SOCIO- ECONOMIC ANALYSIS OF FACTORS AFFECTIN FARMERS' PARTICIPATION IN LARGE-SCALE IRRIGATION SCHEME MANAGEMENT IN KANO RIVER IRRIGATION PROJECT (KRIP) PHASE 1.

BY

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A THESIS SUBMITTED TO THE POST GRADUATE SCHOOL AHMADU BELLO UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCEINCE IN AGRICULTURAL EXTENSION AND RURAL SOCIOLOGY.

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DECLARATION

I hereby declare that this thesis has been written by me and that it is a record of my own research work. It has not been presented before in any previous application for a higher degree except where references is made to published literature and where assistance is acknowledged.

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CERTIFICATION

This thesis entitled **SOCIO-ECONOMIC ANALYSIS OF FACTORS AFFECTING FARMERS PARTICIPATION IN LARGE-SCALE IRRIGATION SCHEME MANAGEMENT IN KANO RIVER IRRIGATION PROJECT (KRIP) PHASE 1** by Haruna Salisu Kura meets the regulation governing the award of the Degree of Masters of Science in Agricultural Extension and Rural Sociology by Ahmadu Bello University Zaria.

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DEDICATION

This research work is dedicated to my beloved wife Mrs Amina Haruna K. and my son Buhari, and daughters, Saudat, Asma'u, Zainab, Hajara, Maryam and Halima for their prayers, contribution and encouragement, which will be remembered for ever.

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ABSTRACT

This study examined the socio-economic factors affecting farmers' participation in large-scale irrigation scheme management in Kano River Irrigation Project (KRIP) phase1. The objectives of the study were to:

1. describe the socio- economic characteristic of farmers in the study area.
2. identify the extent of farmers awareness of Participatory Irrigation Management (PIM) activities.
3. examine the extent of farmers' participation in the study area.
4. examine the relationship between the socio- economic characteristics of farmers and their level of participation in irrigation management
5. examine the benefits derived from farmers participation in irrigation management.

Farmers (150) from six purposively selected irrigation communities from three local government areas were interviewed during the survey period from October to December 2003. The data collected were analyzed using simple descriptive statistics, Pearson Product Moment correlation coefficient and multiple regression analysis. Results obtained from the analysis showed that the mean age of farmers in Kano River irrigation project phase1 was 42 years. Majority of the respondents could read and write in Ajami (an arabic writing system). The average household size was about 9 members. Most respondents acquired their farm land through inheritance while some farmers purchased. The respondents average farm

size was about 1.5ha. Farmers were found to have 14 years of experience in irrigated

agriculture. They seldom received extension visits and they are aware that irrigation management activities are not the sole responsibilities of the government. Also farmers in the study area were highly participating in farm operation, Water Field Canals (WFCs) and collector drain clearance among the aspects of irrigation management activities. Result of correlation analysis also showed that socio-economic characteristics such as years of experience in irrigated agriculture, awareness of participatory irrigation management activities and extension visits were significantly related to participation in irrigation management activities at 1 percent level, while land ownership patterns and farm size were significantly related to participation in irrigation management at 5 percent level. Multiple regression analysis revealed that these variables have a significant influence on farmers' participation. However age and awareness of Participatory Irrigation Management (PIM) activities made the greatest contribution. The benefits derived from farmers' participation in irrigation management activities included conflict management among themselves, increased productivity, equity in water distribution, among others.

It was recommended that more instruction publication and PIM concept should be made in Ajami. It was also advised that irrigation agencies should put more emphasis on facilitation and mobilization of farmers into social formation for effective and efficient participation in irrigation management activities. Moreover the government should overhaul the irrigation system and enforce law against any form of mismanagement or vandalization of the structures.

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CHAPTER ONE

1.0 INTRODUCTION

Irrigation can be defined as the control of soil moisture for crop production, such control can be done through the application of water to the land when the soil moisture become depleted or through the removal of excess water from the soil surface and crop root zone. The objectives of irrigation were summarized as (i) to permit cropping intensification to achieve higher yield, especially in the semi-arid area; (ii) to reduce the risk of crop failure and (iii) to meet special requirements of certain crops like rice and sugar cane for which though the climate could be suitable but not the natural field soil-moisture regimes (Fatokun and Ogunlana 1992).

The significance of irrigation in agriculture has long been appreciated in the Northern states. The contribution of irrigation as a complementary means of food production cannot be over emphasized. Irrigation provides employment to a great number of rural people during the traditionally idle period of long dry season. Irrigation enhances the potentiality of growing economically important cash crops such as onion, tomato, pepper, maize and wheat during the dry season. Hence, irrigated agriculture is a critical component that can ensure

Nigeria's food self sufficiency (Abubakar, *et al.* 1993). The creation of the River Basin Development Authorities (RBDAs) was a response to some important factors such as the 1972-74 Sudano-Sahelian drought including its adverse demographic, ecological and environmental impacts and the declining Gross Domestic Product (GDP). According to the Third National Development Plan (1975-80) the GDP fell by 18.4 percent in 1971-72 and by 7.3 percent in 1972-73. The fall in the GDP was accompanied by the rapid rise in the price index of food stuff and the relative decline in non-oil exports. The other factor was the abundant "petro-dollar" from Nigeria oil-boom of 1970s. This led to the execution of many projects including large-scale irrigation schemes.

The development of seasonally flooded and floodable plains along major rivers and the depression on low terraces (known as “fadama” land) in the savannah zone of Nigeria for small-scale dry season irrigation farming of sugar cane and vegetables dates back to a distant history. Irrigation was based largely on natural recycling of nutrients through annual silt deposition by flooding river. The flood plain of the Hadejia and one of its main tributaries (River Kano) in the present day Jigawa and Kano States were specially noted for their dry season cultivation before the inception of dams and large-scale (formal) irrigation

(Olofin 1993). The emphasis on large-scale irrigation in Kano is perhaps best illustrated from government plan document where it was envisaged that by the end of 1980 not less than 70,000 ha of land would be under irrigation in the Kano River Basin, the highest figure for any river basin in the country (Faniran 1992).

The involvement of beneficiaries in irrigation scheme management activities which agriculturally is believed to enhance sustainability and productivity is affected by certain factors: such as, use of inappropriate technology, planning based on engineering criteria and neglecting the social and economic implication (Bird, 1985). Also Pradhan (1993), emphasized lack of policy framework for Participatory Irrigation Management (PIM), perceptions of farmers and agency personnel and inadequate logistic support for Water Users Associations (WUAs) affect farmers' participation in irrigation scheme management.

1.1 PROBLEM STATEMENT

Farmers' participation in large-scale irrigation project is the current issue

receiving so much attention and contribution from River Basin Development Authorities (RBDAs), research institutes and Non-Governmental Organizations (NGO's) among others. Inspite of the involvement of these institutions, the participation of farmers in irrigation management is very low. Farmers' involvement has not been very effective because most of the researches carried on farmers' participation and farmer-managed irrigation system are not fully disseminated to and understood by the farmers. It has been observed that lukewarm attitude and wrong perception by the farmers towards system management responsibilities, wrong attitude of WUAs officials and agency personnel have greatly contributed to these problems.

The development and farmers' participation in large-scale irrigation scheme management have received so much criticism that the higher technology involved in large-scale irrigation was not benefiting the farmers (Ogunnika 1986); the planning has been dominated by narrow engineering criteria with insufficient thought to the social and economic implications (Bird, 1985); that the farmers were simply left out of the plan conception, planning and design stages (Kolawole, 1982). Constraint to farmers' participation according to Wallace

(1979) is related to the lack of appropriate institutional framework for farmers participation coupled with advanced and inappropriate technology involved.

With noticeable degree of low beneficiaries involvement in the management of irrigation system, collaborative effort among large-scale irrigation stakeholders should be made to keep the scheme dynamic. The alternative, which is the effective participation of local farmers in relation to water availability, system operation and maintenance and scheduling of water charge collection would be more beneficial.

This study examined the factors affecting farmers participation in irrigation management activities in KRIP phase I. Specifically the study addressed the following research questions related to farmers participation in irrigation scheme management.

1. What are the socio-economic characteristics of the participating farmers in the study area?
2. To what extent are the farmers aware of participatory irrigation management activities?
3. What is the extent of farmers' participation in irrigation

management activities in the study area?

4. What are the relationships between socio-economic characteristics of farmers and their participation in irrigation scheme management?
5. What are the benefits farmers (water users) derived from their participation in irrigation management activities.

1.2 OBJECTIVES OF THE STUDY

The general objective of the study was to identify and examine the factors that are affecting farmers participation in irrigation scheme management. The specific objectives are to:

1. describe the socio-economic characteristics of farmers in the study area.
2. identify the extent of farmers awareness of participatory irrigation management.
3. examine the extent of farmers participation in irrigation management (in the study area).

4. examine the relationships between socio-economic characteristics of farmers and their level of participation.

5. to examine the benefits derived from farmers' participation in irrigation management activities.

1.3 JUSTIFICATION OF THE STUDY

The major task of RBDAs since, is the management of irrigation structure from the head works to the farmers plot, provision of agro-support services and input supply. Following the current severe economic situation in Nigeria the Federal Government decided to disengage itself fully from its utility projects including large-scale irrigation management. Considering the importance of irrigation in the agricultural sector and the lukewarm attitude of farmers toward its management, a lot of researches were conducted to enhance farmers participation in irrigation management.

Study conducted by Owunubi *et al*. (1993) shows that low level of farmers' participation and withdrawal of the Federal Government from direct agricultural production as a result of inadequate funding since 1988 have contributed to the deterioration of irrigation structures and acute low level of performance of irrigation schemes. Owunubi *et al*. further enlisted evidence of low level of farmers' participation as:

i) major deterioration of water conveyance and control structures which resulted in acute shortage of water to the coverage areas.

ii) lukewarm attitude of farmers to take initiatives on organizing themselves to maintain structures around their farms even in the evident obstruction of water flow.

iii) too small water charge of ₦1,500 per hectare per season which farmers perceived to be used for system structures maintenance.

iv) expectation of farmers on system maintenance and agricultural production role by government agencies, even with observable little capacity for these.

The low level of participation by farmers in the management, operation and maintenance of irrigation scheme is the main thrust of this study. This is essentially because experience from other countries like Sri Lanka, Nepal and Philippine indicated that irrigation scheme can be sustainable and productive only when there is full participation of water users in its management (Pradhan 1989). There is a need to identify the farmers socio-economic problems and the extent to

which they participate in comparison with above mentioned countries were irrigation schemes are being handled by cooperatives and with great success.

The result emanating from this study, it is hoped would be useful and serve as guide to water users and irrigation agencies especially KRIP and policy makers for the sustenance of irrigation scheme. It is also the anticipation of the researcher that this study would serve as an important document for researchers in the field of Participatory Irrigation Management (PIM).

CHAPTER TWO
2.0 LITERATURE REVIEW

2.1 SOCIO-ECONOMIC CHARACTERISTICS OF LARGE-SCALE IRRIGATORS

The capitally and technically intensive large-scale irrigation scheme which date back to 70's requires imported components installations, designs and constructions expertise to a more formal system. The River Basin Development Authority (RBDA) is an agency responsible for the operational, maintenance and management of large-scale irrigation projects. Other responsibilities offered by RBDAs include resolving conflict among the farmers resettlement of the affected farmers, rural development programmes and provision of agro-support services such as land preparation, seeds, fertilizers, chemicals and assistance in marketing produce (Ogunwale 1990). Research has shown impressive yield records and profit margin enjoyed by farmers in the project areas. However, there exists evidence of some constraints being faced by farmers. Erhabor (1982) identified such constraints as land tenure, availability of labour, skills generated and developed in a farmers and provision of capital assets and sharing of system management are some aspect that determine the success or failure of irrigation. Abdulsalami *et al*. (1998) revealed that water and labour were being used above

the economic optimum levels while fertilizer was under utilized. They identified the major problems faced by farmers to include inadequate and high cost of inputs especially fertilizer, low price of produce, lack of storage facilities among others. Tarfa (1990) identified socio-economic restraints to irrigation management as farmers technical knowledge, educational level, size of farm holding, operating capital and farm income. The farmer technical knowledge of irrigation management was found to be a determining factors of farmers income, in that literate farmers would have a more ready access to irrigation management knowledge.

Farmers perceived large-scale irrigation projects as a drought relief with high expectation of sustainable provision of agro-support services and overall operation, maintenance and management of the system right from the head works to the field canals (FCs) and farm plots by the government. Ogunwale (1990) observed that farmers in general have no interest in participation of system maintenance or accept responsibilities in system management because they pay their irrigation water charges. The water charges of ₦2,500 per ha per season were normally considered by project farmers as expensive especially in the prevailing inadequate supply of water at the system tail ends and non

performance of the agricultural production support services and role. However, Akinola and Ogunwale (1998) pointed out that one of the fundamental issues needed for development projects, economic growth and livelihood sustainability is social consideration in planning, implementation and execution of Nigeria's Irrigated Agricultural Projects. Pradhan (1992) observed that farmers were found to have wrong attitude toward agency personnel as exploits, corrupt, unco-operative and stubborn.

2.2 PARTICIPATORY IRRIGATION MANAGEMENT (PIM)

Participatory Irrigation Management (PIM) according to Vermillion (1991) normally refers to the involvement of water users as organized Water Users Associations (WUAs) in irrigation management activities along with the government usually represented by agency totally controlled and funded by government). Shared management offers the opportunity to improve farmers control over water supplies which is a powerful incentive for participation in WUAs (Hunt 1990). By taking part in system management activities and entering into binding contracts with the government. According to Ashok *et al*. 1997 WUA have greater influence over the quality of irrigation services.

In Nigeria however, the PIM concept was formally introduced in 1989 through a collaborative effort between IIMI and HJRBDA tried at KRIP Kadawa in a case study of deteriorated irrigated infrastructure, for a period of 4 years (Mourya and Musa, 1993). A similar effort was also tried at Wurno Irrigation Project (WIP) under another collaboration between European Union (EU) and Sokoto Environmental Protection Programme (SEPP). Unlike the former this was the case of rehabilitation irrigation scheme. Functional WUAs were developed and the irrigation agencies reviewed their management styles to accommodate new roles and functions of the farmers.

The adoption of participatory management of irrigation system involves radical transformation in the attitude and behaviour of irrigation agency personnel as well as the farmers. Specifically change in the relationship between farmers and the agency personnel, change in the perception of farmers against agency personnel as corrupt and unwilling to help them. Also understanding the need of users, frequent consultation, discussion and decisions making on the basis of information and interaction with the farmers group as a unit would be of important while adopting participatory irrigation management.

2.2.1 **Types of Irrigation Management**.

According to Kolade (1980), management can be defined as the process of coordinating resources and facilities in a manner which enables attainment of optimum result in the bid to achieve national development. The degree to which this is done effectively determines the level of success. From this definition, it is understood that management does not encompass only the top organizers of the project but also extends to the last man supervising input in the field. It is the complete co-operation between all categories of people concerned that determines the success of an irrigation project. Kaigama and Abraham (1990) stated that irrigation management involves the storage of water, its distribution and delivery to the field as well as drainage.

Nigerian irrigation systems can be broadly categorized into two types based upon management responsibility. The two categories are farmer-managed and agency managed systems. However a third system which recently came into being is the Agency-farmer Joint Management System (AFJMS) (Abubakar, 2001). The three management systems are defined as:

i. **Farmer-managed Irrigation System (FMIS)**

In FMIS, farmers take the responsibility for water acquisition, water

allocation. The farmers own the land and the overall management of the system on a continuous basis. Any external assistance to farmer-managed system is occasional as specific need arises. This is usually found in Nigeria in Fadama Irrigation System.

ii. **Agency-Managed Irrigation System (AMIS)**

In AMIS, government personnel are responsible for the management of the system with varying levels of farmer's participation. These are usually found in the River Basin Development Authorities (RBDA).

iii. **Agency-Farmer-Joint Management System (AFJMS)**

In AFJMS farmers are expected to participate in operation ad maintenance of irrigation system structures as well as distribution of water. While the irrigation projects agencies are responsible for the head works and payment of the agency staff.

It has been found in experience of many countries that the sustainability of irrigation system without appropriate participation of the farmers has been very difficult. There are noticeable decrease in production, deterioration of the

infrastructures and the sense of ownership is also lost in Agency-Managed Irrigation Systems (AMIS).

In AFJMS, the feeling of superior-subordinate between the agency personnel and farmer is to be changed. The agency personnel should change their attitude describing the farmers as obstinate, ignorant, unco-operative and traditional. The agency personnel should take the farmer as an important source of system management. In this context, therefore, the farmer also have to change their attitude of describing the agency personnel as exploiters, corrupt, unco-operative and stubborn. Pradhan (1992) explained that under AFJMS the farmers should take the advantage of the technical knowledge of the agency personnels to be involved or responsible for operation and maintenance. Babura (1993) enlisted certain elements to be taken in order to transform agency management to joint management which are:

i) change in the relationship between the farmer and the agency.

ii) change in the perception of both parties (farmers and agency personnel).

iii) understanding the need in the interest of the farmers (users).

iv) frequent consultation not confrontation with each other.

v) discussions and decisions should be on the basis of information and

interaction with farmers group as a unit not on individual basis.

2.2.2 Need and objectives for farmers' participation in irrigation schemes management activities

Irrigation management activities were categorized as (1) activities related to water use (2) activities related to physical system or control structures and (3) organizational activities. Water use activities relate to the application of water for agricultural purposes. Acquisition, allocation, distribution and drainage consideration are involved. Control structures activities include the design, construction and operation and maintenance of the system for the conveyance of water. Organizational activities encompass decision making, resource mobilization, communication and conflict management (Uphoff, 1986).

A study by Umar (2001) observed that government could no longer shoulder the responsibility of the establishment, operation, maintenance and management of public sector irrigation schemes alone. It has become necessary for irrigation agencies to involve the project farmers in all aspects and at all levels. This involvement of beneficiaries should therefore be from project

planning up to its operation and maintenance as well as management. Lawal, *et al*. (2001), enumerate the objectives of participation in irrigation management as follows:

- To mobilize resources of farmers for improved operation and maintenance of irrigation schemes.
- To enhance financial viability of the farmers and irrigation agencies.
- To share burden of management of project between farmers and government.
- To ensure effective and efficient water management in irrigation project areas.
- To promote sustainability of irrigation projects.

2.3 CONCEPT OF PARTICIPATION

Depending on peoples' personal idiosyncrasies, participation is the involvement of the beneficiaries in any development programmes or projects

right from the decision making, planning, implementation, execution and operation of the projects. PAID (1977) define participation as "a total commitment of both the initiators and the beneficiaries in carrying out a mutually planned project to its completion through the involvement of the participating agencies and recipients, using multi-sectoral approach in which people take part in the decision making". This presupposes prior consultation with the supposed beneficiaries not only to ascertain their "felt need" but also identify their priorities, effective access to the decision making process and equitable access to the productive resources and employment opportunities which allow the rural dwellers to contribute to and benefit from the development process (Kolawole, 1990). He further enlisted participation in three stages of the projects - project selection, project execution and project implementation. At the project selection stage the supposed beneficiaries should be consulted to ascertain their needs and priority to ensure that the supposed project is not at variance with local needs and aspirations. This will also obviously scale down the socio-cultural conflict that are bound to arise from the imposition of the project. A project where supposed beneficiaries are sufficiently consulted have greater chance of success than the one imposed, without bearing to their socio-economic and cultural realities.

Aboubacar (1985) in his study outlined farmer participation in the

following forms:

- **Farmers' Participation in Decision Making**

In principle, farmers involved in any programme of rural development in Niger Republic ought to participate in the process of decision making. This has closely been stipulated in the law 60.28 which specifies the relation of peasants with the government.

According to this law and in the light of decree 69/MER/CGD of October 1969, farmers participate in the process of decision-making through the following channels: plot distribution and allocation committee, council of tenant farmers, Development Cooperatives GMP and Committee of development.

- **Farmers Participation in Implementation**

Adoption studies tend to suggest that peasants, particularly the oldest, hesitate to involve in new activities especially when these new activities are initiated from external sources. In his study Aboubacar (1986) found that at the beginning or initial stage of any agricultural development projects farmer involvement is very low, while after many years of project implementation more farmers (late adopters) tend to be involved. This is attributed to the benefit derived by early adopters.

- **Farmers' participation in evaluation**

Farmers' participation in evaluation is of the most important dimension of

peasant participation in government programmes. It indicates the level of understanding by the peasants of the general procedures at work in the programme. It indicates also peasant concerned problems and highlight their understanding and conception of their rights and duties in the management process of programmes. In addition, it gives indications of their level of satisfaction with the programme and gives feed back which can be used to consider the programme.

2.3.1 **Participation and development**

The idea of development implies change and assumes that a transformation of the economic, social, political and physical aspects of the environment can be brought about so that the people who live within that environment can get improvement in the quality of their lives. If one adopts a mechanistic view one is concerned with increasing the economic wealth available to people for immediate or ultimate satisfaction of their need, with regard to development individuals can be distinguished on the basis of status distribution in them (Awolola, 1981).

Participation and Rural Development: According to Voh (1982), rural development aim at improving the socio cultural, economic and technological conditions of the rural people in their environment and since most rural residents are farmers, the improvement of agriculture through provision of basic infrastructural development and social services become important components of rural development programmes.

In his study, Voh (2002) observed that the top down approach to rural development practiced in Nigeria over the years has failed to bring about much desired sustainable rural development. In an attempt to improve development programme delivery to our rural communities, attention is now being paid to the adoption of participatory and community driven development process. These attempt also led to the adoption of new Rural Development Strategy (RDS) by the Federal Government of Nigeria (FGN) on the basis that participatory approach cater for the need of the communities and the development of capacity at community and local government level, policy dialogue and support for decentralization process, gender balances among others.

Participation and Community Development: Community is defined as class or groups with common interests. The interest and aspiration of rural communities which pertain to their means of livelihood, health, education infrastructures and

natural resource at their disposal still remain largely unfulfilled inspite of the million of Naira spent by the Federal and State Ministries of Agriculture and Rural Development (Olukosi, 2002). According to him, for any community development programmes there is a need not only involving the community in development projects in a bottom up manner but empowering the communities to initiate project based on their felt needs and priorities, planned by themselves, implemented by themselves with outsiders as facilitator and not as dictators. When the community provides the impetus for any development effort, the members can identify proudly with it and say "This is our own". Ownership of the development process by the community makes it sustainable.

Participatory Programme Development (PPD): Participatory programme development (PPD) is the process of working in partnership with communities to develop feasible, desirable and sustainable programmes. PPD uses an approach called Participatory Learning and Action (PLA) which enable community members to:

1. analyse their needs.
2. Identify possible solution to meet those needs and
3. develop, implement, monitor and evaluate a plan of action.

Participation can take many forms within development programmes and some type of participation are more participatory than others. Olukosi (2002) in

Table 1 below presented different form of participation from the least participatory to the most participatory.

Table 1: **The participatory continuum**

Mode of participation	Involvement of Local People	Relationship of research and action to local people.
Co-option	Token representatives are chosen but have no real input or power.	On
Compliance	Tasks are assigned with incentives; outsiders decide agenda and direct the process.	For
Consultation	Local opinions are asked, outsiders analyse and decide on a course of action	For/With
Co-operation	local people work together with outsiders to determine priorities; responsibility remains with outsiders for directing the process	With
Co-learning	Local people and outsiders share their knowledge to create new understanding and work together, plans to form action with outsiders facilitation	With/By
Collective action	Local people set their own agenda and mobilize to carry it out in the absence of outsider initiators and facilitators.	By

Source: Olukosi (2002).

Participation and Agricultural Development: Agricultural development project is a rural development project in which, the increase of agricultural productivity is seen as the most important factor for increasing the satisfaction of rural living, since, without this increase of productivity most rural family income

cannot raise (Mosher, 1972).

According to Kolawole (1992), in agricultural programmes peasant participation requires not only paying adequate compensation for the farm land but also an allocation of alternative farm land to farmers displaced because of such projects. It also requires financial, rural and physical commitment of the beneficiaries to the development programmes. Kolawole concluded that grassroots participation in agricultural development embodies the idea of mutual assistance, joint efforts, social responsibility and communal self reliance.

For Mbiti (1979), grassroots participation in agricultural development programmes requires consulting and involving the local people in the identification of local needs and in the conception, formulation and implementation of any project in order to develop the necessary self-reliance and self-confidence needed among the rural people for accelerated development.

2.3.2 **Participation in Irrigation Management**

The significance of farmer participation in the planning and design of irrigation project is increasingly being acknowledged. Particular importance is the

farmer knowledge which Chambers (1983) described as the most underutilized asset in agricultural development. Chambers and Richards (1985) have wrote on the virtues of local knowledge and advocated its utility in planning and design of irrigation projects while, Lowdermilk (1985) suggested that the use of local knowledge about topography, soil types, depth of soil, location of outlets and information about socio-cultural and political implications of certain actions (projects) should be encouraged. Bamidele (1992) summarized the benefits derivables from genuine participation in irrigation scheme as follows:

- lower cost
- a greater livelihood of user acceptance of the technology
- user care and maintenance of part if not all the responsibility for operation and maintenance.

These according to Bamidele, are the strong arguments for a participative approach to irrigation projects. It is common knowledge that participation is a crucial element in the generation of capabilities of farmers for developing irrigation programmes.

Participation in irrigation management entails a division of labour or functions between the supposed beneficiaries and the management. For example,

while the farmer associations can maintain the distributaries and the water courses, collect the improvement fees and fines, resolve conflicts and also provide extension and farmer training (Lowdermilk, 1986; Patil, 1987), the agency will be responsible for head works. However Kolawole (1990) pointed out that at the present stage of our development, it is inconceivable whether the local farmers will be able to handle extension services and farmer training.

2.3.3 **Constraints to Farmer Participation in Irrigation Management**

Kolawole (1990) described constraints to farmers' participation in the operation, maintenance and management of large-scale irrigation projects in relation to the lack of appropriate institutional framework for participation, and the in appropriate technology involved and the low carrying capacity of the Nigerian irrigation scheme. Wallace (1979) explained that large-scale irrigation project was simply imposed and conceived essentially as a basis of agro technical criteria and without adequate knowledge of all other relevant socio-economic and cultural parameters. Omolokun (1977) described this approach to development as technocratic, economic authoritarian, based on erroneous assumption that technological innovations per-se would sufficiently be attractive

enough as to automatically stimulate effective farmers' participation. Base on this assumption, farmers were simply left out of the plan conception, planning and design stages. They were not sufficiently informed as to why their land was expected to be in the operation and maintenance of project.

In his study Kolawole (1982) pointed out that consultants report merely pushed the issue of farmers involvement aside and consequently have not designed a suitable institutional framework for their participation. Local farmers were therefore conspicuously absent from the organogram of all large-scale irrigation project in the country.

2.3.4 **Factors that facilitate farmer participation in irrigation management.**

Makadhu (1993) in his study pointed out that a two way communication between farmers and government professional officers (Agency personnel) is an important pre-requisite during project design, implementation and operation. The farmer have to be convinced of the importance of his participation before and during project implementation. This is being put forward to the farmers by recognising the importance of their involvement so that whatever scheme is finally put on the ground they would have understood and appreciated why certain decision have to be taken.

The irrigators have to get motivated to participate and the incentives for participation have to be visible, tangible and achievable. This is achieved by taking new irrigators or intending participant to the existing scheme where participation is very effective to see and appreciate the benefits that can be accrued from their involvement in the management of irrigation system. There are certain recommended efforts which according to Baba (1990) RBDA should make to enhance farmers and their families participation in irrigation scheme management which among others are:

a) motivating of farmers into farming association, group farming, societies cooperatives councils etc.

b) ensuring that farmers are involved in decision making process so that they could identify themselves with the aims and objectives of the projects.

c) establishment of education and enlightenment centres.

d) re-orientation and capacity building of agencies staff to adjust to the new arrangement (participatory irrigation management).

e) adequate logistics support for WUA Units for effective programme implementation

2.4 SOCIAL FACTORS AFFECTING FARMERS PARTICIPATION IN LARGE-SCALE IRRIGATION SCHEME MANAGEMENT

Pradhan (1989) in his study reported that physical structures for irrigation made of cement and concrete can be washed away or eroded by land slides and floods but strong irrigation organizations can withstand these forces. To have a strong and sustainable irrigation system, it take more than cement and physical structure. A strong organization is also necessary to assure that the system can remain functional. Research conducted by Maigida (2000) also showed that farmers socio-economic characteristics such as formal education, land ownership, wealth status, the number of associations to which farmers belonged and extension contact were significantly related and affected women farmers participation in Woman in Agriculture (WIA) programme.

Institution is defined as an organization established for specific objectives, such organizations could be private or government owned but they are established to perform specific functions beneficial to its members or public in general. Adewumi (1990), classified institution based on the type of contact made with ultimate beneficiaries of their services. Using this criterion two major institutions were identified; primary and secondary.

Primary institutions are those that have direct contact with ultimate

beneficiaries; RBDAs, community development agencies, extension service agencies, co-operative societies and traditional institutions are example of such institution. RBDA played roles in the operation maintenance and management of irrigation system. Its also involved in the provision of agro-support services and provision of irrigation extension specialists to perform functions such as policy change, training of water users, seminars and workshops and provision of technical information (Ogunnika, 1990). However, the agency personnel perception of farmers as ignorance, conservative, and unco-operative weakened the relationship between farmers and agency personnel thus affecting the users participation.

It has been observed that the none fully organized WUAs coupled with farmers perception of its official, financial and legalization problem, inter-villages rivalries among farmers were identified constraints to effective farmers participation in irrigation management.

2.4.1 **Agencies involved in large-scale irrigation management**

According to Musa (1990) there are three (3) distinct agencies that are involved in the development and management of irrigation. These agencies are: River Basin Development Authorities (RBDAS) engaged in large scale irrigation,

State Ministry of Agriculture and Rural Development Authorities engaged in small-scale irrigation and the Agricultural Development Projects (ADPs) engaged in Fadama and informal irrigation system.

2.4.2 **Role of Water Users Association (WUAs)**

The term water users association refers generally to a group of farmers, usually of one hydraulic unit, command or irrigation district in one formal body for the purpose of managing parts of an irrigation system. The primary objective of establishing WUAs is to achieve optimum utilization of available water through a participatory process that endows farmers with a major role in the management decision over time in their hydraulic unit (Garba 2001).

The role of farmers in irrigation management is continuously changing from that of mere beneficiary to that of a partner, particularly in the area of system operation and maintenance. For farmers to make any meaningful contribution in irrigation management, Garba (2001) pointed out that they have to be organized into self supporting, self regulating, self governing and self sustaining group with all necessary institutional and legal framework, for them to operate under the name of Water User Associations (WUAs). This is imperative for the fact that the types of responsibilities to be assigned to these organizations

are the function of their level of organization, commitment and resource mobilization bases.

2.5 BENEFITS FARMERS' DERIVED FROM PARTICIPATION IN IRRIGATION SCHEME MANAGEMENT ACTIVITIES

The desire of the farmers' involvement in a venture depends on what they can benefit from the system. As Jayewerdene (1984) rightly argued that farmers think first in term of productivity before mobilization for civic responsibilities. Torimiro *et al* (2000) observed that economic status is naturally noted as a highly significant drive for participation in any activity especially if such activity is financially intensive. Social attainment is another derivable benefit from large-scale irrigation project. The social benefit according to Abdullahi *et al*. (1990) refers to the contribution of a development programme to the upliftment of the social life of the entire community in terms of better knowledge, high productivity and increased income.

According to Lawal *et al*. (2001) the benefits derivable from farmer participation in irrigation management include among others the following:

- Assist in operation and maintenance for improved system performance. When farmers are mobilized into associations, they are empowered both

economically and technically to undertake operation and maintenance at certain levels of the schemes.

- The spirit of ownership responsibility, harmonious relationship among farmers and between farmers and the agencies personnel is facilitated.
- It ensures effective and efficient use of water and irrigation structures which in turns increases productivity and income of the farmers.
- The conflict among the farmers will be resolved by themselves.
- It ease the collection of water charges. When Water Users Associations (WUAs) members were assisted by the agency to perform the task.
- Facilitate sourcing of credit, agricultural inputs and marketing of farmers farm produce through their Water Users Association (WUAs).
- It saves the financial and management burdens of the government as a result of farmers' participation in operation and maintenance of irrigation schemes.

2.6 SUMMARY OF LITERATURE REVIEW

Irrigation system management involved the storage, delivery, distribution of water from the course to the farmers farm plot. The management of irrigation is categorized into: Agency Managed Irrigation System (AMIS), Farmer Managed Irrigation System (FMIS) and Agency-Farmer-Joint Management System (AFJMS). In AFJMS farmers are expected to participate in operation and maintenance of system structures as well as distribution of irrigation water while the agency will be responsible for head works. River Basin Development Authorities, State Ministry of Agriculture and Rural Development are the agencies that are involved in the development and management of irrigation in Nigeria.

Depending on people's personal idiosyncrasies participation is the involvement of the beneficiaries in any development programmes or project right from the decision making and planning to implementation, execution and operation of the project. The idea behind the local farmers participation is to permit them to analyse their needs, identify possible solutions to meet those needs, and develop, implement, monitor and evaluate a plan of action.

Participation in irrigation management entails a division of labour or function between the suppose beneficiaries and the management. The objectives of involving the farmer in the management of irrigation are: to share the burden of project management, to mobilize resource of farmer for improved operation and maintenance of irrigation system, to ensure effective and efficient water management as well as enhance sustainability of irrigation project.

Factors affecting farmers' participation in irrigation management in Nigeria are related to lack of institutional framework for farmers' participation, in appropriate technology involved in designing and constructions of irrigation projects, farmers perception of irrigation management responsibilities and unco-operative attitude of agency personnel among others. To facilitate farmers participation in irrigation system management, they must be motivated into forming associations where they can easily be convinced of the importance of their participation. Agency personnel have to adjust the new arrangement for frequent consultation with farmers with their involvement in decision making coupled with due consideration of their need and priorities.

The benefits derivable from farmers participation in irrigation management include socio-economic benefits which comprises of increase productivity,

income, better knowledge for the management of the system, better understanding among farmers and between farmers and the agency personnel which in turn enhance sustainability and uplifting social life.

2.7 THEORETICAL FRAMEWORK

A theoretical framework may be defined as the set of theories, concepts and variables within which the identified problem is established and solved. A theory however, is an explanation of the general principles of an art or science. Social change, modernization, social action and participation are the theories on which this study was based.

Rogers (1995) defined social change as the process through which alteration occurs in the structure and function of a social system. Moore (1963) further summed this up in his definition of social change as the significant alteration of social structures (i.e. patterns of social action and interaction) including consequences and manifestations of such structures embodied in norms (rule of conduct) values and cultural products and symbols. Strauss (1959) stated that the essence of human life is change; development and growth. However, Akpoko (1999), stated that, the process of change involves interaction and so

individual must be understood in terms of the group in which they belong or participate. Adequate definition has been provided by Zaltman (1973) that social change is the term used to describe change in the social and economic life styles and values of peoples' technological innovation and social institutions.

The relevance of social change to this study is the change of Federal Government policy on utility projects including large-scale irrigation projects, as a result of its economic decline. Based on this policy the Federal Government decided on joint management of irrigation projects between farmers and irrigation project agencies to reduce the burdens of its financial expenses. The policy also empowered farmers in the name of Water Users Associations (WUAs) to collect seasonal water charges, resolve conflict among farmers, operate and maintain all the irrigation structures within their sector (Irrigation communities) and take part in decision making. The agencies would be responsible for the operation and maintenance of head works, main canals and payment of the agency staff.

Among the sub-theories of social change is a theory of modernization.

Some authors look at this concept in terms of transformation of culture and of personality of the person involved as it is influenced by culture. In irrigation management, Kolawole (1993) explained modernization as the process of improvement of an existing project to meet enhanced criteria which otherwise is meeting the original criteria. It enhances changes to the physical infrastructure on the operation, management and institutional aspects which are designed to enhance the economic and social benefits of the restoration to originally by designed criteria. Modernization implies development to meet enhanced criteria.

It was assumed that developing countries including Nigeria were using traditional means of irrigation farming at the subsistence level which did not encourage massive production as in commercial production. The modernization approach brought about the inception of large-scale irrigation in the early 1970's which transformed subsistence production to semi-commercial and commercial production of high yielding crop varieties. With the fall of Nigerias' economy, the Federal Government transformed the complete management of large-scale irrigation to shared management between government agency and farmers to enhance sustainability of the system.

Social action theory developed by Talcott Parsons, Max Weber and R.K. Marton is the branch of social behaviorism which deals with the study of individuals and collective dynamic assessment. Bottomore (1972) defines social action as an effort involving two or more members of a social system. In analyzing the socio-economic factors affecting farmers participation in irrigation management interest is centred on co-operative rather than antagonistic social action. The relevance of this theory to farmer participation in irrigation management is the collective efforts which farmers were making through their associations of water users, co-operatives and self help group for the operation and maintenance of the system, procurement of input and marketing outlet of their produce. These would enhance sustainability of the project, increase productivity and better livelihood of the project farmers.

Participation is a total commitment of both the initiators and beneficiaries in carrying out a mutually planned project to its completion through the involvement of the participating agencies and recipients using multi-sectoral approach in which people take part in decision making (PAID, 1977). The perspective of participation which is viewed as an important strategy for involving farmers into the development process of their locality. It is viewed as

voluntary contribution by the farmers to participate in social change programme established to solve their problems. It is also viewed as sensitizing and mobilizing mechanism for farmers to take advantage of development projects to improve their well being and to enhance the sustainability of that project. It is viewed as a way through which farmers are involved in decisions making and control over their resources (Maigida, 2000).

There exist a participation perspective on irrigation management, the Participatory Irrigation Management (PIM) is a concept explaining the situation whereby the farming community actively takes part in the decision making and day to day management activities of irrigation schemes with the government agencies, such as River Basin Development Authorities (RBDAs), Agricultural Development Projects (ADPs), Research Institutes etc. The motives behind the concept of PIM is to correct the hitherto dependency relationship between farmers and project agencies. Based on this concept this study focuses on socio-economic variables affecting farmers' participation in irrigation management. The variables are presented in Fig.1. The independent variables in the model age, wealth status, years of experience in irrigated agriculture, level of formal education, land ownership patterns, farm size, member of associations, awareness on PIM, farmers perception on system management and extension visits had a direct effect on level of farmers participation which was the

dependent variable. The consequences of interaction between the independent and dependent variables which could not be measured statistically were indicated by the broken arrow in the model.

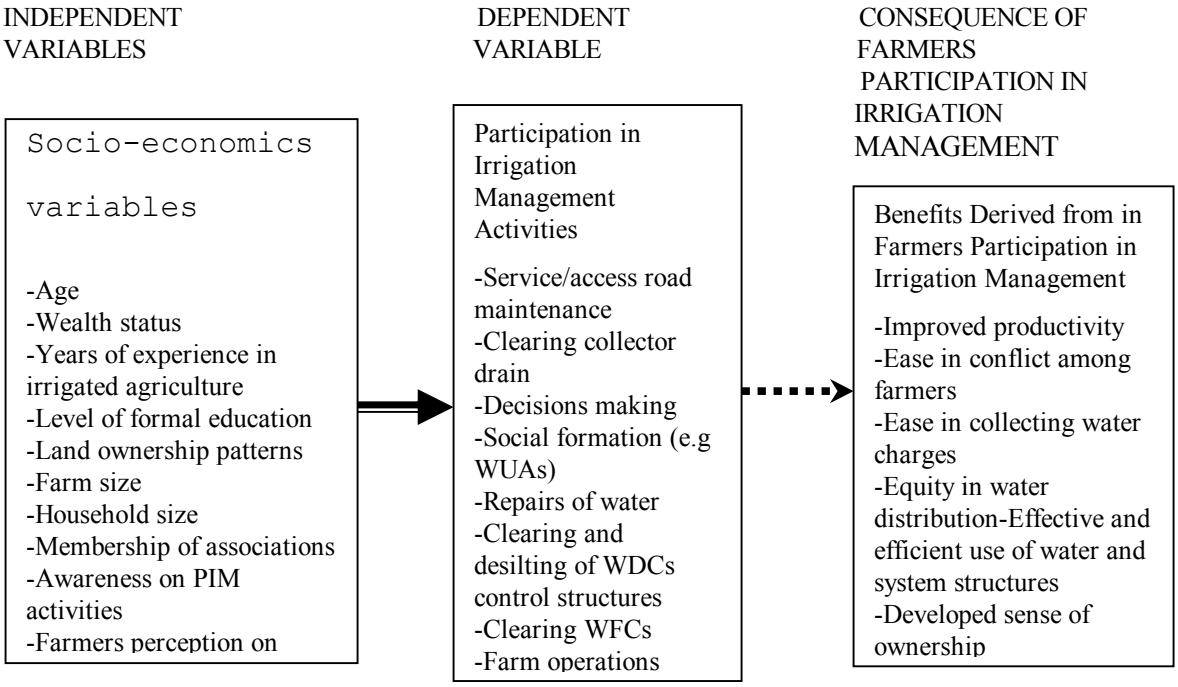


Figure 1: Conceptual Model of Socio-economic Factors Affecting Farmers' Participation in Irrigation Management.

2.8 **HYPOTHESIS**

The null hypothesis developed for this study was that "there is no relationship between socio-economic characteristics of farmers and their participation in irrigation management".

CHAPTER THREE
3.0 METHODOLOGY

3.1 THE STUDY AREA

The study was conducted in Kano River Irrigation Project (KRIP) phase I area (West and East branch canals). The KRIP phase I lies between longitude of 80°30' to 90°40'E and latitude of 11°30' to 12° 03'W in Savannah ecological zone of Nigeria. The project has about 22,000ha developed for gravity irrigation. Presently the dominant crops are tomato, wheat, and maize for dry season and rice for wet season. About 20,960ha (95%) is cultivated during wet season and 16,000ha (73%) is developed for dry season farming. The KRIP phase I is made up of three local government areas namely; Bunkure, Garun Malam and Kura. The project is divided into 29 sectors of varying sizes ranging from 170 to 2,342ha (Owonubi, *et. al*., 1993).

A sector is a single unit and administratively has water management and operations independent of other sectors. Water is released to each sector through a Sector Turn Out (STO) which discharges from the main canal into lateral canals. The lateral canals discharge to branching Water Distributory Canal (WDCs) and finally to the Water

Field Canals (WFCs). Each FC serves about 7 to 20 or more farmers per field. The WFCs are connected to collector drain at their extreme end and each field has a shallow drainage which carry run-off water to the collector drain.

Majority of people in the study area are farmers who traditionally acquired their farm land by inheritance and they adopted irrigated farming as viable option to rainfed agriculture. The predominant Muslim Hausa-Fulani of the study area have their local industries and occupations as: blacksmithing, brick moulding, dyeing, hunting, fishing, tanning and trading.

With regard to participatory irrigation management KRIP,phase I has two advantages:

i) Surface irrigation system was designed throughout the project area. This can easily be managed and operated by farmers.

ii) Almost all the land in the project area belong to the farmers. This is the motivating factor for the farmers to put enough effort to see the system working.

3.2 THE SAMPLING PROCEDURE

The sampling methods used for this study were both purposive and simple

random sampling. Purposive sampling was used in selecting the study sectors irrigation communities). This was done in order to identify sectors across the study area. Simple random sampling technique was used in selecting the farmers for interview.

From the 29 sectors (irrigation communities) that make the KRIP phase I, two (2) irrigation communities were purposively selected from each of the 3 Local Government Areas. These are Bangaza and Agalawa communities from Garun Malam Local Government Area; Agolas IV and Karfi communities from Kura local government area, Lautaye and Shiye communities from Bunkure local government area (*Fig.1 is the map of of Kano State indicating three local government areas of KRIP phase I and sampled irrigation communities*).

The basis for the selection of these sampled communities include the following:

i) The study area is irrigatable and that farmers should be engaged in irrigated agricultural activities; and

ii) To reflect the socio-economic characteristics of KRIP phase I farmers.

Fifteen (15) to thirty-five (35) farmers based on population size were selected using simple random sampling from the selected irrigation communities. The list of farmers was numbered in a piece of paper and the numbers randomly

selected using simple random sampling technique. The wrapped papers were at

Figure 2:

each time of selection thoroughly mixed before selection was done and each time one was selected, was enlisted for interview and thrown out. Thus, out of the estimated farmers population of about 4296 (Land Office and Operation Department HJRBDA September, 2002) a total number of one hundred and fifty (150) farmers were selected for the study. Interview schedules were administered with the assistance of three agency personnel from KRIP Phase I office. In most cases, local language (Hausa) was used by the interviewers for easy understanding by the farmers. Table 2 shows the farmers population in the selected irrigation communities.

Table 2: **Selected irrigation communities (sectors) in KRIP phase I**

S/No.	Sectors (Irrigation Communities)	Population of Irrigation Farmers in a Community (Sectors)	Number of Sampled Farmers	Percentage Sample

1	Agalawa	390	15	10.0
2	Agolas	1028	35	23.3
3	Bangaza	840	25	16.6
4	Karfi	745	25	16.6
5	Lantaye	226	15	10.0
6	Shiye	1007	35	23.3
Total		4296	150	

Source: **Operation Department HJRBDA Sept., 2002**.

3.3 DATA COLLECTION

Primary and secondary data sources were used for collecting the information for this study. To obtain the primary data interview schedule was used to collect information from the farmers' (water users) through the help of HJRBDA personnel at the beginning of 2002/2003 dry season farming. The information collected were on socio-economic characteristics of farmers, institutional factors and farmers' perception on irrigation system management responsibilities.

The secondary data were sourced from Land and Operation Department of the KRIP Phase I Branch Office in Kura local government area and data on Participatory Irrigation Management (PIM) was obtained from records of

NAERLS.

3.4 ANALYTICAL TECHNIQUES

The analytical techniques used or employed in this research were descriptive statistics, Pearson Product Moment correlation analysis and multiple regression analysis.

i) **Descriptive statistics:** This involves the use of frequency distribution tables, percentages, means and ranges. This statistical tool was employed to achieve objectives 1 ((i.e. to describe the socio-economic characteristics of farmers in the study area), objective 2 (i.e. to identify the level of farmers awareness on Participatory Irrigation Management (PIM)), objective 3 (i.e. to examine the extent of farmer participation in irrigation management and objective 5 (i.e. to examine the benefits farmers derived from their participation in irrigation management activities in the study area).

ii. Pearson product moment correlation coefficient was used to determine the relationship between pairs of variables studied and whether the relationship was positive or negative.

iii. The multiple regression analysis was used to analyse the effect of independent variables over the dependent variable. Ninety-nine and ninety five percent levels of probability were used to explain the significance effect of the selected independent variables and the dependent variable.

Pearson correlation and regression analysis were employed to achieve objective 4, to examine the relationship between socio-economic characteristics of farmers and their participation.

The model is specified as follows:

$$Y = A+B_1X_1+B_2X_2+B_3X_3+B_4X_4+B_5X_5+B_6X_6+B_7X_7+B_8X_8+B_9X_9+B_{10}X_{10}+B_{11}X_{11}+u.$$

Y = participation in irrigation management

X_1 = Age (years)

X_2 = Wealth status (Naira)

X_3 = Years of experience in irrigated agriculture (years)

X_4 = Awareness on PIM activities (score)

X_5 = Level of formal education (Number)

X_6 = Land ownership (score)

X_7 = Farm size (ha)

X_8 = Household size (Number)

X_9 = Farmers perception on irrigation system management (score).

X_{10} = Membership of association (Number)

X_{11} = Extension visits (Time)

u = Error term.

3.5 DEFINITIONS AND OPERATIONALIZATION OF VARIABLES

Dependent variable: Farmer participation (Y): This is the dependent variable which represent the farmers involvement in operation and maintenance (O&M) and management of irrigation scheme. Participation can be through self labour, hired labour, family labour and farmers association/self help groups "kungiyar-gayya". The variable was scored according to level of farmer participation which was based on values assigned from less important to the most important elements of participation. Participation in service/access road maintenance=1; participation in clearing collector drains=2; decision-making=3; social formation (e.g. WUAs)=4; monitoring and repairs of Water Control Structures (WCSs)=5; desilting and clearing Water Distributory Canals (WDCs)=6; clearing of Water Field Canals (WFCs)=7; Participation in farm

operation=8; Scores of 1-3 elements represented low participation and scores of 4-7 elements represented high participation.

Independent variables:

i. Age (X_1) - Age is an important determinant of seniority in traditional societies. In Nigeria, the aged and the elderly persons hold a special position of leadership, prestige, and respect among their communities. As such age may play an important role in convincing farmer to effectively participate in irrigation management. In this study age was measured in years of the respondents at the time of study. The respondents were categorized as follows: 21-30years; 31-40 years; 41-50 years and 51 years and above.

ii) Wealth status (X_2) - This refers to landed properties or anything of value of possession of the respondents which included farm plot and house, livestock, economic trees, bicycle, radio, motor cycle and four wheel mobility. To measure this variable, these properties were converted into monetory (Naira) value and were categorized as follows: ₦20,000-N80,000, 80,001-40,000, 140,001 and above. Representing poor, middle, and rich class farmers respectively.

iii) Years of experience in irrigated agriculture (X_3) - This variable explains how long were the farmers engaged in irrigated agriculture. Respondents years of experience in irrigated agriculture were grouped and scored as follows: those respondent having between 1-5 years of experience=1; 6-10 years=2; 11-15years=3; 16-20 years=4; 20 and above =4.

iv) Farmers awareness (X_4) - This variable was defined as the knowledge or realization that the farmers are having in Participatory Irrigation Management (PIM) activities. It was measured by assigning the value of 0 to no opinion, not aware 1; and aware 2.

v) Level of formal education (X_5)- This refers to the type of education acquired through the regular or formal attendance of school and colleges. Level of education was measured by asking the respondents to state the highest type of education they have, whether primary school, secondary school, colleges of education/polytechnic and university. The variable was given a score as follows: those who attend Qur'anic school zero; those who had primary education scored 1; those who had a secondary education scored 2, those who attended polytechnic/colleges of education scored 3, those who had university

education scored 4. The scores on these variables ranged from 0 to 4.

vi) Land ownership ($X_{6)}$ - Land ownership refers to the system through which a farmer acquired the land. The ways in which farmer acquired a farm land include purchased =1, inherited and purchased =2, inheritance =3, inherited, purchased and rented =4, inherited and rented =5, purchased and rented =6, purchased and leased =7, rentage =8, government will and rented =9. To measure this variable a score of 1 to 9 was given base on the autonomous power of ownership, in which an ownership by purchase has more right over the farm plot than ownership by inheritance, lease, rentage and government will.

vii) Farm size (X_7) - This was defined as the farm land cultivated by the respondent during the survey period. Farm size was measured in hectare (Ha). In this study acre was used because both the farmers and agency of KRIP were used to it, which later converted to hectares. The responses was scored as follows: farmers cultivating a piece of land below 0.5ha were given a score of 1; those farmers between 0.5 through 1ha scored=2; those farmers between 2 and above hectares scored=3.

viii) Household size (X_8) - This refers to the total number of people the respondent was feeding and taking care of. It includes wives, children and any other dependent living with respondent were the composition of household. The household size were scored as follows: 1-6 were scored 1, small households 7-12 were scored 2 (medium households) while 13 and above scored 3. (large households).

ix) Farmers' perception on system management (X_9) - this variable explained the farmers' expectation and opinion on who is responsible for management, operation and maintenance of irrigation system. The responses according to the management responsibilities were scored as follows: individual farmer who need water=1, farmers' group contribute money for the system management=2, farmers group labour 3, project authority charge farmers= 4, and project authority carry out maintenance and operation free of charge =5.

x) Membership of farmers association (x_{10}) - This refers to being a member of farmers' association(s) or not. This variable was measured by asking the respondent to state whether he/she belongs to any association(s) or

not. The responses gotten were grouped and scored as follow: those that had no organization has a score of zero, members of one association had a score of 1 point, those that belonged to two associations scored 2 points, those that belonged to three associations scored 3 points and those that belonged to four associations scored 4 points.

xi) Extension visit (X_{11}) - In this study, the variable was defined as how frequent did the respondents get in contact with extension workers. This variable was measured by asking the respondents to state how often has the extension worker visited them in their area to give a talk on how they would effectively participating in irrigation management activities. The responses were given a score as follows:

i. No opinion = 0. ii. Never = 1. iii. Seldom = 2.

iv. Occasional = 3. v. Often = 4.

CHAPTER FOUR

4.0 FINDINGS AND DISCUSSION

4.1.1 Socio-Economic Characteristics of farmers in the study area

The first objective of this study was to identify the socio-economic characteristics of the farmers in Kano River Irrigation Project (KRIP) Phase I. Tables 3 to 13 present data on the socio-economic characteristics of farmers in the study area. These socio-economic characteristics are age, educational level, household, farm size, and ownership, membership in associations, extension visits, awareness of PIM activities, years of experience in irrigation agriculture, wealth status, farmers' perceptions of irrigation scheme management.

Age:

The result shows that about 33% of farmers' in the study area were found to be between 31-40 years of age, 23% between 51 and above, 21-30 years and 41-50 years of age have the same percentage of 22.0% each. The mean age of the respondents was 42 years (Table 3). The finding also shows that more young

people were participating in irrigation farming and management activities of the system structures. The involvement of these categories of farmers may be connected with the knowledge/awareness of irrigation farming and the fact that they are strong and willing to take the responsibility of operation and maintenance exercises.

Table 3: **Distribution of respondents according to their age**

Age	Frequency	Percentage
21-30	33	22.0
31-40	49	32.7
41-50	33	22.0
51 and above	35	23.3
Total	150	100.0

Mean = 42 years.

Educational Level:

The respondents level of education ranged from non formal education (Qur'anic school) to university education. The finding shows that 50.7% of the respondents had Qur'anic education, 12.7% of the respondents posses primary school education, 19.3% secondary education, 10% of the

respondents college of education and polytechnics education and 7.3% of the respondents had university education Table 4. The finding shows that majority (50.7%) of the farmers in the study area could read and write in Ajami (an Arabic writing system) as such instructional materials such as posters, bulletin should be printed in Ajami for the farmers in the study area to read while mobilization, sensitization and facilitation programmes should be broadcast and telecast in Hausa for efficient and effective utilization of resources and farmers participation in irrigation scheme management.

Table 4: **Distribution of farmers according to their educational level**

Educational Level	Frequency	Percentage
Qur'anic school	76	50.7
Primary school	19	12.7
Secondary school	29	19.3
Colleges & polytechnics	15	10.0
University	11	7.3
Total	150	100.0

Household Size:

The respondents household size reflects that 33.6 percent had a household size of 1-6 members, 32.4 percent had a household size of 7-12 members while 34 percent of farmers had a household size of 13 and above the mean household size was 9 members (Table 5). It has been observed that all the categories of household size in the study area were participants in irrigation management activities. However, participation is low. This will never be unconnected with farmers' participation on few aspects of irrigation management activities like farm operation and WFCs clearance and expecting the agency to be responsible for the rest of the irrigation management activities.

Table 5: **Distribution of farmers according to their household size**

Household Size	Frequency	Percentage
1-6	50	33.6
7-12	49	32.9
13 and above	51	34.0
Total	150	100.0

Mean = 9.

Farm Size:

Majority (72.7 percent) of the farmers had a total farm size ranging from 0.5 to 1 hectare of land and very few (2%) of the respondents had 2 or more hectares of land Table 6. The data revealed that there was a considerable problem of land in the study area, which resulted in small farm size holding. This is so because of high population density in the study area. Also, the lukewarm attitudes of farmers toward land degradation issues and its management is connected with this problem of land fragmentation.

Table 6: **Distribution of farmers according to their farm size**

Farm Size	Frequency	Percentage
0-0.4ha	38	25.3
0.5-1ha	109	72.7
2ha and above	3	2.0
Total	150	100.0

Mean = 1.5ha

Land Ownership:

Table 7 indicates that 38.7% of the farmers in the study area acquired their farm land through inheritance, and only 18.7% of the farmers acquired their land through rentage. It was also observed that farmers (16.0%) owned their farm plot through inheritance and purchase while farmers 0.7% acquired theirs through purchase and or leasing. The finding of the study shows that almost all the farmers in the study area acquires their farm land through inheritance or/and purchased. This is the reason behind the participation of the majority of the respondents. Also the finding clears the doubt that lack of participation in other aspect of irrigation management is the resultant effect of tenant presence/domination in the study area, moreover the percentage of tenants in the area that obtain land through rentage, lease or government is very negligible and they don't have a significant effect on participation or non participation on many aspect of irrigation management activities.

Table 7: **Distribution of farmers according to their farm land ownership**

Land Status	Frequency	Percentage

Government will and rent	3	2.0
Rentage	28	18.7
Purchase	6	4.0
Purchased and leased	1	0.7
Purchased and rented	6	4.0
Inheritance	58	38.7
Inheritance and purchased	24	16.0
Inheritance and rented	12	8.0
Inheritance, purchased & rented	12	8.0
Total	150	100.0

Membership of Associations:

Almost two third of the farmers (60.7%) did not belong to any farming group or cooperative association while 12 percent of the respondents belonged to the Water Users Associations (WUAs). This would not be unconnected with lack of farmers' awareness of their significance of being an active member of Water Users Associations (WUAs) for effective implementation of Participatory Irrigation Management (PIM). Very few (2%) of the farmers belong to Water Users Associations (WUAs), Young Farmers Club (YFC), Nigerian Practicing

Farmers Association (NPFA) and co-operative societies. The farmers negative attitude toward social formation is one of the problem that affecting their co-operation and togetherness as such collective action for irrigation management is difficult. Study by Pradhan (1989) revealed that farmers organization in the name of WUAs assist farmers in forwarding their opinion and request to the government, NGOs and donor agencies for emergency situation that needs immediate attention. Considering the result of the study one can easily judge that such kind of assistance will not be easily granted to farmers in the study area.

Table 8: **Distribution of farmers according to their membership of association they belong**

Name of the Association	Frequency	Percentage
None	91	60.7
WUA	18	12.0
WUA and YFC	16	10.7
WUA, YFC and NPFA	22	14.7
WUA, YFC and Co-operatives	3	2.0
Total	150	100.0

Extension Visits:

The result on Table 9 shows that 37.3% of the farmers had not indicate their opinion on whether they were receiving extension visits or not, 22% of the respondents shows that they received extension visit occasionally while 16.7% of the respondents often received extension visits. Only 2.7% of the respondents reported that they had never received extension visits. The study observed that majority of the respondents were receiving extension visit, hence they are aware of participatory irrigation management concept. The more frequent the extension contact with farmers the more information and innovation would be disseminated. However, farmers accept innovations when it is promising.

Table 9: **Distribution of farmers according to the number of extension visits received**

Extension Contact/visits	Frequency	Percentage

No opinion	56	37.3
Never	4	2.7
Seldom	32	21.3
Occasionally	33	22.0
Often	25	16.7
Total	150	100.0

Mean = Seldom

Awareness of PIM Activities:

Some farmers (56%) in the study area were found to be aware that government is handling over most of the irrigation management activities to the farmers. However, farmers (38.7%) were not aware that irrigation management is their responsibilities as indicated in the table below. The farmers awareness realized to have been the reason behind farmers' involvement in different aspect of irrigation management activities. Also farmers awareness is connected to the extension visits the farmers were receiving in the study area.

Table 10: **Distribution of farmers on whether they are aware that HJEBDA handed over most irrigation management activities to the farmers at sector level**

Awareness	Frequency	Percentage
No opinion	8	5.3
No	58	38.7
Yes	84	56.0
Total	150	100.0

Years of Experience in Irrigation Agriculture

With regards to farmers' years of experience in irrigation agriculture, the result on Table 11 shows that 28% of the farmers were found to posses between 16-20 years of experience in irrigated agriculture, farmers 13.3% had 1-5 years of experience. The mean age of the farmers' years of experience is 14.4 years. This shows that majority of the farmers in the study area have above 10 years experience in irrigation farming. Farmers' years of experience in irrigation farming is one of the determinant factor of their participation in different aspect of irrigation management activities. This is so because the more years the farmer spent in irrigation agriculture, the more they acquire skills in irrigation system

maintenance and water use efficiency.

Table 11: **Distribution of farmers according to their years of experience in irrigated agriculture**

Years of Experience	Frequency	Percentage
1-5 Years	20	13.3
6-10 Years	32	21.3
11-15 Years	30	20.0
16-20 Years	42	28.0
21 and above	26	17.3
Total	150	100.0

Mean = 14.4 yrs.

Wealth Status:

Table 12 below present the wealth status of farmers in the study area. It was found that 46 percent of the respondents wealth status ranged from ₦20,000 to ₦80,000 44 percent ranged from ₦140,0001 and above while 10.0% of the respondents are in wealth status of between ₦80,001 to ₦140,000. The items which mostly contributed to the farmers wealth status were farm plot, livestock, houses, motorcycle, bicycle and anything value of possession. The finding

revealed that there are more poor and middle class farmers than rich farmers in the study area. The domination by poor and middle class farmers would not be unconnected with poor marketing output, low saving and farmers low possession of fixed asset such as farm land which majorly constituted to their wealth status.

Table 12: **Distribution of farmers according to their wealth status**

Wealth Status Categories (₦)	Frequency	Percentage
20,000-=80,000	69	46.0
80001- 140,000	15	10.0
140,001 and above	66	44.0
Total	150	100.0

Mean 217,019.23k

Farmers' Perceptions on Irrigation Scheme Management:

Less than half (45%) farmers in the study area perceived that irrigation system management should be the responsibility of the project authority, 25.3% agreed that they would be responsible for system maintenance through farmers group labour while 1.13% perceived system maintenance to be the responsibility

of individual (Table 12). These responses support the finding of Kolawole (1982) and Ogunwale (1990) who reported that farmers perceived irrigation projects as drought relief, social services which government should be responsible for its management.

Table 13: **Distribution of farmers according to should maintain system structures**

Farmers Perception on System Maintenance	Water Control Structures (%)	Water Distributory Canals (%)	Water Field Canals (%)	System Maintenance (%)
- Individual who need water	0	0.7	2.7	1.13
- Farmers group money use	29.3	5.3	14.7	16.4
- Farmers group labour use	4.7	17.3	54.0	25.3
- Project charge farmers	12.0	16.7	6.7	11.8
- Project free of charge	54.0	60.0	22.0	45.3
Total	100	100	100	100.0

In general, farmers in KRIP Phase I are peasants with small land holding with an average farm size of 1.5ha. Majority of them acquired their land through inheritance, about 42 years of age and 14.4 years of experience in irrigated agriculture. Majority can read and write in Ajami (arabic writing system), with

their mean wealth status of ₦217,019:233k. Majority of the respondents do not belong to any farming associations.

4.2.1 Extent of Farmers' Awareness of participatory Irrigation Management Activities.

The second objective of this study was to identify the extent farmers were getting informed on participating in irrigation management activities. Table 14 presents a series of participatory management activities, which farmers in the study area needed to be aware of as their responsibilities.

Table 14 shows that more than half of the respondents in the study area were aware of different aspect of irrigation management activities as their responsibilities. Participation in farm operation took the largest percentage (98.7%) of farmers' awareness. This might not be unconnected with the farmers' being briefed of the government policy not to be responsible for the management of irrigation schemes as it was indicated by its withdrawal from input supply such as tractor, marketing services, seed and fertilizer, among others.

Participation in decision-making recorded the lowest percentage (23.3%) of farmers' awareness. The reason may be the fact that many farmers (about

61%) were not involved in any of the social formation, which serve as the linkage between the authority and the farmers.

Table 14: **Extent of farmers awareness of participatory irrigation management activities**

Irrigation Management Activities	No. of farmers aware (%)	No. of farmers not aware (%)	Total (%)
a. Farm operation	98.7	1.3	100
b. Clearing drainage	50.7	48.7	100
c. Service road maintenance	32.7	66.7	100
d. Social formation (e.g WUA's)	38.7	61.3	100
e. Irrigation management decision making	23.3	76.0	100
f. WUSs maintenance	29.3	70.0	100
g. WFCs clearance	84.0	16.0	100
h. WDCs level desilting & clearance	58.0	41.3	100

4.3 The extent of farmers' participation in irrigation management

The third objective of the study was to examine the extent of farmers' participation in irrigation management activities in the study area. It was found that participation of farmers in these activities went along with their knowledge level or awareness of irrigation management activities considered to be their responsibilities. The highest percentage (94.7%) of the farmers' were participation in all aspect of their farm operation, participation in field canal clearance got 86% of the respondents, about half (50.7%) of the farmers were found to be participating in clearing drainage. Participation in the clearance of Water Field Canals (WFCs) drainage is connected to the proximity of these structures to the farmers' farm plots and when left uncleared will render farmers plot degraded by water logging and leakage. It was found that about 33% of the farmers were participating in clearing and desilting of

Water Distributory Canals (WDCs), about 25% were participating in Water Control Structures (WCSs) and 23% were participating in service road maintenance. The reason for low participation in WDCs' clearance, maintenance of WCSs' and service road maintenance would not be unconnected to the farmers opinion that participation in these structures is beyond their technical and financial capacity hence government project agency should be held responsible. The lowest percentage (14%) of the respondent were reported to be involved in decision making. The reason for farmers' low participation in decision making is related to the agency personnel perception that farmers are not technical and literate enough to be involved in decisions making. It has been observed that there is a closed gap between farmers' participation and awareness level.

This study found that like adoption study conducted by Voh (1979) and Ande (1999), participatory behaviour of the farmers followed close pattern to the

respondents' level of awareness.

Table 15: **Extent of farmers' participation in irrigation management activities in KRIP Phase.**

Irrigation Management Activities	% of participating farmers	% of non participating farmers	Total (%)
a. farm operation	94.7	5.3	100
b. clearing drainage	50.7	49.3	100
c. service road maintenance	23.3	76.7	100
d. social formation (e.g WUAs)	18.7	80.7	100
e. irrigation management decision making	14.0	86.0	100
f. WCSs maintenance	24.7	75.3	100
g. WFCs clearance	86.0	14.0	100
h. WDCs level desilting & clearance	33.3	66.0	100

4.3.1 **Reasons for farmers' participation in irrigation management activities in KRIP Phase I**

Farmers in the study area gave various reasons for participation in irrigation management activities (Table 16). The study revealed that 49.3

percent of the respondents did so because they wanted to irrigate on time, followed by farmers' willingness to participate (32.7%). This study pointed out that many farmers participated in irrigation management activities because of their willingness and interest to irrigate on time. Going by the result of this study, it was observed that WUA's has very little influence over the farmers' participation in irrigation management activities.

Table 16: **Distribution of farmers according to their reason for participation in some irrigation management activities**

Reason for Participation	Frequency	Percentage
Willingness to participate	49	32.7
To irrigate on time	74	49.3
WUAs enforced farmers	12	8.0
HJRBDA enforced farmers	9	6.0
Input invested	6	4.0
Total	150	100

4.3.2 **Farmers reason for not participating in some irrigation management activities.**

Farmers in the study area were reluctant in participating in some irrigation management activities. Table 17 showed that farmers (45%) were not participating because they were not technically and financially capable to do so. About 18.2% farmers did not participate because agency personnel were unco-operative and they were not ready to help farmers for effective participation. The findings further revealed that 16.9% of the respondents were not fully participating because they were not aware of PIM concept, abut 11.3% of the farmers' were not participating well because they were not willing. Small farm land and low level of investment was another reason given by about 10% of the participants.

These findings were in line with Kolawole (1982), Tarfa (1990), Erhabor (1992) and Pradhan (1992), assertioned that operation, maintenance and rehabilitation of irrigation system is beyond farmers technical and financial capacity, non willingness, farmers perception that government should be responsible for system management, small farm land and low level of investment. However, 79 out of 150 (about 53%) did not indicate their opinion.

Table 17: **Distribution of farmers according to their reason for non participation in irrigation management activities**

Reason for not participating in irrigation management activities	Freq.	Percentage (%)
Non willingness	8	11.3
Agency personnel unco-operative	13	18.2
Small farm land and low level of investment	7	9.9
Not aware on PIM concept	12	16.9
Maintenance beyond farmers technical and financial capacities	32	45.0
No reason	79	53.0
Total	150	100

4.4 Relationship between socio-economic characteristics of respondents and their participation in irrigation management activities.

The fourth objective of this study was to determine the relationship between socio-economic characteristics of farmers and their participation in large-scale irrigation scheme management. The result of the Pearson Product Moment correlation analysis in Table 17 and correlation matrix in Appendix II indicated that five (5) variables were significantly related to participation in

irrigation scheme management. These variables are; years of experience in irrigated agriculture, awareness of participatory irrigation management activities, land ownership pattern, farm size and extension visit.

The years of experience (r=0.22), awareness (r=0.53) and extension visit (r=0.29) were positively and significantly related with participation at 1 percent level of significance. Farm size (r=0.21) was strongly and significantly related at 5 percent. Although land ownership pattern (r=0.17) was significant at 5 percent, the relationship was negative. Other variables; age (r=0.016), wealth status (r=0.13), membership in association (r=0.015) level of formal education (r=0.049), household size (r=0.128) and farmers perception in system management (r=0.155) were related with participation in irrigation management, but not significant at 5 percent.

Table 18: **Correlation coefficient of farmers socio-economic variables and participation in irrigation management activities.**

Socio-economic variables	Correlation coefficient

Age	-0.0156
Wealth status	0.0130
Years of experience in irrigated agriculture	0.2152**
Membership in associations	0.0182
Awareness on PIM activities	0.5355**
Level of formal education	0.0487
Land ownership patterns	-0.1742*
Farm size	0.2064*
Extension visit	0.2856**
Household size	0.1278
Farmers perception on system management	-0.1554

* Significant at 5 percent level; ** Significant at 1 percent level

To determine the contribution of independent variables in the participation in irrigation management, a multiple regression analysis was used. Table 18 presents the multiple regression analysis. The result obtained from the analysis showed that five (5) out of the eleven (11) socio-economic variables studied contributed to variation in farmers' participation in irrigation scheme management. These variables are in order of their significance: awareness on irrigation management activities, years of experience in irrigated agriculture, farm size, age and farmers' perception of management responsibilities.

Awareness of participatory irrigation management activities contributed to

participation at 1 percent level of significance. This result indicates that farmers who are aware of system management activities to be their responsibilities participate more in irrigation management. The finding is in line with Ogunnika (1990), Makadho (1993) and Murtala (2001) assertioned that, for effective farmers participation in irrigation management activities, knowledge level through sensitization, mobilization and facilitation programmes for farmers' participation in irrigation management activities are of paramount importance.

Age is second variable found to have influence on farmers' participation in irrigation management at 1 percent level of significance, however, in negative direction. The finding was not in line with the logic of theoretical framework. The possibility of the negative effect might be that majority of the respondents fall between the range of 20-40 years of age who seems to be fairly enlightened and were expecting and relying on project agency to take the responsibility of system Operation and Maintenance (O&M) and management. Taking as granted the little amount of money they pay as water charge, will be enough to manage the system Ogunwale (1990).

Years of experience is the third important variable that significantly influenced farmers' participation at 5 percent level of significance. This study

found that majority of the farmers in the study area have many years of experienced in irrigated agriculture. The significance influence of this variable indicated that experience farmers in irrigated agriculture are technically competent and more committed to management activities than inexperienced farmers. This was in line with the expected result and supports other findings. (Erhabor, 1982 and Tarfa, 1990) which showed that technical skill is determinant factor of farmers' involvement in irrigation farming.

Farm size is the fourth important variable that significantly influenced farmers' participation in irrigation management activities. The farmers size of farm plot was found to be the determinant factor of their willingness to participate, because farmers having a large farm plot seem to have been highly participating in irrigation management activities. The finding support the researchers expectation and in line with Tarfas' (1990) finding.

Farmers' perception of irrigation management responsibilities was the fifth important variable that influenced participation at 5 percent level of significance but in negative direction. This finding was in line with researchers' expectation and the possible explanation for the negative effect might be that farmers perceived large scale irrigation to be a drought relief, social services to be

maintained by the government free of charge as Ogunwale (1990) and Pradham (1992) observed. Farmers' perceived agency personnel as corrupt, unco-operative and not willing to help farmers. These immensely affect participation of the farmers in the study area.

The other variables; wealth status, membership in associations, level of formal education, land ownership pattern, extension visits and household size do not have significant influence on participation in irrigation management activities at either 1 or 5 percent level of probability Table 18. It was hypothesized that there is no significant relationship between socio-economic (personal, institutional and farmers' perception) characteristics of farmers and their participation in irrigation management".

The result obtained from this study indicated that six of the eleven (11) socio-economic variables; (Age, wealth status, membership in association, level of formal education, land ownership patterns, extension visits and household size were not significantly related to farmers participation at either 5 or 1% level. However five (5) variables (Awareness of PIM activities, age, years of experience, farm size and farmers perception) were found to be significantly related to farmers' participation in irrigation scheme management.

The finding of this study therefore rejected

the null hypothesis that "there is no significant relationship between socio-economic characteristics of farmers and their participation in irrigation scheme management". This is in line with theoretical logic developed for this study. The finding is consistent with Maigida (2000) study on women's participation in WIA programme.

Table 19: **Result of Multiple regression analysis on the effect of the socio-economic variables and farmers participation in irrigation management**

Variable	SE	Beta	T-value	Sig T
Age	0.009	0.305	-3.092	0.002**
Wealth status	2.334	0.045	0.582	0.561ns
Years of experience in irrigated agriculture	0.019	0.203	2.111	0.037*
Membership in associations	0.199	0.095	1.374	0.172ns
Awareness on PIM activities	0.051	0.479	6.941	0.000**
Level of formal education	0.076	0.039	0.561	0.571ns
Land ownership patterns	0.271	-0.140	-1.888	0.061ns
Farm size	0.053	0.169	2.070	0.040*
Extension visit	0.0718	0.076	0.984	0.307ns
Household size	0.019	-0.029	-0.298	0.766ns
Farmers perception on system management	0.021	-0.145	-2.013	0.046*

Y =3.135
Multiple R = 0.640
SE = 1.138
F = 8.659
Sig F = 0.0001
Adjusted R^2 = 0.363

* Significance at 5% level of probability
** Significance at 1% level of probability
ns Not significant.

4.5.1 **Benefits derived from farmers' participation in some irrigation scheme management**

The fifth objective of this study was to examine the benefits farmers derived from their participation in irrigation scheme management. The finding shows that the respondents agreed that they derived so many benefits for participanting in irrigation management activities. Majority (68%) of the farmers in the study area agreed that their involvement in irrigation management activities helped in resolving conflict among themselves. Equitable distribution of water was another benefit enjoyed by 62.7% of the respondents, sense of ownership was agreed by (60.7%), improved productivity agreed by 59.3%, and ease of collecting water charge agreed by 50.7% were among the benefits respondent realized from their participation (Table 20).

The finding of this study was in support of Lawal *et al*. (2001) assertion that farmers participation in irrigation management assist in operation and maintenance of the system, inculcate the spirit of ownership among farmers effective and efficient use of water and irrigation structures, ease of conflict resolution and equitable water distribution in the project areas. However, the

finding of this study with regard to input procurement, marketing outlet and improve of economic status indicates that farmers in the study area are not viewing their participation as positive. Some respondents disagree that their participation improved their ability to source input and marketing of farm produce. The reason might be the fact that most of the farmers do not belong to any farming associations, hence input procurement and marketing of farm produce became difficult. The farmers disagreement on improve economic status as one of the benefit derive from farmers participation in irrigation management would be the resultant effect of poor marketing of farm produce high cost of production noticeable in the study area. The finding is not consistent with research expectation and Torimiro (2000) study which observed economic status as highly significant benefits derived from participation in any activity especially if the activity is financially intensive.

Table 20: **Distribution of farmers according to the benefits derived from their participation in irrigation management**

Benefits farmers derived from participation in irrigation management	Agreed (%)	Disagree (%)	No opinion (%)	Total

a. Improved productivity	59.3	19.3	21.4	100
b. Farmers have sense of ownership	60.66	11.3	28.0	100
c. Economic status of farmers are raised	38.7	45.3	16.0	100
d. Ease of conflict resolution among farmers	68.0	28.7	3.3	100
e. Ease of collecting water charges	50.7	39.3	10.0	100
f. Equity in water distribution	62.7	21.3	16.0	100
g. Effective and efficient use of water and system structures	46.7	40.7	12.7	100
h. Improving ability to source of input and marketing farm produce	16.0	62.0	22.0	100

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the findings

The data analysed on socio-economic characteristics of the respondents showed that about 54% of the respondents were of youthful age of 42 years old. More than half (50.7%) of the respondents could read and write in Ajami (Hausa language through arabic writing system), about one third (36.6%) could read in either Hausa or English language. Majority of the respondents (64%) reported farming as their sole occupation. However, one third (36% were found to be practising additional occupations. These additional occupations were civil servant, trading, driving, hand craft and politics. It was observed that the magnitude of representation among the categories of household was too closed. These categories were small household size (33.6%), medium household size 32.4% and large house size 34%. More than two third (72.7%) of the respondents in the study area had a

total farmland size ranging from 0.5 hectare through 1 hectare. They acquired their farmland through inheritance, purchase, rentage, lease and government will.

The findings also revealed that about 61% of the respondents do not belong to any irrigation farming association. WUA membership was determinant factor for effective farmers participation in irrigation management activities. However, it was observed that only12 percent of the respondents were reported as members. Many farmers (60%) were visited by extension agents. However, the average time of extension visit was seldom. The mean years of experience in irrigated agriculture was 14.4 years. The wealth status of 46% of the respondents ranged from ₦20,000 through ₦80,000 while the average wealth status was ₦217,019.23k. Although less than half (45.3%) of the respondents perceived irrigation system to be managed by the project agency, about a quarter of the respondents (25.3%) hold the opinion of managing the irrigation system through farmers group labour.

The level of awareness of the respondents on irrigation management activities was very high, the highest (98.7%) level of awareness is on complete take over of farm operation, and the lowest (23.3%) awareness level of the

farmer knowledge to be involved in decisions making. With regard to participation in all the elements of irrigation management activities. The rate of farmers' participation was to some extent low. However participation in farmer operation took the highest percentage of 94.7%, participation in WFCs clearance was 86%, clearing of drainage is 50.7%, desilting and clearance of WDCs 33.3%, WCSs maintenance 24.7%, membership of WUA 18.7% and participation in decision making 14%.

Majority (74%) of the respondents agreed to participate in irrigation management activities so as to irrigate on time. Although most of the farmers (79%) did not give reasons for non participation in some irrigation management activities, nevertheless some (20.7%) complained that management exercise was beyond technical skill and financial capability of the peasant farmers. About 8.7% of the respondents said that agency personnel were unco-operative while 8% of the respondents were not aware of participatory irrigation management concept. Non-willingness to participation (5.3%) was another reason for non-participation of the respondents in some irrigation management activities.

Correlation analysis for this study revealed that there is a relationship

between all socio-economic characteristics of the respondents and their participation in irrigation scheme management activities. However, five (5) out of eleven (11) variables stated for the study were found to be significantly related to participation in irrigation management. These variables were in order of their significance, awareness on PIM activities, extension visits and years of experience in irrigated agriculture were found to be significant at 1% level. Farm size was significant at 5% level, land ownership pattern though significant at 5% level, the relationship was negative. On the other hand age, wealth status, membership of association, perceptions were not significantly related to participation at either 1 or 5% level of significance.

The regression analysis revealed that five (5) variables awareness on PIM activities, age, years of experience, farm size and farmers perception were found to have a significant contribution in farmers participation in irrigation management activities. Awareness of PIM activities contributed to participation at 1% level of significance, while age contributed to participation at 1% level of probability but in negative direction. Farmers' years of experience in irrigated agriculture and farm size contributed to participation at 5% level of significance while farmers' perception on irrigation system management negatively

contributed to participation at 5% level of significance.

Resolving conflict among farmers (water users) by 68% of the respondents, equitable distribution of water by 62.7%, sense of ownership by 60.7%, increased productivity by 59.3% were identified among the benefits respondent derived from their participation in irrigation management activities.

5.2 CONCLUSION

Based on the findings of this study, it can be concluded that the mean age of the respondents was 42 years old, about half of them could read and write in Ajammi while majority of the respondents do not belong to any social formation. Less than half (forty five percent) farmers in the study area perceived irrigation system management to be the agency responsibility. Majority of the respondents were aware that operation, maintenance and management of the system is not the sole responsibility of the agency. However, less than half of the respondents were found to be highly participating in the irrigation management activities. A number of problems were identified to be the reasons for farmers' low participation in irrigation management activities. These problems were as follows, management activities beyond technical skill and financial capacity of the respondents, agency personnel unco-operative, lack of awareness of PIM concept and farmers non-

willingness to participate. To irrigate on time and willingness were the motivating factors of farmers' participation in irrigation activities (respectively). Correlation analysis revealed that out of the eleven (11) socio-economic variables, only five variables were found to be significantly related with participation in irrigation management. The result of multiple regression analysis showed that awareness on PIM concept, years of experience in irrigated agriculture and farm size were positively and significantly contributed to participation, also age and farmers perception on system management responsibilities contributed to participation in negative direction. The study hypothesized that "there is no significant relationship between socio-economic characteristics of farmers and their participation in irrigation management" However, such was rejected and the alternative hypothesis there is a relationship between socio-economic characteristics of farmers and their participation in irrigation management activities is accepted.

Conflict management among water users (farmers), increased productivity, equitable distribution of water and ease of collecting water charges were among the benefits farmers derived from participation in irrigation scheme management.

5.3 **Recommendations**

Based on the above findings, the following recommendations have been made to enhance effective and efficient farmers participation in irrigation scheme management.

1. It was observed in the study area that majority of the respondents could read and write in Ajami. It is therefore recommended that more instructional publication on PIM concept should be made in Hausa using arabic system of writing (Ajami). Where this seems to be difficult frequent radio broadcast should be used.
2. Participation in farming associations particularly water users association give farmers insight and desire to participate in irrigation management activities. Unfortunately majority of the farmers (60.7%) in the study area did not belong to such organizations, for the fact that farmers were not adequately mobilized to form social groups. Irrigation project agency and other governmental and Non-Governmental Organizations (NGOs) should redouble their effort towards facilitation, sensitizing and mobilizing farmers into Water Users Associations

(WUAs). Not only at the sector (village) level but also down to the branch or block level as water management communities are the vehicles for successful farmers' participation in the management of irrigation system.

3. It has been observed that the influence of water users associations over farmers' participation is very negligible; therefore, the need for orientation and reorientation of WUAs concept to the farmers is very necessary as a vehicle for effective and efficient participation in irrigation management activities.

4. It was also observed that a lot of destruction or deterioration on system structures were made, this made it difficult for the peasant and technically handicaped farmers to rehabilitate. For effective farmers take over, the system should be overhauled by the government and law should be enforced against any body found to be misusing or vandalizing the irrigation structures. It is also advised that KRIP agency must have provisions for resource mobilization to meet the emergency situation that could arise so that the water discharge will never be seized for long throughout the cropping season.

5. Five of the eleven socio-economic variables (years of experience in irrigated agriculture, extension visits, awareness of PIM activities, land ownership pattern and farm size) used in this study were found to be significantly related to farmers' participation in irrigation management activities. Also the variables, age, years of experience, awareness on PIM activities, farm size and farmers' perceptions on irrigation management responsibilities were found to have significant influence over the farmers' participation in irrigation management. It is therefore advised that socio-economic characteristics of the farmers should be given consideration when planning, implementing and executing irrigation projects.

6. The study revealed that a considerable number of farmers perceived irrigation system and structure management as the government responsibilities. In view of this respect, more enlightenment and mobilization campaign should be put in place for the farmers to know about the government policies on utility project responsibilities, cost recovery, sustainability and privatization

among others.

7. Input procurement, poor marketing services and poor economic status were the major problems reported by some of the respondents Observations been made during this study were that many farmers were looking for other occupation as they were experiencing high cost of production and low price of farm produce. To encourage and raise the economic status of the farmers acceptable marketing services should be provided not only in the study area but also in the country as a whole.

5.4 **Suggestion for further studies**

The information contained in this study is believed to be important and useful not only for the implementation of participatory irrigation management in the study area, but also for organizations that are concerned and interested in irrigation scheme management. Kano State is one of the states in the country having the largest area under irrigation and offers various forms of irrigation management such as farmer-managed, agency-farmer-managed and sole-agency irrigation management, but KRIP Phase 1 is not the only area that is affected by

socio-economic factors in farmers' participation in irrigation management activities. It is therefore very important to conduct the same research in different project areas in the state.

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APPENDIX I

SOCIO-ECONOMIC ANALYSIS OF FACTORS AFFECTING FARMERS PARTICIPATION

IN LARGE-SCALE IRRIGATION SCHEME MANAGEMENT: A CASE STUDY OF KANO RIVER IRRIGATION PROJECT (KRIP) PHASE I.

A. **DEMOGRAPHIC CHARACTERISTICS**

1. Name of the respondent_____

2. What is your age _____

3. Did you attend any school?

   a. Yes ( ) b. No ( )

4. If yes, what is the level of your formal education?

   _____

5. Are you married?

   a. Yes ( ) b. No ( )

6. If yes, how many wives do you have? _____

7. Do you have children?

   a. Yes ( ) b. No ( )

8. If yes, how many children do you have? _____

9. Number of dependent relatives: _____

10. Are you a native of the village/town you live presently?

    a. Yes ( ) b. No ( )

11. If no, what are your reasons for living here?

    _____

12. What is your main occupation? _____

13. What is your subsidiary occupation? _____

14. What is your subsidiary occupation? _____

B. FARMING CHARACTERISTICS

15. What are the most important crop(s) you grow on your farm plot in dry season farming?

_____

16. What are the reason(s) for growing such crop(s)?

_____

17. How much did you invest in this cropping season?

_____

18. How much are you expecting? _____

19. When do you normally plant your crop(s) in the dry season farming?

_____

20. State the reason(s) for your specification of planting time.

_____

C. **LAND HOLDING AND LOCATION**

21. Do you own the land?

a. Yes ( ) b. No ( )

22. How did you acquired the land? _____

23. What is the total of all your farm plots (size) _____

24. How many ha did you plan this season? _____

25. How many did you cultivate under irrigation. _____

26. Please indicate the location of your farm plot from the following.

	Top part of the project	Middle of the project	Tail end of the project

a.	Block			
b.	Farm plot			

D. **SOURCE OF INFORMATION AND EXTENSION CONTACT**

27a. Are you aware that HJRBDA handed over most of irrigation management activities at sector level to the farmers.

Yes ( ) No ( ) No opinion ( )

27b. How did you first become aware of the farmer participation in large scale irrigation scheme management? _____

_____

_____

28. Did you have any project extension agent visit you in your area?

a. Yes ( ) b. No ( )

29. If yes, how often do you have a contact with him?

_____

30. Did he give you a talk on how to participate in irrigation scheme management?

a. Yes ( ) b. No ( )

31. If Yes, how often do you really had the opportunity to listen to your extension agent give a talk on the importance and how best to participate in irrigation management?

_____

_____

32. Some farmers hold the opinion that since government withdrew a fertilizer and other input subsidy, an extension worker has no mean of massive gathering of the farmers to give a talk on any innovation.

a. Strongly agree ( ) b. Agree ( )
c. Not agree ( ) d. No opinion ( )

E. **RATE OF FARMERS' PARTICIPATION IN IRRIGATION MANAGEMENT**

33. Do you agree that irrigation farming is profitable?

a. Yes ( ) b. No ( )

34. Do you have access to irrigation water at any time you wish to irrigate your farm plot?

a. Yes ( ) b. No ( )

35. If no what is/are the reason(s) for the water problems.

_____

36. How many years have you been in irrigation farming?_____

37. How do you irrigate your farm land? Please indicate.

a. Using syphontube ( )

b. By pumping machine ( )

c. By cutting the channel embankments ( )

d. By blocking the channel ( )

e. Others specify _____

38. What is the reason for using any of the above?

_____

39. Who did you expect should maintain the water control structures (WCS's) at sector level, Water Distributory Canals (WDCs), and Water Field Canals (WFCs). Please indicate.

	Structures	WCSs	WDCs	WFCs
a)	Project auhthority free of charge	( )	( ) ( )	
b)	Project authority charge farmers	( )	( )	( )
c)	Farmers group labour used	( )	( )	( )
d)	Farmers group money used	( )	( )	( )
e)	Individual who need water	( )	( )	( )

40. To whom do you pay your water fees.

a. HJRBDA agent ( )

b. Block representative ( )

c. WUA's sector representative ( )

d. Court ( )

e. Others specify _____

41. What is/are the reasons for any of the above?

_____

42. Please indicate which of the following irrigation management activities are you aware to be your responsibilities?

	Activity	Aware	Not aware
a)	Participation at farm plot level	( )	( )
b)	Participation at FCs level	( )	( )
c)	Participation in clearing collection drain	( )	( )
d)	Water control structures	( )	( )
e)	Service/access road maintenance	( )	( )
f)	Participation in decision making	( )	( )
g)	Participation at DCs level	( )	( )
h)	Participation in WUAs	( )	( )
i)	Others (specify)	( )	( )

43. Please indicate which of the following irrigation management activities are you participating?

	Activity	Participating	Not participating
a)	Participation at farm plot level	( )	( )
b)	Participation at FCs level	( )	( )
c)	Participation in clearing collection drain	( )	( )
d)	Water control structures	( )	( )
e)	Service/access road maintenance	( )	( )
f)	Participation in decision making	( )	( )

g) Participation at DCs level ( ) ( )

h) Participation in WUAs ( ) ( )

i) Others (specify) _____

44. If you are participating in any of the above activities, indicate your reason.

a. Willingness to participate ( )

b. To irrigate at the right time ( )

c. Farmers/water users association forced it on us ( )

d. KRIP personnel forced it on use ( )

e. More input invested ( )

f. Others specify ( )

45. If you are not participating in any of the above activities please indicate your reasons?

a. Non willingness ( )

b. Agency personnels are not ready to help farmer ( )

c. Small farm land/low input invested ( )

d. Lack of awareness ( )

e. Farming is a subsidiary occupation ( )

f. Others specify_____

46. What do you think will enhance farmers' participation in irrigation Management activities?

_____

_____

47. Are you willing to continue to participate in irrigation scheme management?

a. Yes ( ) b. No ( )

48. If Yes, what are your reasons for your willingness?

_____

_____

49. If, No, what are your reasons for non-willingness to participate?

_____

_____

50. How did you participate in irrigation scheme management?

a. Self labour ( )

b. Family labour ( )

c. Hired labour ( )

d. Community labour ( )

51. What problem(s) do you face while participating in irrigation scheme management activities.

F. FARMERS' MEMBERSHIP OF ASSOCIATIONS AND INSTITUTIONAL ROLES

52. Are you a member of any farming associations?

a. Yes ( ) b. No ( )

53a. If Yes, which association do you belong to?_____

53b. Does your association gives you a full membership right?

a. Yes ( ) b. No ( ) c. No opinion ( )

54. What are the institutional factors militating against farmers' participation in irrigaton management activities.

_____

_____

55. What are the institutional factors facilitating farmers participation.

_____

_____

56. Please indicate what roles do any association(s) you belong to HJRBDA/KRIP agency plays on farmer participation in irrigation management.

	Roles to play	WUA's/ Farmers Association	HJRBDA/ KRIP Agency
a.	Enlighting farmers	( )	( )
b.	Enforce law against structures vandalizers	( )	( )
c.	Enforce law against water fees defaulters	( )	( )
d.	Help farmers to obtain input subsidy	( )	( )
e.	Conflict resolution on water distribution	( )	( )
f.	Train farmers on how to maintain WFCs & WDCs	( )	( )
g.	Capacity building programme	( )	( )
h.	Others specify	( )	( )

G. BENEFITS DERIVED FROM FARMERS' PARTICIPATION IN IRRIGATION SCHEME MANAGEMENT

57. Please indicate among the following benefits you agreed or disagreed farmers' derived from participation in irrigation management activities.

Benefits derived by farmers	Agreed	Not agreed	No opinion

a.	Improve productivity	( )	( )	( )
b.	Sense of ownership	( )	( )	( )
c.	Raised in farmers economic status	( )	( )	( )
d.	Ease of conflict resolution among farmers	( )	( )	( )
e.	Ease of collecting water charges	( )	( )	( )
f.	Equity in water distribution	( )	( )	( )
g.	Effective and efficient use of water and system structure	( )	( )	( )
h.	Improve ability to source of agricultural input and marketing farm produce	( )	( )	( )

58. Assuming the farmers were to be trained to effectively participate in irrigation scheme management by an institution, what do you think is the degree of necessity or priority of training required in each of the following activities?

Activities		Degree of Necessity			
		VN	N	UN	V. UN
a.	Service road maintenance				
b.	Enlighting the farmers				
c.	Conflict resolution				
d.	Monitoring the water control instrument/structures				
e.	Maintaining farm ditches/others canals.				
f.	Deciding on the amount of water entering a farmers plot				
g.	Draining excess water from the farmer's plots				
h.	Deciding on the amount of money the farmer should pay as irrigation fees.				
i.	Collecting the irrigation fee from the farmers				
j.	Deciding on the type of crop to be planted by farmers				
k.	Others specify				

* Check appropriately as below:
VN = Very necessary; N=Necessary; UN=Unnecessary; V.UN=Very unnecessary

Thank you:

APPENDIX II

Correlation matrix showing the relationship between variables

Variables	Y	X1	X2	X3	X4	X5	X6	X7	X8
Y	1.000								
X1	-0.0156	1.000							
X2	0.1301	0.2768**	1.000						
X3	0.2151**	0.6021	0.0595	1.000					
X4	0.0182	-0.1094	-0.0959	-0.1267	1.000				
X5	0.5355**	0.1611*	0.0980	0.2573**	-0.0361	1.000			
X6	0.0481	-0.2105**	0.0285	-0.2804**	-0.0494	-0.0373	1.000		
X7	-0.1742*	-0.2364	-0.1318	-0.3429**	0.0987	-0.0605	0.0494	1.000	
X8	0.2064*	0.3857**	0.4600**	0.2209**	-0.1250	0.1093	-0.0039	-0.2064*	1.00
X9	0.2856**	0.0349	0.1969*	0.2404**	-0.2932	0.2018*	0.0514	-0.1924*	0.20
X10	0.1278	0.6441**	0.3672**	0.5198**	-0.1098	0.1820	-0.0515	-0.2783**	0.49
X11	-0.1554	-0.0955	-0.0984	-0.0984	0.0464	-0.0450	-0.1442	-0.2013*	-0.1