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RESEARCH ARTICLE

An Assessment of the Socio- Economic Status of Rice Farmers in Mwea Irrigation Scheme

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Abstract

In 1998 the farmers of Mwea Irrigation Scheme failed to deliver their crops to the National Irrigation Board (NIB) and stopped utilizing all government systems relating to the management of the scheme effectively putting an end to nearly 60 years of government control over the scheme *(National Irrigation Board website, 2009)*. Kenya is currently going through a food crisis and it is important that areas that have potential to produce more be fully utilized. The scheme has potential and since the change over the farmers and farming methods changed. This report is an assessment of the socio-economic status of the rice farmers today. The aim of the study was to review the current status of the rice farmers ten years after breaking away from direct government control. The specific objectives included establishing the current costs of production, rice yields per acreage, current prices, markets and the challenges facing the farmers. Data was gathered through a primary data collection using questionnaires, individual interviews, discussions, observations and literature review for data validation. The data was analyzed through sorting, calculating percentages, calculating and comparing means, condensing information from key farmers and key informants. The researcher concluded that the farmers are faced with high costs of production, lower yields, higher prices for the rice produce, varied markets, over reliance on rice incomes, high household expenses and poor infrastructure in the farming region. The report recommends that, in order to improve farming methods, yields and fully utilize the potential of the scheme, the government need to provide the farmers with assistance in infrastructure maintenance in the farming area, extension services, resolve land ownership issue and research in diseases. The farmers' would require self reorganization, its recommended that forming of an effective cooperative society would solve most of their challenges by improving bargaining power in purchasing inputs, providing credit facilities and marketing of the rice produce. Building a dam to create a water reservoir would enhance water storage, reduce shortages and streamline rice seasons. This report will be of use to stakeholders, policy makers, academicians, researchers and anyone who will in future be interested in the scheme

Introduction

Background

Mwea Irrigation Scheme was established in 1958 as a resettlement scheme with the primary objective of resettling the landless and ex-detainees during the independence struggle. It is situated in Kirinyaga district, in Central province of Kenya about 100 kilometers from Nairobi. The scheme has a gazetted area of 30,350 acres, of which16, 000 acres are used for rice production and rest of the scheme is used for settlement, public utilities, subsistence and horticultural crops farming. The scheme is served by two main rivers Nyamindi and Thiba rivers. It has about 3000 farmers each working on an average of 4 acres piece of land [1].

The scheme was managed by the government through the National Irrigation board (NIB) until 1998. Land tenure was on tenancy basis where the NIB was the landlord and the farmers were the tenants. The landlord provided inputs, infrastructure, machinery and extension services while the tenant gave labor services at a cost determined by the landlord. The government had an elaborate structure and systems all the way from farming activities management, water management, financing arrangements, storage, processing and marketing. At the end of the harvest, each tenant surrendered the entire crop to NIB and was provided with twelve sacks of unprocessed grain for their annual consumption. With no other income, the twelve sacks were the total benefit the farmers received annually and this was expected to meet all their basic needs. Initially the tenants started as singles but they eventually started families and the twelve sacks were no longer sufficient for feeding the families.

This resulted in families starving[1], malnutrition and poverty says a former tenant [2].

The rice mills were jointly owned between the farmers and the government through their cooperative society Mwea Farmers Multipurpose Cooperative Society (MFMCS)[2] However the marketing of the refined grain was done by the government.

There were many restrictive practices for example, tenants were not allowed to keep livestock, children were required to vacate the scheme when they attained 18years of age, during harvest period visitors were required to obtain permits to enter the scheme and this was ensured through barriers manned by administration police [3].The harvest season was a tense period with tenants working hard to take as much rice to their home stores as possible. However this could only come about from bribing administrative police to allow them take home more than the twelve bags. In some instances, there were searches for crop in the farmers' houses which if found were seized and taken to the NIB stores. This was the height of humiliation for these tenants say Githuku a former tenant.Some of these restrictive practices are still in force as per attached license of Ndegwa Githinji (See Appendix 2).

In the early 1990s signs of distress started to emerge culminating in 1996, at the expiry of the previous tenancy agreement, the tenants refused to sign new tenancy agreements and there were violent confrontations between the government forces and the tenants. First, on June 4 1996, Hon Martha Karua and three others representing over 3,000 farmers at Mwea (almost 100% of farm families), rejected new tenancy agreements from their bosses at the government-run National Irrigation Board (Daily Nation, 1996). The group claimed that Mwea farmers do not accept to be tenants anymore and had a right to own the land. They ridiculed the new agreement's terms which required farmers to deliver all rice, with the exception of a much reduced quantity of some ten bags per year, to the Irrigation Board. There were subsequent threats of eviction, but the tenants held firm in their claim to the land. Already a parallel market was developing in which tenants failed to deliver crop to NIB[3] and sold it instead in the local markets. On 14 July 1996, some 300 women shouted and ululated at government officers who called in police to break up a rally held by opposition politicians in a sports stadium in Mwea. Women farmers crossed the road to a building site and gathered stones in their skirts and dumped them on the playing field. Young men hurled the stones at police [4]. The insurgents drew media attention to their demands for titles deeds and payment arrears. Eventually in 1998, the farmers failed to deliver their harvest to the NIB stores and instead delivered it to their cooperative society (See footnote 2). Unfortunately, the farmers' cooperative had neither the resources nor the capacity to undertake all the work required to run the Scheme effectively [5].

Since then, Mwea has changed, there also emerged 'out of scheme' rice cultivation in stream and river valley bottoms which were formerly infested with reeds and papyrus vegetation. Prior to the farmer protests, rice growing outside the scheme was illegal as per NIB by laws [6], Growing of rice in these niches marked the beginning of '*jua kali*"or "informal" rice system that directly benefited farmers outside the scheme. There are reports of crop diseases attacking the rice fields, pointing to reduced production and shortage. Farmers say production per acre has gone down to 10 bags compared to the average 25 bags [7]. This is mostly due to poor farming methods, increased diseases, poor quality seeds, losses incurred during harvesting in transporting, drying of paddy, storage and milling losses through the single pass mills [8]. The NIB had a systematic and elaborate farming systems and structures that ensured higher yields and higher quality rice. Their mode of operation was technically sound and professional ensuring land preparation was done properly, in good time, quality inputs were used and applied at the right time, extension services were available and enforced when necessary and finally they had state of the art rice mills which produced high quality rice.

Maintaining the premise that the farmers boycott has had a profound positive impact in the lives of

[1] According to former tenants interviewed people actually died of starvation in 1980 (Kariuki, 2009).

[2] Mwea Farmers Multipurpose Cooperative Society – This cooperative was established by farmers to deal with non-rice farming matters, particularly the granting loans for education, medical and development.

[3] Former President Daniel Arap Moi had tired to address the plight of the tenants in 1990 through a road side declaration at Thiba section where he declared all farmers be issued with title deeds and own the land. NIB reacted by issuing licenses (appendix 2) and failed to inform the tenants of this development narrates a former tenant Githuku.

farmers, it is worth noting that the economic potential for the scheme is largely unrealized. In view of the current global food crisis, areas that are productive should be fully utilized and Mwea is one of the areas which can significantly boost food production if its potential is fully utilized.

Statement of the Problem

Amid increased global food crisis and an estimated 10 million people facing starving in Kenya population among other socio economic problems, Kenyans today have renewed their focus on utilization of food baskets and arable land in Kenya. Rice is believed to be the third most important grain after maize and wheat, and as the economy grows, the consumption has gone up [7] Mwea Irrigation scheme produces a large proportion of the rice produced in Kenya. After the exit of NIB in 1998, a casual observation denotes several changes including increased infrastructure, increased population, more financial institutions and more permanent houses among other social economic indicators. However, the author holds the premise that this area can do better than this and contribute more nationally and locally for the benefit of all the stake holders.

This study investigated the socio economic status of the rice farmers and strive to understand the issues that the farmers are faced with today. The results could become a starting point for those interested in helping the farmers improve their farming management for greater yields. The research will possibly come up with practical suggestions on the way forward to improve on rice farming management which will in return lead to increased incomes and the subsequent improvement of standards of living in the scheme.

Objectives

Main Objective

To assess the current socio economic status of the rice farmers in Mwea irrigation scheme.

Specific Objectives

- To identify the current production costs per acre.
- To establish the current rice yields per acre.
- To identify the rice markets and marketing channels.
- To identify the prices and pricing methods.
- To establish farm household incomes and expenditures.
- To identify current challenges facing the farmers.

Conceptual Frame Work

The study involves an appraisal of the socio economic status of the Mwea rice farmers today. It takes into consideration the farming costs, the sales and the farmers' incomes and expenditures. Problem identification and analysis have been done through intensive literature search, observations and interviews with relevant persons. The study will then embark on a solution search for the problem.

This is illustrated in the following model **1**

The two way arrows reflect the fact that all these factors are interrelated such that farming management affects the costs, prices, the farmers' incomes and expenditures and the standards of living.

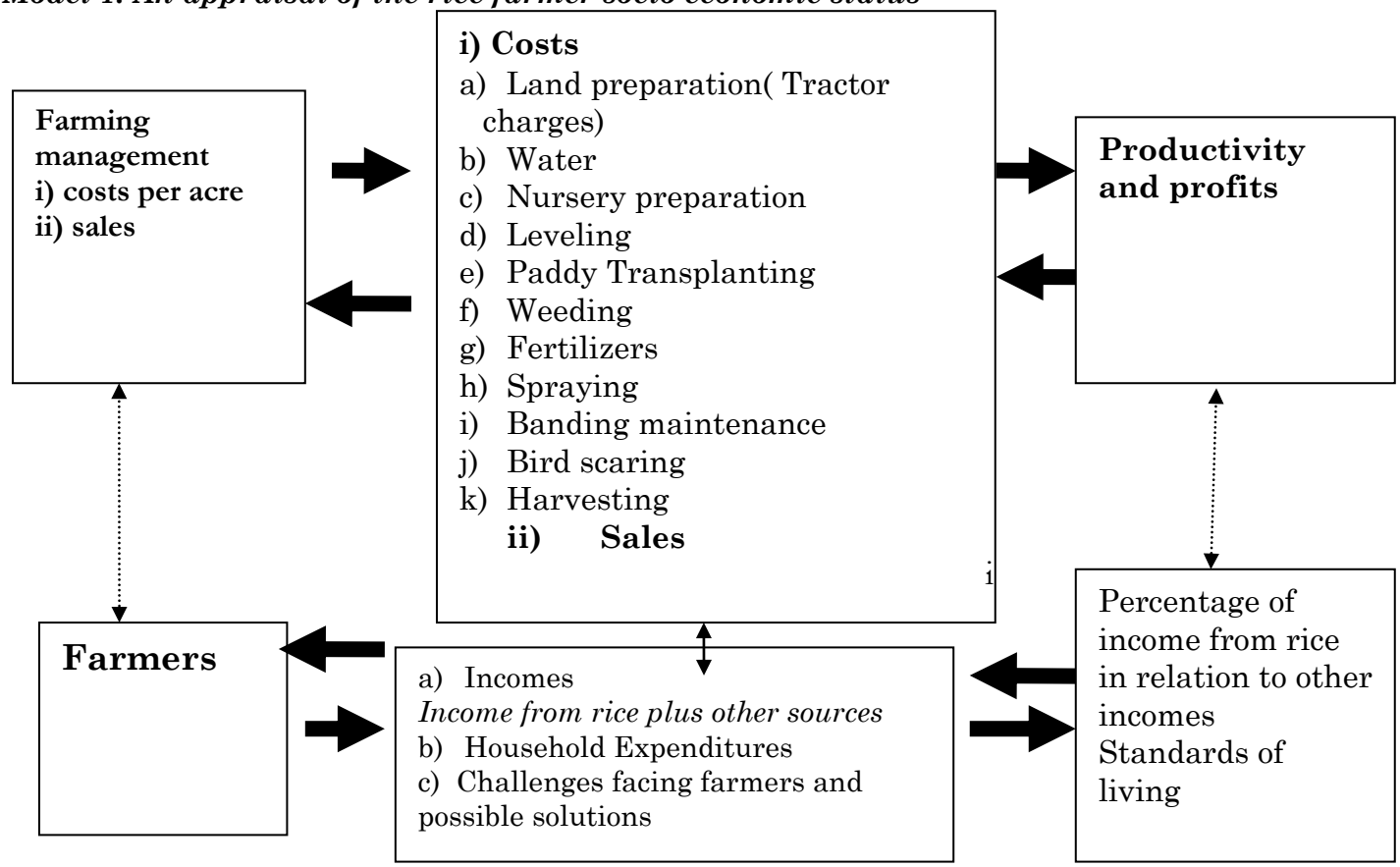
The goals and objectives are taken into account and the expected outputs of the study will be an appraisal of the socio-economic status of the rice farmer today. These will be accomplished through primary data collection, literature search, and individual interviews with Key informants.

Justification of the Study

Since the farmers' takeover of the rice farming, the social economic life in Mwea has definitely changed mainly for the better. There is noticeable freedom in the entire management of rice farming, increased availability of financial services, increased permanent houses and a lot of business activities, more new comers from other areas show that it has become attractive to investors. However there are challenges in coordination of common resources such as water, research and marketing which have had a negative impact on yields and prices. Farming methods have also deteriorated although the incomes have increased largely because a large percentage of the money previously paid to the NIB now goes to the farmers. Still rice farming and social economic life in Mwea is far from recording a level of improvement that is commensurate with the area's potential.

Previously, NIB had systematic and elaborate farming systems and structures that ensured higher yields and higher quality rice. Their mode of operation was technically sound and professional ensuring land preparation was done properly, in good time, quality inputs were used and applied at the right time, extension services were available and enforced when necessary and finally they had state of the art rice mills which produced high quality rice. The situation today is characterized by poor farming methods, increased diseases, poor quality seeds, losses incurred during harvesting in transporting, drying of

Model 1: An appraisal of the rice farmer socio economic status



Source: Ndegwa 2009

paddy, storage and milling losses through the single pass mills [8].

There are numerous studies done in Mwea as an irrigation scheme on issues such as water usage, water borne diseases like Malaria, food security, agribusiness among other issues. Specifically, a previous research by Egerton University (2002)[4] failed to address the way forward for the scheme in terms of better management in the absence of the National Irrigation Board. The nature of the scheme requires that farmers work together for the survival of rice farming and for individual farmers to reap maximum benefits. The farmers need a direction and initial hand holding so as to understand and appreciate the need to work together and how to deal with or overcome the complex situation that threatens their livelihoods and the social fabric that existed before. An understanding of the current status of the farmers would be of benefit to the farmers and other stakeholders including financial institutions, policy makers, non-governmental organizations, researchers and other scholars, and could be used as a yard stick or point of reference.

Limitations

The limitations included:

- Funding of the proposal was limited to private funds.
- The data collection involved using different methods of data collection including individual interviews with opinion leaders who may not be available most of the time.
- There was limited time to carry out the study.

Definition of Terms

Jua Kali: These are rice farms outside the scheme which have been constructed after the exit of NIB.

Tenant: These were the farmers who were leased land by NIB, farmed under the guidance of NIB and delivered the crop to NIB

0Literature Review

Mwea Irrigation Scheme is situated in Kirinyaga district, in Central province of Kenya. The Scheme is about 100 Km South East of Nairobi. Farming in the scheme started in 1956 and rice has been the predominant crop. The scheme has a gazetted area of 30,350 acres, a total of 16,000 acres has been developed for paddy production and the rest of the scheme is used for settlement,

[4] Nguyo (2002) Carried out a research, 'the case of Mwea on Alleviating Poverty andFood Insecurity', The research focused on assessing the impacts of the irrigation scheme on the welfare of tenant farmers and find out if these farmers better off than their counter parts whodo not participate in the scheme?

public utilities, subsistence and horticultural crops farming [1].

The scheme is served by two main rivers, Nyamindi and Thiba Rivers. Irrigation water is abstracted from the rivers by gravity through the help of fixed intake gates, conveyed and distributed in the scheme via open channels. There is a link canal joining the two rivers which transfers water from Nyamindi to Thiba River which serves about 80% of the scheme [1].

Historical Perspective

The Mwea Irrigation Scheme was established in the 1958 as a resettlement scheme with the primary objective of resettling the landless and ex-detainees during the independence struggle. Until 1998 when the NIB exited, the scheme was managed through a bilateral arrangement that had a farmer's cooperative on one hand and the government on the other, working together.

In 1998, the rice farmers who are about 3,000 protested against the National Irrigation Board (NIB), a government body charged with the responsibility of overseeing the farm management, processing and marketing of rice in Kenya. They took over the rice industry and assumed the responsibility of growing and marketing their own rice. The farmers' grievances narrated by Mwaniki [9] a former tenant included:

- Forced labor at minimal rates. Those whose allocated rice fields were not worked on would face withdrawal of their tenancy status and the fields transferred to other tenants.
- Slave master type of experience where water guards and irrigation officers' criss-crossed the rice fields supervising the farmers.
- The farmers were not allowed to keep cattle or even chicken without the authority of the NIB management
- Outdated, oppressive and discriminative colonial age legal system that dictated that women in the scheme, including the widowed cannot own land and once a child reaches 18 years of age, they were expected to leave the scheme
- Farmers had to pay for the recurrent expenditures of the NIB through forced deductions from the income of the rice produce.
- The farmers were not represented in the management of the scheme and were kept un informed on government policies, paddy prices or any decision that affected them.
- Farmers co owned the estimated five million-shilling rice mills with the NIB through their cooperative, yet the farmers never received dividends for the last five years prior to the takeover of rice management. In January 2000, an attempt to take over the mills as well, were reportedly stopped by armed police.
- Farmers were promised title deeds, a promise that was used to woo their votes each election year and were never affected; today they have licenses on their previous land holdings which still have restrictions as per shown in Appendix 2.

Initially, management of the scheme was taken over by Mwea Rice Growers Cooperative Society (MRGCS)[5]. However, the farmers realized that they could not go it alone due to:

- Unskilled personnel
- Lack of finance
- Lack of machinery for scheme maintenance.
- Self interests and corruption (Source: NIB Website)

During this brief period when the scheme was run by the cooperative, the infrastructure deteriorated.

Current Status in the Scheme

The scheme is being run by National Irrigation Board (NIB), and the farmers run Water Users Association (WUA). NIB is responsible of all the main infrastructure, water management in the main and secondary canals, drawing up the cropping program and land administration in the scheme. WUA is responsible of water management in the tertiary unit, facility maintenance in the tertiary units except roads and farmers' other payments. Marketing of rice is open for farmers to decide where to sell and the National Cereal and Produce Board (NCPB) is currently the main buyer. A bulk of the rice is sold to middlemen who supply to local markets like Gikomba in Nairobi, Wakulima market and other local authorities markets all over the country. At the moment farmers do not have a stable credit provider since the farmer's savings and credit society collapsed. Farmers in the meantime are making do with commercial banks and microfinance institutions where terms and conditions for loans are much worse that those offered during the era of the cooperative society. The farmers are using small single pass mills,

[5] Mwea Rice Growers Cooperative Society was established to support farmers by supplying farm inputs; the cooperative worked together with NIB and supplied all farm inputs which were later paid from the farmers' income directly from the NIB.

which can hardly separate broken grain from whole, making the quality of their rice low hence less competitive in the market. Land is now licensed to the farmers from year to year and these licenses can be revoked if farmers failed to adhere to rules as shown in Appendix 2. In 2003, the farmers approached the government for assistance in the schemes' management.

The farmers pay NIB a flat rate of Kshs 2,000.00 per acre for infrastructure maintenance and water management. At the beginning of each financial year, the scheme's NIB management together with a farmers water users association (WUA) officials sits together and draws up a cropping and maintenance programs that reflect the amount of money expected from the farmers. Scheme's NIB management and WUA hold a monitoring and evaluation meeting once a month.

Previous Studies

Achieng [10], a journalist from IPS has given an account of what she terms as farmer's battle for their rights. Her accounts only explain the supposedly sequence of events that happened during the farmers' hostile takeover. She also tries to explain the state of affairs under NIB management. However her account is only informative of the status quo prior to the take over and the chronology of events leading to the revolution and has no solutions to help the scheme population make their lives better by leaping the benefits they were denied under the NIB management.

Another well studied area in Mwea is Malaria. Labatut, Jean-Michel in 2000 carried out a study on Livestock and Agro ecosystem Management for Community Based Integrated Malaria Control [11]. This explains the link between health and ecosystems. Their report blames the farming methods in the scheme currently as part of the grief malaria problem in the area. Malaria is thought to have emerged as a virulent disease at the same time as the early practice of agriculture-about 7,000 years ago. Today, a project supported by the International Development Research Centre is taking a new look at the links between agriculture and malaria. The goal is to reduce the incidence of the disease. This research work has identified possible solutions which touch on the core issues facing Mwea which include improved water management as a strategy that could be effectively used to reduce the Malaria problem, other methods that can be effectively used to control mosquitoes.

A study carried out by Nguyo [12] on Alleviating Poverty and Food Insecurity: The Case of Mwea Irrigation Scheme recognized Mwea irrigation scheme's (MIS) pivotal role in the 1980's when the cost of food import skyrocketed with respect to the value of the domestic currency and its expected impact on the agricultural economy now and in the future. The report has useful information on history, size of the scheme, acreage per person and the population in the scheme. The report also having carried out the study primarily focused on the economic well being of the tenant farmers vis-à-vis access to irrigation/water at Mwea.

The focus of the study was also on the economic arguments for or against having a system, such as Mwea. It also focused on exploring the possibility of using the scheme to provide food security to the scheme population as well as make a national food contribution from the area. It identified the problems facing the scheme farming methods in the absence of NIB which included:

- Water availability, management and usage was in a poor state
- Damaged roads, canals and water gates. The whole irrigation infrastructure was in a very poor state with little hope for improvement.
- Low production per acreage resulting from poor farming methods, scavengers and diseases
- High costs of agro inputs
- Lack of research to help farmers cope with climate changes and crop diseases
- Inefficient milling mechanisms, poor grading and poor marketing.

The study also identified unresolved Issues arising from the change over against NIB which include water management, provision of infrastructure, research on diseases and seeds etc. The Mwea Water Use Management established to control and manage water usage is also brought to the picture in this report. While this is a close research to the expected study, it fails to identify a clear way forward in helping the farmers market their products efficiently, improve the farming methods or fully utilize the scheme to its potential. The socio economic status of the farmers is also not addressed.

Mburu, Omwansa and kihanya [13] carried out an inquiry and wrote a report of the then Mwea Rice Growers Multi –purpose cooperative society which has since collapsed. The inquiry was sponsored by the ministry of cooperative development in 2002 concluded that there was gross

mismanagement of the rice production under the cooperative society. This was more of an audit report which gives guidelines on how to audit the society but this is no longer relevant since the society has already collapsed.

Muturi [8] in his project on improved agricultural rural transport for Kenya a case study of Mwea elaborates the current issues related to crop transportation. The study gives a historical detail of the management under NIB and post NIB and the impacts of the change.He has given various recommendations in major issues such as marketing, transportation; harvesting grading and packaging which an observer would say have been overtaken by events over the last four years due to changes in the political environment, climate changes and the economic global melt down. While he has given the status as at 2003 a few years after the change of management, it would be important to revisit the status today given closer issues related to the scheme have occurred notably water management (NIB website).

"Are We Mortgaging Our Lives?" strived to understand the politics of trusteeship in local development. On account of trusteeship, one agency is entrusted with acting on behalf of another to try to ensure the development of the other. In this case the NIB was the agency acting on behalf of the tenant who was to the beneficiary. Their findings show that the failure of the agency to involve the beneficiaries in their development initiatives leads to the later distancing themselves is the activities of the former. The local community began to view the trustee as the beneficiary serving the interests of its own and that of its master. The relationship between the two then became increasingly troubled as the beneficiaries developed negative perception towards the trustee. As a result, the development initiatives by the trustee failed to be sustainable. Their recommended the Trustees need to legitimize their development activities at the local level through encouraging popular participation as the only way that can make development initiatives sustainable as the beneficiaries continue to own their projects and to associate themselves with their development activities. The future of trusteeship therefore lies in a situation where the trustee and the beneficiaries sit and discuss on the way forward and the necessary interventions to be made. The study highlighted the status of the farmers under the NIB era and post NIB era and especially the restrictions practices that were in place under NIB

An article by African News Network (June 2008) recently gave a journalistic approach on how rice farming has been affected by new diseases and the current water management problems with no identified possible solutions.

Pambazuka [3] published by Fahamu addresses the protection and promotion of human rights amongst rural populations. The publication section on 'Dying to be free' is the story of the heroic struggle for survival, justice and dignity by rice farmers in Mwea District, Kenya. They refer to the NIB system as a 'virtual serfdom' whereby farmers worked on land for which they had no title deed and were forced to hand over their produce to the National Irrigation Board.

The publication also tries to demonstrate how resistance to violations of social and economic rights results in confrontations with the state that inevitably lead to violations of civil and political rights. It also demonstrates that the struggle for 'development' and rights are intimately intertwined. This publication focused on human rights and the struggle of the tenant farmer.

Methodology

Study Design

The main data collection method used was a field survey where data was collected and gathered at the local level by conducting a primary data collection exercise. The survey was done through interviews with individual farmers, key informants and observation of various aspects in the farmers' lives like housing and infrastructure. The instruments used were:

Questionnaires
Sample size calculator from www.raosoft.com which helps to calculate the sample size given the confidence level and margin of error.
Data analysis soft ware from www.spss.com.

The assessment looked at household income and expenditures, yields, costs, markets and challenges facing the farmers.
The assessment was structured around three components:

- The first of these is a set of household interviews with farmers as participants who gave quantitative data on incomes, expenditures, yields, costs and challenges.
- The second component was meetings with key informants who includee National irrigation Board employees who were there during the NIB era and post NIB era or retirees, rice middlemen and consumers.

- Finally, profiles from farmers who gave information on their farming experiences during NIB era as tenants and post NIB era as land owners.

Study Areas

The study area was carried out in all the four sections of the rice farming scheme and some consumer outlets in Nairobi area specifically Nakumatt and Uchumi supermarkets.

Sampling Method and Size

The rice farmers' population is about 3000 using a Margin of error of 5%, a Confidence level 95% and a response distribution of 50%. In this regard using the Raosoft sample size calculator the sample size was 340 farmers.

In the household interviews, a stratified random sample was carried where the population was divided into the four previous NIB rice sections. The sections have similar characteristics in terms of farming methods, population characteristics but differ in geographical location. A sample of 85 persons were picked from each of the four sections totaling to 340. A random selection was taken from each section and each individual farmer had an equal chance of being selected.

The second and third component of data collection from key informants and profiles was a random selection of available and willing persons who qualify the profile of needed information. Five middlemen were randomly selected, twenty consumers from different consumer outlets in Nairobi and profiling of two farmers.

Data Collection Methods

- A questionnaire were developed (see appendix 1), pre-tested and corrections made. The final Questionnaire was then administered to the farmers by research assistants.
- Interviewing key informants who included National Irrigation Board official, opinion leaders and farmers at individual levels
- Profiles of two farmers was recorded and narrated.
- Observation - Interviewers were under instructions to note the physical aspect of the Mwea area in terms of general infrastructure i.e. roads, electrification etc. They will also observe the state of the houses whether brick or mud walled, thatched or mabati etc
- Literature review of recorded information at the NIB, written journals, newspapers and past research documents to validate data.

Data Analysis

Quantitative data from the household interviews were entered into the spss software and various analyses such as averages, totals, were calculated and quantified. The qualitative data collected from key informants will be condensed to produce a summary of information given and finally profiles of the two farmers will be narrated.

Research Findings and Analysis

Research Findings

The Current Production Costs Per Acre

- A comparison of the various costs was done and is shown in Bar chart 1 below where the highest cost was fertilizers, labor for harvesting and transplanting.
- Mean is kshs25, 700 and a standard Deviation of Kshs 5641.3
- The production costs takes about 19% of the farmers' income as shown in the pie chart 1 below where average total incomes, average total expenditures and average production costs were related and 32% expenditures and 49 % is the residue income.

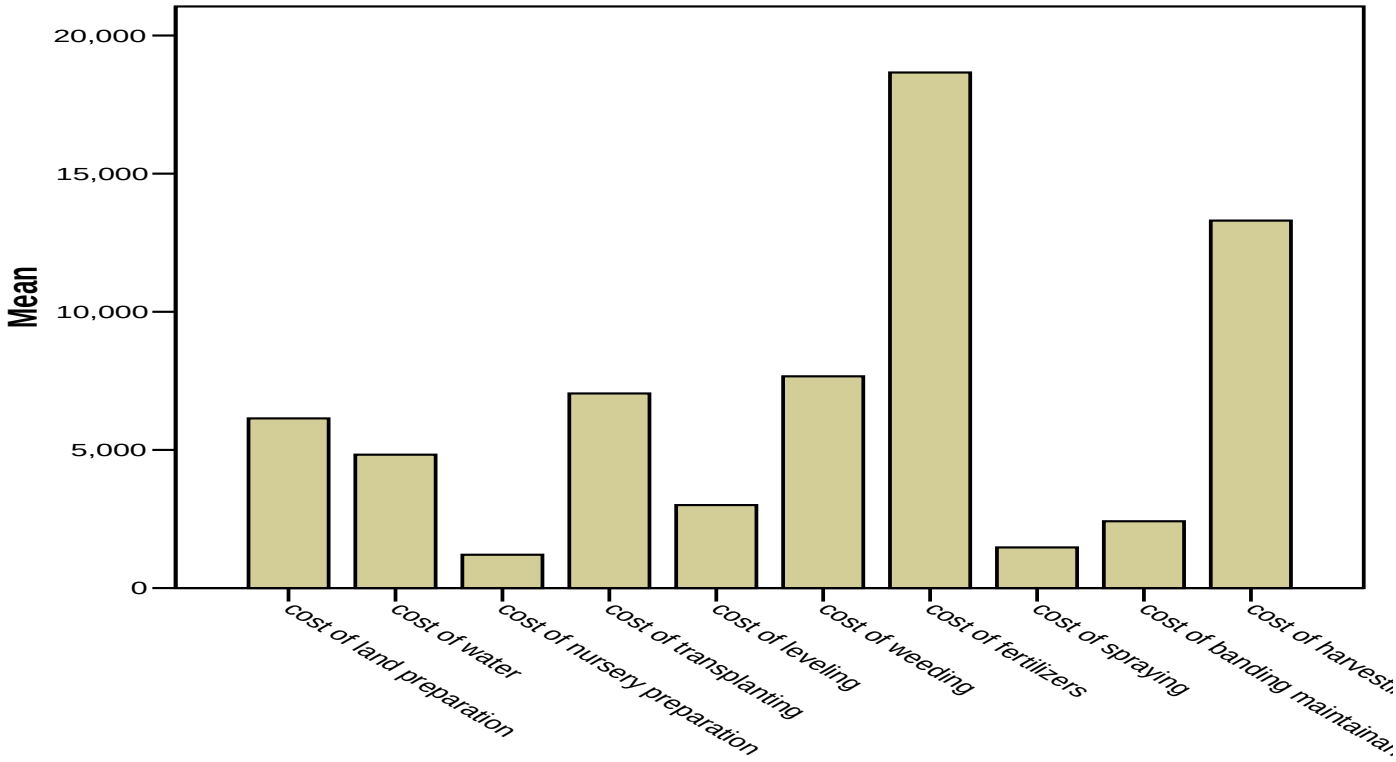
The Current Rice Yields Per Acre

The average rice produce per acre was found to be 26.26 90kgs bags.

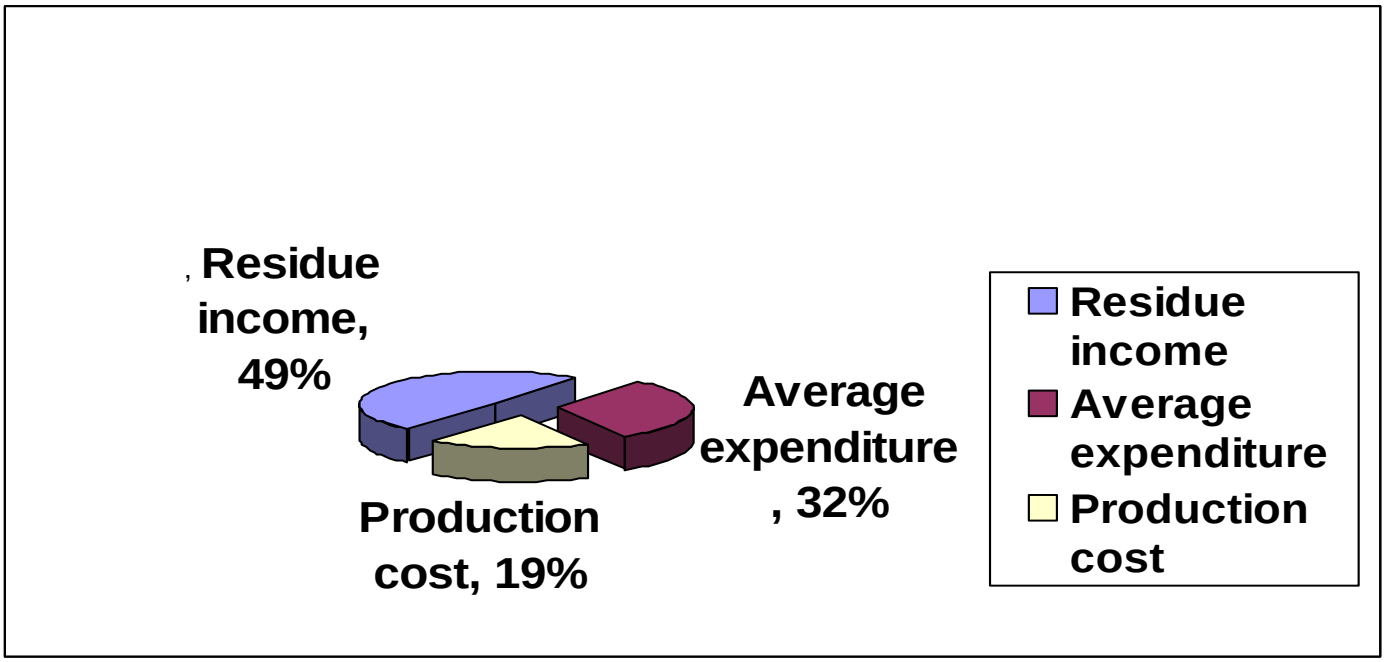
Rice Markets and Marketing Channels

Rice is currently sold to the cooperative society, the national cereals produce board and through middlemen in the local markets. Rice is milled using multiple single pass haulers by a majority of those farmers who do no take their rice to the two major buyers. There are two types of middlemen; one is the type who buys un milled rice and takes it for milling to sell to a second type of middleman who buys the milled rice for markets outside the scheme. The first middleman is physically located in the scheme while the second type travels between the scheme and the destination of selling like Nairobi, Mombasa, and Nakuru etc. The second middleman buys rice directly from farmers who mill their own rice or from the first middleman. This creates several different types of supply chain for rice to reach the consumer as depicted in the table 2 below.

The middlemen sell their rice to markets across the country with the major markets being Mombasa and Nairobi.



Bar Chart 1: Production costs per acre



Pie Chart 1: Percentage of production costs and expenditures from total incomes

Middlemen interviewed expressed concern over the rice market due to importation of cheaper rice from Pakistan. A fifty kilogram package of imported 'Sindano' rice costs about 2,500 Kenya shillings while the equivalent from Mwea costs about 3500. They have resulted to compromising their rice buy buying the imported rice and mixing with the local one to stay in the market.

Prices and Pricing Methods

There are two varieties of rice grown in Mwea, the basmati rice and the sindano (BW).

The average cost for a kilogram of sindano(BW) rice per kilogram was found to be kshs 70

Farmers' average sale of a 90 kilograms bag to middlemen is about kshs 4500.

The average price of basmati rice per kilogram of refined rice sold in the local county council Ngurubani market and middlemen in the mills was Kshs 125.

Farmers' average sale of a 90 kilograms bag to middlemen is about kshs 6000 from those interviewed.

Prices are determined by the forces of demand and supply, during harvest periods rice prices go down and begin to rice as rice reduces in the farmers' stores.

Table 1: Supply chain (NB/The arrow shows the direction of supply chain)

Farmer	National cereals Board	Wholesalers	Retailers	Consumer
Farmer	Cooperative Society	Wholesalers	Retailers	Consumer
Farmer	First middleman	Second middleman	Retailers	Consumer
Farmer	Second Middleman	Wholesalers	Retailers	Consumer
Farmer	Consumer			

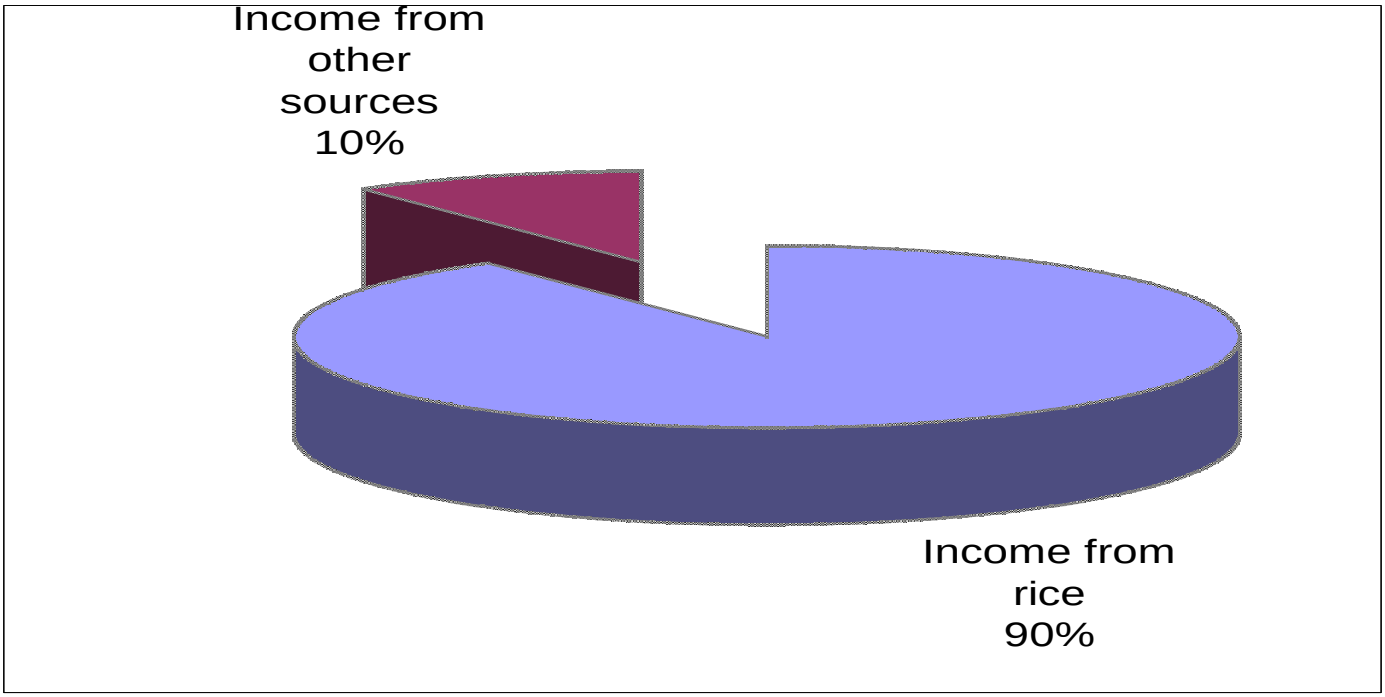
Household Incomes and Expenditures

Incomes

The average annual incomes for the farmers are Kshs252, 943.10 with a standard deviation of Kshs172,021.20.

A calculation was made to compare the income from rice farming with incomes from other sources.

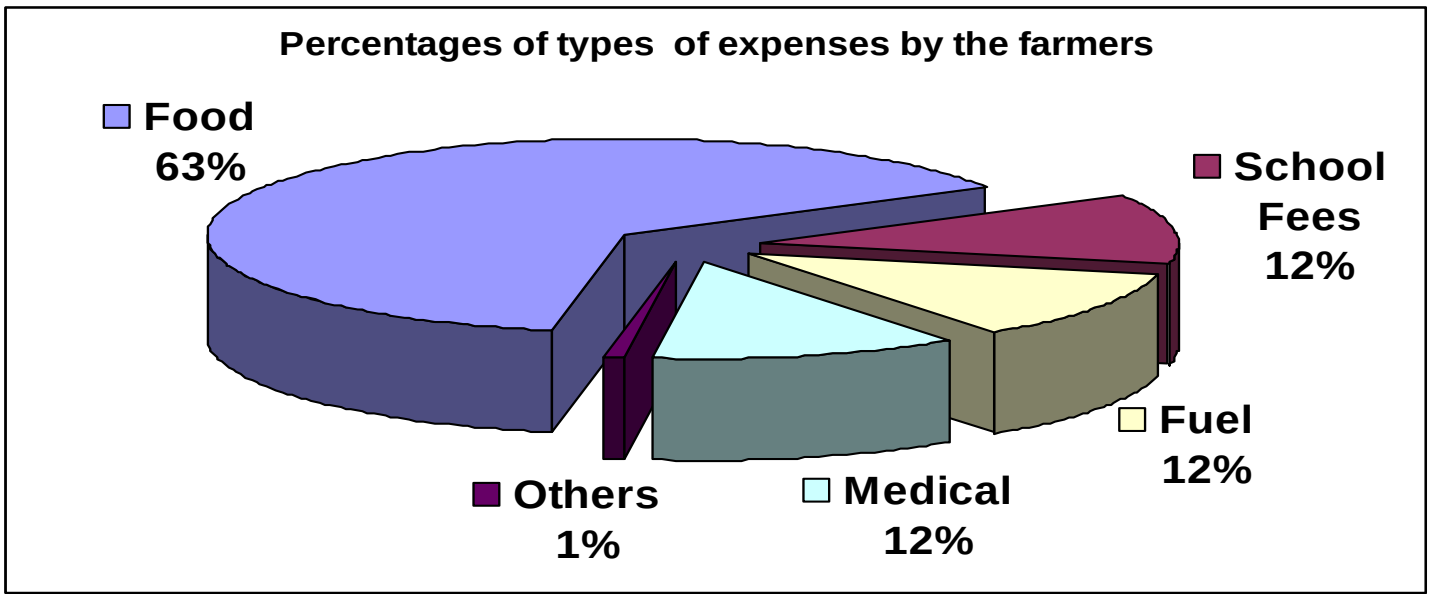
Piechart 2 below shows that the main income generating activity for the farmer is rice farming as compared to income from other sources.



Pie Chart 2: A Comparison of total income from rice and other sources of income

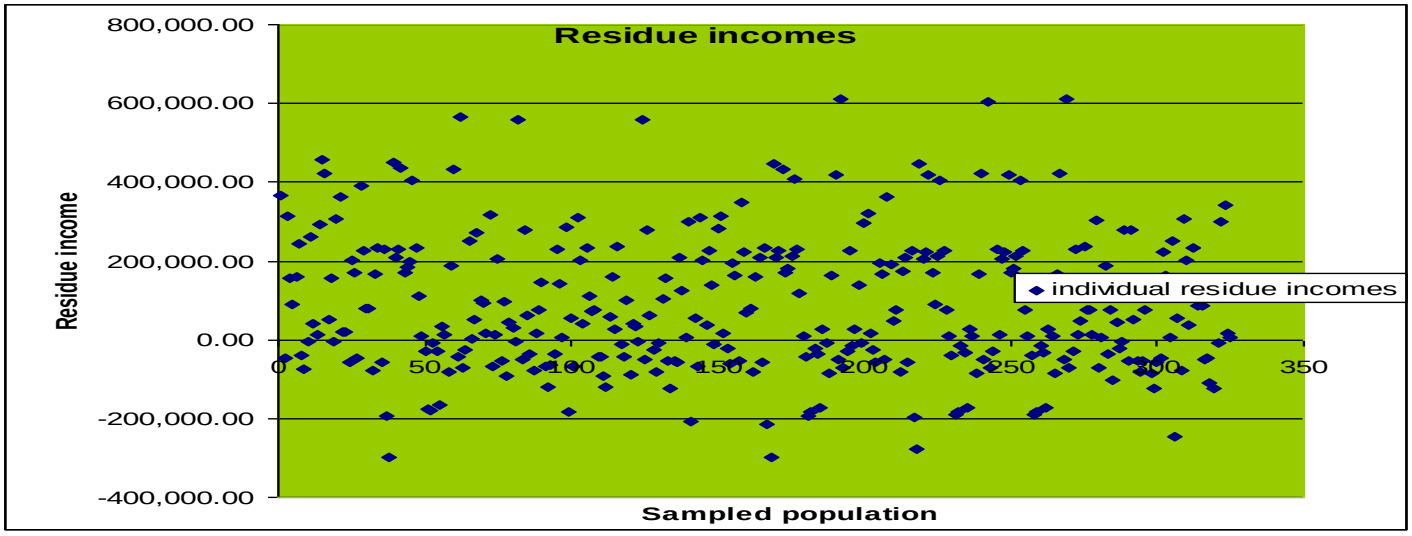
Expenditures

From the Pie Chart 3 below food takes 63% the largest portion of the rice farmer income. School fees, medical and fuel are relatively high averaging 12%.



Pie Chart 3: Representing the house holds expenditure by rice farmers in Mwea

A further effort was made to establish if farmers have any residue incomes. Expenditures and production costs were deducted from the total incomes. Data sorting was done and 37% of the sample population had negative residue incomes while 63% had positive residue incomes and this can be further illustrated in the Scatter diagram 1 below.



Scatter diagram 1: showing farmers residue income

The Challenges Facing the Farmers

Respondents were asked to identify the current challenges facing them and their responses included:

- Water shortage and irregular supply
- High cost of inputs especially fertilizer
- Crop diseases and Pests control
- Unidentified Crop diseases one being "Blast" which affect the crop when it start ripening
- High costs of foods, medical, education and fuel.
- Land tenure is not clear since some farmers have 99 years lease holds while others have licenses
- Dependent on rice as the main income earner amidst uncertainties from rising cost of production.

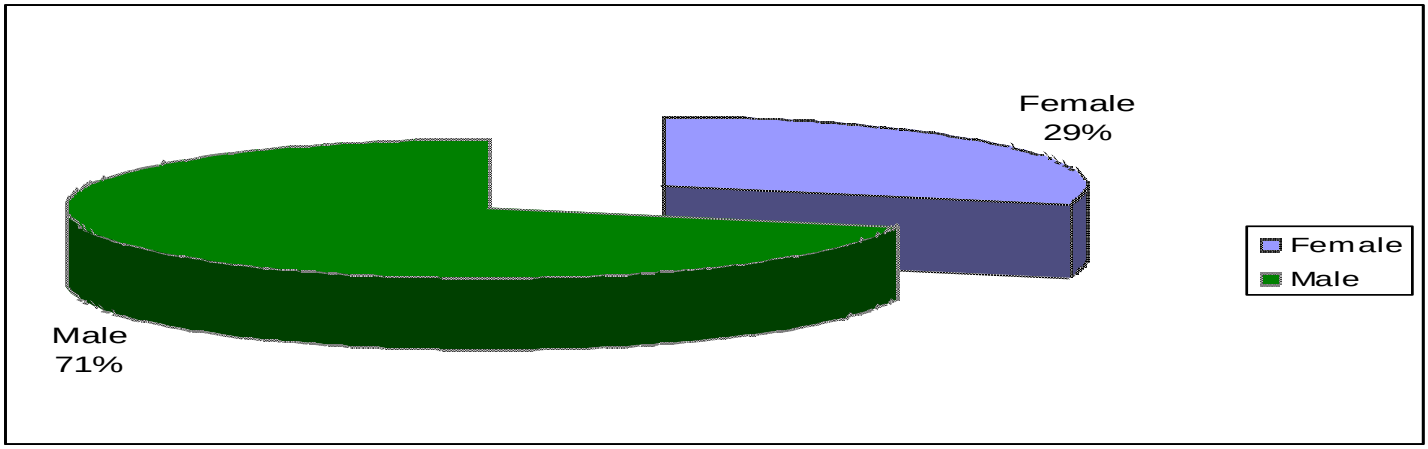
Consumers' Opinions

Consumers interviewed displayed varied views which included price, quality and sometimes the vicinity of retail out lets. Among the twenty consumers interviewed in the retail outlets, 75% base their buying of rice on price and quality is not considered greatly. However about 25% of consumers who buy from the higher markets and supermarkets, they base their buying on quality and were found buying highly priced imported rice. According to them the Mwea rice was highly compromised on quality and they are never sure if they are buying value.

Social Indicators

Gender

The gender proportions were 29% female and 71% male shown in the pie chart 4 below.



Pie Chart 4: Gender proportions

Age

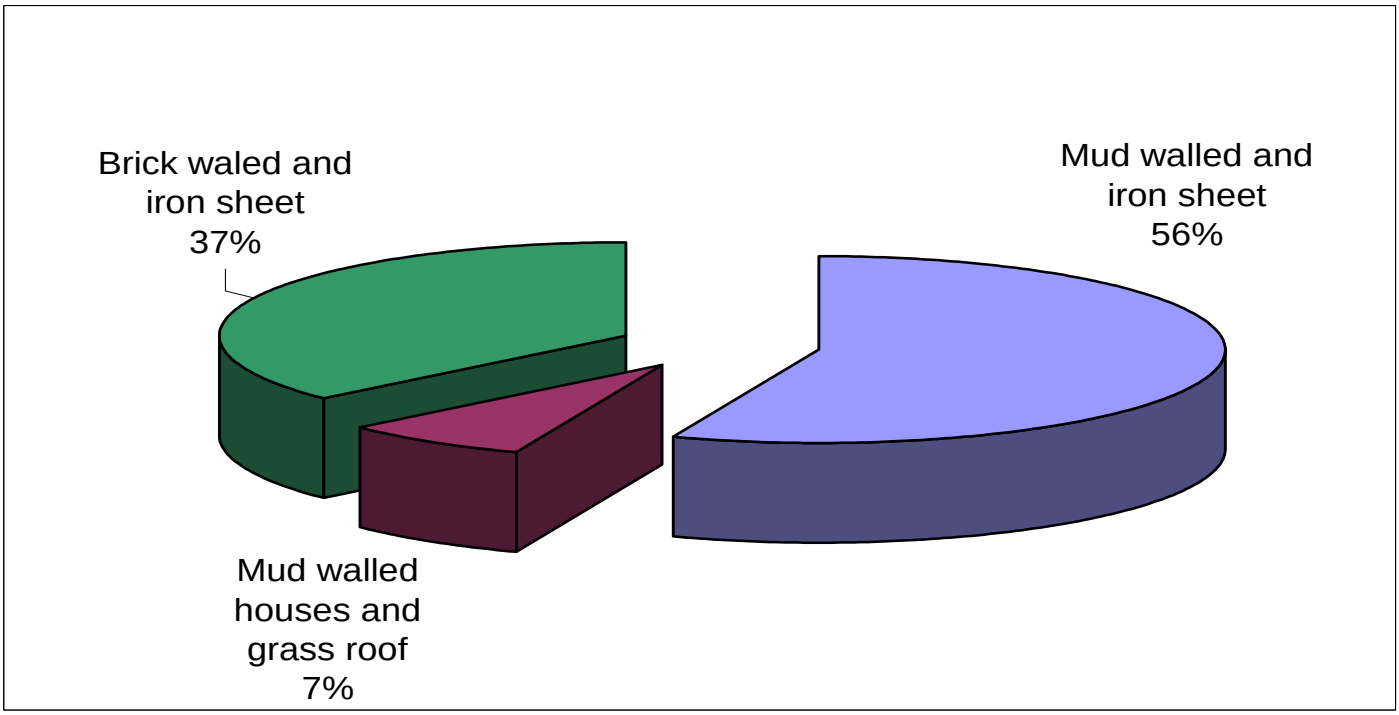
From the above figures, the mean age of the male interviewed was 56.83 and 52.96years for the female Family size.

Family Sizes

The average family size in the sampled population was found to be 6 persons with a standard deviation of 4.

Housing

From the pie chart 5 below the most commonly used type of shelter is that of mud walled and iron sheet roofed which was 56%. However the increased number of brick walled houses which were 37% is an indication that some of the farmers approximately a third have improved their living conditions. A small Number of 7% live in mud walled houses and grass roofed



Pie Chart 5: Housing types

Farmer's Profile: Joseph Migwi Maina

A Profile was taken from one of the farmer photographed below who narrates his story to the author below.

Mr. Maina arrived in the scheme in 1968 from Kiine former Ndia Division. Land was allocated to him by the elders of the Muceera clan and he reported to the NIB offices in Mwea. In the first weeks he reported to work everyday at a central location where all the tenants would report at 8.am in the morning for roll call. He worked three days to build a house for him and three days to cultivate his farm as per instructions from the NIB.

Preparing land included clearing the vegetation and creating the bandings. Building the house involved creating mud breaks commonly know as "Maturubari".

NIB then fed the farms with water, provided tractors for land tilling, seeds and all the inputs.

There was constant supervision from the extension officers and failure to carry out instructions would result in the farmer being expelled and his land allocated to someone else. The farmer did all the work and sometimes

employed workers from neighboring districts like Muranga and Embu.

NIB would ensure water flowed effectively; they maintained the roads and decided the exact planting period which was normally from August to December.

When the rice crop started to ripen, barriers manned by the administration police would be put in all the roads leading to the farms. Any vehicles into the scheme required a permit from the NIB.

This was mainly to stop the crop from being taken home. NIB provided the packaging materials and transport to the stores where the crop was weighed and farmers would know the total number of Kilograms for his harvest.
The farmer would then be assigned 12 bags for annual consumption. The NIB would deduct all

the inputs and services and give the farmers any balance in the month of May of the next year following the harvest of the crop which was normally in December.

Mr. Maina narrates how farmers were restricted from keeping livestock and children were expected to vacate the scheme at the age of 18 years.

Farm management was disciplined during the NIB era until 1998 when the farmers failed to deliver their crop and instead delivered to their cooperative society.

Currently farming has changed, there is more freedom and farmers have a choice of when to farm, they can rent their land to those willing to farm at a cost. However the state of the scheme's infrastructure has depleted heavily. The mushrooming of Jua Kali rice farms outside the scheme has also created a lot of competition for water and led to water shortages.

Mr. Maina however believes live is far much better for him now than before, he has managed to construct a permanent house and farms at his own pace. Children have also been given plots from land that was not cultivated and they no longer have to be expelled from the scheme. He remembers the last price offered by NIB per kilogram of un milled Basmati rice was Kshs 25 while today he is selling at about Kshs 66. He is worried about land ownership since he has a license while there are some farmers that have the leasehold documents.

Observations

The scheme has definite changes that can be seen in terms of increased infrastructure, they now have electricity criss crossing the scheme. When they exited from NIB there was only two banks Kenya Commercial Bank and Cooperative bank. Today they have Equity bank, Post bank and K-Rep Banks in addition which is an increase in financial institutions and credit facilities.

There is a distinct difference in rice farming when compared to the time NIB managed the scheme. There was evidence of rice crop at different stages of growth in the scheme during the research period which was not common in the past as explained below:

Sprouting Rice Farms outside the Scheme and Mwea Division

There was also an observation of a lot of sprouting rice farms outside the scheme and Mwea Division.

***Recently Transplanted (see photo graph 1*)**

Photograph 1: Recently transplanted rice – April 2009
Photo taken by Author, 2009

Rice in the Early Stages of Ripening in Photograph 2 and late Stages of Ripening in Photograph 3 below

Photograph 2: Early Stages of rice ripening

Photos taken by Author 2009

Photograph 3: Late stages of ripening
Photos taken by Author 2009

Photograph 4: Harvested rice fields
Photo taken by Author 2009

These were witnessed in the Gichugu division and Ndia Division when using the old administrative boundaries. See photograph 5 taken along Kutus Embu road near Mururi township of a paddy grown in the valley below coffee farms.

Photograph 5: Rice growing outside Mwea irrigation scheme in gichugu
Photo taken by Author 2009

Poor Status of Water Canals

The rice canals both for drainage and feeding rice fields were in poor state with overgrown weeds and breakages causing poor drainage and water flow. See Photograph 7 [14-21].

Photograph 7: Weeded canals

Photograph by Author 2009

Conclusions and Recommendations

Based on the result of the data analysis it is evident that most of the farmers practice rice farming as the only income generating activity. As such maximizing their output would be beneficial to them and the community surrounding them and become a crucial food basket for Kenya. The researcher wishes to recommend the following:

- Creation of a dam to act as a reservoir for good storage of water and curb the problem of water. This would reduce over reliance on weather patterns and streamline distribution to all farmers. According to Mbatia a former field supervisor, the timing of the season was important and this is no longer followed. Having enough water would allow all farmers to farm at relatively the same time during the relevant season viewed to be from August to December.
- It would be good to provide the farmers with expertise which could include research on diseases and help from agricultural extension officers to educate and train them on best farm practices.
- Cultivation of water canals for purposes of feeding the rice farms and drainage could be done as part of government effort to improve food production in the area. Currently these canals are in poor stage of over grown weeds and breaking points which create water waste through spillage.

- Better management of water flow, according to farmers interviewed, there is a struggle for water and sometimes violence results when farmers are fighting for water. In Murubara Village rice farmers fought with horticultural farmers resulting in serious injuries reports Afred Nderitu former Member of Parliament. Appointment of government agents to control water intakes and gates may be of help to all the farmers.
- The issue of title deeds was not clear since some farmers a minority had leasehold documents (see Appendix 3) a document from Mr. Gaitho a farmer from Nguka Village while

  others had licenses as that of Mr. Ndegwa in Appendix 2. The issue of land ownership could be resolved and a harmonization of ownership made to avoid future conflicts in this area and also allow farmers to access credit facilities using the farm documents as collateral. Currently those holding licenses cannot access credit from the available banks.
- Creation of a cooperative society that would embrace the principals of the cooperative movement and be learn by professionals so as to help farmers rip more from their produce. A cooperative society would be able to buy inputs in bulk and hence provide them to farmers at lower costs. The body would also be able to sort for best prices and reap more benefits. This may also be a cheaper credit facility in comparison to current available facilities that are high. Farmers are highly suspicious of the current cooperative society and majorities are not willing to deliver their crop to them.
- About two thirds of the farmers have positive residue income (*see scatter graph 1*) which could be tapped by organizations willing to mobilize their savings and help them reinvest

  on other ventures and remove the single source of income. These savings could equally be accumulated and used for self financing in farming.
- There would be need to investigate why some farmers are earning positive incomes and others are not. Assisting these farmers in farm management may improve their incomes.
- A third of the farmers have Improve infrastructure i.e. roads for easier transport of rice.
- Avail clean water for domestic use, the medical bill is among the expenses that majored mainly, as water borne disease prone area; there need to be more focus on prevention, cure and information dissemination for purposes of protection.
- Establish a way to solve the dispute between farmers and the rice mills ownership in order to utilize those expensive, underutilized mills that produce quality processed rice grain. This would make the Mwea rice to become one more of good quality.

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Symbols and abbreviations

NIB – National Irrigation Board
MIS- Mwea Irrigation Settlement
MIAD – Mwea Irrigation Agricultural Development
MRGCS – Mwea Rice Growers Cooperative Society
WUA – Water Users Association