes and schemes put in place at various times in history of the study area, agricultural potentials are not fully harnessed. It is therefore, imperative to assess the spatial variation of agricultural development programmes in Kano State, Nigeria.

1.2 STATEMENT OF THE RESEARCH PROBLEM

The principal constraint to the growth of the agricultural sector is the fact that the structure and method of production have remained the same since independence (Ukeje, 2005). The United Nations Food and Agriculture Organization (2005) rate the productivity of Nigeria's farmland to range between low to medium but having the potential to rise from medium to good productivity if properly managed. Despite Nigeria's rich agricultural resource endowment, the sector has been growing at a very low rate. Less than 50% of the country's cultivable agricultural land is under cultivation. Even then, smallholder and traditional farmers who use rudimentary traction technology or crude impliments and production techniques, with resultant low yields, cultivate most of this land. The smallholder farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, and inadequate research and extension services. (Manyong et al, 2005).

FAO (2005) had remarked that Nigeria was among those nations that were at the moment technically unable to meet their food needs from rain fed production at a low level of inputs and appear likely to remain so even at intermediate levels of inputs at some points in time between 2000 and 2025. Farming systems are mainly smallholder-based and agricultural landholdings are scattered. Simple, low-input technology is employed, resulting in low-output labor productivity. Typical farm sizes range from 0.5 ha in the densely populated high-rainfall south to 4 ha in the dry north (FAO, 2005). The advent of commercial exploitation of petroleum resources, however, turned the trend against agriculture. In spite of the existence of a well-articulated agricultural policy document for Nigeria since 1988, the country is yet to establish a systematic focus in her agricultural planning history that shows a conscious effort to purposely prioritize her agricultural

development based on the generally identified components that constitute modern agriculture (Manyong et al, 2005).

Moreover, productivity has not grown sufficiently, due largely to under-investment in research and new technology, slow adoption of existing improved technologies, constraints associated with the investment climate, and lagging infrastructure. Government interventions aimed at accelerating agricultural growth, such as the quite successful Fadama programme have targeted poor producers engaged in largely subsistence production with modest interaction with markets accessibility. In response, the World Bank has worked to prepare the Commercial Agriculture Development Project to improve food production using business template for sustainability in Nigeria. Challenges facing agriculture in developing countries are immense. The debate about development of the agricultural sector has often centered on the question of how to achieve adequate food security, while simultaneously providing sufficient income for food producers (Manyong et al, 2005).

Several studies have attempted to examine spatial pattern of Agricultural development and Agricultural Development Programmes (ADP) in Nigeria. For instance Adefila (2012) examined spatial assessment of farmers' cooperative organizations in agricultural development in Gurara area of Niger State, Nigeria. Both primary and secondary data were used for the study. The study revealed that income generation, duration and years of cooperative experience, type of agricultural activities and quality of leadership were found to be significant at 0.01 alpha values while enrolment in terms of population size was found to be significant at 0.05 alpha values. Based on the findings, it was recommended among other things that agricultural policy makers and economic planners should take into cognizance the morale boosters for the cooperative organizations such as lowering interest rates on granting credit facilities, empowering the farmers' cooperatives to perform

through legislative control and adopting cooperatives as an effective strategy towards socio-economic transformation of the less-privileged and disadvantaged lagging areas and by so doing, it will assist in fostering regional balance in our developmental efforts.

Igwe (2015) examines spatial pattern of Agricultural Production in Nigeria using the principles of location relation to market, the principle of comparative advantage and von Thune's classical theory on land use. Using the above theoretical back ground, the paper revealed that agricultural production of cereals and pulses are determined by natural factors and nearness to market. The paper concludes that tree crops productions are determined by natural factors, internal migrations, agricultural innovation diffusion and existence of marketing boards. Location of oil seeds production are determined and sustained by both natural factors and nearness to market. Livestock which is one of the agricultural products is said to be determined and sustained by existence of market and the vegetation in the North of the Country. Unlike the other agricultural products, industrial crops production tend to be foot-loose (i.e. not so much dependent on nearness to market) and only require a well defined wet and dry season to thrive.

Adefila (2014) investigated Pattern of Agricultural Development in Southern Parts of Katsina State, Nigeria: Notion for Rational Planning. The questionnaire was a major research instrument. A descriptive statistics was adopted to summarize the data. In addition, standardized score (Z-score) technique was employed to assess level of agricultural development.The paper revealed that, the study area experiences differing levels of deprivation in agricultural development. The major constraints to agricultural development include high cost of agro-chemical which accounts for (21.0%), nefarious activities of the middle-men (24.0%), shortage of farm labour (15.0%), and poor storage facilities (15.0%). On the basis of the findings one recommends among other things that government needs to actively promote the establishment of agro-based industries that are

capable of processing agricultural raw-materials in order to reduce wastes arising from poor storage facilities. There should be distributive justice in the allocation of resources in favour of lagging areas in order to have a balanced agricultural development.

Chukwuemeka and Nzew (2011) investigated World Bank agricultural development programmes in Nigeria. Survey research method was adopted. Findings revealed among others, that policy approach that excluded the beneficiaries from participating in the project design, planning and implementation is not desirable. Recruitment of extension staff were not based on expertise and professionalism, but on political considerations. The three financiers – World Bank, Federal and State governments of Nigeria do not fulfill their contributions as and when due. Frequent change in leadership has also affected the operation of World Bank sponsored ADP.

Iwuchukwu and Igbokwe (2012) examined lessons from agricultural policies and programmes in Nigeria. The paper revealed that various stakeholders including farmers/rural people should be involved in planning and execution of agricultural policies and programmes. Also agricultural policy and programmes should be open, transparent and must be framed within a context in which agricultural development policy and programmes are national issues that are based on a consensus broad enough to guarantee continuity and freedom of expression of individuals opinions on decisions.

There were many agricultural development programmes in the history of Kano state. The Agricultural Development Projects (ADPs) were initiated in the mid-1970s, the Kano state ADP is of this group. It included four basic components; farm and crop development (expanded research, extension, and input supply); infrastructure development (feeder road construction and maintenance, water supplies, markets and storage facilities); institutional support, establishing project entities separate from the state agriculture departments; and

technical assistance, largely to manage the new institutions. The performance of these projects is commonly considered to have been disappointing (World Bank, 1996). A combined audit of six agricultural development programmes, including Kano was conducted in 1993, and concluded that the project targets were unrealistic and based on unproven technological assumptions, that there was too little emphasis on farmers' production priorities, and that the institutional structure led to a top-down effort and overemphasis on physical target. The Kano ADPs did not include components related to livestock and did not provide assistance targeted to women (World Bank, 2012).

The State Government in 2012 established 6 Agricultural Skills Acquisition/Training pogrammes for: Poultry Training Institute Makoda, Livestock Training Institute, Fisheries Training Institute Bagauda, Farm Mechanization Training Institute (Kadawa, Rano and Gwarzo), Horticulture Training Institute Bagauda, Irrigation Training Institute Kadawa, and Agricultural Training School Panda (KNARDA, 2014). The problems associated with the programmes are delay in release of funds for the take-off of training and provision of Post Training, difficulties in training of elderly students and poor strategy in post training monitoring and provision of extension services to trainees (Kano State Agricultural Sector committee (KASC, 2015).

However, in Kano State, where population densities are high, not all the communities have access to the assistance and benefits of these agricultural development programmes.From observation many areas were lagging behind, which leads to unbalance agricultural development among the local government areas of the state. This research was therefore, focused on the assessment of the spatial variation in agricultural development programmes to unravel the reason for the imbalance toward repositioning agricultural development programmes such that the majority of farmers will benefit. Considering various government efforts geared towards improving the agricultural sector in the study area, it

becomes necessary to examine the performance of the Local Government Areas (LGAs) in the agricultural development programmes in the study area for the policy makers in planning agricultural development programmes. The study therefore addressed the following research questions:-

1. What are the agricultural developments programmes existing in Kano State?
2. How can the spatial differences in agricultural development programmes be compared among the LGAs in the study area?
3. Why is there spatial variation of agricultural development in Kano State?
4. What are the factors responsible for the pattern of agricultural development in the study area?
5. How can the challenges facing agricultural development programmes in the study area be addressed?

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to investigate the spatial variation in agricultural development programmes in Kano State with a view towards proposing sustainable agricultural development. The specific objectives were to:-

i. identify and characterize the types of agricultural development programmes in Kano State.
ii. compare levels of agricultural development programmes among the LGAs in the study area.
iii. examine the spatial variation of agricultural development programmes in the study area.
iv. analyze the factors responsible for the spatial variation of agricultural Development in the study area.
v. examine the challenges facing agricultural development programmes in the study area.

1.4 **RESEARCH HYPOTHESIS**:

The null hypotheses for the study were:

H_0: There is no significant difference in the distribution of agricultural development Programmes in the study area.

1.5 **SCOPE OF THE STUDY**

This study focused on assessment of spatial variation in agricultural development programmes in Kano State. The local government areas constitute the unit of observation. Twelve (12) local government areas that were captured fall within the three senatorial zones namely, Kura, Madobi, Minjibir and Warawa in central senatorial zone, Dambatta, Gwarzo, Tofa, and Tsanyawa in northern senatorial zone and Doguwa, Gaya, Rano and Rogo in southern senatorial zone. The content of the study covered areas such as access to land (hectares); cropping intensity per annum, number of bags of chemical fertilizers consumed; number of hired laborers, modern equipment employed and access road (Km). The temporal scope covered 2008 – 2014. It is period noted to be when efforts geared towards the revamping agricultural sector particularly it made special emphasis on livestock development and gender bias towards women. The choice of the study area is based on its long existence in traditional and modern agricultural practices. The study focused on rural local government areas since the bulk of agricultural activities take place in those areas.

1.6 **SIGNIFICANCE OF THE STUDY**

The changing agro-economic scenario drew attention of academics, agriculturalist and government institutions research on diffusion of technological development in agriculture. In India majority of its population depends upon agriculture. So a vast rural mass try to earn their livelihood from agricultural land. With fast increasing pressure of population on agricultural land, old methods and techniques of production cannot cope with growing

demand. As a result, new technologies and commercial crops are adopted to develop agro-economy. For these reason emphases on the diffusion of agricultural innovation are stressed. Many studies focus on accelerated agricultural production through the analysis of cropping pattern and level of agricultural development at block level, as well as assessing the role of modern agricultural technology in the development of agriculture in different blocks of this area (Datta, 1983).

With the discovery of crude oil in Nigeria and the subsequent oil boom in the 1970s, far less attention was given to agricultural sector which hitherto had been the main foreign exchange earner for Nigeria. With the resultant decline in agricultural production, Nigeria became a net importer of both food items and agro-allied raw materials. The cumulative effect of this situation is that the agricultural sector failed to perform its traditional functions effectively. To meet up with the crisis, both the federal and state governments formulated several policies and embarked on a variety of agricultural programmes aimed at improving the capacity of the agricultural sector (Okereke, 2000). This is coupled with high handed and unpredictable government intervention programmes which have led to short term investment decisions and rent seeking behavior by programmers has created dysfunctional and disconnected benefits to the poor masses. Clearly, persisted failures of agricultural programmes in Nigeria have revealed the basic weakness of agricultural policies and the inability of the several administrations in Nigeria to solve the basic and fundamental problems of agricultural development (Amalu, 1998). The country has not satisfactorily addressed the issue of how agricultural development programmes could spread spatially so as to maintain a balanced development.

Agricultural developments include both physical and non physical factors. These factors are responsible for agricultural development as well assist spatial variation. The spatial characteristics of agricultural development can be represented by the help of maps. The

method of mapping of spatial characteristics of the level of agricultural development provides a rational base for future orientation of agricultural planning. It can be used as an effective means for delimiting agriculturally weaker areas where agrarian mechanization could not bring about remarkable changes and modification in crop structure and agricultural production (Ahmed and Bachi 2007).

By and large, the concept of equity principle in Nigeria should extend beyond the national and state frontiers to the local governments units within each state of the federation for the agricultural development programmes to spread spatially so as to maintain a balanced development. By so doing, equity and social justice would become an important all-embracing element of Agricultural development programmes planning philosophy in this country.

CHAPTER TWO

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 THEORETICAL FRAMEWORK

This study utilized some fundamental theories that could explain the underlining principles for variation in agricultural development and they include: agricultural comparative advantage model; agricultural game theory; Von Thunen agricultural land use

2.1.1 Agricultural Comparative Advantage Model

David Ricardo (1772–1823) probably first used the law of comparative advantage around the first two weeks of October 1816 (Matsuyama, 1991). It is pertinent to note that specialization is only useful if either of the two regions cited above can obtain other necessary product through international trade. Therefore, the concept of comparative advantage is generally based on the assumption that: there are no transportation cost or barriers to trade, trade is a substitute for resource mobility, the economics of region involved are at full employment, and domestic product and resource markets are highly competitive (Gbadegesin, 1993).

It seems obvious that if one country is better at producing one good and another country is better at producing a different good (assuming both countries demand both goods) that they should trade. This question brings into play the theory of comparative advantage and opportunity costs. A country is said to have a comparative advantage in whichever good has the lowest opportunity cost. That is, it has a comparative advantage in whichever good it sacrifices the least to produce. In the example above, Switzerland has a comparative advantage in the production of chocolate. By spending one hour producing two pounds of chocolate, it gives up producing one pound of cheese, whereas, if it spends that hour producing cheese, it gives up two pounds of chocolate. The country can trade with other countries to get the goods it does not produce (Valley, 2015).

The principles of comparative advantage as applied to specialization in agricultural production seeks to explain which agricultural activity a region should engage in , in order to have maximum output. It stipulates that total output will be greatest when each product is produced by that region which has the lowest opportunity cost. The specialization can only be possible if individual regions or sovereign nations concentrate in the production of those crops or products which they can produce with the greatest relative efficiency and by trading for those goods they can produce efficiently (Gbadegesin, 1993).

The model predicts a positive link between agricultural productivity and economic growth and thus provides a formalization of the conventional wisdom, which asserts that agricultural revolution is a pre condition for industrial revolution. For the open economy, however, the model predicts a negative link that is, an economy with a relatively unproductive agricultural sector experiences faster and accelerating growth. The result suggests that the openness of an economy should be an important factor when planning development strategy and predicting growth performance (Matsuyama, 1991). Specialization enables each regime to shift resources away from that product which has a cooperative advantage.This allocation of resources in accordance with the theory of comparative advantage gives rise to more efficient production that is larger world output result from fix input of resources. Secondly, through specialization trade can also bring about the re – direction of demand, so that product prices in two regions move toward equality (Gbadegesin 1993).

This theory is significant to the study because it forms the foundation of the work to understand the local government area that has a greater opportunity of producing certain type of crops and could be encouraged to increase production through regional specialization.

2.1.2 **Agricultural Games Theory**

The first use of game-theoretic analysis was by Antoine Augustin Cournot in 1838 with his solution of the Cournot duopoly. The use of game theory in the social sciences has expanded, and game theory has been applied to political, sociological, and psychological behaviours as well (Torrens and Osullivan, 2001).

The games theory involves the rational choice of strategies in the face of competition from an opponent. It is founded upon principles in game where two or more people face each other and choose certain strategies to win. The competition may be in the choice of locations or of certain strategies to overcome or outplay the decision makers' opponent. The central idea in the games theory is to work out the best strategy for players that will minimize loss and maximize gains. In addition, the theory predicts that one person can only gain what others loose (Gbadegesin, 1993). The games studied in game theory are well-defined mathematical objects. To be fully defined, a game must specify the following elements: the players of the game, the information and actions available to each player at each decision point, and the payoffs for each outcome. A game theorist typically uses these elements, along with a solution concept of their choosing, to deduce a set of equilibrium strategies for each player such that, when these strategies are employed, no player can profit by unilaterally deviating from their strategy. These equilibrium strategies determine equilibrium to the game a stable state in which either one outcome occurs or a set of outcomes occur with known probability (Ferdosi, 1995).

An implicit assumption of game theory is that whenever an optimizing agent expects a reaction the players, being rational, are able to reproduce any from other agents to his own actions, his payoff is equilibrium calculations of anybody else. In particular, all determined by other player's actions as well and he is the equilibrium strategies must be known to (as they are playing a game). Game theory provides general methods of computed by the

players) (Knoeber, 1989). Game theory was applied in Agricultural science in Iran, on the production and marketing process of Tomato as one of the most important vegetables. Some policies have been made to reduce the risk in some beneficial items, such as low transaction costs, traditional and based on support programmes by farmers and decreasing the symmetric information among producers such as diversification, rotation, short sale, and processors in production quality, better delivery guarantee prices, price stabilization, crop insurance as programmes, reducing the price and revenue risks of well as delivery contracts (Mazaheri, 2007). Agricultural game theory brings to limelight areas relevant to this study with regards to selection and adoption of strategies by local government areas that will make them different from the other local governments areas so that emphasis will be given to the use of that strategy for the selection of agricultural development programmes that will improve the quality of service delivery.

2.1.3 **Von Thunen Agricultural Land Use Model**

Heinrich von Thunen (1783-1850), a German economist and estate owner of the early 19th century, developed a theory of agricultural location that is still worth considering. This model is based on an econometric analysis of his estates in Mecklenburg, near Rostock in Germany. Most of the data used in explaining his theory were obtained by him through practical experience. He attempted to construct a theoretical model of land use pattern, giving a particular arrangement of towns and villages in a situation experienced in Mecklenburg. The main aim of von Thunen's analysis was to show how and why agricultural land use varies with the distance from a market's (Langton, 1991). Von Thunen emphasized that his findings had no claim to universality but were meant as generalizations towards discovering laws which govern agricultural prices and translate them into land use patterns (Chisholm, 1981).

Von Thunen considered four generalized types of economic and agricultural activities, categorized according to relative economic yield per unit area and perishes ability or difficulty of delivering products to the market. He made predictions of the distributions of these activities relative to an isolated urban centre. Assuming an otherwise homogeneous landscape (equal fertility and access to water throughout the area) and isolation of the system (no trade connections with outside states), Von Thunen theorized that the following three factors would affect the spatial distribution of agricultural types: More perishable products would be grown closer to market, Products with higher economic productivity per land area will be grown closer to market, Products that are more difficult to transport will also occur closer to market. According to these assumptions, one would expect that different types of agriculture will form in concentric rings around the market, ordered in distance from the center according to their relative values of the three factors mentioned (Kohler et al, 2000).

Parker (2000) used economic behavior in autonomous agents who were fixed to their cellular locations to investigate emergent spatial land patterns, and had noted Von Thunen's patterns emerging in some simplified cases. Notably, transportation costs alone were sufficient to produce a unique equilibrium that conformed to Von Thunen's predictions. It has also been applied to modern agricultural societies such as rural Brazil (Lim *et al*, 2002) and Mexico (Manson, 2000). They have proven useful as a method for evaluating policy (such as Antena *et al*, 2002 in Niger). Other existing studies have provided insight into how social interactions and varying amounts of information about the surrounding world give rise to important dynamics (Deadman, 1999) gives useful insights into economics and emergence of land use patterns (residential and commercial agglomeration) through, and used Von Thunen's theory as part of the foundation of their work. However, Von Thunen's predictions seem to have never been explicitly investigated by applications of these techniques.

The work titled "Von Thunen's Isolated State and the area around Addis Ababa, Ethiopia" was carried out to compare the agricultural patterns in the immediate upland of Addis Ababa with the crop theory in Von Thunen's isolated state. Although many of the assumptions upon which the isolated state was built were not met in the study area, several striking empiral parallels can be identified. First, there was the 120km^2 eucalyptus forest surrounding the capital city, producing firewood and building materials for the city. The shape of the forest was also found to be wedge-shaped resembling the modified version of the hypothetical patter in the isolated state after the introduction of a canal. Eucalyptus forests were also found around small towns over much of Ethiopia in accordance with the idea that small towns in the isolated state could produce its own land use zones. In addition, vegetable production was found in close proximity to the city although the vegetable and milk did not occur together as suggested by Von Thunun. In zones 3, 4, and 5 of the isolated state, Von Thunen noticed three zones of mixed farming of decreasing intensity. However, the mechanism responsible for this zonation was based on economic rent. Therefore, you can see from this case study that despite the fact that all of Von Thunen's assumptions were not met in Addis Ababa, the agricultural pattern as at the time the study was carried out should be at a minimum serve to heighten the plausibility of Thunen's scheme because of the remarkable parallels between Thunen's theory and the agricultural land use around Addis Ababa. Perhaps the most striking evidence Von Thunen's theory in Addis Ababa was that of the eucalyptus forest. The uses of the three in the city, the actual shape and location of the forest all resemble the conditions in the isolated state (Gbadegesin, 1993).

Moreover Von Thunen model was applied in Oyo division of Nigeria by Oyeleye (1975) the study examined the spatial pattern of croplands in the study area and specifically in a tobacco flue-cured and air-cured growing areas noting the extent to which they conform to some sort of order as proposed by Von Thunen. The outcome of the study reveals that a

major weakness of Von Thunen model was its failure to take into account the influence of non-economic factors which can also affect agricultural land use. Two of such factors noted in the study area are the Land Tenure System and the settlement pattern. In Oyo division, land is held in trust by the community and not by individuals. Within the community, actual occupation and control are decentralized and individual families rather than the community in fact exercises acts of ownership. Land therefore is not available to every farmer on equal basis (Gbadegesin, 1993). This theory explains geographic variation in the intensity of farming systems and in the productivity of labour in an industrializing society. Thus it gives foresight in understanding spatial variation in agricultural development in the study area.

2.2 LITERATURE REVIEW

2.2.1 Spatial Variation in Level of Agricultural Development

Agricultural development denotes the quality of agricultural system of a region; it is a multi dimensional concept which mainly includes development in a real strength of cropped land, improvement in farm practices/system, improved farm implements, irrigation system and irrigated area, high yielding improved varieties of seeds, chemical fertilizers, insecticides and pesticides, intensity of cropping and specialization and commercialization of agriculture (Mohammed, 1980). Regional distinctiveness is supported by the European Union in rural development policy. However, there is little information about the spatial distribution of the potential for rural development across Europe. The concept of territorial capital is used to consider spatial characteristics in assessing the capacity for rural development. Expert-based descriptions of territorial capital are translated into map able proxies to locate regions with development capacities in intensive agriculture, off-farm employment, rural tourism and conservation. Combining these potentials, the capacity for multiple functions within regions is assessed (Land Policy, 2011).

Various aspects play their role in agricultural development of a region. A few such aspects include crop productivity, cropping pattern, crop diversification, cultivation of commercially important crops, advanced methods of agriculture, innovation in agriculture, nature of agrarian relations and maintenance of ecological balance and several others (Mahmud, 1993). Based on the conceptual framework of agricultural development, Bhagabati (1990) presented a model showing the process of interacting aspects like land use, cropping pattern, technification, ecology, agrarian relation and infrastructural and institutional factors. According to him, these aspects are highly interdependent and the status of any one of them generally depends more or less on the achievement of the others. These aspects vary over space either qualitatively or quantitatively or both.

While mapping the levels of economic development in India, Bora and Barthakur (2009) used agricultural indictors of crop productivity, that is average annual food production per capita or agricultural population, per acre yield of major food grain as percentage of national yield; agrarian relations such as agricultural labourers as percentage of rural 345 population, average annual wage per agricultural labour family and concentration ratio of landholding and institutional factor of members of agricultural credit societies per million of agricultural families. These indicators were not used to measure agricultural development but used to show economic development.

Ahmed and Bachi (2007) used some indicators which included percentage of double cropped area as an expression of intensity of cultivation, percentage of gross irrigated area as a measure of agricultural inputs, area under cash crops signifying commercialization of agriculture and yield of clean rice indicating efficiency of agricultural practices. He also used other indictors to show degree of subsistence economy and to obtain an idea about land dependency of cultivators. In the remarkably analytical study of levels of regional development in India, Bhagabati (1990) took as many as 41 indictors of agricultural

development grouped into four 346 subsets of productivity, production conditions, agrarian relations and change in agriculture.

Agricultural development should be assessed not only by the levels of productivity or trends in agricultural production but also with reference to various physical inputs like irrigation, fertilizers, improved seeds and extent of cultivated area. He regionalized India on the basis of land resources and crop productivity index (Mahmud, 1993).

Suwase (2012) assessed spatial variation in the level of Agricultural development in Phaltan Tahsil of Satara India. Data for this study was collected through structured questionnaire. These analyses have been carried out by transfer and combining the data related to 04 variables using Z score analytical technique. The finding of the study shows that modern technological inputs through agro service centers have reciprocal relationship with agricultural development in the study area. Singh and Waseem (2012) examine spatial variation in level of agricultural development programmes in Bulandshahr district of Western Uttar Pradesh India. The research method employed was a survey approach which involved the administration of questionnaire as a research instrument. The result reveals that the spatial distribution of variables and agricultural development is not uniform in Bulandshahr District of Western India. It provides very significant information about the level of agricultural development in western India. Datta, L. (1983) examined spatial agricultural land occupance of Nagaon District, India. Primary data were used to accomplish the study. The result revealed that, overall agricultural development as well as agricultural modernization needs lowering of physiological density under existing land use and cropping pattern, that is lower physiological density maintains lower scope for crop modernization and agricultural development.

2.2.2 **Studies in Agricultural Development programmes: An Overview**

Akindiya (2012) assessed the roles of Agricultural Development Programmes (ADPs), Extension services to aquaculture development in Lagos and Ondo States of Nigeria. Data for the study was collected through structured questionnaire. Primary data were used to accomplish the study. The findings of the study indicated that the extension workers had a very clear understanding of their roles in aquaculture development in Lagos and Ondo State respectively. In terms of Communication and ways of introducing new technology to the fish farmers they perceived their professional routines duties as very important. The extension workers were also satisfied with their job. The major job related factors contributing to the level of satisfaction were fulfillment as extension workers, involvement in special extension activities, length of stay in current station and government funding.

World Bank (2012) examined agricultural development programmes in Nigeria. Secondary data were used to accomplish the study. The paper revealed that increase in total agricultural production in each of the ADPs was below appraisal expectations. Performance of rain-fed crops was especially disappointing, reflecting the difficulties with technology development and transfer programmes and input supplies. While yields of some rain-fed crops--which accounted for a large share of agricultural output--rose in specific states, yields of others declined. The Fadama programmes in the northern ADPs, though small in area relative to rain fed crops, were successful and exceeded their targets for developing small-scale irrigation. They used cheap techniques for extracting shallow groundwater, which permitted high-value vegetable crop production.

Omonijo *et al* (2014) investigated the Impacts of Agricultural Development Programmes (ADP) on rural dwellers in Nigeria: Using Isan-Ekiti state. The research method employed was a survey approach which involved the administration of questionnaire as the research instrument. The result reveals that Agricultural Development Programmes have

significantly increased food production in the locality through increased provision of pesticides and improved seeds to farmers, establishment of new infrastructure and provision of fertilizers. The analysis of the evidence from the result however reveals that accessibility to credit by farmers has no significant effect on increased Agricultural productivity.

Dabo (2012) examined the impact of Kaduna Agricultural Development Project (KADP) on thesocio-economic well being of farmers in Lere Local Government Area Kaduna State. Primary data were used to accomplish the study. The study found out that there are channels of input distribution and difference in the adoption of new technology because of difference in education level, social status, income and dependants. It also found out that 85% the services provided by KADP hasimpacted on the farmers by increasing output of their produce, increase their income and offfarm earnings, improve their social status and house management style and transforming theirsocio-economic well being.

Daneji (2011) examined Agricultural Development Intervention Programmes in Nigeria (1960 To Date) Secondary data were used to accomplish the study. The result reveals that, the design and management of rural development and agricultural programmes in Nigeria can only move forward if the present practice is adjusted to the social and economic realities and progressive strategies and ideas are given a chance. This is with due acknowledgement to existing shortcomings. It also found out that to achieve the most cherished result in this direction, design and management of development programmes should be a collective venture where all the stakeholders will have a say. Not only that, both sponsorship, policy design and implementation should receive the inputs of targets of development programmes.

Prisicillia and Obioma (2015) assessed Rural Development and Food Security Programmes in Nigeria. The data used in this study was collected from both primary and secondary sources. The data analysis revealed that to achieve food security in a more practical way, the following specific recommendationsshould also be implemented to the later ; Farm demonstration center, Establishment of micro credit scheme, Extension service delivery, Veterinary services ,Input delivery and Infrastructural facilities

2.2.3 **Agricultural Development: Some Idicators**

Cropping intensity is one of the important indicators of development in agriculture. It measures the number of times a piece of land is cultivated during an agricultural year. It works out to be 1.396 on an average in the region of India which is not quitea high figure for the all round development in agriculture. However, the Estimated figures work out to be satisfactory, i.e., 1.658 and 1.648 in the states of Arunachal Pradesh and Tripura respectively in sharp contrast to 1.046 and 1.100 in the States of Mizoram and Nagaland (Singh and Chauhan, 1993).

Fertilizer use remains very low in most of Africa despite widespread agreement that much higher use rates will be required for sustained agricultural productivity growth. Many studies have examined the causes of continued low use of modern inputs in sub-Saharan African countries such as weak input, credit, and output markets, poor soils, and high production risks have often been identified as the main reasons for low uptake of fertilizer among African farmers (World Bank, 2008).

In 2002, the Zambian Government launched programmes and policies under the framework of its Poverty Reduction Strategy Paper (PRSP) which, in the agricultural sector, includes: the Fertilizer Support Programme (FSP) out-grower schemes, land and infrastructure development, technology development, agriculture extension, and maize

marketing in support of small-scale farmers. Despite government's efforts over the past several decades, overall fertilizer consumption has expanded slowly and maize yields remain at the level of 1.2 to 1.8tons per hectare over the past decade (Dessy, et al., 2006).

It is expected that the more land size and quality will lead to a higher agricultural production. The impact of enhancing forest (including both planted and natural forest) on agricultural production is anticipated to be negative since enhancing forest, *ceteris paribus*, narrows down the area for cultivation. The effect of land rights on production is assumed to affect an individual's investment incentives (Alchian & Demsetz, 1972; Feder & Feeny, 1993; Besley, 1995). Three positive links between land rights and investment incentives have been explicitly identified and formally modeled in the literature. The second link emphasizes the effect of the rights to collaterize land on the investment incentives (Feder, & Feeny, 1993). The third is one between investment incentives and land transfer rights (Besley, 1995). Therefore, the common wisdom is that temporary or insecure property rights may have a negative effect on agricultural production, as there is less incentive for investments by the temporary or insecure owner. However, empirical results on land titling are mixed. Studies for different countries in Central Africa show neutral effects of legal land rights on agricultural production (Place & Hazell, 1993; Platteau, 1996). Other studies have documented that insecure rights lead to less input use, investments, and, therefore, lower production (Lutz *et al*, 1994). Toan and Iyer (2006), use panel data of Vietnam in 1993-1998 and find that households in provinces which have made a significant progress in land titling appear to have a higher proportion of cultivated area devoted to multi-year crops.

Labour is the active factor of production that influences all economic activities and thus remains the main factor of welfare and development of any human community. The

agricultural output depends on the technology employed, on the skill of the labourers as well as on the quality of the soil and the animals (Boghean and State, 2013).

Labour plays a positive role in agricultural production. As common in any other empirical work on agricultural production, we expect a positive effect of the labour force on agricultural production.With respect to the quality of labour, various studies have identified the level of education as an important determinant of agricultural productivity better education may affect the ability to use information and translate it into better management, leading to a more efficient use of agricultural production factors (Appleton and Balihuta., 1996; Jolliffe, 1998).

Better roads are expected to favor production of high-value products and therefore contribute to higher values of agricultural products Road density and access to roads are expected to be positive correlated with agricultural production since it can help to reduce costs of transportation within the area (Pender *et al*, 2001). Poor infrastructure in developing countries has also contributed to increased costs on agricultural production process in terms of high costs of transportation, increased costs of farm inputs and maintenance of agricultural inputs and equipment. The road networks especially in rural areas are in bad condition and in most of rainy seasons village roads are impassable (National Agricultural Policy, 2013). Rural infrastructure plays a critical role in poverty reduction, economic growth and empowerment for the African rural poor. The lack of adequate and reliable infrastructure touches the life of every rural African family daily; investments in rural infrastructure, particularly rural roads, storage, processing and market facilities, will therefore be required to support the anticipated growth in agricultural production and improve competitiveness (UNICED, 1997).

Africa's road network is particularly underdeveloped. It is clear that many Sub-Saharan African countries face a significant handicap in terms of rural road infrastructure, and they compare unfavourably with both North Africa and other parts of the world. For example, local road densities in a sample of representative countries in Sub-Saharan Africa show a mean density of 0.86 km per thousand head of population, while the equivalent density in Tunisia is 2.6 km/1000 persons, and in South Asia is some 1.8 km/1000 persons; for middle-income countries, the density is 8.5 km/1000 persons. Africa has the lowest density of paved roads of any of the world's regions, which hinders access to markets (FAO, 1996).

The role of credit in supporting agriculture, including its potential to help households handle risk, and purchase inputs/technology to improve agricultural productivity, has garnered recent policy interest in many developing countries. Examining these questions has traditionally been difficult, because of limited access to credit in areas where agricultural activity is high — in Sub-Saharan Africa (Ellis, 2000).

In Uganda, Using panel data from Northern Peru, Guirkinger and Boucher (2008) found that credit constraints lower the value of agricultural output substantially, whereas productivity is independent of endowments such as land and liquidity for unconstrained households. Credit-constrained farmers can also misallocate resources for agricultural production (Carter, 1989; Feder et. al., 1990; Foltz, 2004). And in a study of land tenure security reforms in Paraguay, Carter and Olinto (2003) found that without an adequate supply of credit, increased tenure security and accompanying demand for land can lead to under-investment in other capital for agriculture for liquidity-constrained farmers.

Feder et al. (1990) found that, the source of borrowing also matters. Governments in many developing countries have made recent efforts to improve access to credit for farmers without large landholdings, which makes the role of banks and microfinance institutions

(MFIs) an interesting policy question. Pitt and Khandker (1998, 1999), for example, find in Bangladesh that consumption-poor households and those with higher than average seasonal fluctuations in consumption and labour supply would be more likely to participate in micro credit programmes.

A growing number of studies of Sub-Saharan Africa examine the effects of extending credit access for agriculture and helping households manage risk. Using national data from Rwanda, relieving household credit constraints would increase agricultural output by around 17 percent. They also found that access to information through media and participating in networks like farmers cooperatives can contribute significantly to reducing credit constraints (Ellis, 2000). From a randomized study in Mali, Beaman et al. (2014) found out that MFI agricultural loans in randomly selected villages, compared to cash grants offered to randomly selected households in non-program villages, boosted purchases of agricultural inputs and farm profits for farmers with high returns to capital.

Mechanization is one factor that has had a significant effect on total food production since the beginning of modern agriculture. Mechanized harvesting, for example, was a key factor in increasing cotton production in the last century (National Academy of Engineering, 2000). In the future, mechanization will also have to contribute to better management of inputs, which will be critical to increasing total food production in global production systems that vary widely among crop types and regional economic status. Agricultural mechanization, one of the greatest achievements of the 20th century was enabled by technologies that created value in agricultural production practices through the more efficient use of labor, the timeliness of operations, and more efficient input management with a focus on sustainable, high-productivity systems (Hendrickson, 2009).

Early innovations were implements and tools that increased the productivity of draft animals and assisted farmers in preparing land for cultivation, planting and seeding, and managing and harvesting crops. This important innovation increased the productivity of farmers working in the sticky soils of the Midwest of America. A major turning point occurred when tractors began to replace draft animals in the early decades of the 20th century (GHI (Global Harvest Initiative, 2011). For most of the 20th century, four key factors influenced increases in the rate of crop production: more efficient use of labour; the timeliness of operations; more efficient use of inputs; and more sustainable productions systems. These four drivers played out at different rates in different crop production systems, but always led to more efficient systems with lower input costs (Hendrickson, 2009). In general, advances in machine system automation have increased productivity, increased convenience, and reduced skilled labour requirements for complex tasks. Moreover, benefits have been achieved in an economical way and increased overall Total food production (Sevila and Blackmore, 2001).

Agricultural extension represents a mechanism by which information on new technologies, better farming practices and better management can be transmitted to farmers (Birkhaeuser, Evenson and Feder,1991), (Evenson, 1998). Birkhaeuser, Evenson and Feder (1991) reviewed 15 studies published between 1970 and 1989 on the impact of extension (typically measured by some form of contact with an extension agent) on farm productivity (output per unit area) or output (expressed in physical or monetary terms) their review reported 26 estimates. Eleven estimates are statistically significant at the 90% per cent confidence level or higher, with the highest estimate indicating that contact with extension services raises output by 27 percent.

Over recent decades the poultry industry has made tremendous adjustments to meet the increasing demand for inexpensive and safe supply of meat and eggs (Paine, 1997). Over

the past three decades, the poultry sector has been growing at more than 5 percent per annum (compared to 3 percent for pig meat and 1.5 percent for bovine meat) and its share in world meat production increased from 15 percent three decades ago to 30 percent currently (FAO, 2006a). This growth has been accompanied by structural changes within the sector, characterized by the emergence and growth of "land-independent" (industrial) farming establishments, and the intensification and concentration of poultry operations. Pressure to lower production costs and increase supply has led to more efficient operations, made possible through the shift to larger, specialized and more integrated facilities, and through improvements in the use of animal genetics, optimized nutrition and new production technologies (FAO, 2006b).

Livestock made a major, although largely underestimated, contribution to rural development in developing countries. They produce food, enhance crop production and provide additional economic goods and services as well as cash income (FAO, 2005). The inclusion of livestock diversifies and increases total farm production and income, provides year-round employment and disperses risk. Sales of livestock products provide funds for purchasing crop inputs and for financing farm investments. Livestock often form the major capital reserve of farming households and, in general, enhance the economic viability and sustainability of a farming system (FAO, 2006b). Despite these positive contributions to agriculture and economic development, many formal livestock projects have failed to meet their objectives, with the result that donors are becoming more and more reluctant to support such developments. Furthermore, animal production is increasingly being viewed far more critically (FAO, 1994).

In many countries, the difficulties associated with increasing sustainable animal production are exacerbated by limited public-sector investment and weak, ineffective support services. Programmes and projects are often poorly designed and inadequately targeted, leading to

the inefficient and fragmented allocation of scarce development resources (Behinke and Kerven, 1993). The animals themselves are the major resource, but their mobility makes them a difficult resource to quantify, especially under the extensive management systems that predominate in much of the developing world. While this may create problems for the government statistician and the tax collector, it is unique in that it allows for the exploitation of feed resources for which there are no alternative productive uses, such as extensive arid, semi-arid and cold savannahs, crop residues and agricultural fallow (FAO, 1994).

2.2.4 **Factors Responsible for the Pattern of Agricultural Development**

Agricultural production in much of Asia, Africa, and Latin America is more heterogeneous and more labour-intensive in general. It is intresting to note that specialization, mechanization, and technological change have increased productivity of agricultural commodity crops such as soya beans and sugarcane in Brazil, wheat and rice in China and India, palm oil in Indonesia and Malaysia, and others (Feder *et al*. 1985). However, incorporating and disseminating technological advances that improve productivity and incomes in smallholder farming systems remains a challenge throughout the developing world (Barlow and Jayasuriya 1984).

The prevalence of local farmers' markets and slow and local food movements, and the emergence of Payments for Ecosystem Services (PES) and multifunctional agriculture (MFA) within agricultural landscapes are also supporting this change (Thompson 1998, Hinrichs 2000, Heal and Small 2002, Loureiro and Hine 2002, Weatherell *et al*. 2003, Loureiro and Lotade 2005, Antle and Stoorvogel 2006, Swinton *et al*. 2006, Heiman *et al*. 2009).

A variety of constraints play into farmers' decisions, especially with respect to available production technologies, biophysical or geophysical, labour and input market, finance and credit, social norms, inter temporal tradeoffs, policy, and constraints to knowledge or skills (Stoorvogel *et al*. 2004). Many factors in particular, variables that vary across farms and are sources of heterogeneity influence farmers' choices about what crops to grow, whether to use a new technology, and how to manage their land. Just as individual consumers have different preferences about products they consume, farmer characteristics, asset endowments, risk preferences, and inter temporal considerations affect their choices. Farmer attitudes, resource availability, and education and knowledge are especially important; farmers may be risk-averse towards making changes in cropping decisions or adopting new agricultural practices, or might have very conservative attitudes towards technology or lower or higher levels of concern for the natural environment (McCann 1997, Hanson *et al*. 2004, Musshoff and Hirschauer 2008, Serra *et al*. 2008).

A farmer's income or resource base and ability to obtain credit will also influence his/her choice of crops, farming systems, and willingness to invest in new crops, systems, or technologies (McCann 1997, and Bradshaw 2007). A risk-averse farmer or one who is credit or income-constrained (which often is the norm rather than the exception, particularly in developing countries) may be less likely to adopt new technologies, even if they are likely to reduce his susceptibility to risk or increase productivity or income over the long-run (Nerlove *et al*. 1996, Hanson *et al*. 2004). Lack of knowledge and information about the costs and benefits of adopting new technologies or conservation practices *or* lack of knowledge about how to implement such technologies or practices will also affect a farmer's propensity to adopt them (Chavas *et al*. 2010, Chavas and Kim 2010). Even if farmers have full information and can implement new technologies efficiently and at low cost, differences in inter temporal preferences or credit constraints may mean that farmers are unwilling to sacrifice current profits or income for long-term improvements in soil

fertility, risk-reductions, or improved yields (Shively 2001, Sunding and Zilberman 2001, Coxhead and Shively, 2002).

Biological and geophysical factors and input and output market conditions are important variables that also impact farmer decision-making and adoption of land use practices or technologies. Biological and geophysical factors that influence production can include water availability, soil fertility, and risks of floods, droughts, frost, or pest or weed infestations, and the importance of each of these factors varies with the types of crops planted (Loomis *et al*. 1971, Leemans and Born, 1994). Input market conditions can shape farmer production decisions in a number of ways; dynamics of local and seasonal labor availability may mean that it is not profitable to grow a crop with a very narrow harvesting window in a month where the overall demand for agricultural labor is high in the region (Fisher 1951, Binswanger and Rosenzweig, 1986). Input price volatility and economies of scale with respect to inputs or technologies can also contribute to farmers planting different mixes of crops, or planting more land in one crop than another (Zilberman *et al*. 2012). Similarly, output market conditions including prices, price variability, transportation costs, and supply chain transactions costs are important determinants of how profitable it is for farmers to grow a crop. Many of these variables are influenced by location; Rogers (2003) notes that communities closer to urban centers are likely to adopt new technologies more quickly. Consumer attitudes and willingness to pay (i.e., the maximum amount a consumer would be willing to pay for a good or attribute) for differentiated crops or particular attributes, such as organic or local production or pesticide-free varieties, also affect the agricultural systems that emerge in response to the demands of a changing market.

Policies and regulations can impact the profitability and evolution of different agricultural systems by facilitating or hindering trade in particular types of agricultural products, by influencing farmer decisions about what crops to grow or how much land to farm using

policies such as price supports or set-aside programs, or by making different types of production or land-use relatively more or less "expensive" via regulations, taxes and subsidies, or standards (Hardie *et al*. 2004, Goetz and Zilberman, 2007).

In addition, many policies that do not specifically target agriculture, such as labor and immigration or water policies have a significant effect on the costs of agricultural production. For example, laws such as those that regulate pesticide usage and application or limit water use can make it more costly to produce using synthetic pesticides or inefficient irrigation systems (Lichtenberg *et al*. 1988, Lichtenberg, 2002). While in the short-run such regulations may have a negative impact on farmer welfare, they also serve to stimulate innovation and adoption of new technologies in order to comply with regulations and reduce the costs of production (Lichtenberg, 2002).

Early studies on adoption noticed that the number of adopters, or the cropped area of using the new technology, were S-shaped (or followed a logistic curve) as a function of time. They explained this pattern by imitation behaviour among farmers; adoption is slow until enough farmers begin using the technology, and then rates of adoption speed up rapidly before they plateau (Rogers, 2003). The more profitable the new technology, the faster the rate of adoption and the higher the level of adoption after the diffusion process has played out (Griliches, 1957). Farmers are heterogeneous, however, which impacts how and when they make decisions. Farmers in areas with soils with lower water-holding capacity will reap greater benefits from adopting irrigation technologies, and pest control strategies are adopted first in regions with high pest pressures. Over time, technologies and practices diffuse as producers gain knowledge and experience, or "learning by doing," and as more and more farmers begin to use the technology, or "learning by using." More and more farmers will adopt a technology as the fixed costs of adoption decline with time, and for some technologies, the gains from adoption increase with time as the network of producers

using the technology increases in size (i.e., technologies that exhibit network externalities, such as cell phones) (Sunding and Zilberman, 2001).

2.2.5 **Agriculture and Economic Development**

Despite all the laudable programmes promoted by various governments, agriculture has suffered from years of poor management, inconsistent and poorly implemented government policies, and the lack of basic infrastructure. Still the sector accounts for considerable percentage of GDP and two-thirds of employment. Nigeria is no longer a major exporter of cocoa, groundnut (peanuts), rubber, palm oil due to over dependence on petroleum as main source of revenue (Onwualu, 2009). Nigeria imports approximately US$3.5 billion in food products annually and exports onlyUS$500 million. Imports are dominated by bulk/intermediate commodities such as wheat, rice and sugar. However, with expanding purchasing power and a growing consumer base capable of purchasing higher priced foods, psrocessed goods and live animals are two of Nigeria's larger import categories. With regards to seafood, Nigeria is a major importer with mackerel, herring and croaker being some of the dominant categories. It is estimated that 60% of inputs used in the food processing sector are imported (Agriculture and Agrifood Canada, 2011).

Agriculture has a strong hold in an economy, for without it a country will always depend on foreign countries to feed its population. The potential contribution of agriculture to economic growth has been an on-going subject of much controversy among development economist. Several authors argue that growth in the overall economy depends on the development of agricultural sector (Thirtle and Piesse 2000). Timmer (1995) observed that agriculture indirectly contribute to economic growth via its provision of better caloric nutrient intake by the poor, food availability, food price stability and poverty reduction.

Nigerian agriculture was seen as a low-productivity, traditional sector that only passively contributed to development by providing food and employment. Furthermore, the importance of agriculture was expected to decline as development advanced. Nevertheless, agricultural growth was still considered necessary for development and for a country's transformation from a traditional to a modern economy (Adelman, 2001).

According to Hayami (2001) these theorists understood that "successful industrialization cannot be expected without the parallel effort of increasing food production to avoid the danger of being caught in the Ricardian trap. Although early development economists saw agricultural growth as an essential component and even a precondition for growth in the rest of economy, the process by which this growth was generated remained beyond the concern of most development economists (Ruttan, 2002). For this reason, Lewis's theory was employed to support the industrialization strategies adopted by many developing countries between the 1950s and 1970s. The governments of many of these countries tried to accelerate the industrialization process by heavily taxing agriculture both directly and indirectly until the 1980s (Schiff and Valdez, 1992).

Surplus agricultural income provides savings for investment in both urban and rural areas. This savings link-age also works through forward linkages to urban areas. Lower food prices, stimulated by technological change in agriculture, maintain low real wages in industrial sectors and thus foster investment and structural transformation (Hart, 1998). Finally, some regional studies also considered the formation of social capital, suggesting that increased inter-actions between farmers, input suppliers, processors, and banks might help generate the confidence and trust needed to initiate non-agricultural business and commercial agriculture (Irz, Lin, Thirtle, and Wiggins, 2001).

Irz and Roe (2000) also found that a minimum rate of agricultural productivity growth is necessary to counter population growth and avoid the Malthusian trap. More importantly, the authors found that the demographic and technological characteristics of several Sub-Saharan African countries are consistent with such a poverty trap. There is currently no separate policy articulation for the development of agribusiness except for the brief objectives stated in the 1988 Agricultural Policy for Nigeria document for agricultural commodity processing. The Nigeria agricultural policy is outdated and inconsistent with the situation of today. Most regulations and laws change frequently or are inconsistently applied, causing uncertainties in production and market prices of products, hence unpredictable projections in return on investments and lack of protection for local manufacturers due to inconsistency of policies (Onwualu, 2012).

The challenges and constraints that have made it impossible for Nigerian agriculture to be developed have been discussed severally these include: Lack of Basic physical infrastructure and essential services, lack of appropriate technology and machinery for production, processing of agricultural products, difficulties in accessing credit facilities for investment in agriculture, apathy towards investment in the agricultural sector, poor entrepreneurship development (Onwualu, 2009; 2010).

2.2.6 **Contributions of Agricultural to Economic Development programmes in Nigeria**

Ukeji (2003) submits that in the 1960‟s, agriculture contributed up to 64% to the total GDP but gradually declined in the 70‟s to 48% and it continued in 1980 to 20% and 19% in 1985, this was as a result of oil glut of the 1980's. Historically, the root of the crises in the Nigerian economy lies in the neglect of the agricultural sector by the Federal Government towards developing dependence on a mono-cultural economy based on oil.

Notwithstanding Nigeria's rich endowment in black oil and other mineral resources the wellbeing of her economy still largely depends on agricultural sector. The Nigerian economy is essentially agriculture in terms of national output and employment generation. It is the largest contributor to Gross Domestic Production (GDP) (average 38% in the last 8 years) with crops accounting for 80%, forestry 3% and fishery 4%. It provides employment for about 65% of the adult labour force and the food and fibre needs of a large and increasing population. The agro-industrial enterprises depend on the sector for raw materials whilst 88% of the non-oil exports earning come from the sector (Izuchukwu, 2011).

Agriculture contributes significantly to national food self–sufficiency by accounting for over 90% of total food consumption requirements, its helps to maintain a healthy and peaceful population and also a source of food and nutrition for households. Furthermore, the ultimate objective of interest of economists in productivity should be to find ways of increasing output per unit of input and attaining desirable inter-firm, intra-firm and inter sector transfers of population resources thereby providing the means of raising the standard of living In Nigeria, agriculture export has played an important role in economic development by providing the needed foreign exchange earnings for other capital development project (Izuchukwu, 2011).

Ekpo and Egwaikhide (1994) observed that Nigerian agricultural export has enlarged to include cocoa beans and palm kernel. Statistics indicate that in 1960 agricultural export commodities contributed well over 75% of total annual merchandise exports. In 1940"s and 50"s Nigeria was ranked very high in the production and exportation of major crops in the world. For instance, Nigeria was the largest exporter of palm oil and palm kernel, second to Ghana in cocoa and third position in the exportation of groundnut In terms of

employment, the sector is still leading in economic activities, while accounting for one-third of the Gross Domestic Product (GDP).

2.2.7 **Impact of Agricultural Development Programmes on Production**

The Agricultural Development Project (ADP) system was noted to have made remarkable success in the agricultural and rural landscape in Nigeria. The achievements and impact of the ADPs were identified to be in the area of revitalized extension service, local capacity building, rural infrastructural development, input distribution, technology development, transfer and adoption, as well as improved rural livelihood and food security. Significant ADP achievements in the above focus areas have guaranteed programme continuity for the past two decades in Nigeria (Ugwu, 2007). Nigerian agriculture has been characterized by small scale production. This characteristic has led to low income hence, the farmers cannot afford yield increasing technologies and consequently experienced low output. Due to low incomes and output, the levels of investment in farms have been very low, forming a cycle called "vicious cycle of poverty" (Ezeh, 2007).

The ADP became a central motive force for direct investment by government on small holder agriculture (Ezeh *et al*, 2006). The ADP was designed to improve the traditional systems of production and raise productivity by transfer of relevant and proven production technologies to farmers, easing constraints on inputs supplies and provision of rural infrastructure (Obasi, 1995) Strategies for achieving the ADP objectives in the crop sub-sector are usually the employment of On-farm Adaptive Research (OFAR) and Small Plot Adoption Technique (SPAT) (Ezeh, 2007). These are achieved under the umbrella of the Training and visit (T and V) system of extension with male and female contact farmers as the centre piece of all extension actions. A contact farmer (male or female) is a progressive and receptive farmer trained by the Village Extension Agent (V.E.A) on the new practices

and through whom information is communicated to other rural farmers within the rural Community (Dimelu, 2002).

Despite numerous policies and programmes geared towards improving the living standards of Nigerians, it has been difficult to stem the growth of rural poverty especially among the women (Ezeh, 2007). This unequal access to resources has made rural poverty to be synonymous with women. World Bank (1996) and Ayobatele and Amudipe (1999) confirmed that, the available statistics show that the increase in total agricultural production in each of the ADPs was below appraisal expectations. Performance of rain fed crops was especially disappointing, reflecting the difficulties with technology development and transfer programmes and input supplies. While yields of some rain fed crops which accounted for a large share of agricultural output rose in specific states, yields of others declined.

The Fadama programmes in the northern ADPs, though small in area relative to rain fed crops, were successful and exceeded their targets for developing small-scale irrigation. They used cheap techniques for extracting shallow groundwater, which permitted high-value vegetable crop production (World Bank, 2012). Agricultural Development Programmes have significantly increased food production in the locality through increased provision of pesticides and improved seeds to farmers, establishment of new infrastructure and provision of fertilizers. The analysis of the evidence from the result however reveals that accessibility of credit by farmers has no significant effect on increased Agricultural productivity. The study therefore recommends that government should increase its effort in the area of Agricultural credit financing (Olamuyiwa and Uche, 2014).

Agriculture is one of the most important sectors of the economies of developing countries of the world. The growth of this sector is, however, not in consonant with its strategic

importance in the economies of various countries (Ogbonna, 2011). For more than two decades now, the agricultural sector of the Nigerian economy has continued to perform below expectation despite the huge sums of money being allocated to the sector in each year's budget (Onyeahialam, 2002). In 2002, about N9.874 billion was budgeted for the sector (Obasanjo, 2002). Also during the same year, 72 million dollars donated by Food and Agricultural Organisation (FAO) were distributed to the 36 states of the federation in addition to the years' allocation (Iheagu, 2002). According to Iheagu (2002), the money cannot be said to have been justifiably used, rather, what one sees is the prevalent poor attitude of the government to the execution of agricultural programmes.

In spite of the presence of ADP, food shortages have been getting worse from year to year. For instance in 2006, the Country's Gross Domestic Product (GDP) in 2002 contributed a total of N33 billion or 40.5% (NBS, 2007). However, at current factor cost, this sector's contribution to GDP declined from 22% in 2003 to 28% in 2008 with unsteady improvement to 31.3% in 2009 and 6.7% in 2002, due to unsteady productivity of the agricultural sector (CBN, 2007). Something therefore must be wrong with the World Bank assisted Agricultural Development Programme Policy, its contents and implementation strategies which, over the years of its operation has caused the agricultural sector to remain almost stagnant. In short, the World Bank Agricultural Policy has been faced with a dilemma. The problem is much more confounding than it meets the eye when one realizes that the peasant farmers in most parts of Nigeria, especially Enugu State still engage in 'primitive' and 'traditional' method of agricultural production (World Bank Publication, 2012).

Tamuno (2006) argues that Nigeria's diverse agro ecological conditions permit a range of farming systems but current productivity of both land and labour is low. Agriculture is predominantly the business of small holders. Women account for much of the agricultural

labour force; and the problem of low labour productivity is partly rooted in the gender specific allocation of responsibilities in rural production and household maintenance system. Afigbo (2000) argues that agricultural performance was poor during the oil boom of the 1970s as the naira became over valued, public expenditure concentrated on other sectors, and made young men left the rural areas for employment in the rapidly expanding non-agricultural sectors. Obiajulu (1997) argues that the problem was compounded by the effects of poor rains throughout the 1980s and early 1990s. The situation led to problems in the production of cereal and root crops. While we agree with the two situations, it is important to note that even when the oil boom ended in the early 1980s, agricultural performance remained severely constrained by a combination of poor weather and adverse policies including an overvalued currency, price controls, trade restrictions, and the inefficient operations of commodity marketing boards.

Agricultural growth however began to revive in the mid 1980s, leading to the rising GDP at an estimated average rate of about 6% between 1984 and 1986, and about 3.8% thereafter (World Bank publication 1996). Three factors combined to promote this growth, 1984 was the first year with good rainfall in Northern Nigeria after the long drought of the 1970s and early 1980s, the northern states established state wide Agricultural Development Projects (ADPs) with a smallholder orientation and a focus on extension, input distribution and rural infrastructure, and by the mid-1980s these efforts were beginning to pay off, with the progress recorded by the pilot ADP in the North, it was made a Nation wide affair (ADP publication, 2009).

2.2.8 **Agricultural Development Programmes in Nigeria**

2.2.8.1 *Agricultural Policies and Programmes in the Colonial Era*

The potential of agriculture for propelling Nigeria's economic development was recognized by the colonial government when policies were put in place to encourage

output growth and to extract the surpluses .The predominant theme of development in this period was the surplus extraction philosophy or policy whereby immense products were generated from the rural areas to satisfy the demand for raw materials in metropolitan Britain.This early interest of the extraction policy was on forest resources and agricultural exports like cocoa, coffee, rubber, groundnut, oil palm etc (Ayoola, 2001).

Documented policies of the era were: Forest Policy (1937), Forest Policy (1945), Agricultural Policy (1946), Policy for the Marketing of Oils, Oil Seeds and Cotton (1948), Forest Policy for Western Region (1952), Agricultural Policy (1952), Policy for Natural Resources (undated) and Western Nigeria Policy of Agricultural and Natural Resources (1959). More than half of policies in the era focused on forest matters while less emphasis was made on food and animal production (Iwuchuku and Igbokwe, 2012).

2.2.8.2 *Farm Settlement Scheme (FSS)*

This was initiated by some regional governments in Nigeria and was a critical element of Western Nigeria Policy of Agricultural and Natural Resources of 1959. The main objective of this scheme was to settle young school leavers in a specified area of land, making farming their career thereby preventing them from moving to the urban areas in search of white collar jobs. These settled farmers were also to serve as models in good farming systems for farmers residing in nearby villages to emulate. Unfortunately, the dream of this scheme did not materialized because some of the settlers were too young and inexperienced in farming. Thus, causing a high percentage of drop-outs among the settlers (Amalu, 1998). Secondly lack of understanding of the meaning and implication of the scheme by some settlers who assumed that through their participation in the scheme they would eventually get paid job. They were discouraged and some withdrew as soon as the allowances were not given any more. Thirdly, the cost of establishing a viable farm settlement was too high in terms of cash and staff (Amalu, 1998). Finally, expenses made

on the scheme was incurred mainly on installation of infrastructure like construction of houses, schools, markets, roads etc for the settlers which did not directly bring about increase in agricultural output by the participants as targeted.

2.2.8.3 *Agricultural Policies and Programmes in Post Colonial Era*

From independence (1st October 1960) to 15th January 1966**,** new policies were formulated in the post independence era to actualize more equitable growth in agriculture.

According to Jibowo (2005) some national agricultural programmes that were established and implemented following Nigeria's political independence in 1960 and the subsequent establishment of the Federal Ministry of Agriculture in 1970 included:

a) Programmes established between the end of the Nigerian civil war and the year 1980 included: National Accelerated Food Production Project (NAFPP, 1972), River Basin Development Authority (RBDA,1973), Agricultural Development Project (ADP, 1975), Operation Feed the Nation (OFN, 1976) and the Green Revolution Programme (1980);

b) Programmes established after 1980 to 2005 included: Accelerated Development Area Project (ADAP, 1982), Multi-state Agricultural Development Project (MSAP, 1986), Nigerian Agricultural Insurance Scheme (NAIS, 1987), National Fadama Development Project (NFDP, 1992) and the National Special Programme for Food Security (NSPFS, 2003).

2.2.8.4 *The National Accelerated Food Production Programme (NAFPP)*

This programme was established in 1972, following the end of the Nigerian civil war and the need to end the food crisis that engulfed the nation at that time. The programme was designed with the basic aim of increasing food production in the country, through: Education of farmers on methods of increasing their productivity in the area of food crop

production and the organization of workshops, seminars and conferences for farmers to enhance their education for greater agricultural productivity. The main problems that caused the program to fail were: the cost-sharing arrangement that involved the farmer in the last two phases of the programme; since cooperative societies were the main organs through which money was disbursed for on-lending to farmers, farmers who were not members of cooperative societies were left out; unceremonious withdrawal of funding from the cooperative societies by the Federal Government; and demonstration trials that did not give a true reflection of the technology that was introduced (Iwuchukwu and Igbokwe, 2012).

2.2.8.5 *River Basin Development Authorities (RBDAs)*

This was another national agricultural programme that came into existence in 1973. Its aims and objectives include, the provision of irrigation facilities through construction of dams for all year-round agricultural production, provision of potable water to people in the rural areas for increased agricultural production, assisting to bring more land under cultivation by increasing the farm size of the small scale farmers through the provision of land clearing services using government tractor hiring services at minimum charges, increasing the total output per farmer with increased net returns, construction of feeder roads to the rural areas for good transportation, improving the rural infrastructures generally to help stem the rural-urban migration, and the construction of fish ponds to enhance the distribution of fingerlings to farmers (Iwuchukwu and Igbokwe, 2012).

Some of the river basin and rural development authorities included: Lower Benue River Basin and Rural Development Authority; Upper-Benue River Basin and Rural development Authority; Sokoto-Rima River Basin and Rural Development Authority; Lake Chad Basin and Rural Development Authority; Kano-Ja'amare River Basin and Rural Development Authority; Benin-Owena River Basin and Rural Development

Authority; Niger River Basin and Rural Development Authority, among others (Decree 25 of 1976). According to Iwuchukwu and Igbokwe (2012) problems found in the programme were: a number of the authorities' grew out of proportion and the operations of some suffered from intensive political interference. Also, substantial public funds were expended to streamline sizes and functions of RBDAs through the disposal of their non-water assets.

2.2.8.6 *Agricultural Development Projects (ADPs)*

The Agricultural Development Projects came about in 1975, after a bilateral agreement between the Federal Government of Nigeria and the World Bank. The two basic aims and objectives of the ADPs were meant to achieve included increased food production and the raising of income of the small scale farmers; with the ultimate goal of improving their living standard and welfare. Initially, nine pilot (enclave) ADPs, covering a few local government areas, were established in Funtua, Kaduna state (1975), Gusau, Sokoto state (1975) Gombe, old Bauchi state (1975), Ayangba, old Benue state (1978), Lafia, old plateau state (1979), Bida, Niger state (1980), Ilorin, Kwara state (1980), Oyo-North, Oyo state (1981), and Ekiti-Akoko, Ekiti state (1982). Upon assessment, five years after their establishment, the ADPs were found to be successful. This gave rise to the establishment of state-wide ADPs that covered all the states of the federation at the time and additional ADPs were created in newly created stated, soon after creation. The enclave ADPs was converted to state ADPs of their various states.

The ADP programme was made up of Adaptive research, Extension/technology transfer, input supply and rural infrastructure provision. Other major operational components of the ADPs include the Training and Visit as well as the Unified Agricultural Extension System. The World Bank, federal Government of Nigeria, state and local governments all played one role or another towards the success of the ADPs (Amalu, 1998). Some problems that occurred in the implementation of the projects, according to Iwuchukwu and Igbokwe

(2012) were; Shortage of funds; ADP emphasized the technologies they wanted to introduce. For example, the programme over-emphasized modern/ high-input technology like sole cropping while majority of the farmers practiced mixed/relay cropping; untimely supply of the subsidize inputs; high labour mobility; limited involvement of input agencies; dwindling funding policies and counterpart funding problems, as well as intricacies of technology transfer. The performance of these projects is commonly considered to have been disappointing. A combined audit of six of them, including Kano and Sokoto, was conducted in 1993, and concluded that the project targets were unrealistic and based on unproven technological assumptions, that there was too little emphasis on farmers' production priorities, and that the institutional structure led to a top-down effort and overemphasis on physical targets (World Bank,2012)

2.2.8.7 *Operation Feed the Nation (OFN)*

The Operation Feed the Nation was launched in 1976. The aims and objectives of the program included, among others: the creation of a lasting awareness in all Nigerians that the population of the country was growing much faster than food production; to convince Nigerians that farming was not a dirty job as some people thought; to reduce the escalating cost of bread basket for the average family unit in Nigeria, by cutting down on the demand for certain food items and increasing the supply and consumption of certain others; to put into effective use some of the findings that have accumulated in our universities and research institutes over the years; to promote a lasting and meaningful practical opportunity to all university and secondary school students to experience methods of problem solving before graduation; to encourage domestic food production by traditionally non-food producing sectors of the economy; to encourage the spirit of self – sufficiency and national self-reliance in food production as well as improve the feeding habits of Nigerians by encouraging good nutritional habits. Some of the problems of this program had were: indiscriminate use of land for farming activities; most of the participants were

very young and inexperienced and without the fundamental knowledge of farming; hired labour was the main source of labor employed by participants; there was absence of readily available markets for the produce of the programme and livestock diseases caused havoc on farms of the novice farmers (Iwuchukwu and Igbokwe, 2012).

2.2.8.8 *Green Revolution*

The Green Revolution took off in 1980. This programme was more or less a continuation of the Operation Feed the Nation program. The aims and objectives were also not much different from those of the OFN. Using subsidy of the prices of agricultural inputs and machineries, including improved seeds, agro-chemicals, among other incentives, the government encouraged farmers to produce food, cash crops, as well as livestock, massively. The programme did not achieve its objective of increasing food supply because there was delay in execution of most of the projects involved in the programme as well as no monitoring and evaluation of the projects for which huge sums of money were spent (Iwuchukwu and Igbokwe, 2012).

2.2.8.9 *Directorate of Food, Roads and Rural Infrastructure (DFRRI)*

The Directorate of Food, Roads, and Rural Infrastructure, which was one of the cardinal agricultural programmes of the Babangida regime, was established in 1986. The aims, objectives and functions of the directorate included to: identify, involve and support viable local community organizations in the effective mobilization of the rural populace for sustainable rural development; identify and support the production of food and fiber crops; construct, rehabilitate and maintain rural feeder roads to facilitate food production and rural development; support rural water supply and on-farm storage in cooperation with the local people; identify and promote other programmes for improving the quality of life of rural people; encourage contributions of labor, time and materials from local communities, to be complemented with grants from the Directorate, Local and State governments. The

problems of the programme included poor quality of infrastructures provided by the directorate; mismanagement of funds; lack of proper focus and programme accountability (Idachaba, 1988).

2.2.8.10 *National Fadama Development Project (NFDP)*

In 1992 the Federal Government of Nigeria in conjunction with the World Bank established the National Fadama Development Project. The initial project (Phase1) covered the old Bauchi, Kano, Jigawa, old Sokoto, and Kebbi states. The scheme was designed to improve the flooded plains of the savannah (Fadama). This led to the development of small irrigation pumps and shallow tube wells for small scale irrigation farming system (SSIFS). The relative success of Fadama 1 led to the establishment of Fadama 11 and the current Fadama 111. NFDP adopted community driven development (CDD) approach with extensive participation of the stakeholders at early stage of the project. This approach is in line with the policies and development strategies for Nigeria which emphasize poverty reduction, private sector leadership and beneficiary participation (http.//www.fadama.org// 2015). Overall appraisal of the first and second phases of the project show remarkable success. The main problem associated with the project was the unskilled handling of water application through irrigation (Afolayan, 1997).

2.2.8.11 *National Special Programme for Food Security (NSPFS)*

This is a programme that was officially launched in 2003. The aim of the programme was to attain food security and alleviate rural poverty in Nigeria. It aimed at helping farmers to increase output and income, strengthen extension service delivery, promote simple farm technologies, utilize land, water, and other resources for food production. Setbacks associated with the programme were seen in the inability of majority of the beneficiaries to repay their loan on time, complexity and incompatibility of innovation and difficulty in integrating technology into existing production system. Others include: insufficient

knowledge of credit use, poor extension agent- farmer contact, unavailability of labor to carry out essential farming activities, lack of modern storage facilities and high cost of farm input (Iwuchukwu and Igbokwe, 2012).

2.2.8.12 *Commercial Agricultural Development Programme (CADP)*

The objective of the Commercial Agriculture Development Project for Nigeria was to strengthen agricultural production systems and facilitate access to market for targeted value chains among small and medium scale commercial farmers in the five participating states (Lagos, Kano, Kaduna, Enugu, and Cross River). The targeted value chains were: oil palm, cocoa, fruit trees, poultry, aquaculture and dairy, with maize and rice as staples. There were two components to the project. The first component of the project was agricultural production and commercialization which was to provide resources to facilitate the adoption of appropriate and existing agriculture technologies and support staple crop production systems to complement the country's food security initiatives and develop domestic and export markets. The second component of the project was rural infrastructure (network of farm access roads and rural energy). This component was to provide resources for construction of new roads, rehabilitation of existing ones and maintenance of roads to communities, and selected agricultural activities (Onwualu, 2012).

2.2.8.13 *National Agriculture Transformation Agenda (NATA)*

The Agriculture Transformation Agenda is aimed at an overall development of the agricultural sector with focus on value chain development as a blueprint towards reviving agriculture to its former glory. The transformation agenda is aimed at making agriculture work for Nigerians especially rural farmers such that it becomes not just a development programme but also an income generating commercial activity. The basic components of the transformation agenda include the development of value chain in selected key crops - – rice, cassava, sorghum, cocoa and cotton. If properly implemented, it will definitely work

for Nigeria. Ultimately, the weak links in the chain for each of the crops will be developed to ensure that the entire value chain from production to consumption is simultaneously developed (Onwualu, 2012).

2.2.8.14 *Agricultural Extension Service*

According to Adeniji, (1991) Agricultural Extension programmes in Nigeria started during the colonial era when the country was under British rule. They were initially done using mass methods of extension communication through campaign to encourage people to grow cash crops for export. One of such methods was issuing instructions to the people through their chiefs and village heads. These stations were charged with the task of developing crop based on technologies for adoption by the farmers in the various areas (Nwaco, 2010). Most of these schemes had however failure rate. Extension organization and the ministries became very bureaucratic and relatively ineffective. New methods of extension organization were required. This emerged with the setting up of Agricultural Development Projects (ADP) and River Basin and Rural Development Authorities (RBRDA) in the middle of the 1970s. The Agricultural Development Projects were concerned with raising the productivity of farmers by distributing Agricultural inputs from farm service centers located in rural areas. This was backed up by an extension system that teaches the farmers the best way to use the inputs supplied (Nwaco, 2010).

Adeniji, (1991) further explained that the extension agents undergo training workshops every forth night. They spend the other two weeks training the farmers. It is hoped that both the farmers and the workers become up to date about current farm practices and technologies. The training season are also supposed to provide a forum for the village level extension workers to present the problems of farmers in their area so that appropriate and immediate solutions can be provided (Erebor, 1998).

2.2.9 **Kano state Agricultural Development Programmes**

2.2.9.1 *River Basin Development Authority (RBDA)*

The existing abundant water resources in the country and its potential for increasing agricultural production prompted the establishment of River Basin Development Authority (RBDA). The scheme became necessary because of persistent short rainy seasons in many parts of the country which has continued to restrict cultivation to single cropping pattern the year round. However, the establishment of various large-scale irrigation facilities the country witnessed unprecedented multiple cropping patterns. In addition, larger areas were put into cultivation, while livestock and fisheries production were intensified. Available statistics from eight River Basin Development Authorities showed that there was an increase in the tempo of activities in 1998 when the total land area developed by the authorities rose from 30.3 thousand ha in 1994 to 47.7 thousand ha in 1998 (Iwuchukwu and Igbokwe, 2012). William (1981) had earlier reported that the Hadejia-Jama'are River Basin and Tiga and Challawa dams located in former Kano State could conserve enough water to irrigated land that can produce over 50% of the nations need for wheat, 30% of its need for rice, cotton and sugar cane. In addition, it could produce several thousand tons of fish; develop livestock, poultry and hydroelectric power generation.

2.2.9.2 *Special Mass Food Production Programme (SMFPP)*

As part of the state's contribution to increase food production, the Kano State Government implemented this programme between 2003 and 2005 to stimulate sustainable growth in agricultural production and enhance food security for the teaming population (Kano State Agricultural and Rural Development Agency) (KNARDA, 2006).

2.2.9.3 *Agricultural Mechanization Programme*

In an effort to increase production through agricultural mechanization and improve the farmer to tractor ratio, government had in addition to the procurement of over 108 new

tractors with their complementary implements, repaired and maintained the existing fleet of the Tractor Hiring Services. In 2011, the Government Launched the first phase of the Tractorization Programme involving the distribution of 80 new tractors with their implements to benefiting farmers' associations under the following funding arrangement: FGN 25%; KNS 15%; Association 60% (KNARDA, 2013).

2.2.9.4 *Grains Buffer Reserve*

The State Government has by 2010 procured and distributed 28,401.2 metric tons of assorted grains to the public at subsidy aimed at stabilizing prices during lean and festive periods under its Grains Buffer Reserve programme (KNARDA, 2011).

2.2.9.5 *Livestock Development Programme*

In an effort towards the upgrading of the performance of our indigenous livestock through cross breeding with exotic breeds, government had restocked its 8 livestock Development Centers with various livestock including cattle, sheep and goats as well as the provision of Artificial Insemination Services to Livestock Farmers in the State. Farmer-Pastoral conflicts have significantly reduced as a result of improving over Grazing Reserves as well as provision of water points (Cattle dams) in 15 Grazing Reserves (KNARDA, 2013).

2.2.9.6 *Development of Industrial Crops*

As a commitment towards improving the production of industrial crops, a total of 5,846 farmers were supported to develop 2,787 hectares of land for maize production in 38 Local government areas. Input support provided in form of assorted fertilizers comprises 33,444 bags of NPK and 6,688 bags of UREA. As a result of the intervention, the total average yield obtained by the farmers stood at 6,688 metric tons of maize Support was also provided to 4,224 selected farmers from 38 Local government areas of the state to develop 4,101 hectares for cotton production. Production input support provided in form of assorted fertilizers comprises 24,606 bags of NPK and 12,303 bags of UREA. As a result of the

interventions, the total average yield obtained by the farmers stood at 2,460.6 metric tons of cotton. 326 selected farmers from 16 Local government Areas were supported to develop 290 hectares for Groundnuts production. Production input support provided in form of assorted fertilizers comprises 1,680 bags of NPK. As a result of the interventions, the total average yield obtained by the farmers stood at 1,276 metric tons of the crop. The State Government in 2013 launched the Kano Commercial Crops Development Initiative (KCCDI) aimed at promoting further, the production of export crops such as Groundnuts, sesame, cotton, garlic etc (KNARDA, 2014).

2.2.9.7 *Kano Rice Development Programme*

In the course of its agricultural development, the State Government collaborated with many National and International Organizations to bring in new ideas, production technologies and additional human, financial and material resources. The Kano Rice Development Programme was conceived to encourage extensive rice production involving the rehabilitation/expansion of irrigation lands of 13 dams. The MARDITECH Corporation of Malaysia carried out technical studies that will enable the State harness its abundant water and land resources for the benefit of the people. These studies have provided data that will allow for the rehabilitation of the dams and for expansion of the irrigation infrastructures to provide for an additional 9,000 hectares of available irrigated land largely dedicated to paddy rice production, making it possible for the State to produce one million metric tons per annum (KNARDA, 2012)

2.2.9.8 *Job Creation and Poverty Reduction Initiatives Programme*

The State Government in 2012 established 6 Agricultural Skills Acquisition/Training Institutes of: a. Poultry Training Institute, Tukui Makoda Local Government, Trained Livestock Training Institute. Fisheries Training Institute Bagauda The Farm Mechanization Training, Institute (Kadawa, Rano and Gwarzo) Horticulture Training Institute, Bagauda

Irrigation Training Institute, Kadawa and KNSG/LFN Agricultural Training School, Panda. The Programmes were aims at empowering women and youth in the state to engage in income generation activities, wealth creation and reduce youth restiveness; enhance the socio-economic status of trainees and enhancing food security (KNARDA, 2014).

2.2.9.9 *Commercial Agriculture Development Project*

Commercial Agriculture Development Project (CADP) is aimed to improve Agriculture production in Nigeria by supporting the commercialization of agriculture production, processing and marketing outputs among small and media-scale commercial farmers and agro-processors. CADP is supporting the Federal Government of Nigeria strategy options of diversifying into non-oil sources of growth and away from over dependence on oil and gas. To achieve the above objectives, the project will help to improve access of participating commercial farmers to new technologies, improved infrastructures, finances, and output markets, to strengthening agricultural production systems and facilitate access to market for some targeted value chains among small and medium scale commercial farmers in five participating states; Cross Rivers, Enugu State, Kaduna State, Kano State, and Lagos State. These value chains are rice, oil palm, cocoa, fruit trees, poultry production, aquaculture and dairy, with maize and rice as staples. The project has two components: agricultural production and commercialization and rural infrastructure (CADP, 2014).

2.2.9.10 *Fadama III Programme*

The desire to realize the full potential of Fadama resources in Nigeria led to the design of the National Fadama Development project, mainly funded by the World Bank, with counterpart funding by the federal and benefiting state government. The Fadama I and II projects successfully refined approaches for improved utilization of these lands. The Fadama III operation will support the financing and implementation of five main

components designed to transfer financial and technical resources to the beneficiary groups in: (i) institutional and social development; (ii) physical infrastructure for productive use; (iii) transfer and adoption of technology to expand productivity, improve value-added, and conserve land quality; (iv) support extension and applied research; and (v) provide matching grants to access assets for income-generation and livelihood improvements (KNARDA, 2014).

CHAPTER THREE

METHODOLOGY

3.1 THE STUDY AREA

3.1.1 Location and Size

The study area is located between Latitudes 10º 31^0 and 12º32" North of the Equator and Longitudes 7^0 33^0 - 9^0 30^0 "East of the Greenwich Meridian (Fig. 3.1). Kano State is a state located in North-Western Nigeria. Created on May 27, 1967 from part of the Northern Region, Kano state borders Katsina State to the north-west, Jigawa State to the north-east, and Bauchi and Kaduna states to the south. It has forty four Local Governments namely ; Ajingi, Albasu, Bagwai, Bebeji, Bichi, Bunkure, Dala, Dambatta, Dawakin Kudu, Dawakin Tofa, Doguwa, Fagge, Gabasawa, Garko, Garum Mallam, Gaya, Gezawa,Gwale, Gwarzo, Kabo, Kano Municipal, Karaye, Kibiya, Kiru, kumbotso, Kunchi, Kura, Madobi, Makoda, Minjibir, Nasarawa, Rano, Rimin Gado, Rogo, Shanono, Sumaila, Takali, Tarauni, Tofa, Tsanyawa, Tudun Wada, Ungogo, Warawa, Wudil. It has total land area of 21,276.9 Square Km. with a population of 9,401,288 (NPC, 2006) projected population of 12,150.811 (2016) and this accounts for about 6.7% of Nigeria's population thereby making it one of the most populous states in Nigeria (Zoml, 2013).

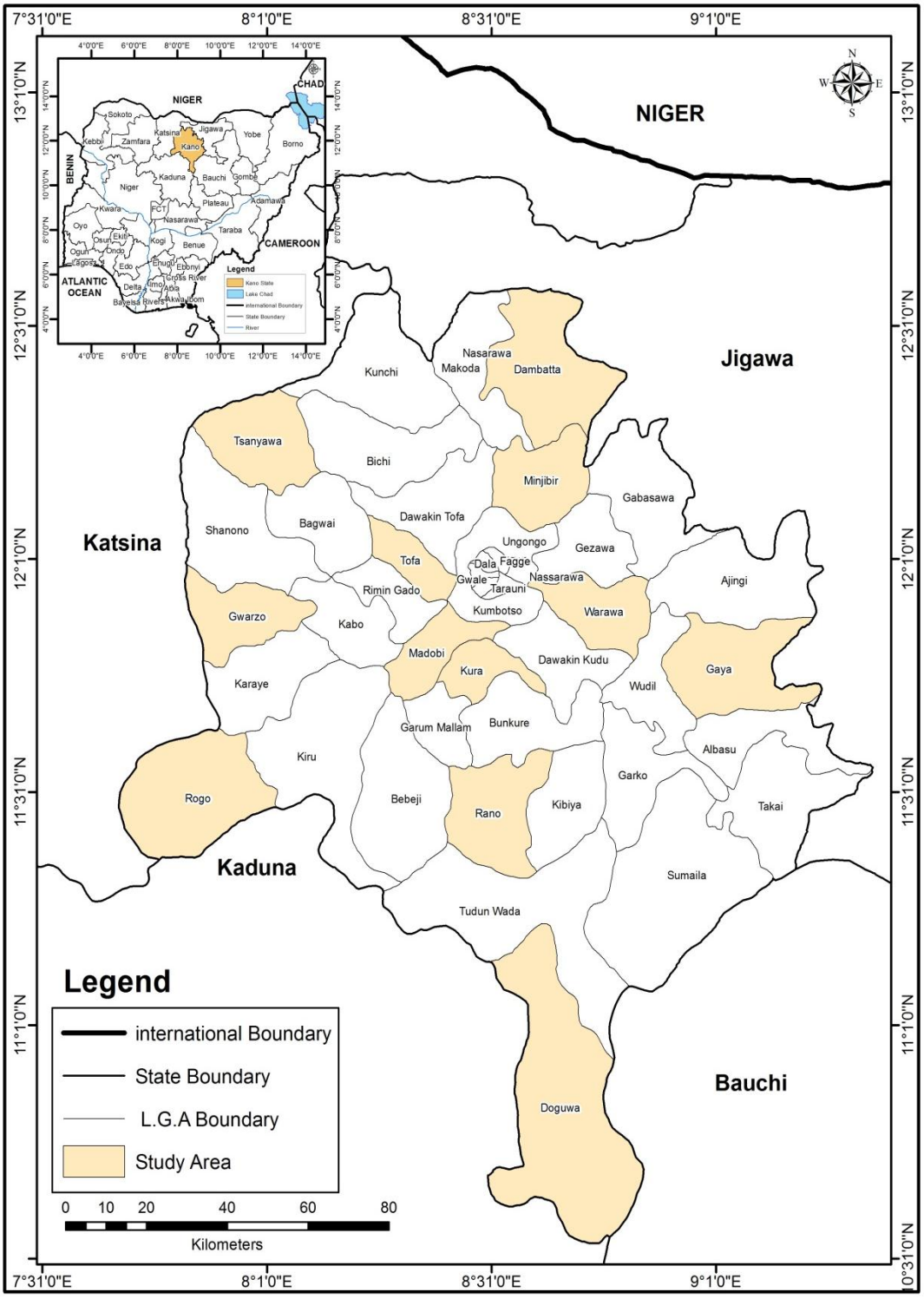

Figure 3.1: Kano State of Nigeria

Source: Adapted from the Administrative Map of Kano State, (2016)

3.1.2 **Relief and Drainage**

Rural areas of Kano are located on the high plains of Hausa land. The areas are underlain by the basement complex rocks of Precambrian era. There are deposits of some mineral resources in the study area such as tin and columbine at Riruwai Doguwa Local Government Area, Kaolin at Gwarzo and Shanono LGAs. The northern extreme of the state comprising of Dawakin Tofa, Dambatta, parts of Minijibir and Gezawa Local Government Areas consist of Chad formations which are made up mostly of clay and sands (Research and Documentation Directorate Kano Report 2009).

The land forms of the study area include Granitic out crops, Ruwares, Residual Hills, Rivers, Valleys all which are distributed within the state and a water fall at Zainabi in Riruwai Doguwa Local Government Area. The study area is underlained by the Basement complex rocks which are hard and impervious in nature with rivers that flow in north – south direction. Several dams have been constructed to meet the rural water supply demands. About 25 small to large dams including those at: Gari dam, Wasi dam, Kafin – Ciri dam, Chalawa Gorge Dam, Ruwan Kanya dam, Watari dam, Kanye dam, Gude dam and the Bagauda lake dam. Together with such rivers as River Kano, River Watari, River Chalawa, River Wudil, River Dudduru Gaya. They form the major hydrological system that has the potential for rural water supply and agricultural development (Ahmed, 2003). In the basement complex area, the USDI (1968) identified two hydrological areas as the upland area and the Gari area corresponding to the Africa surface and the Post-Africa surface. The upland area comprises of Rivers Kano, Challawa, Iggi and Gaya. While the Gari area comprises of Rivers Gari, Thomas, and Jakara. The upland area receives higher annual rainfall (Over 800mm) than the Gari area (less than 800mm).

Runoff coefficient is higher in the upland (16-19%) than in Gari (4-9.6%). The mean unit runoff is similarly lower in Gari (0.39 to 0.63m^3s/km^2) than in upland (1.45-1.77m^3s/km^2).

Peak discharge is also higher in upland because of the higher rainfall and larger catchments. Peak unit runoff varied from 0.07-0.14m^3s/km^2 in the upland to 0.01-0.03 m^3s/km^2 in the Gari area.

In the Chad sedimentary area, which is of limited extent, there is virtually no surface drainage because of the high transmission losses. This means there is no reasonable surface water potential here. Infiltration rates are high while runoff coefficient is low. The knowledge of relief and drainage gives a foresight to understand the major hydrological centres that posses the potential sources of water for irrigation schemes and this affect agricultural development in the study area.

3.1.3 **Climate**

Kano sate is located in the tropics, a region characterized by alternating wet and dry seasons, with annual rainfall of 850mm occurring between April/May and September/October with peak in July and August. The climate of Kano is described as Aw by Koppen, with both annual and seasonal variability. Wet years and dry years may record between 850 and 750mm (Olofin, 1987).

The climate is determined by the movement of two air masses, a moist rather cool southerly mass known as south-westerly's and a hot and dry northern air called the north-easterlies'. The moist southern air forms a wedge under the lighter dry air and the region where the two air masses meet is primarily an area of pronounced moisture gradient. The humidity gradient is called the intertropical discontinuity (ITD). The annual motion of the ITD is northwards between February and August and southwards between September and January. The north-south movement of the ITD influences weather pattern. Maximum rainfall is recorded in an area of considerable disturbance (air movement) 8^0 to 9^0 southwards of the ITD. However, when disturbance is limited or when the northward

movement of the ITD is restricted drought is recorded. The level of disturbance and the northward movement of the ITD is influenced by the global pattern of pressure and winds as well as the interaction of the surface air and the upper air mass (the jetstreams). When the ITD is southwards, the state is under the north easterlies and there is weather change. The weather change arising from the movement of the ITD gives four seasons (Ahmed, 2003). Kano state has a wide land mass, as such from north to south there is a slight variation in climatic condition. However, the alternate wet and dry periods have significant influence in agricultural production.

3.1.4 **Soil**

The soil has appreciable reserves of weatherable minerals due to the slight weathering and leaching arising from low rainfall. The soil exhibits profile development having a textural, structural or colour B horizon. The soils are deep, well drained except for hydromorphic soils, and poorly structured. The texture ranges from sandy loamy in the south to loamy sandy in the north. Soil physical deficiency includes the occurrence of iron capping or hard crust. The iron pan concretion limits rooting depth and the cap may be exposed as a result of severe erosion. Iron pan is formed from the accumulation of iron liberated as a result of chemical weathering. Iron accumulates and hardens due to hydration and oxidation. Where accumulation is limited, the iron only forms concretions and mottles. Hard surface crust prevents infiltration of water, thereby facilitating run-off and making the soil droughty. It reduces the availability of water to plants as well as preventing the emergence of seedlings. Crust formation is common in silty or very fine sandy topsoil's low in organic matter. It is due to the washing in of very fine soil particles to fill soil pores. Soils are chemically rather poor with 80-90% sand and 2 to 4% clay content. Soil pH ranges from 5.4 to 7.8 and acidity is said to be satisfactory. Cultivated soil has very low organic carbon content at 0.21 to 0.3%. This is due to the low input of organic matter (litter and manure). The soil exhibits deficiency of nitrogen and phosphorus, which are largely released from the decay

of organic matter which is low. Total nitrogen level ranges from 0.02 to 0.04 while available phosphorus level is 5.0 to 9ppm. This is why it is essential to apply organic manure as well as inorganic chemical fertilizer (NPK and UREA) in cultivated areas in order to sustain fertility levels. The planting of trees also help to add more organic matter to the soil thereby enriching the soil (Ahmed, 2003). The texture of the soil ranges from sandy loam in the south to loamy in the north and thus, affects agricultural development in the study area.

3.1.5 **Vegetation**

The study area is covered with savannah but largely categorized into two. First, Northern guinea savanna which is an open woodland or bush land with grasses shorter than in the southern guinea where grasses are 1.5 to 3m tall. Second, the Sudan savannah has scattered trees in open grassland with grasses under 1.2m tall. The vegetation has been largely cleared for cultivation to form cultivated parkland. Parkland has scattered protected trees at some distance apart in open cultivated land. Small trees and shrubs are more common on fallow land where regeneration may take place. About 75% of the land is cultivated parkland with average tree densities of less than 25 per hectare. Within the two broad types of vegetation identified, there are pockets of other structural types. Thicket vegetation is found along large river channels and floodplains and it is described as impenetrable shrubby vegetation. Surviving savannah woodland is found as forest/game reserve such as the Falgore Reserve (370 Km^2). Here the trees and limited number of shrubs form a light canopy. Where the woodland reserve is degraded due to uncontrolled exploitation it changes into shrub vegetation or bush which is made of shrubs and herb and it is not closed. The grazing reserve has been degraded through uncontrolled exploitation of forest resources. The common species include *Adansonia digitata* (kuka in Hausa) and *Vitex domiana* (Dinya) which provide edible fruits and leaves. *Diospyros mespiliformis* (Kanya) and *Tamarindus indica* (Tsamiya) provide edible fruits while *Moringa oleifera* (zogale)

provides edible leaves. *Parkia clappertoniana* (Dorawa) which has declined in the Sudan following the three dry decades, *Anogeissus. Leiocarpus* (Marke) and *Khaya segalensis* (Madaci) are popular fuel wood species whose population has been decimated particularly in the Sudan. *Senegalensis* is good timber, fuel wood, medicinal and provides fodder in the dry season but it has virtually disappeared (Ahmed, 2002).

3.1.6 **Population, people and economics activities**

According to the 2006 census figures from Nigeria Kano State had a population totaling 9,383,682. The study area is mostly occupied by the Hausas and Fulani's. Hausa happens to be the most commonly spoken language. The people of Kano have been known for the "extensive initiative and perseverance". Kano merchants have been famous in West Africa the first textile industry in Nigeria the Gwammaja Textiles established by the Kano Citizens Trading Company. It should be noted that even the pre-colonial period, Kano "was probably Nigeria's most celebrated textile exporting center."

Agriculture is one of the most important pillars of the State's economy with about 75% of the total working population engaged directly or indirectly in this economic activity. The principal food crops cultivated in abundance are millet, cowpeas, sorghum, maize and rice for local consumption while groundnuts and cotton are produced for export and industrial purposes. During the colonial period and several years after the country's independence, the groundnuts production in the state constituted one of the major revenue sources of the country. Kano State is a major producer of hides and skins with over 80% of the tanneries located in the industrial estates of the state producing high quality tanned leather ranked among the best in the world, which are exported. Some of the exportable crop commodities grown in Kano State include sesame, soybeans, cotton, garlic, gum Arabic and chilli pepper. Most of these commodities are available at Dawanau Market about 13 Km from

the Kano city centre. Kano State contributes over 20% of Nigeria's non-oil export revenue (Zoml, 2013).

3.2 METHODOLOGY

3.2.1 Reconnaissance

A reconnaissance survey was carried out in order to get acquainted with the study area. During the familiarization tour, the researcher was able to make observations particularly about the agricultural practices and study the physical characteristics of the area in relation to agricultural productivity. It was done on 22/09/2015 to 30/09/2015. It was carried out in the entire 12 sample Local Government Areas. The cooperation of stakeholders in agricultural development process was solicited to undertake the study and also for providing vital information that might be needed.

3.2.2 Selected Agricultural Development Indicators in Kano State

The study has carefully selected a number of indicators as surrogates to measure the variation in agricultural development programmes in the study area. They include:-

i. Access to land
ii. Cropping intensity per annum
iii. Chemical fertilizer consumption (bags)
iv. Number of Agricultural labourers/hired
v. Financial institutions/commercial banks
vi. Access to road (km)
vii. Modern equipment adopted on farms
viii. Number of research extension workers
ix. Number of livestock (cow/goat)
x. Number of poultry (birds)

3.2.3 **Types of Data Utilized**

In line with the objectives of the study, the data used include the following:-

i) Data on socio-economic characteristics of the respondents;

ii) Data on length of road covered (km)

iii) Data on land availability for cultivation of crops;

iv) Data on the activities of extension services;

v) Data on agricultural development programmes in the State;

vi) Data on the farm labourers;

vii) Data on farm inputs such as hybrid seeds, chemical fertilizers;

viii) Data on farm tools and modern equipment adopted on farm operations;

ix) Data on factors responsible for the pattern of agricultural development in the study area;

x) Data on challenges facing agricultural development programmes in the state.

3.2.4 **Sources of Data**

Data for this study were collected through both primary and secondary sources.

3.2.4.1 *Primary Sources of Data*

The primary sources of data were from two categoris of respondents namely: target groups covered (i) Farmers (ii) key informants. The key informants are the officials of the programmes, staff of ministry of agriculture and community leaders while focus groups are farmer's cooperatives, women farmers and old aged farmers groups. The major research instruments used are questionnaire and Focus Group Discussion (FGD). Structured questionnaire (Appendix I and II) used as an interview schedule to obtain data on socio-economic characteristics of the respondents, length of road covered (km), land availability for cultivation of crops, activities of extension services, agricultural development programmes in the State; farm labourers; farm inputs such hybrid seeds, chemical

fertilizers, farm tools and modern equipment adopted on farm operations. An in depth interview conducted among key informants to ensure that appropriate data are obtained and at the same time are gathered from all respondents to allow for credibility and comparability of results.

3.2.4.2 *Secondary Sources of Data*

The secondary data were obtained from relevant government ministries and agencies.The ministries concern are Kano state ministry of Agriculture and Rural development, Commercial Agricultural development programme office and Fadama III programme office. Other relevant information were sourced from annual reports, internet, research projects, journals, articles, conference papers, Publication from World Bank and National Population Commission (NPC). Information gotten from these sources was used to develop, improve, support literature review and field data for this study.

3.2.5 **Sample Size and Sampling Techniques**

Twelve LGAs were purposely selected for this study (Table 3.1). The selection was based on their location within the three senatorial zones of the state. Kura, Madobi, Minjibir, and Warawa in the Kano (Central) zone. Dambatta, Gwarzo, Tsanyawa, and Tofa in the Kano (Northern) zone And Doguwa, Gaya, Rano, and Rogo in the Kano (Southern) zone. The reason behind the choice of these local government areas is because they are engaged in commercial farming. The Kano state projected population of the Local Government Areas under study is 2,614.755 for 2016 using the formula: $Pn = Po(1 + r)t$ (i)

Where Po = population in later period

Pn = population in earlier period

t = time interval (years)

r = rate of growth 3.3%

To determine the sample size, Krejcie and Morgan (1970) method of determining sample size was used which state that: for an area with a population of more than one million (1,000,000) the sample size to be used is 384. According to the 2006 census figures, Kano State had a population of 9,383,682. When projected to 2016 using 3.3% growth rate the figure was 12,150.811, with selected LGAs under study accounting for 2,614.755 share of the population. Therefore, using the above formula, 384 (farmers/key informants) respondents were used for the study.

More so, to obtain the proportion of questionnaires to be administered in the selected LGAs the sampling method for determining the number of the respondents, the study adopted the formula:

$\frac{n}{N} XQ$ (II)

$n =$ population of each local government

$Q =$ total number of sample for the study area

$N =$ total population of the study areas

Table 3.1: Kano State LGAs with their Population

S/N	Local Govt. Areas	Population 2006	Projected Pop 2014	Selected wards
	Kano central			
1	Dala	418759	542963	
2	Dawakin Kudu	225497	292397	
3	Fagge	200095	259443	
4	Garum Mallam	118622	153805	
5	Gezawa	282428	366066	
6	Gwale	357827	463958	
7	Kano Municipal	371243	481354	
8	Kumbotso	294391	342809	
9	Kura **	143094	185537	Dalili, Kosawa, Rigar duka
10	Madobi**	137685	178522	Galinja, Kauramata, Kubaraci
11	Minjibir **	219611	284748	Azore, Chedi, Wasai
12	Nasarawa	596411	773307	
13	Tarauni	221844	287643	
14	Ungogo	365737	474215	
15	Warawa**	131858	170967	Garundau, Jigawa, Katarkawa ,
	Kano north			
16	Bagwai	161533	209444	
17	Bichi	278309	360855	
18	Dambatta **	210474	272901	Gwanda, Kore, Dambatta East
19	Dawakin Tofa	246197	319219	
20	Gabasawa	211204	273847	
21	Gwarzo **	183624	238083	Lakwaya, Madadi, Mainika
22	Kabo	153158	198585	
23	Kunchi	110170	142846	
24	Makoda	220094	285374	
25	Rimin Gado	103371	134031	
26	Shanono	139128	180393	
27	Tofa**	98603	127849	Dindere, Gajida, Yanako
28	Tsanyawa **	157730	204513	Daddarawa, Dunbulun, Gozarki
	Kano South			
29	Ajingi	172610	223806	
30	Albasu	187639	243293	
31	Bebeji	191916	248838	
32	Bunkure	174467	226214	
33	Doguwa**	150645	195326	Doguwa, Maraku, Falgore
34	Garko	161966	210005	
35	Gaya **	207419	268939	Kazurawa, Maimakawa, Wudilawa
36	Karaye	144045	186769	
37	Kibiya	138618	179722	
38	Kiru	267168	346410	
39	Rano**	148276	192255	Rurum S/Gari, Rurum Tsohon Gari, Zurgu
40	Rogo **	227607	295115	Jajaye, Ruwan Bago, Zoza
41	Sumaila	250379	324641	
42	Takai	202639	262741	
43	Tudun Wada	228658	296478	
44	Wudil	188639	244589	
	Total	**9,401.288**	**12,150.811**	

Source: Adopted from NPC (2006) **: Selected Local Government areas.

Considering the sampling techniques, a multi-stage approach was adopted. First, a purposive sampling was used to select the twelve Local Government Areas that are part of the study. Secondly three wards were selected in each local government area. The reason behind the choice of the local government areas and three wards in each local government was based on the fact that they engaged in commercial agriculture, making a total of total of (36) wards for the study. Thirdly, the households were randomly selected where the questionnaire was administered to the farmers.

For the Focus Group Discussions (FGDs), three groups were selected consisting of farmer's cooperatives, women farmers and old aged farmers groups in each of the selected wards. The FGDs were conducted separately among the farmers. Three (3) FGD sessions were conducted at each local government to compliment data being collected from the questionnaire survey. The distribution of sample by LGAs is presented in Table 3.2.

Table 3.2: Distribution of Sample Size by LGAs

S/N	LGAs	Pop. 2006	Projected Pop. 2014	Sample Size
1.	Dambatta	210474	272901	39
2.	Doguwa	150645	195326	29
3.	Gaya	207419	268939	39
4.	Gwarzo	183624	238083	34
5.	Kura	143094	185537	28
6.	Madobi	137685	178522	27
7.	Minjibir	219611	284748	41
8.	Rano	148276	192255	29
9.	Rogo	227607	295115	42
10.	Tofa	98603	127849	20
11.	Tsanyawa	157730	204513	30
12.	Warawa	131858	170967	26
Total		2,016.262	2,614.755	384

Source: Field Survey, (2016)

3.2.6 **Data Analysis**

The study employed varieties of statistical techniques to analyze the data collected from the field. Based on the stated objectives of the study, the quantitative techniques used were as follows:

Objective (i): Characterizing the types of agricultural development programmes in Kano state. The data obtained from the field was analyzed and interpreted using descriptive statistics such as frequency counts, averages, percentages and graphs such as bar and pie charts.

Objective (ii): Comparing level of agricultural development programmes among the LGAs in the study area. The Location Quotient (LQ) approach was adapted to measure the level of variation in agricultural development programmes based on the indicators of agricultural development. The location quotient is expressed as:

LQ = Beyene et al, (2005) (iii)

$$\frac{Si/_S}{Ni/_N}$$

Where:-

LQ = location quotient

$Si =$ the number of a variable in a unit area (LGA)

$S =$ the total number of that variable in the State

$Ni =$ the number of people in a unit area (LGA)

$N =$ the total number of people in the State

This statistical technique helps to measure the relative regional concentration of a given agricultural development indicators as compared to some regional aggregate. The coefficient was derived by calculating each unit area's percentage share of the regional (State) population and its percentage share of each of the agricultural development variables. The differences between the percentage population and share of the parameters

are obtained. The localization coefficient value is derived by taking the sum of the negative and positive scores for each variable for all the unit areas (LGAs) and the value is divided by 100. The coefficient of localization ranges from zero to unity. Zero indicates an even distribution of the facility and unity indicates that such facility is localized. In order to produce the spatial pattern of agricultural development in the study area, the location quotient values for all the indicators in each dimension were added together and divided by the number of the variables to obtain the mean for the LGAs. In order to produce the spatial pattern of the agricultural development the mean scores for the LGAs were arranged in descending order of performance and cateogrized into upper, middle and bottom third accordingly. The location quotient (LQ) technique was employed by Falola, (1999) to examine the spatial inequality in social services in Nigeria and used health care and education as surrogates to measure level of development.

Objective (iii): Analyze the differences in the spatial pattern of agricultural development programme in the study area. The Standardized score (Z-score) technique was employed to get the variation of agricultural development indicators in the study area. It measures the individual observation from the mean of observations, usually expressed in comparative form. The score of each factor on each LGA is standardized into Z-scores by scores into zero mean and unit standard deviation. The zero means form the base line from which scores of each observation on a particular variable was compared. The score of each LGA in each variable is then standardized into z-scores by changing all the scores by all the LGA into zero mean and unit standard deviation. The composite scores are obtained by adding all the standardized scores of the variables for a particular LGA together. This aggregate score or the composite score gives room for the determination of the relative position of LGAs. In fact, all the Local Government Areas that have negative or positive composite scores are tagged disadvantaged and advantaged respectively.

The formula for the standardized score for the study stated as:

$$Zi = \frac{x - \overline{X}}{SD}$$ Michael et al, (2004) (iv)

Where Zi = Standardized score for the ith observation

x = is the individual score on a given variable

$\overline{X}$ = The mean of the value X variable

SD = Standard Deviation of x variables

Objective (iv): Examine the factors responsible for the pattern of Agricultural development in the study area. Factor analysis was employed to determine the factors most responsible for the pattern of agricultural development in the study area. Factor analytic technique reduces the number of variables and detects structure in the relationship between variables. Therefore factor analysis is applied as a data reduction or structure detection method. The column labeled Component show the number of factors extracted during the factor analysis, there are many factors as there are variables that are put into the analysis. In our analysis, we used 16 variables, so we have 16 factors. Eigenvalues are the variances of the factors. Because we conducted our factor analysis on the correlation matrix, the variables are standardized, which means that each variable has a variance of 1, and the total variance is equal to the number of variables used in the analysis. The column label total contains the eigenvalues. The first factor will always account for the most variance (and hence have the highest eigenvalue), and the next factor will account for as much of the left over variance as it can, and so on. Hence, each successive factor will account for less and less variance. The column for percentage of Variance contains the percent of variance accounted for by each factor. The Cumulative % column contains the cumulative percentage of variance accounted for by the current and all proceeding factors.

Objective (v): Addressign the challenges facing agricultural development programmes in the study area. The data obtained was analyzed by employing descriptive statistics such as frequency count, averages, and percentages to summarize the data into tabular form.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 SOCIO-ECONOMIC PROFILE OF THE RESPONDENTS

The socio-economic attributes considered include age, gender, education, marital status, occupation and family size of the respondents.

4.1.1 Age

The study examined the age of the respondents and the result is presented in Figure 4.1 It was found that, less than half of the respondents were between the age group of 31 – 40 (32.03%). This type of result may be due to the fact that, the respondents in this age group where the onces that participate actively in farming activities and gave audience to the researcher. Where as about one fourth of the respondents were between the age group 41 – 50 (24.7%).

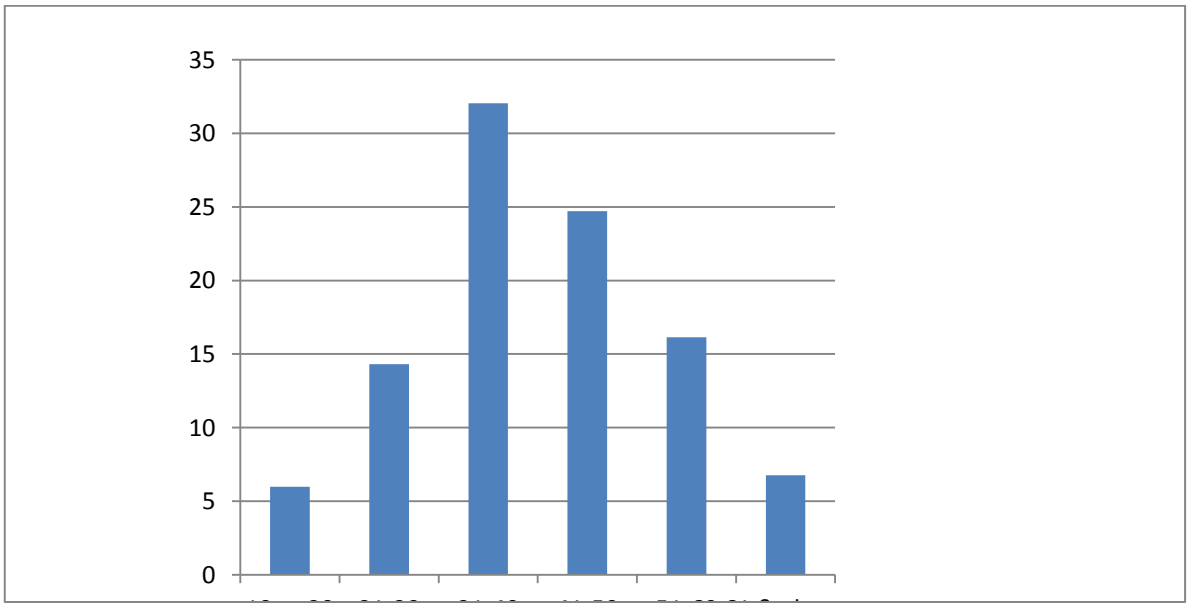

Figure 4.1: Age of the Respondents

Source: Field Survey (2016)

The result also showed that less than one third of the respondent were between the age group of 10-20 (5.99%), 21-30 (14.32%), and above 60 (6.77%) respectively and these constituted small proportions of the respondents. Comparing the LGAs, the active group

took the lead in each of these LGAs with Madobi having a significant percentage of respondents from 31-40 (32.03%) years old because they practice farming through out th e year

4.1.2 **Gender**

The male is not only the explorer but known to always want to subdue his environment. He is seen to be dominant in the quest for knowledge and even in the game of risk taking. Figure 4.2 present the gender distribution of respondents in the study area.

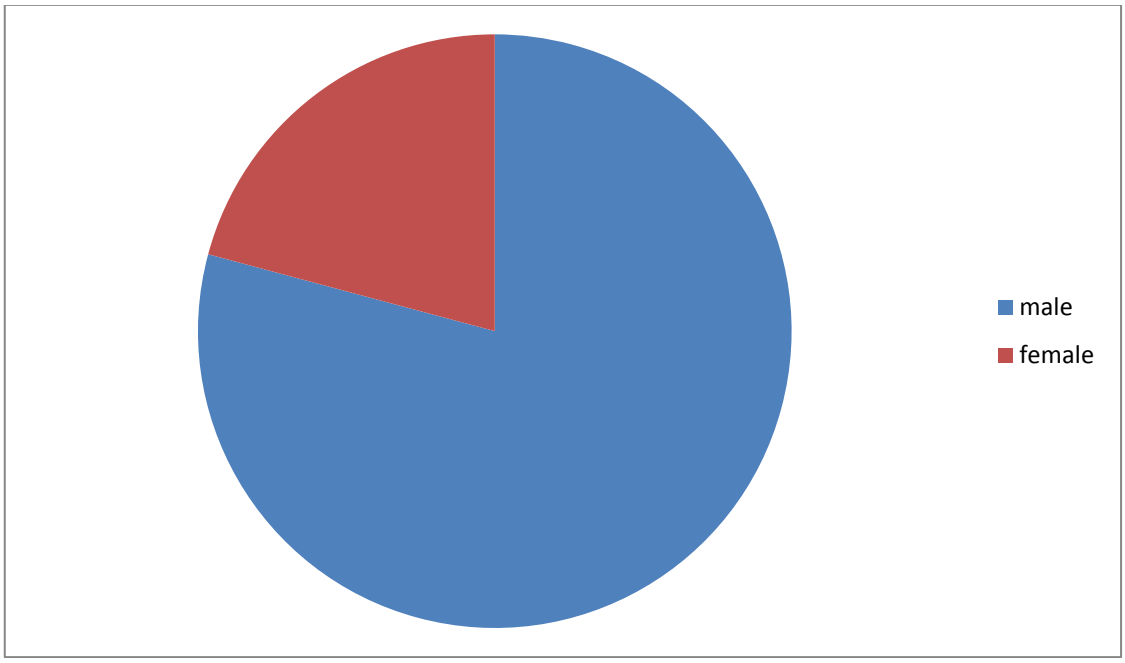

Figure 4.2: Gender of the respondents

Source: Field Survey (2016)

It shows that 79.5% of the respondents were males and only 20.5% were females. In one of the FGDs with women farmers of a local government under study opined that:

> *The highest number of male respondents could be attributed to the fact that males are the majority of the farmers while the lowest number of women might be attributed to the fact that most of the women were not allowed to practice farming due to the culture of the area* (FGD, Women farmers Warawa LGA,2012).

This is in line with the work of Laker et al, (2001) who reported that regrettably, women's lower social and economic status limits their access to education, training, land ownership,

decision making and credit, and consequently their ability to improve their access to and use of land.

4.1.3 **Marital Status**

Marriage is an institution which is the legal union of an adult male and female whom agreed to live as husband and wife. This is done in conformity with the culture, tradition and religion of the people living in the study area. Figure 4.3 illustrate different type of marital union among respondents.

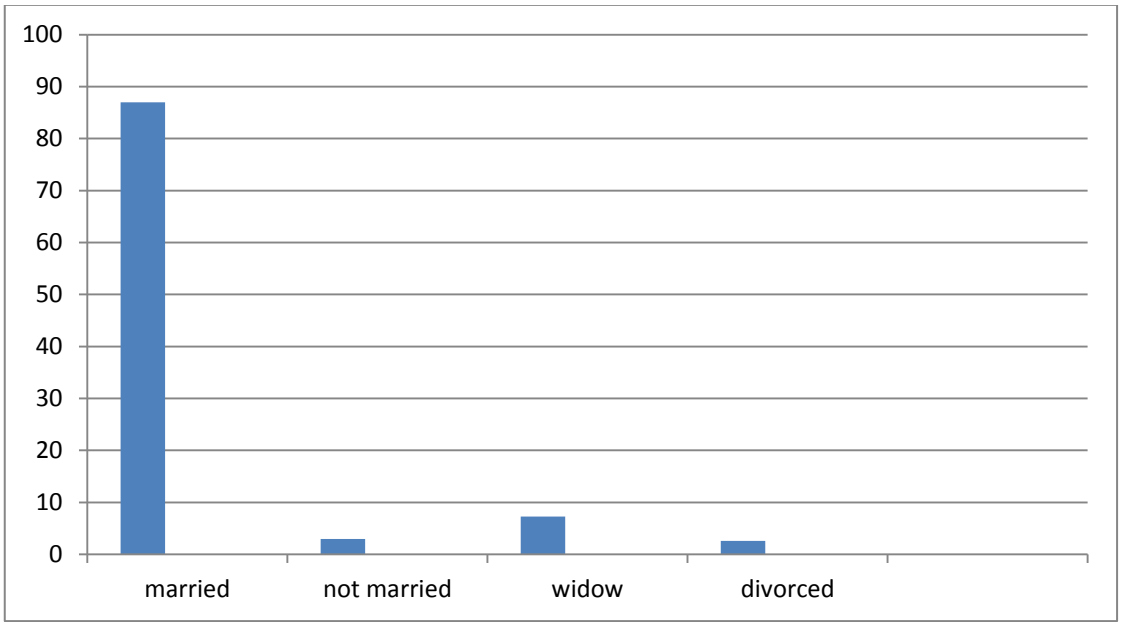

Figure 4.3: Marital Statuses of the Respondents

Source: Field Survey (2016)

Figure 4.3 show that, 89.98% of the total sample reported that they were married and 2.6% were divorced. This may be due to the fact that married people were more conscious to practice agriculture because they have family. It may also be that many of the unmarried youths tend to leave the villages to urban areas either to school or in search of white colour jobs. The married respondents in the settlements studied were more of polygamous than monogamous which is permissible to some religion. As shown in figure 4.3, a comparism of the LGAs put Gwarzo with the highest percentage of married respondents while Tofa with the least percentage of never married respondents. Married respondent benefited

much from agricultural development programmes because majority of them practice farming.

4.1.4 **Educational Qualification of the Respondents**

Educational attainment is often used as one of the many social and economic indicators to ascertain the state of development in an economy. The study examined the educational attainment of the respondents and the result is presented in Table 4.1. It was found that about 67.7% of the total sample to had acquired Islamic education, the high number of respondents with Qur'anic Education was due to the fact that majority of the people in the study area are Muslim.

Table 4.1: Educational Qualification of the Respondents

Level of Education	Danbatta		Doguwa		Gaya		Gwarzo		Kura		Madobi		Minjibir		Rano		Rogo		Tofa		Tsanyawa		Warawa		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Qur'anic Education	34	8.9	20	5.2	25	6.5	23	6.0	15	4.0	19	4.9	32	8.3	22	5.7	16	4.2	17	4.4	18	4.7	19	4.9	260	67.7
Primary	0	0	0	0	2	0.5	2	0.5	1	0.2	1	0.3	1	0.3	1	0.3	2	0.5	0	0	2	0.5	0	0	12	3.1
Secondary	2	0.5	3	0.8	4	1.0	3	0.7	4	1.0	2	0.5	3	0.8	1	0.3	7	1.8	2	0.5	3	0.8	3	0.8	37	9.5
Higher Education	1	0.3	3	0.8	5	1.3	4	1	5	1.3	4	1.0	2	0.5	2	0.5	9	2.3	0	0	3	0.8	2	0.5	40	10.3
Others	2	0.5	3	0.8	3	0.8	2	0.5	3	0.8	1	0.3	3	0.8	3	0.8	8	2.1	1	0.3	4	1.0	2	0.5	35	9.2

Source: Field Survey (2016)

Also, Table 4.1 reveals that, about 10.3 % of the respondents had tertiary education, 9.5% had secondary education, 9.2% had aquired other foams of education and 3.1% had primary education. When analyzed according to sampled local governments Rogo 2.3%, Kura 1.3%, Gaya 1.3% and Madobi 1.0 % have the highest respondents that acquired tertiary education while the other sample local governments have less than 1% that acquired tertiary education. In the submission of one of the farmers' cooperative in a FGD:

> *That those with tertiary education get more assistance from agricultural development programmes because they are the majority of the civil servants and they are aware of the programmes"*(FGD, farmers cooperative leader, Dambatta LGAs).

This is in line with the work of UNDP (1990) who reported that education increased the range of capabilities available to people. The well-educated were in a better position to find employment or earn better wages. Also, as entrepreneurs or public officials, they would be better placed to innovate, manage and invest. In other words, well-educated people are more valuable to society and better equipped to help themselves

4.1.5 **Occupation**

The study investigated different occupations of the respondents in the study area and result is presented in Table 4.2 shows that about 54.2% of the respondents were farmers which explain that agriculture is the main occupation in the study area. This is in line with the work of Adebayo and Okuneye (2005) who submitted that about 203 million people, or 56.6 percent of the total labor force, were engaged in agricultural labor in 2002.

Table 4.2: Occupation of the respondents

Occupation	Danbatta		Doguwa		Gaya		Gwarzo		Kura		Madobi		Minjibir		Rano		Rogo		Tofa		Tsanyawa		Warawa		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Farming	24	6.3	9	2.3	20	5.2	30	7.8	14	3.6	17	4.4	29	7.6	16	4.1	12	3.1	10	2.6	15	3.9	12	3.1	208	54.0
Civil Service	7	1.8	10	2.6	8	2.1	-	-	6	1.6	5	1.3	6	1.6	7	1.8	13	3.4	5	1.3	7	1.8	7	1.8	81	21.1
Trading	4	1.0	4	1.0	4	1.0	2	0.5	4	1.0	2	0.5	2	0.5	2	0.5	5	1.3	2	0.5	3	0.8	3	0.7	37	9.3
Others	4	1.0	6	1.6	7	1.8	2	0.5	4	1.0	3	0.8	4	1.0	4	1.0	12	3.1	3	0.8	5	1.3	4	1.0	58	15.7

Source: Field Survey (2016)

Also, about 21.1% of the respondents were civil servants with highest respondents in Rogo 3.4%, Doguwa 2.6 and Gaya 2.1% while the remaining sampled local government has less than 2%. Very important was the 15.7% and 9.3% that constituted trading and others respectively.This result could also be due to the gender nature of the respondents which is 79.5% male to 20.5% female, since majority of the male engage in farming activities while the female take into petty trading in their houses.

4.1.6 **Household Size**

The study examined the family size of the respondents and the result is presented in table 4.3. It is observed that respondents whose household size were between 5-8 people are more in the study area accounting for 31.6% of the respondents, with highest respondents in Gwarzo (4.1%), Minjibir (4.1%), and Dambatta (3.4%).

Table 4.3: Family size of the respondents

Family Size	Danbatta		Doguwa		Gaya		Gwarzo		Kura		Madobi		Minjibir		Rano		Rogo		Tofa		Tsanyawa		Warawa		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
1 – 4	7	1.8	6	1.6	10	2.6	5	1.3	4	1.0	2	0.5	9	2.3	3	0.8	9	2.3	2	0.5	6	1.6	6	1.6	69	17.9
5 – 8	13	3.4	10	2.6	7	1.8	16	4.1	12	3.1	12	3.1	16	4.1	11	2.9	1	0.3	7	1.8	8	2.1	9	2.3	109	31.6
9 – 12	12	3.1	8	2.1	14	3.6	7	1.8	7	1.8	5	1.3	9	2.3	8	2.1	16	4.1	6	1.6	9	2.3	5	1.3	117	27.4
13 – 16	3	0.8	4	1.0	5	1.3	3	0.8	3	0.8	4	1.0	4	1.0	6	1.6	9	2.3	5	1.3	4	1.0	3	0.8	55	13.7
17 and above	4	1.0	1	0.3	3	0.8	3	0.8	2	0.5	4	1.0	3	0.8	1	0.3	7	1.8	-	-	3	0.8	3	0.8	34	8.9

Source: Field Survey (2016)

Also as reflected in Table 4.3, about 27.4% of the household size have 9-12 people; about 17.9% household size have 1-4 children, 13.7% with 13-16 people and about 8.9% of the household have 17 people and above. The Local Govrnmemnts with highest respondents are Rogo 1.8%, Madobi 1.0% and Dambatta 1.0%.The household size has an effect on household resources, as the higher the number of people in a household the higher the demand for resources.It could also be responsible for underdevelopment since majority of the rspondents are peasant farmers whose income is small to carter for their household needs.

4.2 Types of Agricultural Development Programmes in Kano State

Since Nigeria's independence in 1960, successive administrations have introduced a myriad of Agricultural Development Programmes and policies aimed at enhancing agricultural productivity to feed the rapidly expanding population and provide raw materials for the agro industries and for export (Ingawa, 2004). In order to examine variation in Agricultural Development Programmes in the study area, it is essential to characterize the agricultural development programmes in Kano state based on their types and the result in the various local government areas under study as shown in Table 4.4. Irrespective of the local government area, the highest impact of the agricultural development programmes implemented were mostly felt in Agricultural skill acquisition training, and agricultural mechanization programmes as indicated by 14.7% and 10.6% of the respondents (table 4.4). While it was found from the respondents that other agricultural development programmes in the study area such as Development of Industrial Crops, Growth Enhancement scheme, Commercial Agricultural Development, and Kano Rice Development Programme constituted less than 10% respectively. However, about 38.1% of the respondents not aware on the major types of agricultural development programme in the study area, this is due to the fact that majority are not aware of the existing agricultural development programmes in the study area. (Table 4.4).

Table 4.4: Major Types of Agricultural Development Programmes in Kano State

Agricultural development programmes	Danbatta		Doguwa		Gaya		Gwarzo		Kura		Madobi		Minjibir		Rano		Rogo		Tofa		Tsanyawa		Warawa		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Agricultural skills acquisition training programme	5	1.3	5	1.3	8	2.1	5	1.3	4	1.0	3	0.8	5	1.3	5	1.3	7	1.8	2	0.5	5	1.5	2	0.5	56	14.7
Agricultural mechanization programme	4	1.0	1	0.3	4	1.0	3	0.8	7	1.8	5	1.3	1	0.3	4	1.0	4	1.0	2	0.5	1	0.3	5	1.3	41	10.6
Growth Enhancement Scheme	4	1.0	2	0.5	5	1.3	4	1.0	2	0.5	2	0.5	6	1.6	4	1.0	3	0.8	2	0.5	3	0.8	2	0.5	39	10.0
Commercial Agricultural Devt. programme	4	1.0	0	0	2	0.5	4	1.0	4	1.0	2	0.5	3	0.8	3	0.8	2	0.5	2	0.5	2	0.5	5	1.3	33	8.4
Development of industrial crop	2	0.5	4	1.0	3	0.8	4	1.0	2	0.5	1	0.3	2	0.5	2	0.5	2	0.5	1	0.3	5	1.5	1	0.3	29	7.7
Livestock development programme	3	0.8	3	0.8	1	0.3	2	0.5	1	0.3	1	0.3	2	0.5	0	0	2	0.5	2	0.5	1	0.3	1	0.3	19	5.1
Kano rice Development Programme	1	0.3	0	0	2	0.5	2	0.5	3	0.8	1	0.3	1	0.3	1	0.3	2	0.5	0	0	0	0	2	0.5	15	4.0
Fadama III Programme	0	0	0	0	0	0	0	0	0	0	0	0	4	1.0	0	0	0	0	0	0	0	0	2	0.5	6	1.5
No response	16	4.1	14	3.6	14	3.6	11	2.9	5	1.3	12	3.1	17	4.4	10	2.6	20	5.2	9	2.3	13	3.4	6	1.6	147	38.1
TOTAL																										

Source: Field Survey (2016)

When analyzed according to the sampled LGAs, the agricultural and skill acquisition training institute prgramme as depicted in Table 4.4 is the most wide spread programme. This programme had the highest respondents in Gaya 2.1% followed by Rogo 1.8% and Tsanyawa 1.5 % LGAs and all the sample local governments have less than 1.5%. This programme did not achieve its objectives because there is no monitoring and evaluation. This was also observed by Iwuchukwu and Igbokwe, (2012) that many agricultural development programmes have not achieved their objective of increasing food supply because there was delay in execution of most of the projects involved in the programmes as well as no monitoring and evaluation of the projects for which huge sums of money were spent. The only programme that was successful under this initiative is the goat rearing programme where two goats were given to women or a youth. In this programme there was no training because it's part of the custom of the locality to keep goats which are adapted to climatic condition of the area. Both youth and women benefited a lot from this programme.

Table 4.4 also shows that Kura 1.8%, Madobi 1.3% and Warawa 1.3% LGAs have the highest respondents that have benefited from Agricultural mechanization programme. This is a reflection of high road access level. They have many tractors in which they hire from the local government secretariat. In one of the FGDs a farmer averred that:

> *This programme has achieved its objectives because many farmers have benefited from it. The only problem was that the cost of hiring farm tools was too high only the middle class farmers can afford to hire the tractors from the local government secretariat. And in places where there is no road, they only hire the tractors during the dry season because during rainy season the roads are not accessible* (FGDs, Madobi LGA, 2014).

It also shows that the Growth Enhancemnt Support (GES) had the highest respondents in Minjibir 1.6%, Gaya 1.3%, and Danbatta 1.0% compared to other sampled local Governments that had less than 1%. This programme had not achieved its objectives

because of its long procedures and considered too elitist. In one of the FGDs, a farmers' cooperative leader averred that:

> *This programme was not meant for us, because majority of the farmers did not acquire western education and for a farmer to benefit from the GES programme he has to fill so many forms and also own a phone."*(FGD, Tsanyawa LGA, 2016)

As further indicated in Table 4.4, the impact of the Commercial Agriculture Development Programme (CADP) was more pronounced in Warawa 1.3%, Kura 1.0%, Gwarzo 1.0% and Danbatta 1.0% because this places are close to the main road, have high literacy level and have good soil for the production of maize and rice, which are the main emphasis of the commercial agriculture development programme. All the remaining sampled local government areas have less than 1.0% with no respondents from Doguwa LGA. The programme has not achieved its objectives because it is only limited to some of the areas in the state. In the submission of a farmer in a FGD:

> *The activities of commercial agricultural development programme did not reach us because it is limited to places that have access to road network and we in Doguwa local government area are too far from Kano central.*"(FGD, Doguwa LGA, 2014).

It also shows that Development of industrial crop programme has the highest respondents in Tsanyawa 1.5%, Doguwa 1.0% and Gwarzo 1.0% compared to the other sampled local governments that have less than 1%.This is a reflection that the programme had not achieved its objectives because only minority benefited from it. A farmer submitted that:

> *Farmers from Tsanyawa LGA started to reap the benefit of the programme but due to lack of proper monitoring and sustainability mechanisms, the programme died prematurely."(FGD, Tsanyawa LGA, 2014).*

Also table 4.4 shows that the livestock development programme has the highest respondents that benefited from it in Danbatta 0.8% and Doguwa 0.8% with no respondent

in Rano local government area. This programme has not achieved its objectives because there was no monitoring and evaluation, this led to majority of the beneficiaries to sell the cows and used the proceeds for other activities. It also depicts that Kano rice development programme has the highest respondent in Kura 0.8% with no respondent from Doguwa, Tofa and Tsanyawa LGA's .This revealed that there was no spatial coverage of the programme as only few areas in the state benefited from the programme. Moreover, the Fadama III programme as shown in table 4.4 has the respondents only in Minjibir 1.0% and Warawa 0.5% and there were no respondents from all the remaining sample local government because the life span of the programme has ended.

However as shown in table 4.4, about 38.2% of the respondents did not respond to the major types of agricultural development programmes in the study area because they were not aware of the existing agricultural development programmes, with highest respondents in Rogo 5.2%, Minjibir 4.4% and Danbatta 4.1% and the lowest respondents in Warawa 1.6% and Kura 1.3%. This reflects that out of the twelve (12) sampled local government areas only two (2) Kura and Warawa local governments benefited much from the agricultural development programmes.

4.3 Comparism of Levels of Agricultural Development Programmes among the Local Government Areas in Kano State

Location Quotient (LQ) was employed to examine the spatial variation in the level of agricultural development programmes among the Local Governments included the study area and the results is presented in Table 4.5.

Table 4.5: Spatial Variation in Level of Agricultural Development Programmes across LGAs

LGA	LQ I	LQ II	LQ III	LQ IV	LQV	LQVI	LQVII	LQVIII	LQIX	LQX	Mean	Rank	Group
Tofa	0.12	1.03	1.25	0.11	1.06	0.11	1.09	1.82	0.23	1.18	0.80	1	Upper Third
Madobi	2.05	1.07	1.67	0.64	1.14	1.08	0.12	2.01	0.11	1.11	1.10	2	“
Warawa	1.15	1.62	0.44	1.78	1.34	0.66	1.12	1.43	0.59	1.87	1.20	3	“
Kura	0.05	2.22	1.99	0.78	0.44	1.93	1.16	1.43	1.19	1.81	1.30	4	“
Gwarzo	2.11	3.0	0.21	1.25	0.46	0.11	1.22	1.18	2.54	1.37	1.34	5	Middle Third
Gaya	3.12	2.31	1.33	2	0.56	0.78	1.29	0.76	0.33	1.44	1.39	6	“
Dambatta	2.88	2.03	1.28	1.43	0.47	1.77	0.56	0.56	1.76	0.55	140	7	“
Tsanyawa	0.44	2.1	0.11	1.03	1.22	1.59	2.11	1.92	2.33	1.34	1.45	8	“
Minjibir	1.29	2.87	2.12	0.55	1.55	1.9	1.78	0.32	2.33	0.78	1.51	9	Bottom Third
Doguwa	0.33	1.67	2.06	1.65	2.33	1.44	2.0	0.38	1.23	3.91	1.71	10	“
Rano	2.82	0.99	2.21	3.73	2.42	2.38	1.96	2.01	2.15	1.33	2.20	11	“
Rogo	2.25	0.9	2.11	1.23	1.67	1.0	9.22	0.99	0.89	1.77	2.20	12	“

Source: Field Survey (2016)

Key:LQ1= Access to land LQII= Cropping intensity LQIII= Chemical fertilizer LQIV = No. of LabourerLQV = Financial institution LQVI = Aceessto road LQVII = Modern equipments LQVIII=No extention workers LQX = No. of livestock LQXI = No. of poultry

Table 4.5 reveals that Gwarzo, Gaya and Dambatta did not rank among the first category of LGAs that benefited from various Agricultural Development Programmes. This fact becomes obvious when the numbers of programmes are related to the number of people served. It thus means that, the assistance from Agricultural Development Programmes in those areas is inadequate for the teeming population. It is discovered that Local Government areas within the upper third comprise Tofa 0.80, Madobi 1.10, Wawara 1.20, and Kura 1.30 and at the bottom third includeMinjibir 1.51, Doguwa 1.71, Rano 2.20, and Rogo 2.20 in that descending order of performance. Figure 4.4 depicts the spatial pattern in the level of agricultural development programmes among the twelve local government areas (LGAs) in Kano State.

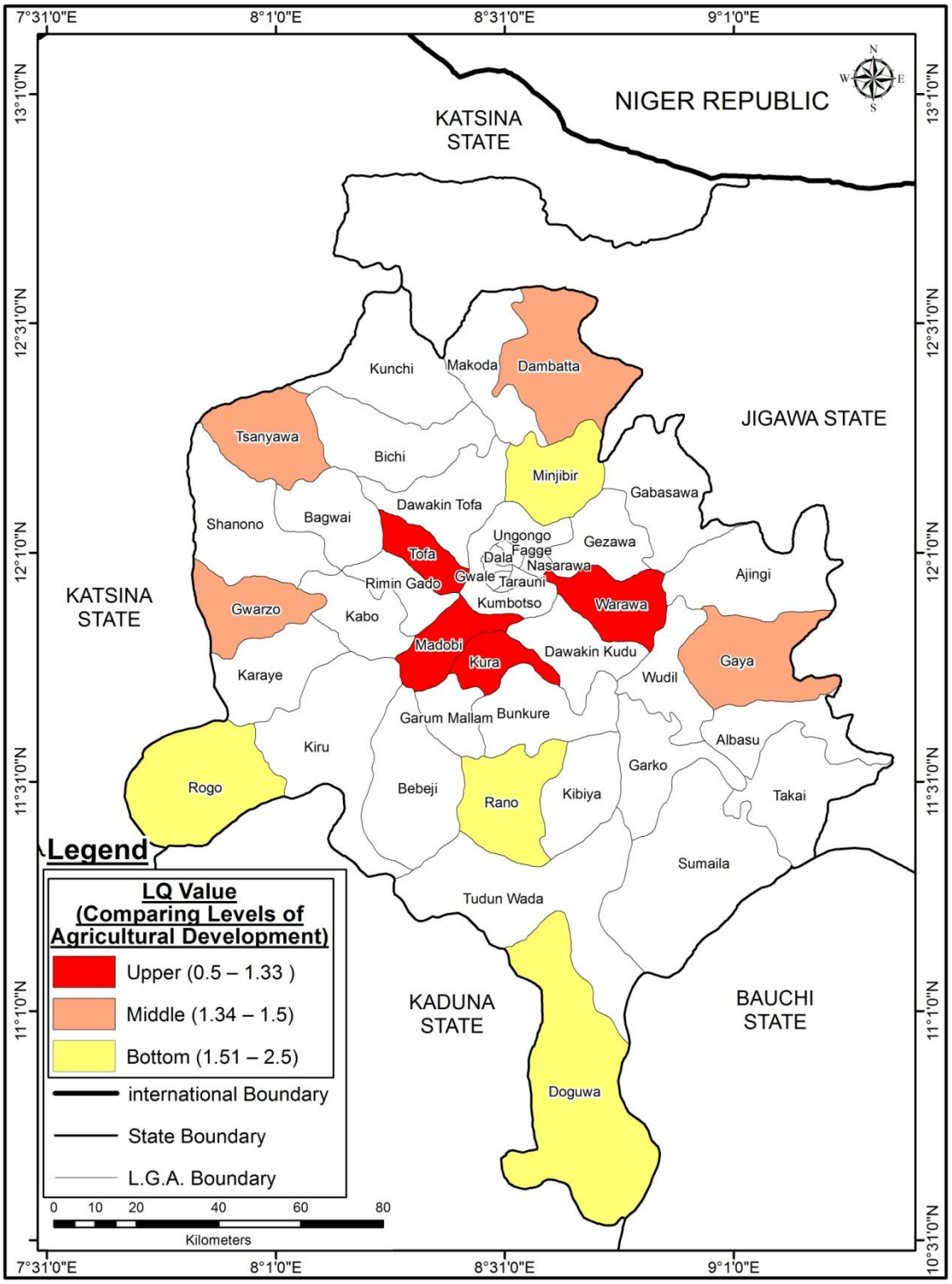

Figure 4.4: Levels of Agricultural Development Programmes among the Local Governments in Kano State.

Source: Field Survey, (2016)

As reflected in Figure 4.4, On the overall the LGAs that fall with in the upper category are compact and concentrated in the central part of the State, (Kano central) with distant areas like Doguwa receiving less support from agricultural development projects. Some areas are left behind in receiving assistance from agricultural development programmes include Gaya, Dambatta, Minjibir and Rogo LGAs which are also farther away from the apart Central senatorial district. This is in line with the findings of Jawan and lokhande (2014) that relatively high level of agricultural development is found in the central part of the district, this area enjoys high level of modernization of agriculture and irrigation facilities and were commercial farming is observed. The analysis of the indicators takes a three dimension approach namely (1) infrastructural (2) farmoutput (3) farm asset and technology dimension.

4.4 Level of Spatial Balance in Agricultural Development Programme

4.4.1 Infrastructural Dimension

In order to understand spatial balance of infrastructural dimension in the study area, location quotient technique was also employed. The infrastructural dimension indicators for agricultural development were;

i. Access by Road (km)

ii. Commercial Banks and number of Financial Institutions

Table 4.6 presents the location quotient values for the twelve local governments LGAs in Kano state. The analysis reveals values for Gwarzo 0.29, Tofa 0.59 Gaya 0.67 and Warawa 1.00 rank first among the first category of developed areas in infrastructural facilities because these areas enjoy good roads, have access to bank loan and they receive assistance from agricultural development programmes. Despite the shortage of water in Gaya LGA due to its location in the far north, they are provided with dams, tube wells as such they practice irrigation farming extensively.

Table 4.6: Spatial Balance in Infrastructures

LGA	LQ I	LQ II	Mean	Rank	Group
Gwarzo	0.46	0.11	0.29	1	Upper Third
Tofa	1.06	0.11	0.59	2	"
Gaya	0.56	0.78	0.67	3	"
Warawa	1.34	0.66	1.0	4	"
Madobi	1.14	1.08	1.11	5	Middle Third
Dambatta	0.47	1.77	1.12	6	"
Kura	0.44	1.93	1.19	7	"
Rogo	1.67	1.00	1.34	8	"
Tsanyawa	1.22	1.59	1.41	9	Bottom Third
Minjibir	1.55	1.9	1.73	10	"
Doguwa	2.33	1.44	1.89	11	"
Rano	2.43	2.38	2.41	12	"

Key: LQI = Access by Road LQII = Financial Institutions

Source: Field Survey (2016)

Table 4.6 revealed that developed areas within the middle comprise Madobi 1.11, Dambatta 1.12, Kura 1.19 and Rogo 1.34.The least developed areas at the bottom third include Tsanyawa 1.41, Minjibir 1.73, Doguwa 1.89 and Rano 2.41 in that descending order of performance.

Figure 4.2 shows spatial pattern in infrastructural dimension in the level of agricultural development programmes among the twelve local government areas (LGAs) in Kano State.

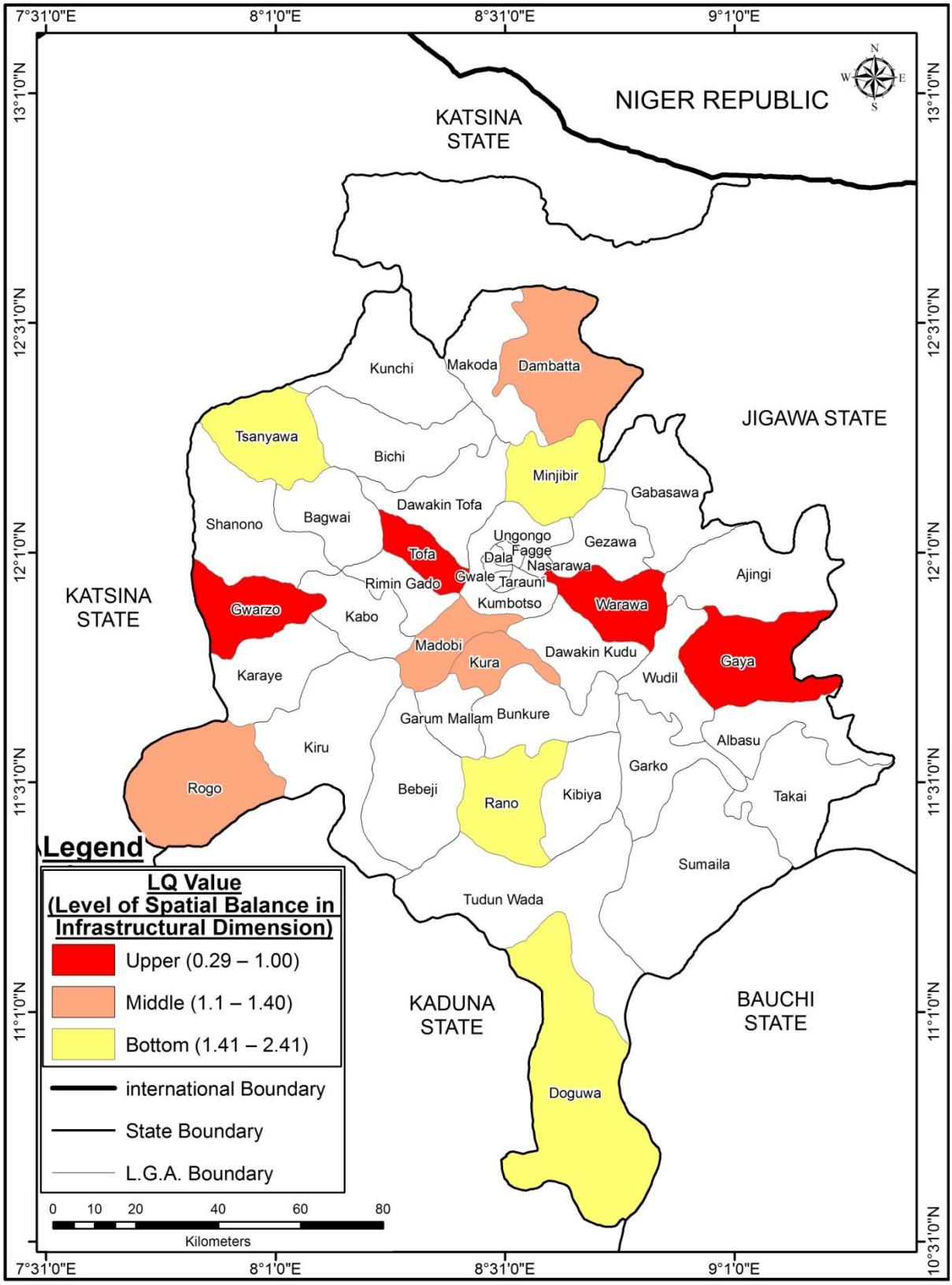

Figure 4.5: Level of Spatial Balance in Infrastructural Dimension in Kano State

Source: Field Survey (2016)

As reflected in Figure 4.5 some LGAs have achieved a more significant level in infrastructural development. This result shows that the infrastructural facilities are fairly

spatially distributed in the state. On the contrary only four LGAs performed fairly well in LQ1 (access to road) which is not too good for the LGAs. The result of LQ II (financial institution) is not encouraging; most LGAs are deficient in this facility. The activities of financial institutions are only concentrated in only few LGAs in the study area namely Gwarzo, Tofa, and Gaya. The implication of this is that, it can cause different level of agricultural development among the LGAs.

4.4.2 **Farm Output Dimension**

Table 4.7 presents the location quotient values for the twelve local government areas (LGAs) and the farm output dimension indicators are:

iii. Crop Intensity Per annum

iv. Extension Workers

v. Chemical Fertilizer Consumption

vi. Number of Agricultural Laborer

The analysis reveals that Tofa 1.05, Tsanyawa 1.29, Rogo 1.31 and Warawa 1.32 were rank among the first category of developed areas, because they received more assistance from the agricultural development programme. Rogo LGA was ranked among the first category of developed areas because of its rich soil and favorable climatic conditions for both rainy season and irrigation farming.

Table 4.7: Farm Output Dimension

LGA	LQIII	LQIV	LQV	LQVI	Mean	Rank	Group
Tofa	1.03	1.25	0.11	1.82	1.05	1	Upper Third
Tsanyawa	2.1	0.11	1.03	1.92	1.29	2	"
Rogo	0.9	2.11	1.23	0.99	1.31	3	"
Warawa	1.62	0.44	1.78	1.43	1.32	4	"
Dambata	2.03	1.28	1.48	0.56	1.34	5	Middle Third
Madobi	1.07	1.67	0.64	2.01	1.35	6	"
Gwarzo	3.0	0.21	1.25	1.18	1.41	7	"
Doguwa	1.67	2.06	1.65	0.38	1.44	8	"
Minjibir	2.87	2.12	0.55	0.32	1.47	9	Bottom Third
Gaya	2.31	1.33	2.0	0.76	1.60	10	"
Kura	2.22	1.99	0.78	1.43	1.61	11	"
Rano	0.99	2.21	3.73	2.01	2.22	12	"

Key: LQIII = Crop intensity LQIV = Extension workers LQV = Chemical fertilizers LQVI = Agric. Labourers

Source: Field Survey (2016)

Moreover, the analysis of Table 4.7 reveals that developed areas within the middle comprise Dambatta 1.34, Madobi 1.35, Gwarzo 1.41 and Doguwa 1.44. The least developed areas at the bottom third include Minjibir1.47, Gaya 1.60, Kura 1.61 and Rano 2.22 in descending order of performance, due to lack of fertilizer, the farm output per annum is low in these areas. Doguwa LGA is receiving less support from agricultural development programmes becouse it is far from Kano central.

Figure 4.6 depicts spatial pattern in farm output dimension in the level of agricultural development programmes among the twelve local government areas (LGAs) in Kano State.

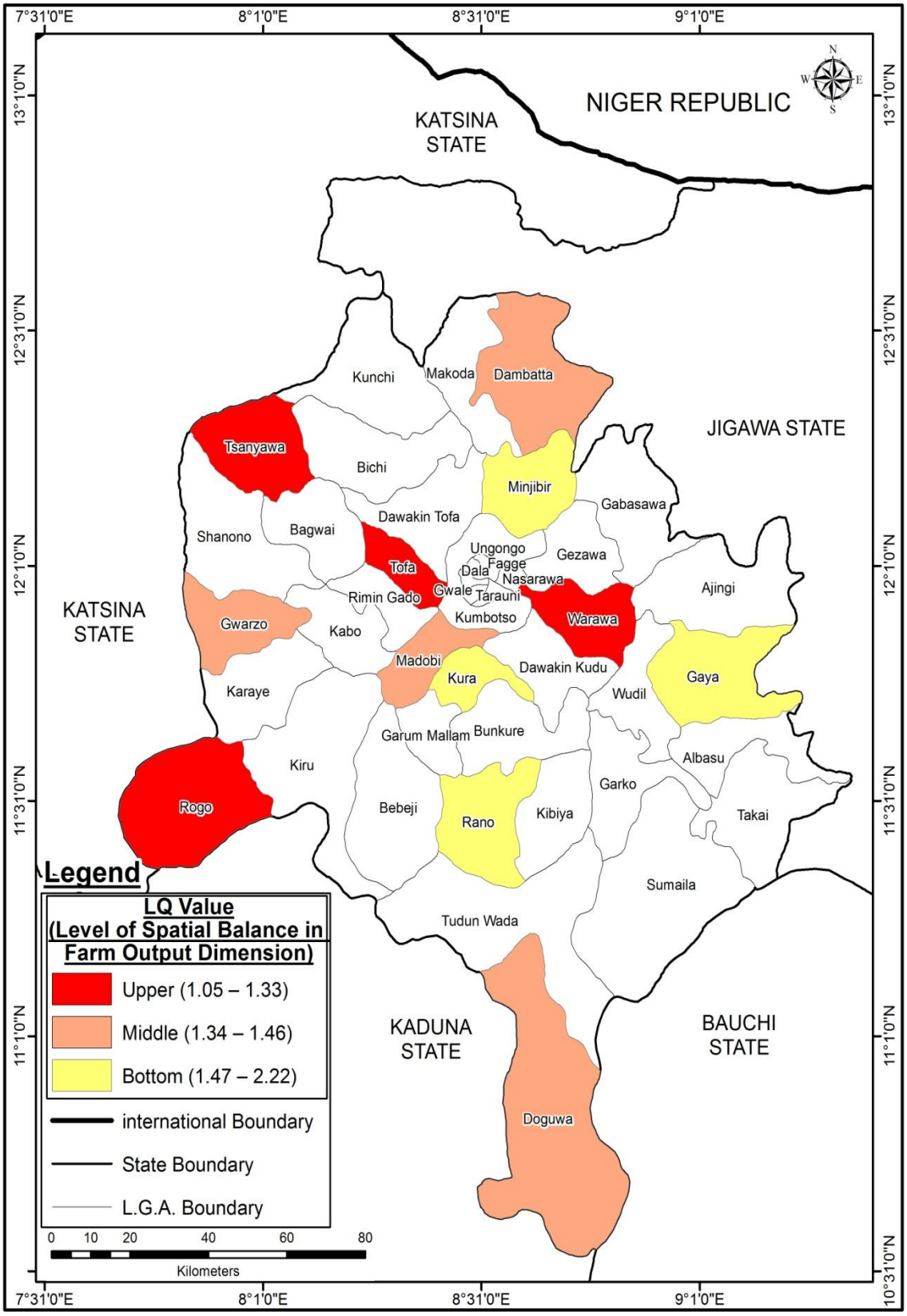

Figure 4.6: Level of Spatial Balance in Farm Output Dimension in Kano State

Source: Field Survey (2016)

As shown in figure 4.6 some LGAs in the study area fall with in the least developed LGAs in th study area, which are geographically advantaged or disadvantaged as a consequence of uneven impact of nature, government policies, trade and others. For instance, despite the fact that Kura local government receives more assistance from agricultural development programmes, it can only benefit from those useful to rice and maize. The soil is clay based and water lodged because of this limitation, that they did not rank first in farm output facilities.

4.4.3 **Farm Asset and Technology Dimension**

The result of the location quotient technique is presented in Table 4.8 while figure 4.7 shows the spatial pattern of farm asset and technology dimension in the study area. The farm asset and technology dimension indicators are:

vii. Access to Land (heactres)

viii. Number of modern equipment

ix. Number of livestock

x. Number of poultry

Table 4.8: Farm Asset and TechnologyDimension

LGA	LQ VII	LQ VIII	LQ IX	LQ X	Mean	Rank	Group
Tofa	0.12	1.09	0.23	1.18	0.66	1	Upper Third
Madobi	2.05	0.12	0.11	1.11	0.85	2	“
Kura	0.05	1.16	1.19	1.81	1.05	3	“
Warawa	1.15	1.12	0.59	1.87	1.18	4	“
Dambatta	2.88	0.56	1.76	0.55	1.44	5	Middle Third
Gaya	3.12	1.29	0.33	1.44	1.55	6	“
Minjibir	1.29	1.78	2.33	0.78	1.55	6	“
Tsanyawa	0.44	2.11	2.33	1.34	1.56	8	“
Gwarzo	2.11	1.22	2.54	1.37	1.81	9	Bottom Third
Doguwa	0.33	2.0	1.23	3.91	1.87	10	“
Rano	2.82	1.96	2.15	1.33	2.07	11	“
Rogo	2.25	9.22	0.99	1.77	3.56	12	“

Key: LQVII = Access to land LQVIII = Modern equipment LQIX = Livestock LQX = Poultry

Source: Field Survey (2016)

Table 4.8 revealed that Tofa 0.66, Madobi 0.85, Kura 1.05 and Warawa 1.18 rank among the first category of developed areas in farm asset and technology dimension, and all this LGAs are close to the urban centers. This is in line with the work of Rogers (2003) notes that communities closer to urban centers are likely to adopt new technologies more quickly. Kura local government has accessible road network and big farm lands which makes it easy to have access to mechanical farm equipments like tractors. Tofa, Madobi, Kura, and Warawa were also ranked in the first category. They receive much assistance from agricultural development programmes. These local governments are the most productive areas especially in the dry seasons. They export large quantity of crops to the southern parts of Nigeria, they are big participants in commercial agriculture. They produce tomatoes, sugar cane, and onions e.tc. Madobi LGA for example farm throughout the year (4-6 times), this is because they have good soil and favourable climatic conditions and most of the farmers have access to big farm lands.

Figure 4.7 depicts spatial pattern in the level of agricultural development programmes among the twelve local government areas (LGAs) in Kano state.

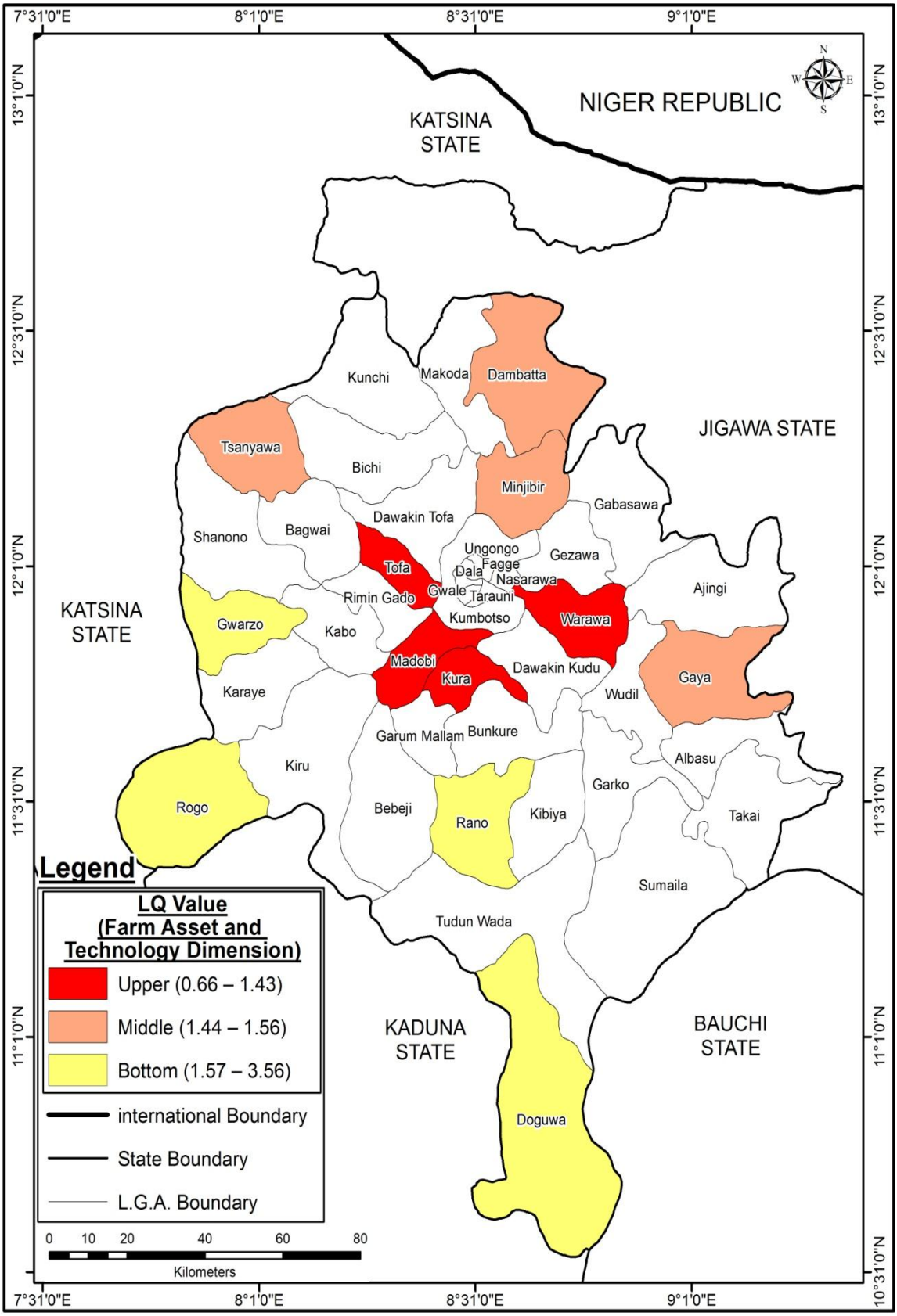

Figure 4.7: Level of Spatial Balance in Farm Asset and Technology Dimension in Kano State

Source: Field Survey (2016)

The LGAs that fall within the upper category of developed areas are compact and concentrated in the central part of the State, (Figure 4.7) with distant areas like Doguwa 1.87 and Rogo 3.56 receiving less support from agricultural development project.The least developed areas at the bottom third include Gwarzo1.81, Doguwa 1.87, Rano 2.07 and Rogo 3.56 in that decending order of performance. Gwarzo is one of the least privileged LGA, this is also affirmed by the findings of FGD that:

> *"In Gwarzo local government majority of our lands are small and we cannot use tractors, we normally use cows so these limit our agricultural production and development in the area." (FGD, Gwarzo LGA, 2016).*

The implication of this is that, there will be high underdevelopment in these areas since the facilities are related to technological advancement, without which advancement in the level agricultural development will be very slow.

4.5 **Pattern of Agricultural Development in the Study Area**

The study examined the pattern of Agricultural Development in the study area.The standardized scores of all the variables analysed are presented in Table 4.9. The Z-score analytical technique was adopted to investigate the ten (10) indicators of Agricultural Development in the study area. The first column indicates the names of the local governments selected for the study, the other ten columns show the Z-score values for each local government and the last column presents the composite scores. The results showed that the impact of these indicators is less in five (5) out of the 12 local government areas namely Kura, Doguwa, Gwarzo, Minjibir and Gaya. While the impact is positive in the six (6) local government areas which include Madobi, Warawa, Dambatta, Tofa, Rogo, Rano and Tsanyawa. Table 4.9 present Z-scores for Agricultural Development indicators

Table 4.9: Standardized scores by LGAs in Agricultural Development programme

LGA	ZI	ZII	ZIII	ZIV	ZV	ZVI	ZVII	ZVIII	ZIX	ZX	SUM	Rank
Madobi	0.02	1.92	0.22	0.12	-0.03	0.36	-0.04	-0.16	-0.09	-0.07	2.25	1
Warawa	-0.16	0.21	0.04	0.05	0.04	0.89	0.49	0.16	0.23	0.16	2.11	2
Danbatta	0.07	-0.19	0.05	0.11	-0.06	0.21	0.01	0.09	0.23	0.16	0.69	3
Tofa	-0.07	-0.41	0.05	-0.06	-0.05	0.28	0.16	0.57	-0.04	0.11	0.53	4
Rogo	-0.09	-0.19	-0.03	-0.03	0.02	0.17	-0.09	0.35	0.03	0.22	0.36	5
Rano	0.19	-0.25	0.03	0.11	-0.02	-0.09	0.45	-0.55	0.25	0.10	0.23	6
Tsanyawa	-0.03	0.01	-0.05	-0.15	-0.02	0.28	-0.32	0.17	0.03	0.26	0.17	7
Kura	0.00	-0.01	0.29	0.11	-0.16	-1.05	0.89	-0.33	0.09	0.02	-0.15	8
Doguwa	-0.19	0.13	0.01	0.13	-0.18	-0.29	0.07	-0.17	0.02	-0.27	-0.75	9
Gwarzo	0.07	-0.25	-0.17	-0.15	0.58	-0.36	-0.23	-0.70	0.20	0.14	-0.85	10.
Minjibir	0.11	-0.25	-0.02	0.04	-0.10	-0.49	-0.51	0.07	0.03	0.01	-1.10	11
Gaya	0.01	-0.30	-0.25	-0.22	-0.06	0.27	-0.34	0.42	-0.83	-0.73	-2.02	12

Keys: ZI Ac.R land, ZII T. Crp.Yrs, ZIII Bag. Fertz ZIV F. laborers, ZV finc. Insti, ZVI Ac. Road, ZVII Md. Equit, ZVIII Exten Wok, ZIX Ac. Livestock, ZX Ac poultry

Source: Field Survey (2016)

Also as shown on table 4.9, the composite score values of the indicators responsible for the variation range from -2.02 to 2.25 while Gaya local government enjoy the least of the indicators with a score of -2.02. Madobi local government ranked first from the indicators responsible for the pattern of Agricultural Development with a score value of 2.25.Warawa local government ranks second in the order of the indicators responsible for the pattern of Agricultural Development with a score value of 2.11 while Dambatta local government came third with a score of 0.69. Of considerable importance are the scores of Madobi and Warawa local governments which are in multiple of folds compared to other local government. It is Gaya local government that is solely disadvantaged in terms of access to livestock while Madobi local government is advantaged in terms of crop intensity per annum. They practice farming throughout the year six to eight times (4-6) because they

have enough rainfall and good soil that can retain a lot of water. It is equally worth noting that no local government area has positive scores in all of the indicators. As reflected on table 4.9 the impact of the indicators are less in 5 local governments. The affected areas include Kura, Doguwa, Gwarzo, Minjibir and Gaya with scores ranging from - -0.15 -0.75 -0.85-1.10- and -2.02 in that descending order of performance respectively. It is observed that none of local government has negative scores in all of the factors. The spatial pattern of the composite scores of agricultural development indicators are presented in Figure 4.8.

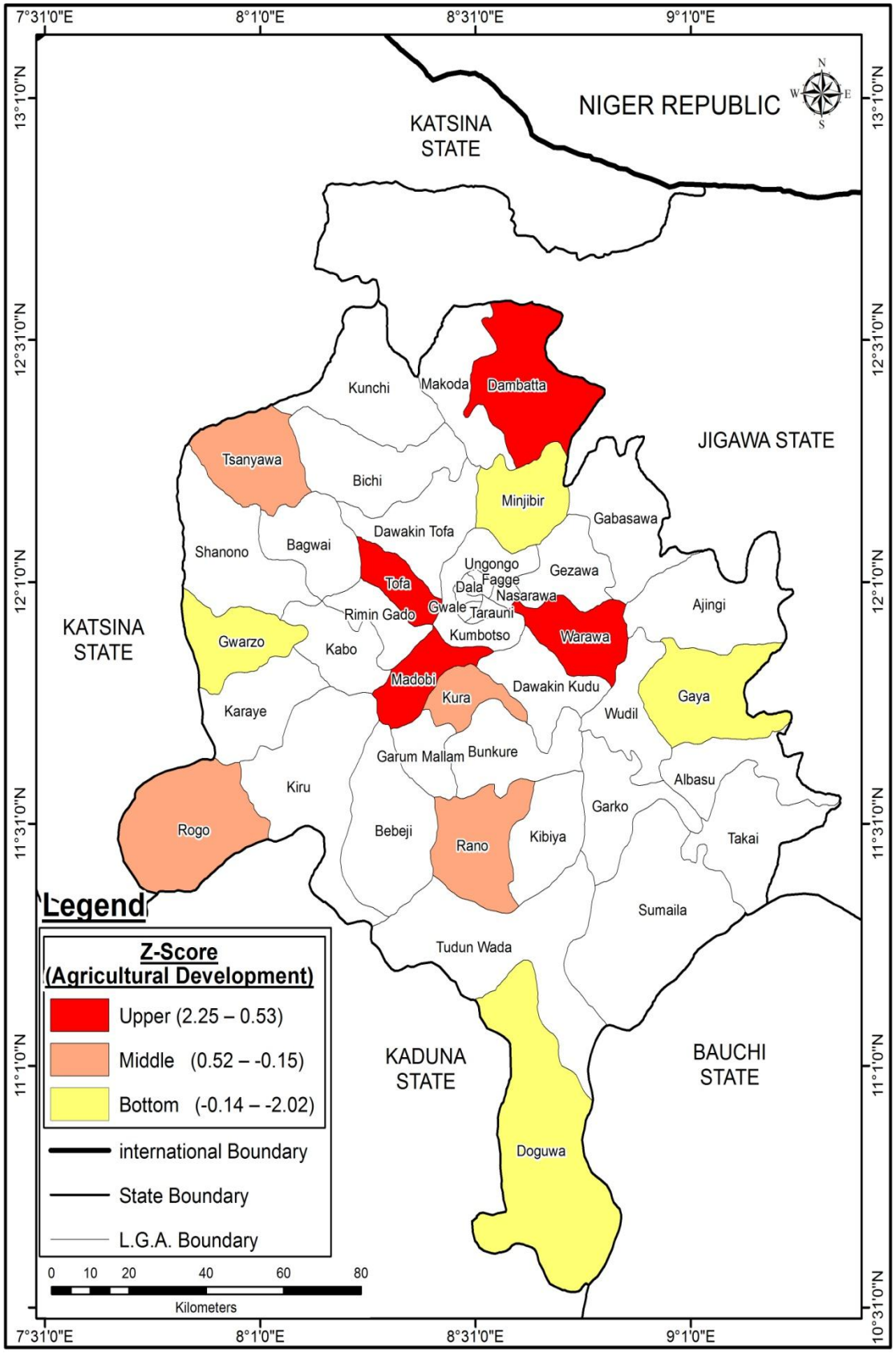

Figure 4.8: Composite-Score of Agricultural Development Indicators in Kano State

Source: Field Survey (2016)

As reflected on Figure 4.8, the study showed clearly the varying degrees of the distribution of the indicators of Agricultural development in the study area.In the analysis, it showed that even though the disadvantaged LGAs rank low, they still enjoy varying degrees of previlages in some agricultural dvelopment indicators and those that ranked high also have areas in which they performed low.

Hypothesis Testing

To test the null hypothesis which states that there is no significant difference in the distribution of agricultural development programmes in the study area, a One-Way Analysis of Variance (ANOVA) was usd at 5% level of significance

ANOVA

Table 4.10: Infrastructural Dimension

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.699	11	.154	1.452	.161
Within Groups	11.487	108	.106		
Total	13.185	119			

Level of Significance 0.05

Source: Field Survey (2016)

The p-value of the analysis of variance (0.161) is greater than 0.05 therefore, the null hypothesis is sustained and conclude that that there is no significant difference in the distribution of agricultural development programmes in the study area.

4.5.1 **Combined Indicators for Agricultural Development**

The data matrix of the z-scores is analyzed in the following sub-sections. There are three major criteria selected for this study namely infrastructural dimension, farm output dimension, farm asset and technology dimension. It must be emphasized that, all the variables in this study were treated equally, that is, they have a weight of unity as far as the study area is concerned.

4.5.2 Infrastructural Dimension:

This criterion is presented in table 4.11. It shows the data matrix in respect of standardized score values for Kano State. It revealed that Eight Local Government Areas (LGAs) were advantaged while the remaining areas where found to be disadvantage.

Table 4.11: Standard score on LGAs in Kano states on infrastructural dimensions

LGAS	ZI	ZII	Sum Z	Rank
Warawa	0.04	0.89	0.93	1
Madobi	-0.03	0.36	0.33	2
Tsanyawa	-0.02	0.28	0.26	3
Tofa	-0.05	0.28	0.23	4
Gwarzo	0.58	-0.36	0.22	5
Gaya	-0.06	0.27	0.21	6
Rogo	0.02	0.17	0.19	7
Danbatta	-0.06	0.21	0.15	8
Rano	-0.02	-0.09	-0.11	9
Minjibir	-0.10	-0.09	-0.19	10
Doguwa	-0.18	-0.29	-0.47	11
Kura	-0.16	-1.05	-1.21	12

Key: ZI Financial Institution = ZII Access Road

Source: Field Survey (2016)

As reflected the scores of the LGAs in the advantage category range from 0.93 – 0.15 while those in the disadvantages category ranges from -0.74 - -0.11. Warawa LGA was found to be most advantaged and privileged than other areas. The reason for this could not readily be explained but it is probable that Warawa LGA is located very close to the central part of the state as such it received much assistance from the agricultural development government.

The disadvantaged categories include Kura LGA that appeared to be the worst with a composite score value of -1.21 and Rano seemed to be the least advantaged with a score of

-0.11 some of the other LGAs in this group include Minjibir and Doguwa in order of Phierarchy of disadvantage. The spatial pattern of the composite scores on infrastructural dimension are presented in Figure 4.9.

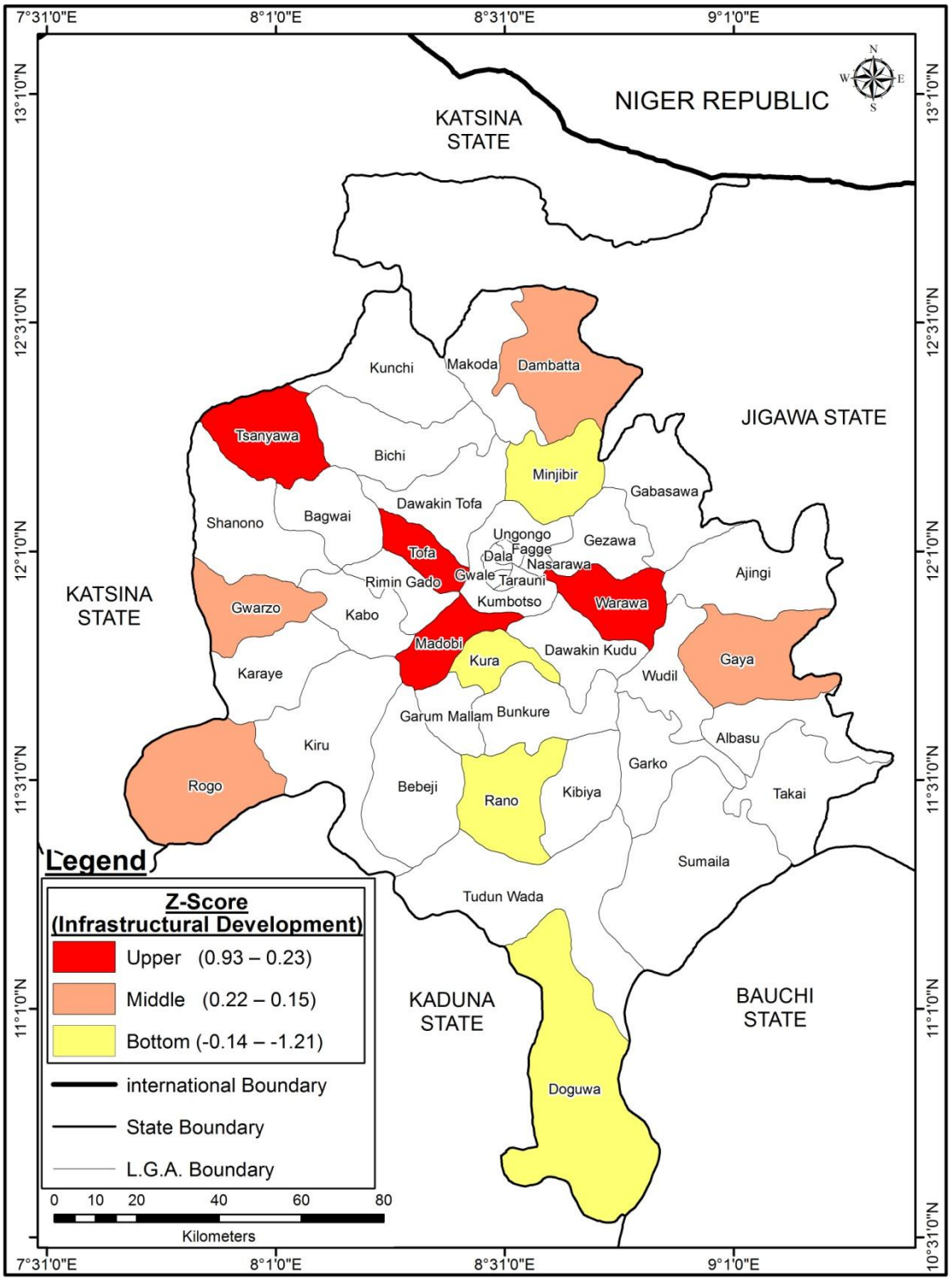

Figure 4.9: Composite-Score of LGAs in Kano State on Infrastructural Dimension

Source: Field Survey (2016)

A close examination of the scores in Figure 4.9 reveals the fact that eight LGAs are relatively advantaged out of twelve sampled Local Government Areas in Kano state. The advantaged areas include, Warawa, Madobi, Tsanyawa, Tofa, Gwarzo, Gaya, Rogo and Danbatta with score values of 0.93, 0.33, 0.26, 0.23, 0.22, 0.21, 0.19 and 0.15. On the other hand Rano, Minjibir, Doguwa and Kura, with score values of -0.11, -0.19, -1.21 and 0.47 are under- prviledged respectively. As reflected in Fig 5.1 Doguwa LGA appeared to be one of the disadvantaged areas because it is located far away from the central part of the state.

Looking at the performance of the LGAs under the infrastructural facilities, there are different levels of performance, some LGAs performed better in all the facilities while some did not. In our previous analytical technique that is the Location Quotient, (LQ) shows the infrastructural dimension as a criterion. It is interesting to note that some LGAs in Kano state such as Warawa and Tofa LGAs maintain the status quo of enjoying more of the privileges as the z-score values confirmed.

Hypothesis Testing

To test the null hypothesis which states that there is no significant difference in the distribution of infrastructural facilities in the study area, a One-Way Analysis of Variance (ANOVA) was used at 5% level of significance.

ANOVA

Table 4.12: Infrastructural dimension

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	24.016	11	2.183	5.044	.000
Within Groups	161.016	372	.433		
Total	185.032	383			

Level of Significance 0.05

Source: Field Survey (2016)

The p-value of the analysis of variance (0.000) is less than 0.05 therefore; we reject the null hypothesis and conclude that that there is a significant difference in the distribution of infrastructural facilities in the study area.

4.5.3 Farm Output Dimension

The standard scores of the variables selected under this criterion are presented in Table 4.13. The table has seven columns. The first column represents the names of the twelve sample local government areas in Kano State. While column 2 to 7 presents the scores on the farm output variables selected under this criterion (see Table 4.13). The sixth column represents the sum of z-scores otherwise known as the composite scores. The seven columns show the rank of the LGAs.

Table 4.13: Standard scores on LGAs in Kano states on farm output dimensions

LGAS	ZI	ZII	ZIII	ZIV	Sum Z	Rank
Madobi	1.92	0.22	0.12	-0.16	2.1	1
Warawa	0.21	0.04	0.05	0.16	0.46	2
Tofa	-0.41	0.05	-0.06	0.57	0.15	3
Rogo	-0.19	-0.03	-0.03	0.35	0.1	4
Doguwa	0.13	0.01	0.13	-0.17	0.07	5
Kura	-0.01	0.29	0.11	-0.33	0.06	6
Danbatta	-0.19	0.05	0.11	0.09	0.06	6
Tsanyawa	0.01	-0.05	-0.15	0.17	-0.02	8
Minjibir	-0.25	-0.02	0.04	0.07	-0.16	9
Gaya	-0.30	-0.25	-0.22	0.42	-0.35	10
Gwarzo	-0.25	-0.17	-0.15	-0.70	-0.64	11
Rano	-0.25	0.03	0.11	-0.55	-0.66	12

Key: ZITotal crop = ZII Bags of Fertilizer = ZIII Farm labourers = ZIV Extension workers

Source: Field Survey (2016)

A cursory look at table 4.13 indicates glaring that seven local governments are advantaged while the remaining five local government areas are disadvantaged under this criterion. The composite score values of the advantaged LGAs ranges from 0.05 representing the score for Danbatta to 2.1 representing the score of Madobi local government areas (LGAs) and it is regarded as the most privileged as far as the farm output is concerned. Some of the other local government areas in this category of advantage include among others Warawa, Tofa, Rogo, Kura and Danbatta and Doguwa with z-score values of 2.1, 0.46, 0.15, 0.07 and 0.06 respectively. It can be noted that non out of the twelve LGAs has positive scores in all the 4 variables. This implies that each of LGAs are either advantaged or disadvantaged in each of the farm output variables.

Further analysis of table 4.13 shows that, in the five sample LGAs in Kano State, within the disadvantaged category Rano LGA exhibited a high level of deprivation with a composite score of -0.66 followed by Gwarzo -0.64, Gaya -0.35, Minjibir -0.16 and Tsanyawa -0.02 in descending order. The spatial patterns of the composite scores on farm output dimension are presented in Figure 4.10.

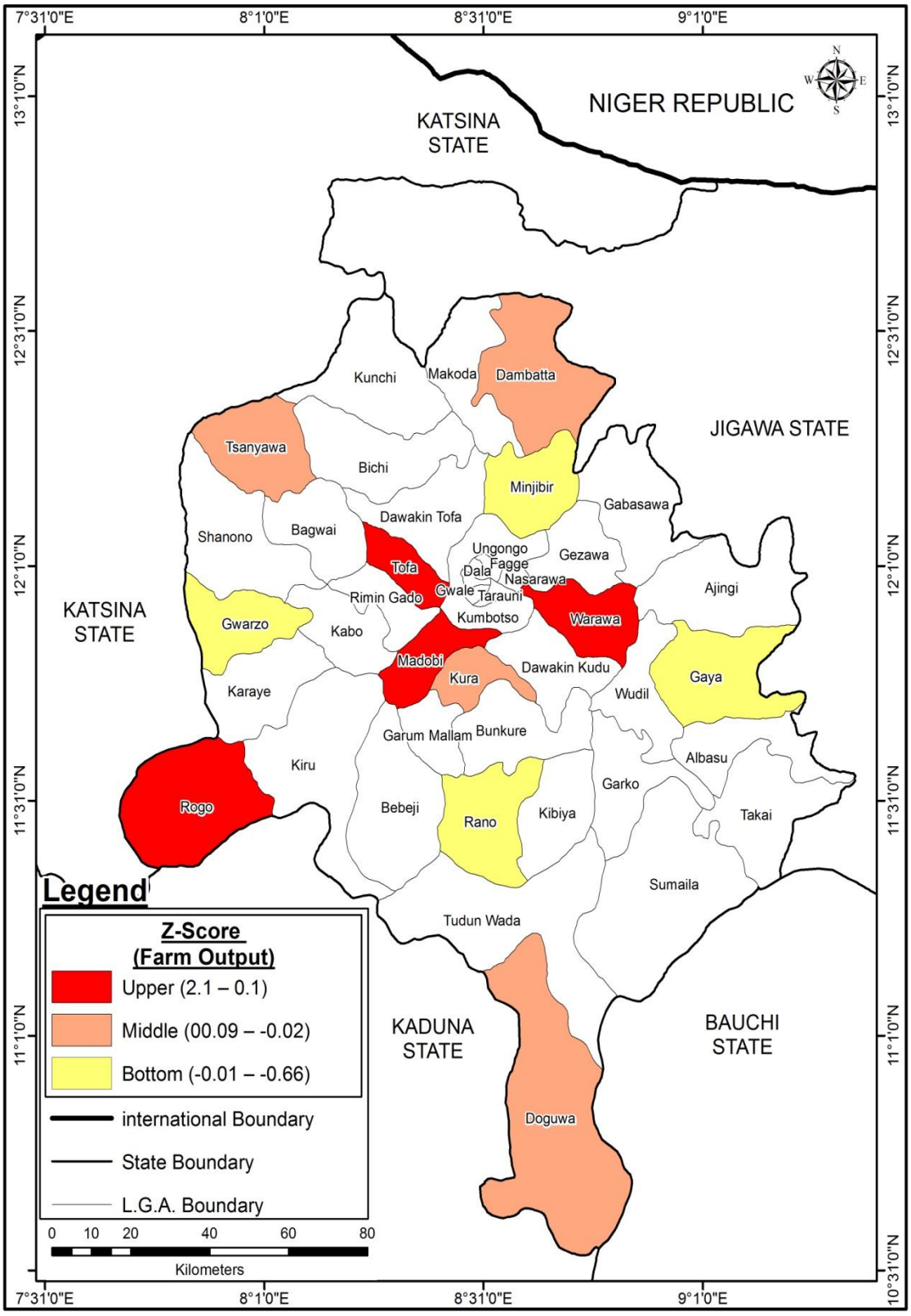

Figure 4.10: Composite-Score on LGAs in Kano State on Farm Output Dimension

Source: Field Survey (2016)

Further examination of the composite scores of the farm output variables (Figure 4.10) shows that different LGAs performed differently in the facilities. Some have advantage in some facilities and are disadvantage in other facilities. For example, Minjibir LGA performed poorly in total crop production per annum (Z1) and fertilizer consumption per annum (ZII) but performed better in ZIII and ZIV facilities. It thus turned out Minjibir ranked 9 in the overall farm output facilities.This points to the fact that some LGAs Performed fairly well and some did not in some facilities. However, when all the facilities were ranked together, the analysis presents a totally different result as revealed by the Figure 4.10. For instance, Gwarzo local government area is found to be under privileged in all the farm output variables with score values of -0.64 respectively. It is not supprising therefore, the LGAs ranked 11^{th} respectively. It is interesting to note that some LGAs in Kano state such as Warawa, Tofa and Rogo LGAs maintain the status quo of enjoying more of the privileges as the z-score values confirmed. Surprisingly Madobi ranked 1 as confirmed by z-score but it is not among the first category of developed areas as confirmed by LQ values.

Hypothesis Testing

To test the null hypothesis that there is no significant difference in the distribution of farm output facilities in the study area, a One-Way Analysis of Variance (ANOVA) was used at 5% level of significance.

ANOVA

Table 4.14: Farm output dimension

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	12.311	11	1.119	3.018	.001
Within Groups	137.949	372	.371		
Total	150.260	383			

Level of Significance 0.05

Source: Field Survey (2016)

The p-value of the analysis of variance (0.001) is less than 0.05 therefore; we reject the null hypothesis and conclude that that there is a significant difference in the distribution of farm output facilities in the study area.

4.5.4 **Farm Asset and Technology Dimension**

The standard scores of the local government areas (LGAs) on the farm asset and technology dimension are represented in table 4.15 while the spatial patterns of the composite scores are presented in Figure 4.11. The table consists of seven columns, has its first column representing the names of the sample Local Government Areas (LGAs) in Kano State. The other four columns numbered Z1 to Z4 represent the scores for farm asset and technology variables. The last two columns gave the sum of z-scores (composite scores) and the ranking of the scores respectively.

Table 4.15: Standardized scores by LGAs in Kano States on Farm Asset and Technology Dimensions

LGAS	ZI	ZII	ZIII	ZIV	Sum Z	Rank
Kura	0.00	0.89	0.09	0.02	1.0	1
Rano	0.19	0.45	0.25	0.10	0.99	2
Warawa	-0.16	0.49	0.23	0.16	0.72	3
Minjibir	0.11	0.51	0.03	0.01	0.66	4
Danbatta	0.07	0.09	0.23	0.16	0.55	5
Tofa	-0.07	0.16	-0.04	0.11	0.16	6
Rogo	-0.09	-0.09	0.03	0.22	0.07	7
Gwarzo	-0.07	-0.23	0.20	0.14	0.04	8
Tsanyawa	-0.03	-0.32	0.03	0.26	-0.06	9
Doguwa	-0.19	0.07	0.02	0.27	-0.08	10
Madobi	0.02	-0.04	-0.09	-0.07	-0.18	11
Gaya	0.01	-0.34	-0.83	-0.73	-1.89	12

Key: ZI Assess to Land = ZII Modern Equipment = ZIII Number of goats = ZIV Number of Poultry

Source: Field Survey (2016)

A glance at table 4.15, revealed the fact that eight LGAs are found to be advantaged while the remaining four LGAs are under privileged with score values of -1.89 representing Gaya and 1.0 representing Kura LGAs respectively. Kura LGAs has maximum advantage as far as the distribution of farm asset and technology dimension are concerned. The spatial pattern of the composite scores on farm asset and technology dimension are presented in Figure 4.11.

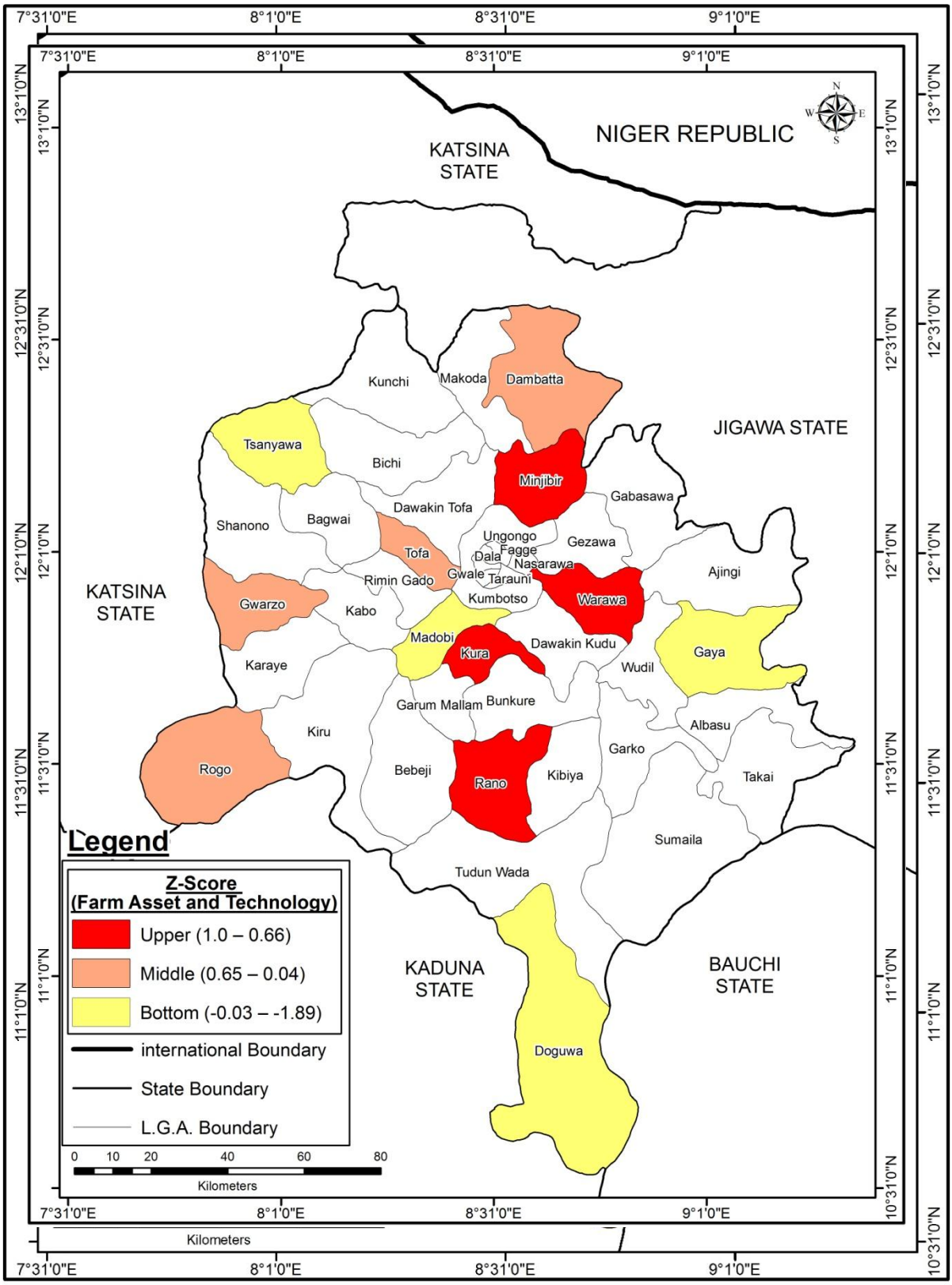

Figure 4.11: Composite-Score on LGAs in Kano State on Farm Asset and Technology Dimension

Source: Field Survey (2016)

Figure 4.11 show that, the factor of being close to the central area must have helped to explain the concentration of farm asset and technology facilities in Kura LGA. Some of the other LGAs in this category of advantage include Rano 0.99, Tofa 0.16, Warawa 0.72, Minjbir 0.66, Danbatta 0.55, Rogo 0.07 and Gwarzo 0.04 in that descending order of performance in the distribution. It must be noted that even though these LGAs in the advantaged category have positive scores, they enjoy varying degree of privileges in the farm asset and technology facilities. Rano LGA ranked second among the category of developed areas which is also affirmed by the findings of FGD that;

> *"One thing that sets Rano apart from other local governments is farming close to water bodies and dams; this system keeps the soil wet year round. The local calls this method Binaso system of irrigation". Through this method they are supplying huge amount of groundnut during dry season.* (FGD, Rano LGAs, 2016).

Hypothesis Testing

To test the null hypothesis that there is no significant difference in the distribution of farm asset and technology facilities in the study, a One-Way Analysis of Variance (ANOVA) was used at 5% level of significance.

ANOVA

Table 4.16: Farm asset and technology dimension

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.369	11	1.306	6.474	.000
Within Groups	75.062	372	.202		
Total	89.431	383			

Level of Significance 0.05

Source: Field Survey (2016)

The p-value of the analysis of variance (0.000) is less than 0.05 therefore; we reject the null hypothesis and conclude that that there is a significant difference in the distribution of farm asset and technology facilities in the study area.

4.6 Factors Responsible for the Spatial Pattern of Agriultural Development in Kano State

4.6.1 Factors Influencing Pattern of Agricultural Development

Many factors in particular, variables that vary across farms and are sources of heterogeneity influence farmers' choices about what crops to grow, whether to use a new technology, and how to manage their land. Table 4.17 presents the factors responsible for the pattern of agricultural development in Kano State.

Table 4.17: Factors Responsible for the Pattern of Agricultural Development in Kano State

	Danbatta		Doguwa		Gaya		Gwarzo		Kura		Madobi		Minjibir		Rano		Rogo		Tofa		Tsanyawa		Warawa		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Fertilizer	10	2.6	3	0.7	10	2.6	5	1.3	4	1.0	10	2.6	14	3.6	15	3.9	11	2.8	5	1.3	6	1.5	4	1.0	97	24.9
Access to road	10	2.6	3	1.7	11	2.8	7	1.8	0	0.0	11	2.8	8	2.0	0	0.0	7	1.8	6	1.5	11	2.8	5	1.3	79	21.1
Lack of capital	8	2.0	4	1.0	9	2.3	5	1.3	3	0.7	3	0.7	7	1.8	8	2.0	8	2.0	4	1.0	3	0.7	2	0.5	64	15.3
Pest & disease	4	1.0	0	0.0	2	0.5	7	1.8	2	0.5	0	0.0	5	1.3	5	1.3	8	2.0	1	0.3	1	0.3	1	0.3	36	9.3
Water	5	1.3	8	2.0	3	0.7	3	0.7	0.0	0.0	0	0.0	0	0.0	0	0.0	3	0.7	0	0.0	9	2.3	0	0.0	31	7.7
Flooding	0	0.0	0	0.0	0	0.0	0	0.0	5	1.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	1.8	12	3.1
Land ownership	0	0.0	1	0.3	0	0.0	7	1.8	1	0.3	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	10	2.7
Market	0	0.0	6	1.5	0	0.0	0	0.0	4	1.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	10	2.5
Soil	0	0.0	0	0.0	0	0.0	0	0.0	3	0.7	0	0.0	0	0.0	0	0.0	5	1.3	2	0.5	0	0.0	0	0.0	10	2.5
Gov't assistance	2	0.5	2	0.5	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.5	7	1.8
Seed	0	0.0	2	0.5	3	0.7	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	1.5
Storage facilities	0	0.0	0	0.0	0	0.0	0	0.0	4	1.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	1.0
Extension workers	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.5	0	0.0	2	0.5	4	1.0
Mechanical tools	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.5	7	1.8	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	10	0.8
Nomadic crisis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.7	3	0.7
Rainfall	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3

Source: Field Survey (2016)

Table 4.17, shows that about 24.9% of the respondents were of the opinion that the major factor responsible for the pattern of Agricultural development in the study area is fertilizer, about 21.1% of the respondents opined that the major factor is lack of good road and about 15.3% of the respondents were of the view that the major factor is lack of capital. While it was found from the respondents that, other factors responsible for the pattern of agricultural development in the study area are pest and diseases, soil, seeds, land ownership, extension workers, lack of government assistance, rainfall, flood, market, storage facilities and nomadic crises constitutes less than 10% of the sampled population.

When analyzed according to the sampled LGAs, (Table 4.17) shows that Rano had 3.9% and Minjibir 3.6 % being the highest percentage of the respondents that said fertilizer is one of the factor that limit agricultural development in their areas. The other sampled local government areas had less than 3%. This is in line with the findings of World Bank (2008) that, Fertilizer use remains very low in most part of Africa despite widespread agreement that much higher use rates will be required for sustained agricultural productivity and growth. Many studies have examined the causes of continued low use of modern inputs in sub-Saharan African countries such as weak input, credit, and output markets, poor soils, and high production risks have often been identified as the main reasons for low uptake of fertilizer among African farmers.

Also it shows that, majority of the sample LGAs have the problem of accessible road with highest respondents in Madobi 2.8%, Gaya 2.8% and Tsanyawa 2.8% with no respondents in Kura and Rano. This is in line with the work of National Agricultural Policy (2013) that the road networks especially in rural areas, are in bad condition and in most of rainy seasons village roads are impassable. Furthermore still in table 5.9 shows that capital is one of the major factor that limit agricultural development in the study area with highest respondent in Gaya 2.3%, Danbatta 2.0, Rano 2.0 and Rogo 2.0%. Other sampled local

government area's have less than 2%. Also it shows that Rogo 2.0%, Gwarzo 1.8 and Minjibir 1.3% have the highest respondents that said pest and diseases is one of the major factors that limit agricultural development in their study area, with no respondents in Doguwa and Madobi LGA.

Table 4.17 further analysis shows that Tsanyawa had 2.3% and Doguwa 2.0% as locations with highest number of respondents that said shortage of water is a major factor that limit agricultural development in their area because they have limited ground water more especially during dry season and all the other sample LGAs had less than 2%. Finally, in all the sampled LGAs, other factors such as seeds, land ownership, extension workers, lack of government assistance, rainfall, market, storage facilities and nomadic crises constituted less than 2% of the sampled population. This is in line with the work of Stoorvogel *et al*, (2004) who reported that, a variety of constraints play into farmers' decisions, especially with respect to available production technologies, biophysical or geophysical, labour and input market, finance and credit, social norms, inter temporal tradeoffs, policy, and constraints to knowledge or skills

4.6.2 **Factor Analysis**

Factor analysis was used to show the strength of each factor responsible for the spatial pattern of agricultural development in the study area. The result of the factor analysis (rotated matrix) reduced the 16 independent variables to 6 factors responsible for the pattern of agricultural development in the study area, with a cumulative percentage variance of 50.7%. Thus, leaving 49.3% of the total variance unexplained. The unexplained variances are the variables responsible for the pattern of agricultural development not captured in this research work. The factors are grouped into six components presented in Table 4.18.

Table 4.18: The Factors Underlying Pattern of Agricultural Development in Kano State

Factors	Variables	Eigen Value	% of Variance	Cumulative %
1	Environmental issues	1.702	10.638	10.638
2	Geophysical and commercial	1.429	8.933	19.571
3	Biophysical	1.346	8.412	27.982
4	Infrastructure	1.286	8.039	36.021
5	Modern techniques	1.191	7.444	43.466
6	Access to credit facilities	1.157	7.232	50.698

Source: Field Survey (2016)

4.6.3 **Rotated Matrix of factors Responsible for the Pattern of Agricultural Development**

The rotated matrix in respect of the variables responsible for the pattern of Agricultural Development in Kano state is presented in table 4.19. This table contains the rotated component loadings which represent both how the variables are weighted for each component but also the correlation between the variables and the component. Because these are correlations, possible values range from -1 to +1. The rotation method used is varimax, which does not permit the factors to be correlated (orthogonal rotations).

Table 4.19: Rotated Component Matrix of the factors Responsible for thePattern of Agricultural Development in Kano State.

	Factor					
	1	2	3	4	5	6
p1	-.334	.070	-.053	-.011	-.682*	.183
p2	-.220	-.027	-.207	.458	.612*	-.019
p3	-.071	-.071	.766*	-.043	-.247	.034
p4	.010	-.035	.569*	-.064	.376	-.111
p5	-.074	-.018	.054	-.057	-.001	.765*
p6	.217	-.085	-.030	-.009	.035	.735*
P7	.095	-.124	.062	-.222	-.055	-.229*
P8	.093	-.049	-.353	.659*	-.127	-.109
P9	-.127	-.046	-.488	-.765*	.078	-.047
p10	.002	-.026	.023	.016	-.094*	-.062
p11	.699*	.429	-.016	.034	-.015	.003
p12	.106	.722*	.045	-.039	-.023	-.024
p13	-.298	.253	.184	-.062	.359*	.086
p14	-.033	.764*	-.134	.075	.084	-.010
p15	-.025	-.009	-.014	.168	-.236*	-.057
p16	.785*	-.071	-.019	.009	.110	.090

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 11 iterations.
*Significant loading

Source: Field Survey (2016)

The columns under the heading factor are the rotated component that has been extracted. Six (6) factors were extracted (Table 4.19). These are the factors that we are most interested in them. Factor 1 has an Eigen value of 1.702 and all the variance accounted for 10.638 percent of the total variance .This factor has significant loading on 2

variables, namely P11 (flooding) and P16 (nomadic crises) These variables are more related to farmer environment therefore, this factor could be defined as environment issues .The implication of this dimension is that negatively affect the pattern of agricultural development in the study area. Factor II has significant loading on 2 variables with an eigen value of 1.429 and explains 8.9% of the total variance. The variables are p12 (rainfall) and P14 (market) .The underlying factor is therefore labelled as geophysical and commercial dimension.

Factor III has significant loading on 2 variables, namely p3 (pest and diseases) and p4 (soil).It explains 8.4% of the total variance, and has an eigenvalue of 1.346.consquently the factor is described as Biophysical dimension. Factor 1V has significant loading on 2 variables with an eigenvalue of 1.286 and 8.0% of the total variance. The variables are p8 (access to road) and p9 (capital) and thus this factor is called infrastructural. Factor V has significant loading on 5 variables, namely p1 (fertilizer) p2 (availability of water), p10 (farmer education), p13 (storage facilities) and p15 (mechanical tools) and account for 7.4% of the total variance with an eigenvalue of 1.191. The variables relate more to farmer's productivity and this factor could be called modern techniques. In other words application of fertilizer, water, farmer education, storage facilities, and technology influence rural farmera productivity.

Factor VI has high loading on 3 variables namely p5 (seeds), p6 (government assistance e.g. loan, credit from cooperatives and fund form government) and p7 (land ownership).This factor has eigenvalue of 1.157 and explains 7.2 % of the total variance and this factor is called accessibility to credit facilities.

4.8 Addressing the Challenges facing Agricultural Development Programmes in Kano State

The research examined the challenges facing agricultural development programmes in the study area and the result is presented in Table 4.20. The problems of agricultural development programme in the study area vary from differnt respondents' point of view. It was found out that 51.0% of the respondents pointed out that the major problem of agricultural development programmes in the study area is that the programmes do not target the original farmers as 14.6% of the respondents' were of the view that the major problem is late distributions of fertilizer to the cooperatives. About 12.7% of the respondents opined that the major problem is dully political. The category of respondents who reported insufficient input, lack of extension workers, long procedures and none continuity are the major problems of Agricultural Development programme are just less than 10% of the sampled population.

Table 4.20: Challenges facing Agricultural Development Programmes

Challenges of Agricultural Development Programmes	Danbatta		Doguwa		Gaya		Gwarzo		Kura		Madobi		Minjibir		Rano		Rogo		Tofa		Tsanyawa		Warawa		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Not targeted the original farmers	24	6.2	16	4.1	21	5.4	17	4.4	17	4.4	18	4.7	23	6.0	18	4.7	7	1.8	9	2.3	14	3.6	13	3.4	197	51.0
Late distribution of fertilizers	5	1.3	5	1.3	6	1.6	5	1.3	3	0.8	3	0.8	4	1.0	3	0.8	8	2.1	4	1.0	6	1.6	4	1.0	57	14.6
Programme politicized	4	1.0	4	1.0	6	1.6	3	0.8	3	0.8	3	0.8	4	1.0	5	1.3	8	2.1	3	0.8	4	1.0	2	0.5	49	12.7
Lack/Excess	3	0.8	0	0	2	0.5	4	1.0	2	0.5	2	0.5	4	1.0	1	0.3	6	1.6	1	0.3	3	0.8	3	0.8	31	8.1
Insufficient of inputs	2	0.5	3	0.8	2	0.5	4	1.0	1	0.3	1	0.3	3	0.8	1	0.3	7	1.8	2	0.5	2	0.5	4	1.0	32	7.8
Long procedures of the programmes	1	0.3	0	0	2	0.5	1	0.3	1	0.3	0	0	3	0.8	1	0.3	4	1.0	1	0.3	1	0.3	0	0	15	4.1
Lack of continuity of the programmes	0	0	1	0.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.5	0	0	0	0	0	0	3	0.8

Source: Field Survey (2016)

When analyzed according to sampled LGAs (Table 4.20) with the exception of Rogo LGA, all the other LGAs responded that, the major challenge of agricultural development programmes is that the programmes are not targeted at the original farmers. This was also observed by the World Bank (2012) in a combined audit of six agricultural development programmes in Kano and Sokoto, which concluded that the project targets were unrealistic and based on unproven technological assumptions, that there was too little emphasis on farmers' production priorities, and that the institutional structure led to a top-down effort and overemphasis on physical targets. Also Table 4.20 shows that, some of the respondents said late distribution of fertilizer is a major challenge of agricultural development programme with highest respondents in Rogo 2.1% and all the other sampled local governments had less than 2 %. In the submission of one of the cooperative leaders in a FGD:

> *Agricultural inputs usually reach us around August and September when it is already late, if we get it we normally keep it for dry season farming,"* (FGD, Rogo LGA, 2014).

Also as reflected in table 4.19 Rogo LGA has the highest percentage of the respondents, with 2.1% stating that politics is one of the major challenge that affect agricultural development programmes in their area. This is in line with the work of Iwuchukwu and Igbokwe (2012) which states that, major problems found in the programmes were due to the fact that a number of the authorities' grew out of proportion and the operations of some suffered from intensive political interference.

Table 4.20 further analysis shows that some of the respondents said one of the major challenge of agricultural development programme is that agricultural inputs are insufficient and do not meet the minimum requirements of the farmers with Rogo having the highest respondents' of 1.8%, Warawa 1.0% and Gwarzo 1.0% and all the remaining sample local government areas have less than 1%. Further analysis of Table 4.19 reveals that 3 LGAs

that have the highest respondents that said lack of extention workers is a major challenge facing agricultural development programme in their area are Rogo 1.6 %, Minjibir 1.0% and Gwarzo 1.0 % and all the other sample LGAs have less than 1.1%. This is in line with the finding of Uzoigwe (2007) who opined that the failure of ADPs in Nigeria is largely due to the ineffectiveness of the extension agents, some of whom are non-specialists. Thus, some of them studied courses not related to agriculture, but due to political consideration, they were employed as extension agents.

Also further analysis of Table 4.20 reveals that, Rogo LGA 1.0% has the highest respondents that said long procedures of the programmes is a major challenge facing agricultural development programmes and all the other sample local government had less than 1%. A farmer submitted.

> *That most of the farmers cannot write nor read and most of the programmes requires farmers to fill so many forms, so this limit our ability in getting the assistance from the agricultural development programmes* .(FGD, Minjibir LGA, 2014).

Further more and still in Table 4.20 it shows that in all the sample local governments only Rogo 0.5% and Doguwa 0.3% that said none continuity of the programmes is a major challenge of Agricultural development programmes in the study area. This is related to the findings of Ogidefa (2010) that despite the countless numbers of rural development policies introduced at different times by successive governments coupled with the huge financial and material resources employed, little or nothing is felt at the rural level as each policy has often died with the government that initiated it before it starts to yield dividends for the rural dwellers.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

The distribution of assistance from Agricultural Development programmes varies in space across the sampled Local Governments. The findings revealed a high variation in Agricultural development programmes across the sampled local governments.

5.1.1 Types of Agricultural Development Programmes

The major types of agricultural development programmes in the study area are Agricultural Skill Acquisition/Training programme 14.7%, Agricultural Mechanization Programme 10.6%, Growth Enhancement Scheme programme 10.0%, Commercial Agricultural development programme 8.4%, Development of industrial crops 7.7%, Livestock Development Programme 5.2%, Kano Rice Development Programme 4.0% and Fadama III Programme constitud 1.5%. However, about 38.1% of the respondents did not respond on the major types of agricultural development programmes. This is due to the facts that, majority of the respondents are not aware of the agricultural development programmes in the study area.

5.1.2 Comparative Level of Agricultural Development among LGA's

The level of Agricultural development programmes among the LGAs is compared using location quotient technique. The result is categorized into upper, middle and bottom based on their performance in the assistance of agricultural development programmes. The upper group include Tofa 0.80, Madobi 1.10, Warawa 1.20 and Kura 1.30. While the middle group include Gwarzo 1.34, Gaya 1.39, Danbatta 1.40 and Tsanyawa 1.45. The bottom group are Minjibir 1.51, Doguwa 1.71, Rano 2.20 and Rogo 2.20.

5.1.3 **Spatial Variations of Agricultural Development Programmes**

The spatial pattern of agricultural development programme in the study area was examined using location quotient technique. The result showed the level of spatial balance in infrastructural dimension, farm output, farm asset and technology dimension. In a nut shell, farm asset and technology dimension exhibit a very high degree of variation within the study area, and indeed the variables under infrastructural and farm output dimension exhibit a fair level of distribution in the study area. Overall, the pattern of agricultural development programme is compact and concentrated in the central part of the State, (Kano central) compared with distant areas like Doguwa receiving less support from agricultural development programmes. This is inline with the findings of Jawan and Lokhande (2014) that relatively high level of agricultural development is found in the central part of the district. This area enjoys high level of modernization of agriculture and irrigation facilities and well commercial farming is observed.

However, for the purpose of comparison and more importantly, in order to make the Agricultural development programmes condition clear in the study area. The other approach was adopted and that is the standard scores (z-scores) using the three dimensions and the associated ten variables. In general the composite scores confirm the prevalence of spatial variation in the distribution of agricultural development programmes in the study area. The Z- score result showed varying degrees of the indicators of agricultural development among the sampled local governments areas, such that seven areas namely Madobi, Warawa, Dambatta, Tofa, Rogo, Rano and Tsanyawa dominated the indicators with scores ranging from 2.24, 2.11, 0.69, 0.53, 0.36, 0.23, 0.17 and 0.15, while the impacts of the indicators of agricultural development are less in 5 local governments areas. The affected areas include Kura, Doguwa, Gwarzo, Minjibir and Gaya with scores ranging from –0.15, -0.75, -0.85, -1.10 and -2.02. It is interesting to note that virtually all the

LGAs are either advantage or disadvantage under each dimension except for Warawa area that is advantaged in all the dimensions. One attempts to probe into the position of Warawa area along with other LGAs and discovered that Warawa might be enjoying locational advantage as an area close to the state capital. Among other factors that might account for the observed pattern in the study area include economic, environmental, biophysical and Geophysical.

5.1.4 Factors Responsible for Spatial Variations in Agricultural Development Programmes

Moreover, descriptive statistics was used to examine the factors responsible for the pattern of agricultural development in the study area. The result revealed that about 24.9% of the respondents were of the opinion that the major factor responsible for the pattern of Agricultural development in the study area is fertilizer, about 21.1% of the respondents opined that the major factor is lack of good road, about 15.3% of the respondents were of the view that the major factor is lack of capital and about 9.3%.were of the view that the major factor is pest and disease, of equal strength are those that reported that the major factor is shortage of water that is 7.7%. While it was found from the respondents that, other factors responsible for the pattern of agricultural development in the study area such as soil, seeds, land ownership, extension workers, lack of government assistance, rainfall , flood, market, storage facilities and nomadic crises constitutes less than 5% of the sampled population. However, Factor analysis result showed the strength of each factor responsible for the pattern of agricultural development in the study area. Factor I has an Eigen value of 1.702 and 10.63 percent of the total variance, Factor II has an Eigen value of 1.429 and explains 8.9% of the total variance, factor III has an Eigen value of 1,346 and explains 8,4% of the total variance, factor IV has an Eigen value of 1.286 and 8.0% of the total variance, factor V account for 7.4% of the total variance with an Eigen value of 1.191 and factor VI has an Eigen value of 1.157 and explains 7.2% of the total variance.

5.1.5 **Addressing the Challenges facing Agricultural Development Problems**

The problems of agricultural development programmes in the study area were examined using descriptive statistics. It was found that about 51.0% of the respondents pointed out that the major problem of agricultural development programme in the study area is that, the programme do not target the original farmers, about 14.6% of the respondents were on the viewed that the major problem is late distributions of fertilizer from the cooperatives. About 12.7% of the respondents opined that the major problem is dully political. Of equal strength are those that reported that the major problem is lack of extension workers that is 8.1%. The category of respondents reported no continuity is the major problem of Agricultural Development programme are just 0.8% of the sampled population. A cross examination of the senatorial zone indicated that Agricultural Development programmes do not target the original farmers.

5.2 **Conclusion**

The primary aim of this study is to investigate the spatial variation in agricultural development programmes in Kano State with a view towards proposing sustainable agricultural development. The result rvealed that, the major types of agricultural development programmes in the study area are; Agricultural Skill Acquisition/Training programme, Agricultural Mechanization Programme, Growth Enhancement Scheme programme, Commercial Agricultural development programme, Development of industrial crops, Livestock Development Programme, Kano Rice Development Programme and Fadama III Programme. However majority of the respondents did not respond on the major types of agricultural development programmes this shows that government at all levels and development partners have not succeeded in giving assistance and creating awareness of the existing agricultural development programmes. The result showed the level of Spatial Variations in Agricultural Development Programmes interms of infrastructural dimension,

farm output, farm asset and technology dimension. In a nut shell, there is a very high degree of variation within the study area. The problem of gap- narrowing is one that demands drastic reorientation of policy. It is viewed with all seriousness that after over five decades of independence there is hardly any excuse for the persistence of the wide gap, except on the ground of lack a sound policy to create the right atmosphere for the achievement of agricultural development programmes in Kano State and other states in Nigeria.

The challenges facing agricultural development programmes in the study area were examined. The result revealed that, the major problem of agricultural development programmes in the study area is that, the programmes do not target the original farmers. Sustainable agricultural development programmes is unlikely to occur without serious attention from the government. Hence, there is need for proper channels towards implementing necessary agricultural development programmes appropriate strategies should be strictly adhered to in order to deal with the prevailing challenges.

5.3 **Recommendations**

The following recommendations are proffered to help tackle the problems and challenges militating against good management of agricultural developments programmes in order to achieve sustainable agricultural development in Kano state. This is because over the years only a few laudable achievements have been recorded given the introduction of a myriad of agricultural development agricultural programmes in the state.

1. There is need for the Agricultural Development Programmes to undertake their activities in lagging areas so that all the communities will have access to benefits and assistance from the Agricultural Development Programmes.
2. The Kano state government should as a matter of necessity, redesign the Agricultural Development Programmes to emphasize on the production of all crops.

3. There is need for the Kano State governments to provide assistance for both rainy and dry season farming because this research has discovered that most of the assistance were given during the dry season to boost irrigation farming.
4. There should be monitoring and evaluation by the official of the programme atleast once in a month so that the Agricultural development programmes would be sustainable.
5. As the Agricultural development programme does not generate money internally, some of its professional services should be commercialized. However such services should be subsidized. Those to be included are seed multiplication, livestock and feed production.
6. Extension workers should be employed and encouraged to visit farmers on regular basis to teach them modern agricultural technology.
7. State governments should take more responsibility by making yearly budgetary allocation on the programmes instead of the usual counterpart funding.
8. There is need to involve the programme beneficiaries in the design, planning and execution of projects. This will equally avoid top-down approach in policy co-ordination. It will also stimulate the interest of the beneficiaries or host communities.
9. There is need to identify and target the poor in project implementation. It is on record that most often, project designed to benefit the poor, more often than not end up benefiting only the rich in the society.
10. Policy planners and operators of Agricultural Development Programmes should take cognizance of the relative ranking of Agricultural development programmes performance suggested in this work to serve as for a better performance.

5.4 Contribution to Knowledge

1. The study established that some areas have benefited from agricultural development programmes more than their average shares and this singular factor explains the edge they have over other areas.
2. The study also established that, there is existance of varying degrees of the indicators of agricultural development among the twelve local government's areas in Kano state interms of farm asset and technology dimension, farm output dimention, infrastructural dimension.
3. The study established that agricultural development programmes in the study area are compact and concentrated in the central senatorial zone.

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APPENDICES

APPENDIX I: QUESTIONNAIRE
DDEPARTMENT OF GEOGRAPHY
FACULTY OF PHYSICAL SCIENCES
AHMADU BELLO UNIVERSITY, ZARIA

INTRODUCTION

The purpose of this questionnaire is to collect information about spatial variation in agricultural development programs in Kano State. All information given will be treated as confidential and used for academic purpose only.

SECTION A: CHARACTERISTICS OF THE RESPONDENTS

1. Name of Local Government_____

2. Name of ward _____

3. Age

a. 0 – 20 ( )
b. 20-30 ( )
c . 0-40 ( )
d 40-50 ( )
e 50-60 ( )
f. 60 and above ( )

4. Gender:

a. Male ( )

b. Female ( )

5. Marital Status

a. Married ( )
b. Never married ( )
c. Widow ( )
d. Divorced ( )

6. Level of Education

a. Islamic Education ( )

b. Primary Education ( )

c. Secondary Education ( )

d. Other Specify

_____

7. What is your main occupation?

a. Farmer ( )

b. Business ( )

c. Civil Servant ( )

d. Others Specify

_____

8. No. of children. (a) 1-4 (b) 4-8 (c) 8-12 (d) 12-16 (e) 16 and above

9. House hold size (a) 1-3 (b) 3-5 (c) 5-7 (d) 7-9) 9 and above

SECTION B: TYPES OF AGRICULTURAL DEVELOPMENT PROGRAMMES IN YOUR AREA

10. Types of agricultural development programmed exist in the study area

(a) Agricultural mechanization programme

(b) Livestock development programmes

(c) Development of industrial crops

(d) Development crop development initiative

(e) Kano rice development programme

(f) Agricultural skills acquisition/training institute.

(g) Others

11. Nature of saving

a. Self ( )

b. Contribution ( )

c. Bank ( )

SECTION C: INFRASTRUCTURAL DIMENSION

12. Access to road from farm to the market/home (a) Yes (b) NO

13. Cost of transport (a) high (b) moderate (c) low

14. Access to land (a) Yes (b) NO

15. Form of access to land (a) inheritance (b) purchase (c) hire (d) mortgage

16. Access to irrigation land (a) Yes (b) NO

17. Form of access to irrigation land (a) inheritance (b) purchase (c) hire (d) mortgage

18. How many times do you repeat cropping on the farmland per annum? (a) 1 – 2 (b) 3 – 4 (c) 5 – 6 (d) 7 – 8 (e) above 9 times

19. Which of the following modern equipment do you use on the farmlands? (a) Tractors (b) trowel (c) wheel barrow (d) harvesters (e) others specify

20. Do you have access to any of the financial institution in your area? (a) Yes (b) No

SECTION D: AGRICULTURAL INPUTS DIMENSION

21. How many bags of chemical fertilizers do you apply on farmland per annum?

(a) 10– 20 (b) 20-30 (c) 30– 40 (d) 40-50 (e) over 50bags

22. Where do you usually get supply of the chemical fertilizer?

(a) Farmers' cooperatives

(b) Local government

(c) State government

(d) Market

(c) Others specify

23. What is the average costs of the chemical fertilizer utilized on the farm per annum (₦)?

(a) ₦50,000-60,000 (b) ₦60,000 - ₦70,000

(c) ₦70,000 –80,000 (d) ₦80,000 –90,000 (e) ₦90,000 and above

24. What type of crops do you plant on the farmland during rainy season?

25. What type of crops do you plant during dry season……..

26. Which of the following chemicals do you use to spray your farmlands?

(a) Herbicides (b) Pesticides (c) Insecticides

(d) Fungicides (e) Others specify

27. How many farm labourers do you engage on farmlands annually?

(a) 1 – 10 (b) 10 – 20 (c) 20 – 30

(d) 30 – 40 (e) Above 40

SECTION E: AGRICULTURAL EXTENSION SERVICES

28. Do you have agricultural extension workers in your locality? (a) Yes (b) No

29. If yes, how many of the extension workers are available in your area?

(a) 0 -2 (b) 3 -4 (c) 5 – 6 (d) 7 – 8 (e) Above 9

30. How often do they come to your farm per annum?

(a) 0 – 5 (b) 6 – 10 (c) 11 – 15 (d) 16 -20 (e) Never

31. Which of the following functions do they perform in your area?

(a) Supply of hybrid seedlings

(b) Supply of spraying machines

(c) Enlightenment on the use of Modern equipment

(d) Demonstration of how to apply fertilizers

(e) Organize workshops

32. Access to livestock Yes ( ) NO ( )

33. Satisfaction with respect to livestock services Yes ( ) NO ( )

34. Change in livestock birth rate Yes ( ) NO ( )

35. When did you start...?

36. Access to fisheries Yes ( ) NO ( )

37. Satisfaction with respect to fishery services YES ( ) NO ( )

38. Change in level of production _____

39. When did you start the fishery? _____

40. Access to poultry_____

41. Satisfaction with respect to poultry services_____

42. Change in level of production_____

43. When did you start the poultry _____

SECTION F: FACTORS RESPONSIBLE FOR PATTERN OF AGRICULTURAL DEVELOPMENT

44. Which of the following factors are responsible for the spatial pattern of agricultural development programmes in your area?

(i) Environmental issues (a) land degradation (b) erosion (c) flooding (d) soil fertility (e) others specify

(ii) Geophysical (a) physical terrain (b) climate (c) changes in weather (d) landscape (e) others

(iii) Biophysical (a) crop diseases (b) insect pests (c) vegetation cover (d) others specify

(iv) Infrastructural facilities (a) access to land (b) water for irrigation (c) farm equipment (d) others

(v) Commercial issues (a) marketing channels (b) demand for farm products (c) storage facilities

(vi) Modern techniques (a) application of fertilizer (b) hybrid seeds (c) manure (d) machines

(vii) Credit facilities (a) access to loan from bank (b) credit from cooperatives (c) fund from government (d) others specify

SECTION G: CHALLENGES FACING AGRICULTURAL DEVELOPMENT IN YOUR AREA

45. What are the challenges facing agricultural development programmes

a. Politics **( )**

b. Not targeted to the original farmers ( )

c. late distribution of fertilizer ( )

d. not enough ( )

e. extention workers ( )

f. no continuity ( )

g. long procedures ( )

APPENDIX II: FOCUS GROUP DISCUSSION GUIDE
FOCUS GROUP DISCUSSION CHECKLIST

1. Types of agricultural development programmed exist in the study area
2. Which one is the most popular?
3. Nature of saving
4. Access to road from farm to the market/home
5. Access to land
6. Which type of modern equipment do you use on the farmlands?
7. How many bags of chemical fertilizers do you apply on farmland per annum?
8. What type of crops do you plant on the farmland during rainy season?
9. What type of crops do you plant during dry season?
10. How many farm labourers do you engage on farmlands annually?
11. Do you have access to any of the financial institution in your area?
12. Do you have agricultural extension workers in your locality?
13. Access to livestock
14. Access to poultry
15. What do you think are the factors that effect the spatial distribution of agricultural development in the study area?
16. What are the challenges facing agricultural development programmes in the study

SAMPLES OF COMPUTED LOCATION QUOTENT VALUES APPENDIX III

ACCESS TO LAND

LGA	Population	Land	si/S	ni/N	LQ	Rank
Danbatta	272901	32	0.028	0.022	1.265	6
Doguwa	195326	20	0.019	0.016	1.204	11
Gaya	268939	28	0.028	0.022	1.257	9
Gwarzo	238083	30	0.025	0.020	1.265	7
Kura	185537	39	0.020	0.015	1.307	4
Madobi	178522	41	0.019	0.015	1.317	3
Minjibir	284748	34	0.030	0.023	1.290	5
Rano	192255	80	0.021	0.016	1.338	1
Rogo	295115	19	0.029	0.024	1.195	12
Tofa	127849	43	0.014	0.011	1.322	2
Tsanyawa	204513	29	0.021	0.017	1.257	8
Warawa	170967	23	0.018	0.014	1.246	10
	2,614.755	**395**				

CROPPING INTENSITY PER ANNUM

LGA	Population	Crop Intensity	si/S	ni/N	LQ	Rank
Danbatta	272901	35	0.024	0.022	1.057	7
Doguwa	195326	41	0.023	0.016	1.405	3
Gaya	268939	25	0.021	0.022	0.968	11
Gwarzo	238083	27	0.020	0.020	1.005	10
Kura	185537	40	0.020	0.015	1.289	4
Madobi	178522	81	0.047	0.015	3.192	1
Minjibir	284748	28	0.024	0.023	1.013	9
Rano	192255	37	0.017	0.016	1.061	6
Rogo	295115	30	0.025	0.024	1.049	8
Tofa	127849	20	0.010	0.011	0.936	12
Tsanyawa	204513	39	0.021	0.017	1.273	5
Warawa	170967	44	0.021	0.014	1.523	2
	2,614.755	**449**				

CHEMICAL FERTILIZER CONSUMPTION (BAGS)

LGA	Population	Chemical Ferlizer	si/S	ni/N	LQ	Rank
Danbatta	272901	54	0.029	0.022	1.289	7
Doguwa	195326	58	0.021	0.016	1.290	6
Gaya	268939	36	0.021	0.022	0.955	12
Gwarzo	238083	38	0.020	0.020	1.038	11
Kura	185537	74	0.025	0.015	1.666	1
Madobi	178522	73	0.023	0.015	1.571	2
Minjibir	284748	53	0.029	0.023	1.219	8
Rano	192255	59	0.021	0.016	1.335	5
Rogo	295115	49	0.029	0.024	1.192	10
Tofa	127849	65	0.015	0.011	1.413	3
Tsanyawa	204513	52	0.020	0.017	1.209	9
Warawa	170967	59	0.019	0.014	1.363	4
	2,614.755	**670**				

NUMBER OF AGRICULTURAL LABOURERS

LGA	Population	Number laborers	si/S	ni/N	LQ	Rank
Danbatta	272901	53	0.029	0.022	1.286	7
Doguwa	195326	70	0.023	0.016	1.433	3
Gaya	268939	39	0.023	0.022	1.024	12
Gwarzo	238083	43	0.021	0.020	1.082	11
Kura	185537	79	0.022	0.015	1.437	2
Madobi	178522	83	0.021	0.015	1.443	1
Minjibir	284748	58	0.030	0.023	1.295	6
Rano	192255	63	0.023	0.016	1.433	4
Rogo	295115	49	0.029	0.024	1.204	9
Tofa	127849	51	0.014	0.011	1.286	8
Tsanyawa	204513	47	0.019	0.017	1.108	10
Warawa	170967	62	0.019	0.014	1.377	5
	2,614.755	697				

FINANCIAL INSTITUTION/COMMERCIAL BANKS

LGA	Population	Financial Institutions	si/S	ni/N	LQ	Rank
Danbatta	272901	5	0.027	0.022	1.195	9
Doguwa	195326	2	0.018	0.016	1.151	12
Gaya	268939	48	0.027	0.022	1.213	8
Gwarzo	238083	15	0.032	0.020	1.629	1
Kura	185537	4	0.018	0.015	1.188	10
Madobi	178522	10	0.019	0.015	1.284	4
Minjibir	284748	3	0.028	0.023	1.176	11
Rano	192255	9	0.020	0.016	1.284	5
Rogo	295115	7	0.030	0.024	1.239	7
Tofa	127849	12	0.014	0.011	1.310	3
Tsanyawa	204513	8	0.021	0.017	1.250	6
Warawa	170967	14	0.019	0.014	1.340	2
	2,614.755	95				

ACCESS ROAD

LGA	Population	lenth Road	si/S	ni/N	LQ	Rank
Danbatta	272901	45	0.030	0.022	1.318	6
Doguwa	195326	38	0.019	0.016	1.161	9
Gaya	268939	46	0.030	0.022	1.358	5
Gwarzo	238083	35	0.021	0.020	1.092	10
Kura	185537	30	0.013	0.015	0.865	12
Madobi	178522	49	0.021	0.015	1.457	3
Minjibir	284748	32	0.025	0.023	1.049	11
Rano	192255	40	0.020	0.016	1.266	8
Rogo	295115	43	0.031	0.024	1.293	7
Tofa	127849	50	0.015	0.011	1.471	2
Tsanyawa	204513	47	0.023	0.017	1.380	4
Warawa	170967	60	0.024	0.014	1.683	1
	2,614.755	515				

MODERN ADOPTED ON FARMS

LGA	Population	Modern Equipment	si/S	ni/N	LQ	Rank
Danbatta	272901	10	0.028	0.022	1.248	6
Doguwa	195326	12	0.023	0.016	1.427	5
Gaya	268939	4	0.013	0.022	0.576	11
Gwarzo	238083	6	0.015	0.020	0.781	9
Kura	185537	40	0.048	0.015	3.172	1
Madobi	178522	9	0.018	0.015	1.214	7
Minjibir	284748	2	0.005	0.023	0.218	12
Rano	192255	17	0.036	0.016	2.255	3
Rogo	295115	8	0.025	0.024	1.049	8
Tofa	127849	15	0.018	0.011	1.696	4
Tsanyawa	204513	5	0.010	0.017	0.606	10
Warawa	170967	35	0.033	0.014	2.355	2
	2,614.755	163				

NUMBER OF RESEARCH EXTENSION WORKERS

LGA	Population	Extension Workers	si/S	ni/N	LQ	Rank
Danbatta	272901	16	0.027	0.022	1.183	9
Doguwa	195326	17	0.020	0.016	1.220	8
Gaya	268939	33	0.032	0.022	1.437	2
Gwarzo	238083	13	0.019	0.020	0.956	12
Kura	185537	15	0.018	0.015	1.170	10
Madobi	178522	18	0.018	0.015	1.245	7
Minjibir	284748	19	0.030	0.023	1.283	6
Rano	192255	14	0.017	0.016	1.074	11
Rogo	295115	25	0.034	0.024	1.381	4
Tofa	127849	35	0.017	0.011	1.615	1
Tsanyawa	204513	20	0.023	0.017	1.346	5
Warawa	170967	30	0.020	0.014	1.393	3
	2,614.755	340				

NUMBER OF LIVESTOCK (COW/GOAT)

LGA	Population	Access to livestock	si/S	ni/N	LQ	Rank
Danbatta	272901	54	0.029	0.022	1.305	5
Doguwa	195326	49	0.021	0.016	1.288	7
Gaya	268939	36	0.022	0.022	0.989	12
Gwarzo	238083	51	0.025	0.020	1.296	6
Kura	185537	57	0.020	0.015	1.331	4
Madobi	178522	44	0.019	0.015	1.277	9
Minjibir	284748	42	0.029	0.023	1.250	10
Rano	192255	65	0.022	0.016	1.383	2
Rogo	295115	39	0.030	0.024	1.239	11
Tofa	127849	60	0.014	0.011	1.337	3
Tsanyawa	204513	46	0.021	0.017	1.277	8
Warawa	170967	67	0.020	0.014	1.388	1
	2,614.755	610				

NUMBER OF POULTRY (BIRDS)

LGA	Population	Access to poultry	si/S	ni/N	LQ	Rank
Danbatta	272901	43	0.029	0.022	1.283	7
Doguwa	195326	33	0.019	0.016	1.195	11
Gaya	268939	30	0.023	0.022	1.024	12
Gwarzo	238083	37	0.025	0.020	1.274	9
Kura	185537	48	0.020	0.015	1.308	5
Madobi	178522	40	0.019	0.015	1.281	8
Minjibir	284748	35	0.029	0.023	1.246	10
Rano	192255	50	0.021	0.016	1.335	4
Rogo	295115	45	0.031	0.024	1.297	6
Tofa	127849	59	0.015	0.011	1.387	1
Tsanyawa	204513	53	0.023	0.017	1.347	3
Warawa	170967	55	0.019	0.014	1.365	2
	2,614.755	528				

LIST OF PLATES

Plate I: Shows the evidence of sugarcane farm during the time of questionnaires administration by the researcher in the study area. The photograph was taking during the field work in the study area.

Plate II: To plate 4.3 shows some of the crops for irrigation farming during the time of questionnaires administration by the researcher in the study area.

Plate III: Shows the water used for irrigation farming during the time the time of questionnaires administration by the researcher in the study area. The photograph was taking during the field work in the study area.

Plate IV: Depicting Water used for irrigation River Dudduru

Plate I: Sugarcane farm.

Plate II: Tomato Farm

Plate III: Depicting pepper irrigation in the study area

Plate IV: Depicting Water used for irrigation River Dudduru

Furthermore, the information from fig 5.2 to fig 5.10 is illustrated diagrammatically in a graph showing the factors responsible for the spatial pattern of agricultural development in the study area.