

**BUNYALA RICE IRRIGATION SCHEME (KENYA)
A CASE STUDY OF THE MUNAKA OUTGROWERS
COMMUNITY BASED ORGANISATION**

by

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EXECUTIVE SUMMARY

Flooded rice cultivation is profitable but requires high initial investment that is beyond the reach of resource poor smallholder farmers. A baseline survey was carried out in September-October 2007 among members of Munaka outgrowers Community Based Organisation (CBO) in Bunyala Irrigation Scheme. The study was aimed at determination of the strengths and weaknesses of out grower paddy farmers in Bunyala Irrigation Scheme with the aim of converting the farms into sustainable profit making enterprises through technical and material assistance.

Results showed average land per household to be 2.8 acres with 1.3 being set aside for paddy. These parcels of land are consolidated to form large units that are easily operated on. Most of the households decision makers are middle-aged and the old with little education. However, there is a small well educated group comprising 3% and a further 13% moderately schooled to help disperse improved technologies to the majority. Many farmers were found to have difficulties in agronomic practices like fertilizer application and pests and disease control yet they had virtually no contact with relevant extension services.

An overwhelming majority of the respondents (96%) pointed out that rice is the most profitable enterprise in the area but was highly constrained financially. In order to make the farms profitable, it was observed that training in the areas of basic agronomy and bookkeeping coupled with proper supervision was necessary. In addition to training, finance should be provided in the form of working capital. The capital should be given in kind to the barely literate and the inexperienced farmers. These measures have the potential of uplifting the standards of living in the area thereby making it a model in the region.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ii
TABLE OF CONTENTS	iii
LIST OF FIGURES	v
LIST OF APPENDICES	vi
1.0 BACKGROUND	1
2.0 METHODOLOGY	3
2.1 Study area	3
2.2 Data collection and analysis	5
3.0 RICE PRODUCTION	5
3.1 Introduction	5
3.2 Rice production protocol	8
3.2.1 Ecological requirements	8
3.2.2 Agronomy	8
3.3.3 Land preparation	8
3.3.4 Planting	9
3.3.5 Transplanting	9
3.3.6 Fertilizers	9
3.3.7 Water control	9
3.3.8 Harvesting and yields	10
3.3.9 Pests	10
3.3.10 Diseases	10
4.0 POST-HARVEST HANDLING AND MARKETING	11
4.1 Post-harvest handling	11
4.2 Marketing	12
5.0 STAKEHOLDERS	15
6.0 MUNAKA OUTGROWERS CBO	15
6.1 Organization structure	15
6.2 Membership and composition	17
6.3 Farming and farmer characteristics at Munaka CBO	18
6.3.1 Socioeconomic characteristics	18
6.3.2 Land ownership	20
6.3.3 Farming as a commercial enterprise	22
6.3.4 Fertiliser use	22
6.3.5 Constraints	23
6.3.5.1 Pests and diseases	23
6.3.5.2 Other constraints	24
6.3.5.3 Agricultural credit	24
7.0 DISCUSSION	25
7.1 Conclusion and recommendations	29
8.0 REFERENCES	30
9.0 APPENDICES	31
9.1 PROJECTIONS	31
9.1.1 Revenue generation	31
9.1.2 Budget	32
9.2 Sample questionnaire used in the survey	36
9.3 Names of farmers who were interviewed	39

LIST OF TABLES

Table1. Kenya rice production statistics for 2002-2003.....	7
Table 2. The estimated range of losses during the handling and and processing of rice in South-East Asia.....	13
Table 3. Rice stakeholders and their roles in Bunyala irrigation scheme.....	17
Table 4. Distribution of the members of the Munaka Outgrowers CBO in the administration set-up of Bunyala irrigation scheme.....	21
Table 5. The levels of education, alternative occupations and gender proportions among members of the Munaka CBO expressed as percentages.....	22
Table 6. Disparities in fertilizer application among members of Munaka CBO possessing equal parcels of land (the respondents are expressed as a percentage of all interviewees).....	27
Table 7. Fertilizer application by members of the Munaka CBO showing disparities in levels of nitrogen as contained in different fertilizers.....	27
Table 8. Farmer ranking of the main pests and diseases limiting rice production.....	28
Table 9. The main constraints limiting paddy production as ranked by farmers belonging to Munaka CBO.....	29

LIST OF FIGURES

Figure 1. Land per capita as observed over the years in Budalangi division over time	2
Figure 2. Map showing the location of Bunyala irrigation scheme in Kenya.....	5
Figure 3. Market outlets as mentioned by farmers of Munaka CBO expressed as a percentage of those who sold the crop last year.....	15
Figure 4. Prices of unpolished rice per kg as pointed out by farmers in Bunyala.....	15
Figure 5. A sketch map showing the relative positions of the three blocks that make Munaka CBO.....	19
Figure 6. Organization structure of the Munaka Outgrowers CBO in Bunyala irrigation scheme.....	20
Figure 7. Percentage composition of farmers in Muluwa, Munaka and Munemari block that make the Munaka CBO.....	21
Figure 8. Education level of farmers belonging to the Munaka CBO in Bunyala irrigation scheme.....	23
Figure 9. The proportions of the young, middle aged and old among members of the Munaka CBO.....	23
Figure 10. Land distribution among members of the Munaka CBO in the Bunyala Irrigation Scheme expressed as a percentage of respondents.....	24
Figure 11. Land set aside for rice production by members of the Munaka CBO in the Bunyala Irrigation Scheme expressed as a percentage of respondents.....	25
Figure 12. The relative importance in profitability of different farm enterprises as viewed by Munaka CBO members.....	26
Figure 13. Farmers' sources of credit in Bunyala Irrigation Scheme.....	30

LIST OF APPENDICES

9.1. Projections.....	37
9.2 Sample questionnaire used in the survey.....	42
9.3 Names of farmers who were interviewed.....	45

ACRONYMS

NCPB-National Cereals and Produce Board

LBDA-Lake Basin Development Authority

DFL-Dominion Farms Limited

NIB-National Irrigation Board

CBO-Community Based Organization

NERICA-New Rice for Africa

CDF-Constituency Development Fund

1.0 BACKGROUND

Kenya's irrigation potential stands at 539 000ha of which only 105 000ha (19%) has been developed and annual growth a lowly 0.5% per annum. This situation justifies increased investment in irrigation development to ensure accelerated growth and sustainable development. Among the constraints cited as limiting irrigation development in Kenya are; low prioritization due to wrong perception, lack of a national policy, legal and institutional framework to guide development and management of the sector, inadequate public and private sector investment, inadequate development of infrastructure, weak water users associations and inadequate support services. These constraints led to the collapse of many irrigation schemes in 1999.

Bunyala irrigation scheme in western Kenya was launched in 1968 and became operational a year later. It is one of six irrigation schemes spread across the country, the others being Mwea, Ahero, Perkera, Galole and Bura. The scheme specializes in rice production drawing water from river Nzoia, it is located at the old stage of the river on the shores of lake Victoria.

Bunyala irrigation scheme is composed of two categories namely the public and the smallholder community irrigation schemes. The public (nuclear) are owned by the government which then gives tenancy rights of four acres to each farmer. The NIB is mandated to run the public scheme mainly in providing the infrastructure and maintaining them and is the one that carries out irrigation. The smallholder community irrigation scheme (outgrowers) is owned by farmers through their associations and are developed on a cost sharing basis between the farmers, government and other development partners.

Budalangi division in which the Bunyala scheme is largely located has available agricultural land of 112km² but this has been on the decline over the years (Figure 1). Bunyala irrigation scheme is situated in two locations, these are Bunyala central in Busia district and Usonga in Siaya. These areas are characterized by high levels of poverty with Bunyala central having an index of 63% in 1999 (District statistics office). The current poverty indices in Western and Nyanza Provinces where the scheme is located are 61 and

65% respectively compared to 31 and 44% for central and Nairobi in that order (Government statistics, 2007).

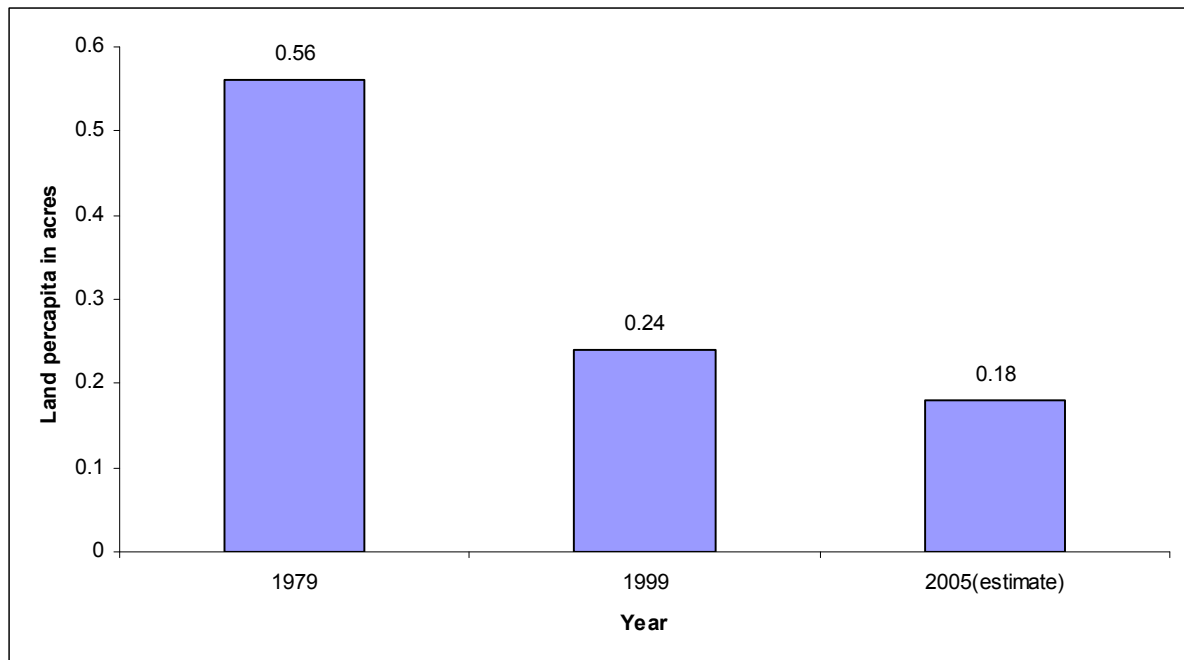


Figure1. Land per capita as observed over the years in Budalangi division over time (Source: DAO'S annual reports).

Many rural areas in Kenya are characterized by abject poverty, but they tend to have local resources that can be used to alleviate the situation when the limiting factors are identified and properly applied. Bunyala is traditionally a fishing area as it located on the shores of Lake Victoria. However, increasing population and competition from neighbouring communities has greatly depleted the fish forcing the locals to find alternative means of livelihoods. This is because the larger part of the lake belongs to neighbouring Uganda.

Bunyala has the potential of producing flooded rice which is popular because of its higher grain yields than upland rice. However, it is an expensive undertaking that is beyond the reach of resource poor smallholder farmers. Although the government helps by excavating main canals, the remaining operations are still too expensive for the farmers and hence the need for further external assistance without which they engage in time consuming and ineffective manual activities leading to missing out on ideal growing

periods and subsequent loss of yields. The overall aim of this study is to develop a poverty reduction programme for rice growers in Bunyala Irrigation Scheme. Specific objectives are:

1. To determine the strengths and weaknesses of out grower paddy farmers in Bunyala Irrigation Scheme
2. To convert individual rice farms into sustainable profit making enterprises through technical and material assistance

2.0 METHODOLOGY

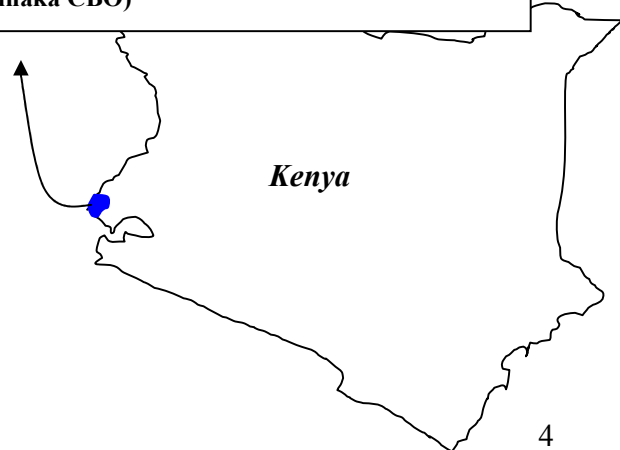
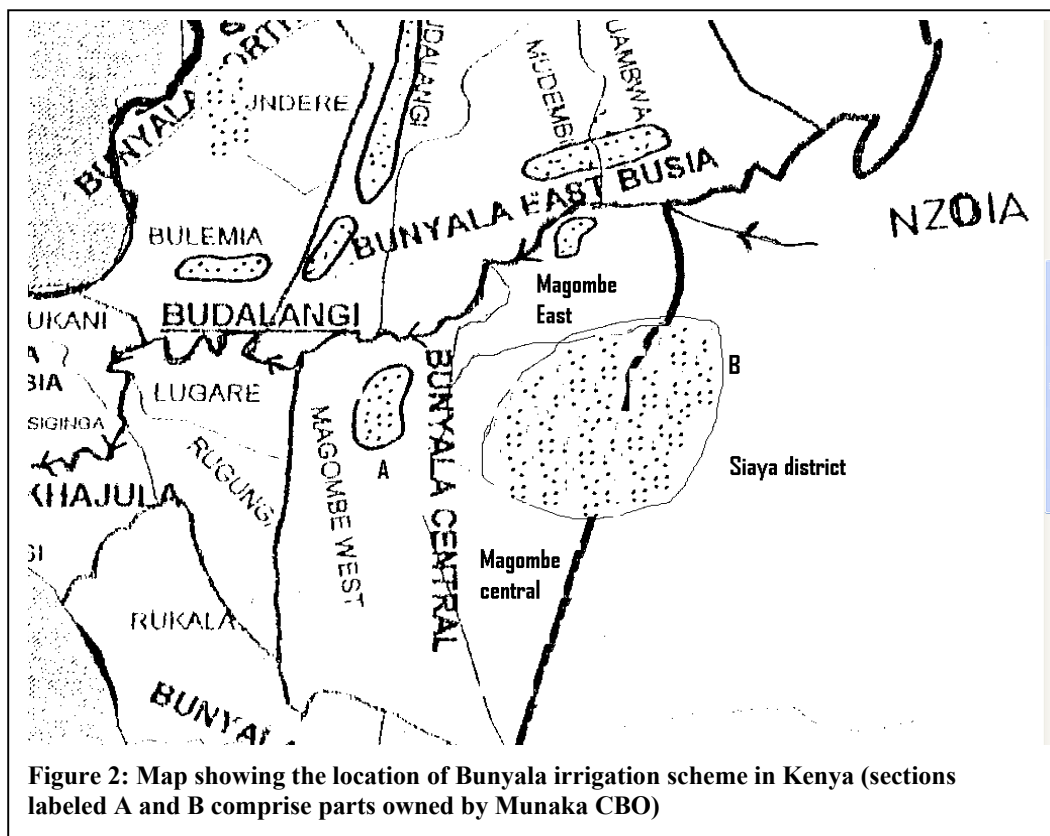
2.1 Study area

Bunyala is located on the eastern part of Lake Victoria and is found in the most westerly district of Kenya (Figure 2). Bunyala Irrigation Scheme traverses three administrative sub locations in two neighbouring districts of Siaya and Busia (Bunyala district has recently been carved out of Busia, information in this report is based on data from the Busia district headquarters). The area is fairly served with basic infrastructure particularly electricity. However the main all weather road has not received maintenance attention in recent years so it is virtually impassable during rainy season and only powerful four-wheel drive vehicles are capable of plying it. Matters came to a head late last year when river Nzoia broke its banks causing severe flooding that destroyed the road at Makunda thus delinking areas like Maumau. Boats are now used to ferry people across but the risk is high with some passengers drowning. The advent of mobile telephones has made it possible for the inhabitants of this potentially remote area to easily access information.

Bunyala is an alluvial flood plain with low terraces having potential for rice production. Soils are alluvial sediments from various sources and are classified as AA1 and AA2. AA1 is described as well drained, deep dark grayish brown to yellowish brown, friable, stratified sanday clay loam to clay; in places mottled, firm clay; in places slightly saline or sodic; on river levees eutric Fluvisols, with vertic Fluvisols and vertic and eutric Gleysols, partly saline sodic phases. AA2 is imperfectly to poorly drained, deep, grayish brown to very dark grey, mottled, very firm, saline and sodic, cracking clay; in river

baackswamps: Pellic Vertisols and vertic Gleysols, saline and sodic phases (Jaetzold and Schmidt, 1982).

The flood plains and river terraces are almost flat to gently undulating with slopes between 0 and 5%, the AEZ is LM4, a marginal cotton zone. This AEZ has a very uncertain growing period of 130 days of which only 45 days are sure. Altitude ranges between 1135-1200m above sea level with mean temperatures of 22.7-22.3⁰c. Annual rainfall averages 900-1100mm and binomial with much of it falling in the first season (400-480mm), therefore irrigated rice is a better option than cotton.



2.2 Data collection and analysis

Data was collected through household survey of the Munaka out growers CBO using a semi-structured questionnaire. Interviews with stakeholders were conducted, these were the National Irrigation Board (NIB), Ministry of Agriculture at the division office, World Vision, Saga micro-finance, local rice millers, K-Rep bank, rice traders at local trading centres and Ruambwa-Mudembi Irrigation CBO. Documentary sources of information were also obtained from the district office of the Ministry of planning and National Development, Dominion farms Limited, Ministry of Agriculture (both division and district offices), journals and books. In addition, the internet was used to supplement the data.

A meeting was held with leaders of Munaka outgrowers CBO which was used to refine the questionnaire. Enumerators were selected from among the farmers on the basis of their ability to translate English to *Kinyala* the local dialect accurately. The enumerators were then trained and the questionnaire pre-tested and modified before commencing the work. The respondents were mainly household heads or their spouses but in their absence those present were interviewed. Some of the factors for which data was collected included personal background characteristics like age, education and sex, size of land owned, acreage planted to food crops, types of food crops grown, fertilizer use, availability of credit constraints among others. Observations were also made as part of data collection to complement and confirm responses. Data were analysed using descriptive statistics to compute means, frequencies and cross-tabulation by means of SPSS for windows. The same software combined with MS Excel were used to draw and format charts and figures.

3.0 RICE PRODUCTION

3.1 Introduction

Rice is a staple food of half the world's population with 90% of it grown and produced in Asia (Faakin, 1971). In Kenya, rice is fast becoming a regular dish particularly in the urban communities and is increasingly becoming the staple food in many institutions such the military, schools and hotels (Maobe, 1988), and is now the third most important

cereal crop after maize and wheat. Rice is gaining popularity among the rural folk as well and consumption has risen dramatically over the last fifteen years to stand at 120,000 metric tons per annum. But rice production over the last three years has been far below Kenya's domestic consumption requirements of 45,000 to 50,000 hence a deficit of 70,000 metric tones that is met through imports (Table 1).

According to MOA (2003), Kenya has a potential of producing 400 000 and 11 000ha of rain fed and irrigated rice respectively but is currently cultivating 9000ha of which 97% is irrigated. Much of this potential lies in the Lake Victoria basin that is currently restricted by the Nile Treaty of 1920s signed by the British and Egyptian governments and bars any countries from engaging in any major irrigation activity. It is in this basin that Bunyala irrigation scheme is found and being a mixture of public and smallholder scheme does not contravene the treaty.

Table1. Kenya rice production statistics for 2002-2003.

Province	Production (Metric tones)		Value(Billions Ksh)	
	2002	2003	2002	2003
Eastern	39 450	38 070	1 145 000 000	913 680 000
North-Eastern	130	420	6 500 000	21 000 000
Nyanza	3 250	6 855	29 460 977	62 140 000
Western	246	333	5 904 000	7 992 000
Coast	2 023	2 070	59 665 360	25 555 222
Total	45 099	47 748	1 246 530 337	1 030 367 222

Source: MOA (2003) In Africa, the West African Rice Development Association (WARDA) developed a superior strain of rice, the staple in many countries, called NERICA, a crossbreed of African rice (*Oryza glaberrima*) and Asian rice (*Oryza sativa*) (AICAD, 2006). Experiments are now being undertaken in other parts of the continent including Kenya.

Advantages of the new upland varieties include ability to be grown without the elaborate and expensive irrigation systems required by traditional rice varieties. It has observed to be more resistant to weeds, drought, pests, and disease and can produce higher yields and 25 percent greater protein content. Average production under irrigation is 5.5 tones/ha

for the aromatic and seven for the other varieties while the rain fed yields on average 2 tones/ha. The rain fed rice is mostly grown in Kwale, Kilifi and Tana River at the Coast and Busia (Bunyala) and Teso in western province.

SACRED AFRICA (an NGO) is running a rice evaluation programme for adaptability and seed production potential of New Rice for Africa varieties (NERICA) in nearby Bungoma district. The American based Dominion farms Limited situated in the Yala swamp in neighbouring Siaya district has been licenced by Kenya Plant Health Inspectorate Services (KEPHIS) to produce certified seed. It is obvious that such seed bred in similar conditions will be of great benefit to Munaka

Many stakeholders in Bunyala cite rice as the most profitable enterprise in the area. In a survey carried out among members of the Munaka CBO, 96% of the respondents rated rice as the most profitable enterprise in the area. Below is an illustration of the gross margin calculation for one acre of the aromatic rice (Basmati).

Gross margin for the non-aromatic varieties is much lower, for instance variety IR fetches Ksh 1 800.00 per bag and a gross margin of Ksh 22 434.00.

Paddy yield, 30 bags @ ksh 2 550.00	76 500.00
Variable costs	
Rotavation	3 000.00
Leveling and nursery preparation	2 000.00
Fertilizers	3 393.00
Pesticides	4 553.00
Water charges	4 000.00
25 kg seed @ 70.00	1 750.00
Transplanting	1 500.00
Weeding	2 000.00
Other labour needs	2 200.00
Harvesting	3 200.00
Sacks and twines	1 100.00
Working capital sub-total	28 696.00
Interest on working capital @ 10% of 50%	2 870.00
Total variable costs	31 566.00
Gross margin/acre	44 934.00

3.2 Rice production protocol

3.2.1 Ecological requirements

Rice requires high temperatures averaging 20-38⁰c and hence low altitudes of below 1200m above sea level. High altitudes lead to low temperatures and hence poor flowering late maturity and generally poor yield. At higher altitudes, rainfall coincides with flowering thus discouraging seed setting. Long periods of sunshine are essential especially the last 45 days from panicle initiation to harvesting. Rice can grow in damp, water logged soil or standing water. Standing water has the advantage of controlling weeds. Rice can be grown in many types of soils ranging from sandy loams to heavy clays. Heavy alluvial are the best because they permit puddling and reduce loss of water and nutrients. Optimum pH is 5.5-6.5 in dry soils and 7-7.2 upon flooding.

3.2.2 Agronomy

There are three kinds of rice depending on their growth habit. These are:

1. Upland rice which requires over 750mm of rain over a period of 3-4 months. This rice cannot tolerate drought and is cultivated like other cereals. The yields are fair but less than those of paddy.
2. Floating rice which is very tall (upto 5 metres) and takes over seven months to mature.
3. Swamp/lowland/paddy rice is grown in water from planting until approach of harvest. Water is applied either by flooding through surface irrigation, growing in swamp or by constantly irrigating by means of overhead means.

3.3.3 Land preparation

Land is first cleared then divided into paddocks with bunds/embankments around them. Each of the paddocks has an inlet and an outlet which are made operational during land preparation. A portion of the paddock whose size varies according to requirements is demarcated for nursery. A hectare of transplanted rice requires 350m² nursery bed. Before sowing the bed is flooded to a depth of 10cm to enable puddling by dragging a board back and forth to produce a fine mud. Flooding of the main field then follows before a tractor mounted rotary cultivator (rotavator) puddles the soil (hence the name paddy), followed by leveling. Often animals are used to make land level by dragging a

board before draining to give a level seedbed for the seedlings. In some places puddling is done using animals.

3.3.4 Planting

Clean certified seed of more than two months is used to ensure there is no dormancy. Improved varieties that are widely grown include; BG 90-2 and IR 1561-228-3-3 (Anon, 1983-85). Others are local Sindano and Basmati 217 from Pakistan. Seed is pre-germinated by putting in a bag and soaking in water for 24 hours before being removed drained and covered with grass for 24-48 hours until pre-germination occurs. The nursery is drained to leave a thin film of water on which a nematicide/insecticide (Furadan) and some nitrogen is applied. The latter is applied at the rate of 80-110kg/ha of Sulphate of Ammonia (SA). Seed is then broadcasted evenly at the rate of 45 kg/ha. This ensures fast growth of seedlings to be transplanted 3-4 weeks later at a height of 15-20cm. The seedlings are closely monitored for any symptoms of diseases but preventive measures are more often undertaken such as applying a fungicide at planting.

3.3.5 Transplanting

Seedlings are ready after 3-4 weeks depending on day length and temperature. Rice growth, development and yield are greatly influenced by seedling age, hence they should not be allowed to overgrow and neither should they be too tender to withstand transplanting shock. The seedlings are feeble and should not be transplanted in water depth of more than 10cm, otherwise they submerge. The spacing is 10×10cm to give a population of about one million plants per hectare.

3.3.6 Fertilizers

Triple super phosphate and is broadcasted at the rate of 120kg/ha before transplanting (or 56kg/ha of P₂O₅). Later the crop the crop is top dressed with 250kg of SA in two portions, the first half immediately after transplanting and the other 40 days later. It is important to alternate the nitrogen fertilizers (SA and urea) to avoid acidifying soil.

3.3.7 Water control

Water is controlled to a third of the height of the growing plant up to a maximum of maximum of 15cm. water should flow slowly through the field hence the need for flat land. Stale water is drained off and fresh water allowed in every 2-3 weeks. Harvesting is made easy by draining three weeks before when 50% of the heads bend. Flooding has the effect of smoothing weeds so it should be done properly. The few weeds that sprout particularly some aquatic ones are quite problematic, but they are pulled manually because of close spacing. Herbicides may be used but this is seldom in Kenya.

3.3.8 Harvesting and yields

Rice takes between 130-150 days to mature depending on location and variety. A well grown crop can be harvested all at once. Cutting is done with a sickle. Stems are cut and bundled together and transported to the threshing place. Grains are dried while still attached to the crop up to a moisture content of 14% after which they can be stored or milled. Rice grain yield range from about one to ten tonnes per hectare depending on variety, management and environment (Yoshida, 1981). The yield is a product of number of panicles, percentage of filled grain and the 1000-grain weight (Tanaka *et al.*, 1964).

The directly sowed rice yields 1100-1700kg/ha. Paddy production in Bunyala averages 4700kg/ha with good farmers reaching 5600kg. Mwea scheme produces an average of 5000-5700kg/ha but good farmers achieve as much as 7800-9300kg before the collapse of Ahero scheme, two crops per season were the norm. The first crop could produce 5 400kg/ha while the second gave 3000kg for an annual production of 8 400kg.

3.3.9 Pests

The main pests of rice are birds and rats. Insect pests are not a serious issue like in other crops. Birds are scared in small scale farms but poisoned by the large scale farmers. Rats are controlled by clearing bushes and baiting. They include rice hispid, white rice borer, pink stralk borer, army worms and maize webworm. These are controlled by application of insecticides.

3.3.10 Diseases

Rice blast is the most devastating and can easily complete crop failure so that no yields are realized. It is a fungal disease caused by *Piricularia oryzae*. It is regarded to be a disease of hot humid western Kenya and seed and airborne. It can attack the plant all stages causing seedling and leaf blight in the active growing phase and a neck rot slightly below the head. The first symptoms are small bluish flecks on the lower leaves which later develop in to brown spots with grey centers which finally merge until the whole leaf is brown and shriveled. Early attack leads to failure of the grains to fill with panicles falling over and causing rotten neck. A combination of high temperatures in the range 24-27⁰c, high humidity of over 90% and high nitrogenous fertilizers are optimal conditions for the fungus. The best control method is by planting resistant varieties such as IR. Seed dressing may be a satisfactory precautionary measure.

Rice yellow mottle virus (RYMV) is endemic to Africa and was first discovered in Kenya in 1966. It is mechanically transmitted by insects and tools as it gains entry in to rice through injuries. It is a major problem in paddy as well as lowland rice fields. Heavy losses have been recorded and in some instances even 100% (e.g. in Mali). Control is by minimizing injury to seedlings during transplanting and weeding as well as controlling insect vectors. But the surest way is use of resistant varieties, many organizations are running programmes to develop resistant varieties. Other diseases include stem rot leaf spot and yellow mottling.

4.0 POST-HARVEST HANDLING AND MARKETING

4.1 Post-harvest handling

Post-harvest handling operations include threshing, drying, storage milling and subsequent handling. There are plenty of losses that arise from these operations which should be born in mind and correction measures undertaken. Table 2 shows estimates of such losses in south East Asia, a region whose general efficiency is much higher than in sub-Saharan Africa.

Table 2. The estimated range of losses during the handling and and processing of rice in South-East Asia.

Operation	Percentage loss
Harvesting	1-3
Handling	2-7
Threshing	2-6
Drying	1-5
Storing	2-6
Milling	2-10
Total	10-37

Source: Padua (1975).

There are four rice schemes within the nucleus of Bunyala Irrigation Scheme. The best is power (electric) driven with a capacity of 10bags/hr and is able to grade the rice as well as separate bran from husks. Its potential has never been fully utilized and faces a perennial problem of paddy hence being out of business. Constant power outages and limited storage space are further drawbacks. A smaller diesel fueled mill with a capacity of 6 bags per hour is also in the area. The later is handicapped by expensive fuel and lack of paddy. There are two small rice mills that can polish bags of paddy per hour. The later three mills have no capacity to grade rice and end up mixing the whole lot thus missing out on premium market. All the chaff is also rendered useless unlike the first which produces bran as a useful byproduct for sale.

4.2 Marketing

Bunyala Irrigation Scheme has a history of producing rice for sale, indeed its cultivation may be considered to be marketed production which is defined as that part of farm output that is sold irrespective of other household requirements (Kumar, 1999). When members of Munaka CBO were asked to name their market outlets for the last crop, majority (48%) of those who were able to produce some yield (blast disease wiped out the crop) mentioned NIB while few consumed or sold it locally (Figure 3).

Farmers gave diverging pricing figures ranging from Ksh 32 per kg of unpolished rice to Ksh 37 but 76% of them mentioned Ksh 34 per kilogram for unpolished Basmati rice (Figure 4). The driving force in pricing is the variety with Basmati fetching premium while Sindano fetched a lowly Ksh 14 per kilogram and was not even considered by

farmers for planting. The prices of varieties IR, BW and BG were ranged between Ksh 24 to 30 but were not grown last season.

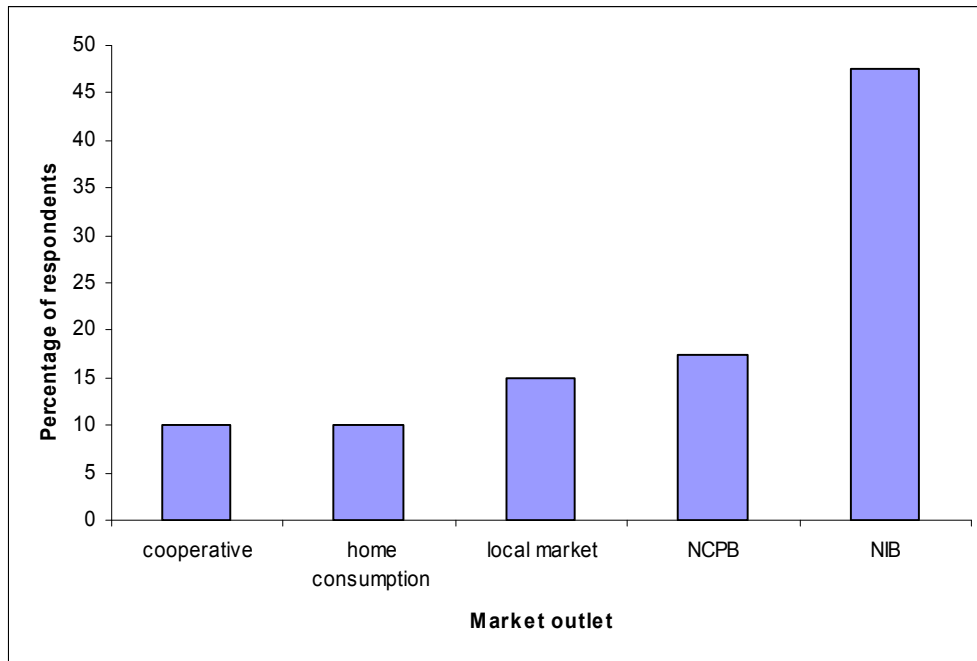


Figure 3. Market outlets as mentioned by farmers of Munaka CBO expressed as a percentage of those who sold the crop last year.

A number of market outlets were observed around the scheme. Given that the local staple food is “ugali” (maize meal dish), the local market for rice is small. A tour of local market centres (Nyadorera and Ruambwa) during market days affirmed this fact as little rice was observed displayed compared to large volumes of maize that were observed. Small amounts of this produce are on sale on a daily basis in the local trading centres of Mubwayo and Magombe while along the Ruambwa-Maumau road, some more is on sale directly from homes and is found displayed by the roadsides

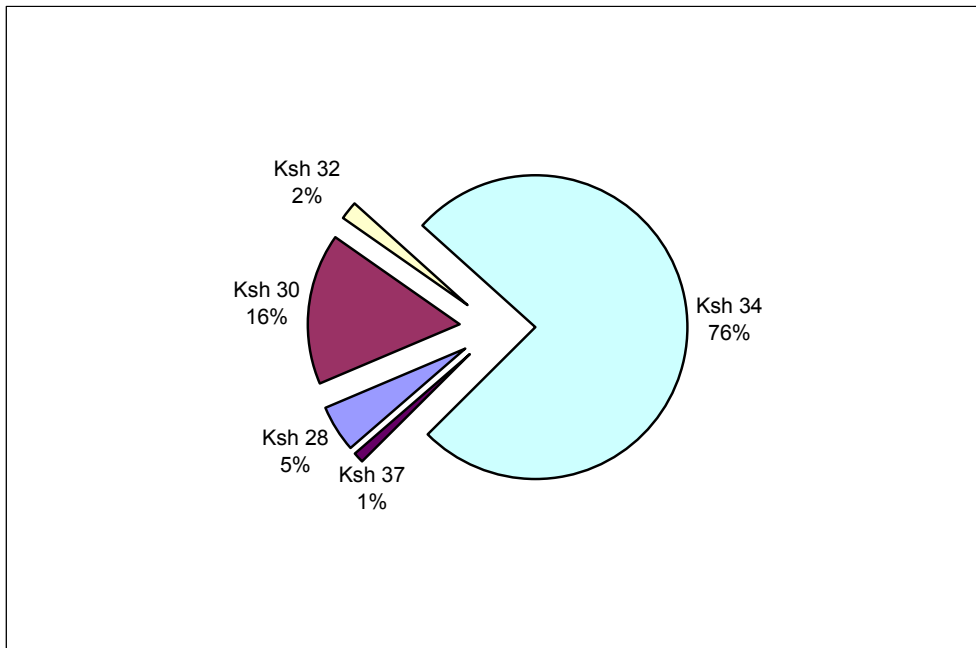


Figure 4. Prices of unpolished rice per kg as pointed out by farmers in Bunyala.

The implication is that rice is primarily produced for the external market whose outlets were observed to be the following;

1. Thousands of bags of rice are purchased by NIB and LBDA who take to distant mills such Mwea rice millers.
2. Local millers purchase, process and sell to distant markets. At least one of them is able to purchase hundreds of bags and ferries to Mombasa and Kisumu under the brand of the local cooperative society.
3. Bodaboda (bicycle) traders who purchase unpolished rice and take it to the local mills before selling it to the surrounding towns like Port Victoria, Siaya and Busia. The amount is in the region of tens of bags.
4. Small amounts are ferried to Lake Victoria Islands and neighbouring Uganda by hawkers, this mainly takes the form of batter trade.

Local supermarkets preferred samples of well labeled and packaged (2kg) rice thus pointing the way for the future. The Dominion Farms Limited sells large amounts of rice and can possibly come in handy should there be need (in case of improbable marketing difficulties). In this era of information and communication technology (ICT), the scheme

should be well connected (internet) in order to source not only for markets but also for quality and affordable goods and services to promote effectiveness.

5.0 STAKEHOLDERS

Bunyala has a wide recognition owing to the annual occurrence of floods that displaces many inhabitants and calls for local and international relief efforts to help the government. In the process, some of these bodies have tried to go a step further and help the locals to come up with sustainable means of livelihoods. They include World Vision, Action Aid and several NGOs (Table 3). Some of these organizations have started assisting paddy farmers by proving partial finance for some activities. As an example, the World Vision has financed acquisition of pesticides for some farmers with instructions to make it a revolving fund.

Table 3. Rice stakeholders and their roles in Bunyala Irrigation Scheme.

Stakeholder	Function in relation to rice production
Ministry of agriculture	Projects implementer
BUCODEV	Food security and capacity building
FFS	Food security, capacity building and production techniques
Social services	Group dynamics and capacity building
KENFAP	Lobbying, advocacy and marketing for farmers
Action Aid	Food security and education
K-Rep bank	Loans farmers
CDF	Funds community projects
Ministry of youth affairs	Loans and capacity building to young farmers
World Vision	Loans and capacity building
National Irrigation Board	Provides water and maintains canals
KAPP	Trying new varieties of rice on-farm
Dominion farm	Large scale rice producer and seed merchant
SACRED Africa	Running NERICA trials in nearby Bungoma district
Kadet	A microfinance for traders

6.0 MUNAKA OUTGROWERS CBO

6.1 Organization structure

Munaka Outgrowers CBO was initially a self-help group that was registered by the ministry of culture and social services in august 2006. However, the group has since

amalgamated with the neighbouring Muluwa self-help group to become a CBO and is currently in the process of being registered accordingly. For ease of management occasioned by lengthy distances, the land has been divided into three blocks (Figure 5). The CBO is governed by an executive committee that is elected after every three years. It is composed of five members led by the chairman (Figure 6). The management committee is charged with the duty of running the organisation's day to day affairs. Each block has replicated the executive committee structure.

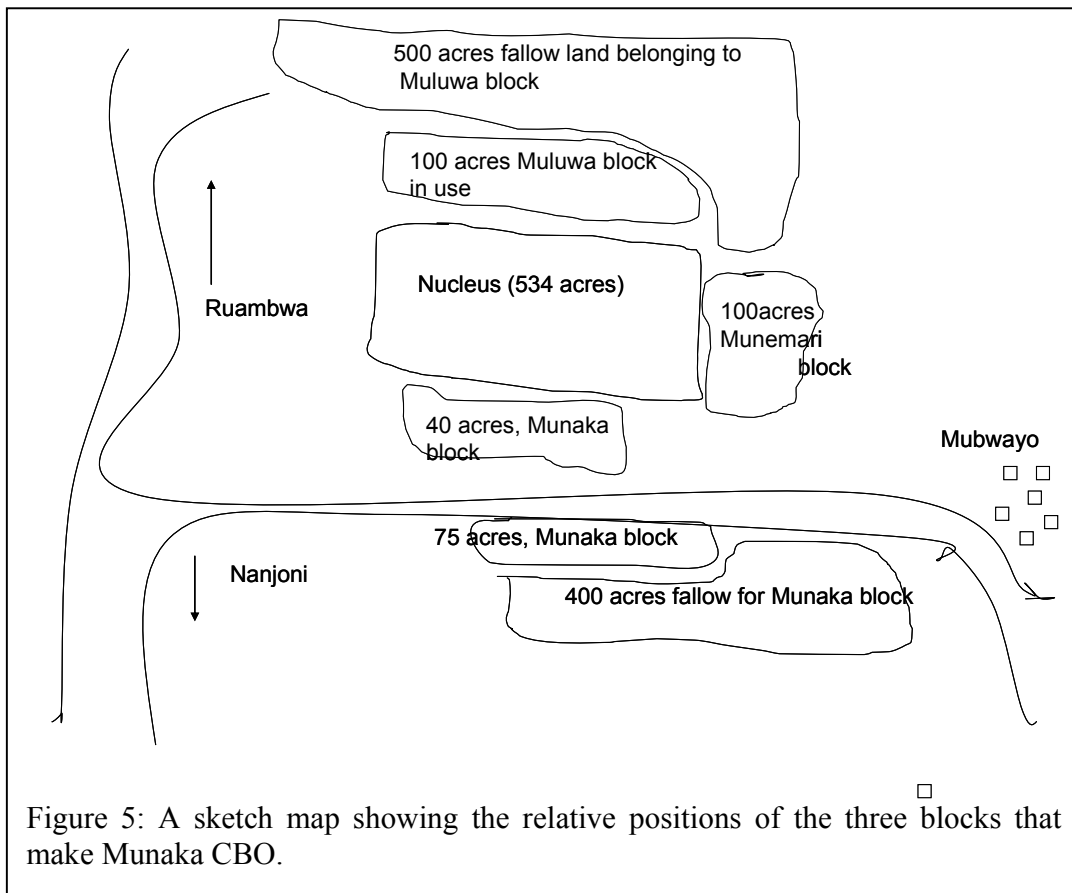
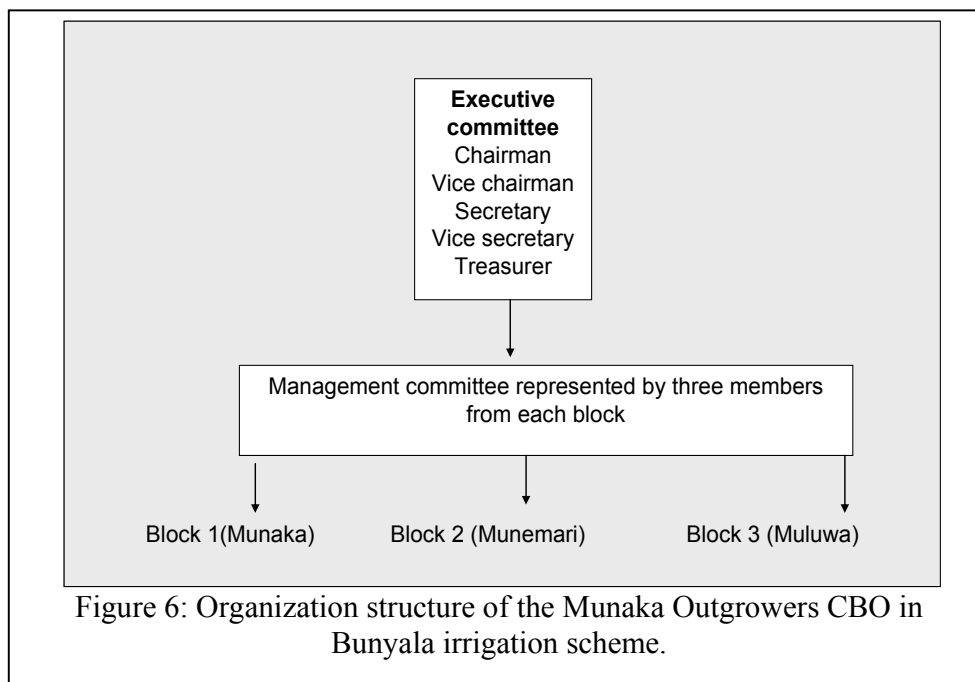


Figure 5: A sketch map showing the relative positions of the three blocks that make up Munaka CBO.



6.2 Membership and composition

Munaka CBO is composed of 325 households who are spread across four administrative sub-locations in two districts (Table 4). The present study succeeded in covering 94% (307) of the household heads or their spouses.

Table 4. Distribution of the members of the Munaka out growers CBO who were interviewed in the administration set-up of Bunyala Irrigation Scheme.

District	Location	Sub-location	No of farmers
Busia	Bunyala central	Magombe central	126
		Magombe east	104
		Magombe west	5
Siaya	Usonga	Sumba	72
Total			307

The farmers have grouped themselves in to three blocks namely Munaka (A), Munemari (B) and Muluwa (C) with the latter comprising the majority (Figure 7). The respective composition of these blocks among the respondents are 111, 71 and 125.

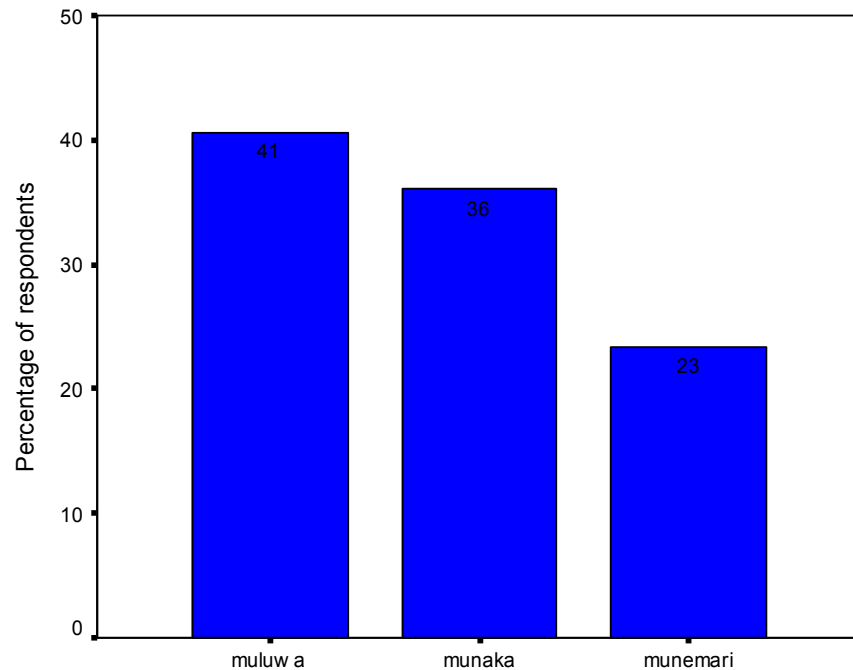


Figure 7. Percentage composition of farmers in Muluwa, Munaka and Munemari blocks that make the Munaka CBO.

6.3 Farming and farmer characteristics at Munaka CBO

6.3.1 Socioeconomic characteristics

The farmer survey covered 307 of 325 farmers (or 94.8%) belonging to the Munaka CBO. Majority (50%) of household heads of their spouses among the respondents were barely literate possessing primary education while a while 35% did not have any formal education (Table 5; Figure 8). The proportion of household heads with college education and above and whose services are available to the rest was 3%. An overwhelmingly large proportion (77%) of the respondents was exclusively farmers. Most households are headed by males but a significant proportion (38%) of the respondents was females notably widows and those whose spouses work in distant places.

Table 5. The levels of education, alternative occupations and gender proportions among members of the Munaka CBO expressed as percentages.

Education		Occupation		Gender	
None (informal)	34.7	Farming only	77	Male	62
Primary	49.7	Farm + trade	10	Female	38
Secondary	12.7	Others	13		
College	2.3				
University	0.6				

The Munaka CBO is dominated by old persons whose composition was 46% (Figure 9). The old in this study are defined as those with over 50 years while the middle aged ranged between 36-49 years and comprised of a large group of 43%. Few households (12%) were headed by people under 35 years of age.

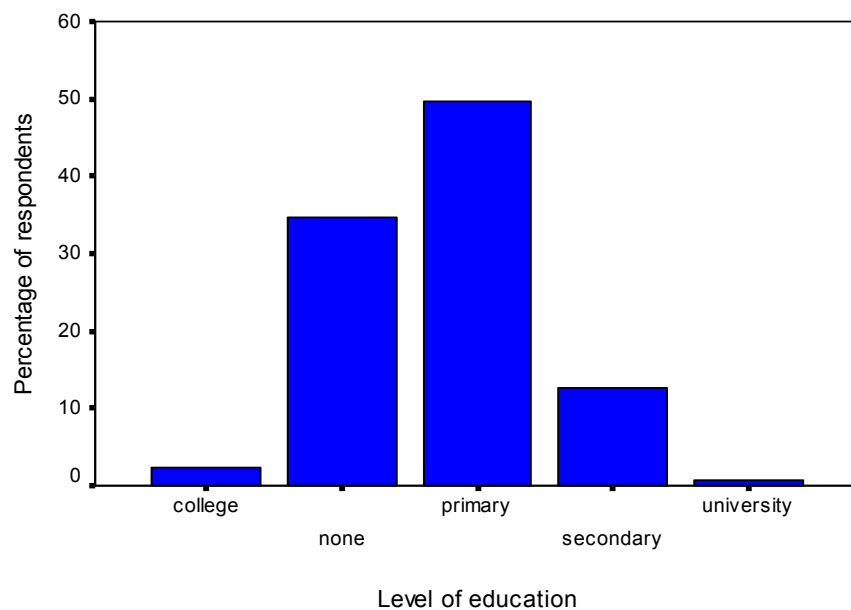


Figure 8. Education level of farmers belonging to the Munaka CBO in Bunyala irrigation scheme.

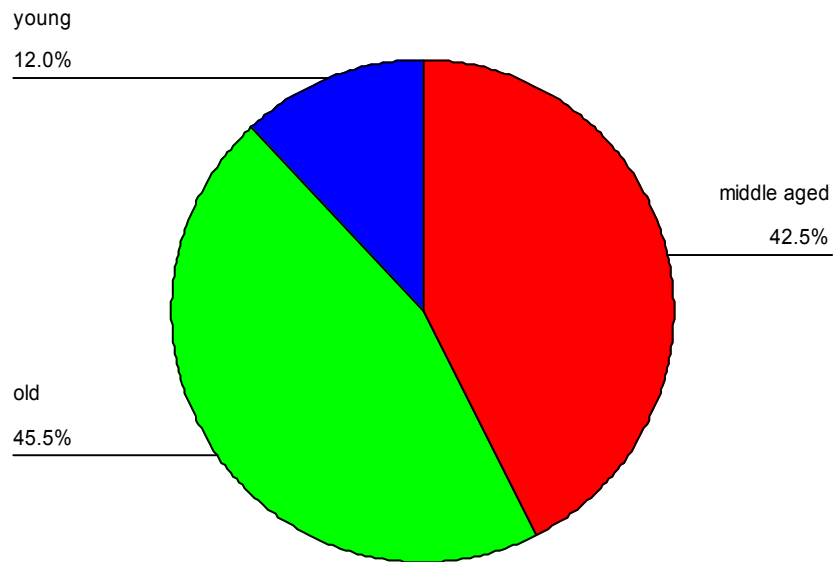


Figure 9: The proportions of the young, middle aged and old among members of the Munaka CBO

6.3.2 Land ownership

Members of the Munaka CBO are typical smallholders dominated by those owning between one and two acres who comprised of 21% (Figure 10). A minority 12% may be regarded as moderate land with more than five acres. A good proportion (6%) of members of the group own no land but they lease for purposes of rice production owing to its reputation as the most profitable venture in the area. A group of farmers constituting 12% does not know how much land they own due to a combination of factors such as cultural that bar such knowledge from women, illiteracy and age among others. Over 60% of the respondents grew rice on less than one acre of land with only two percent cultivating the crop on more than four acres (Figure 11).

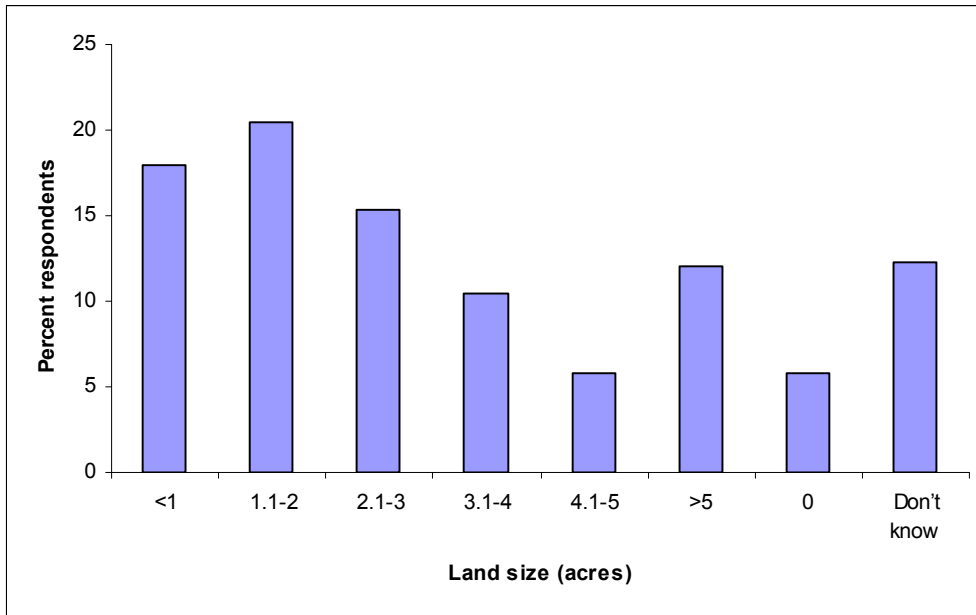


Figure 10. Land distribution among members of the Munaka CBO in the Bunyala Irrigation Scheme expressed as a percentage of respondents.

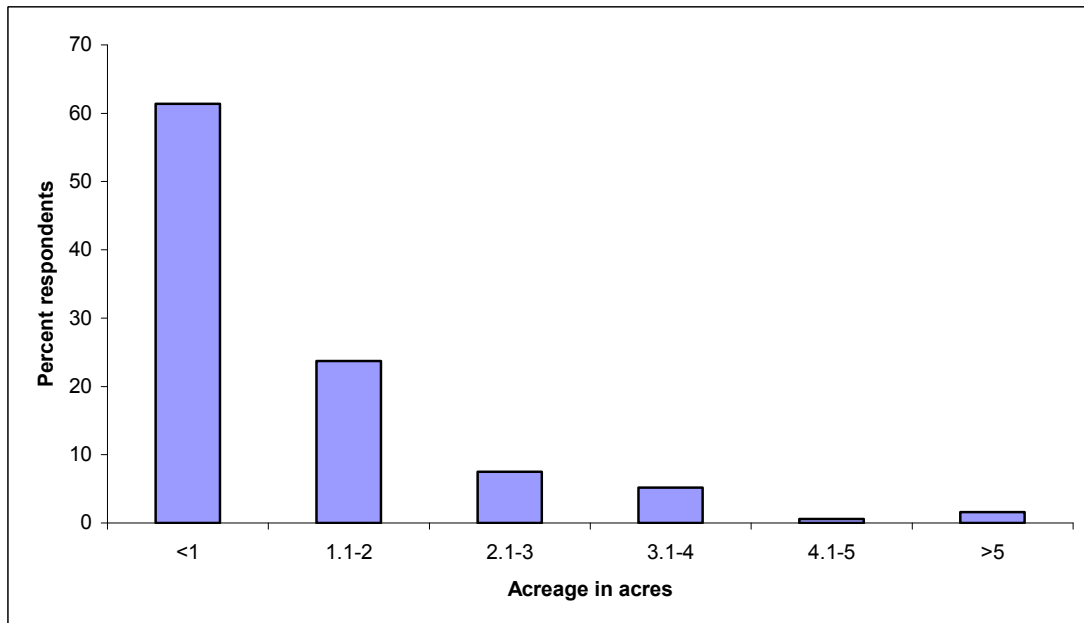


Figure 11. Land set aside for rice production by members of the Munaka CBO in the Bunyala Irrigation Scheme expressed as a percentage of respondents.

6.3.3 Farming as a commercial enterprise

Cultivation of paddy as an enterprise is considered to be the most profitable undertaking by a whopping 96% of the respondents (Figure 12). This is backed by the 53% of the respondents who kept records while those who didn't also affirmed that it was obvious fact. This gives great goodwill to any effort of improving any aspect of the rice sub-sector not only among members but also all around them.

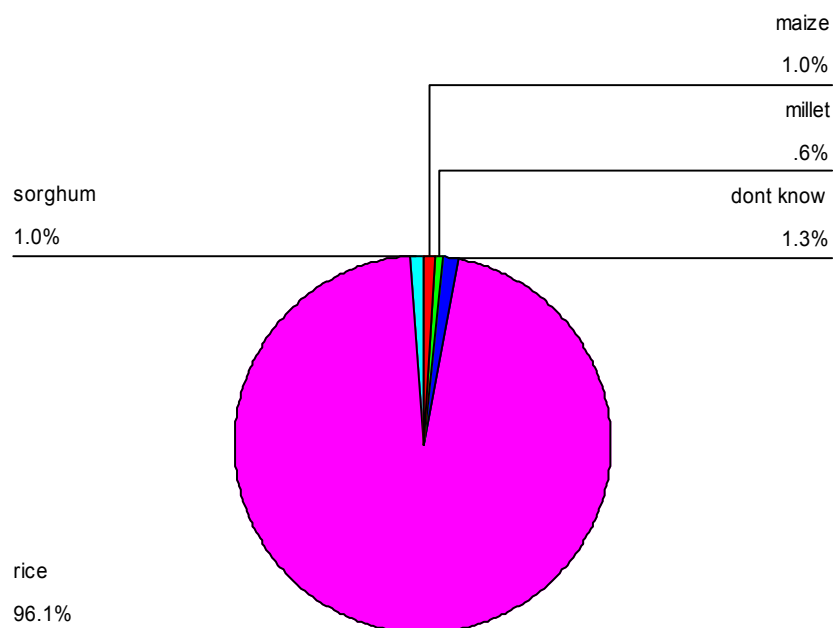


Figure 12 The relative importance in profitability of different farm enterprises as viewed by Munaka CBO members.

6.3.4 Fertiliser use

Knowledge of fertilizer application in rice is high among the respondents with most of them (60%) citing sulphate of ammonia (SA) as the first fertilizer. The proportion of respondents who could not name a second fertilizer was 80% suggesting that the main fertilizer being used by the members is SA. But there appears to be technical shortcomings in fertilizer use as many respondents either over or under applied the fertilizer. As an example, of the 38 respondents owning one acre of paddy, 20 applied 50kg, 12 applied 100kg one each applied 20 and 30kg while two did not apply any (Table 6).

Table 6. Disparities in fertilizer application among members of Munaka CBO possessing equal parcels of land (the respondents are expressed as a percentage of all interviewees).

Fertilizer amount (kg)	Size of land (acres)			
	0.5	1	1.5	2
0	2	2	0	0
50	15	20	3	3
75	0	0	3	1
100	5	12	5	14

Many respondents are evidently ignorant of fertilizer grades and their implication on amounts applied for instance, among 89 respondents who applied 50kg, 46 used SA (21% N) while 41 applied Urea (46%N), the rest could not recall which one they used (Table 7). Similar amounts of these fertilizers have different amounts of nitrogen, a fact that has escaped many respondents.

Table 7. Fertilizer application by members of the Munaka CBO showing disparities in levels of nitrogen as contained in different fertilizers.

Fertilizer amount (kg)	Fertilizer type			Total
	SA(21%N)	Urea (46%N)	Don't know	
0	3	3	4	10
25	23	10	2	35
50	46	41	2	89
75	5	3	0	8
100	54	23	1	78

6.3.5 Constraints

6.3.5.1 Pests and diseases

Rice blast disease was ranked first by 80% of the farmers as compared to only 9% who ranked caterpillars as the most damaging among pests and diseases (Table). Some of the other serious pests and diseases mentioned include Rice Yellow Mottle Virus (RYMV), birds and rats.

Table 8. Farmer ranking of the main pests and diseases limiting rice production.

Pest or disease	Ranking
-----------------	---------

	First	Second	Third
Rice blast	80	6	5
Caterpillars	9	46	3
RYMV	0	5	8
Birds	0.3	4	6
Rats	2	25	28
Borer	1	1	6

6.3.5.2 Other constraints

Lack of finance was given the top priority (62%) as the main limiting factor in rice production outside of pests and diseases (Table 9). Other constraints cited were lack of technical skills in rice production such as poor application of pesticides. Irrigation related difficulties were pump failure, mistimed flooding and poor drainage among others. The greater part of the farmers comprising 77% suggested that getting financial assistance from external sources could solve most of their shortcomings. This was followed by only 8% who thought that getting technical skills like timely and proper pesticide application was more important, but this is a more affluent group.

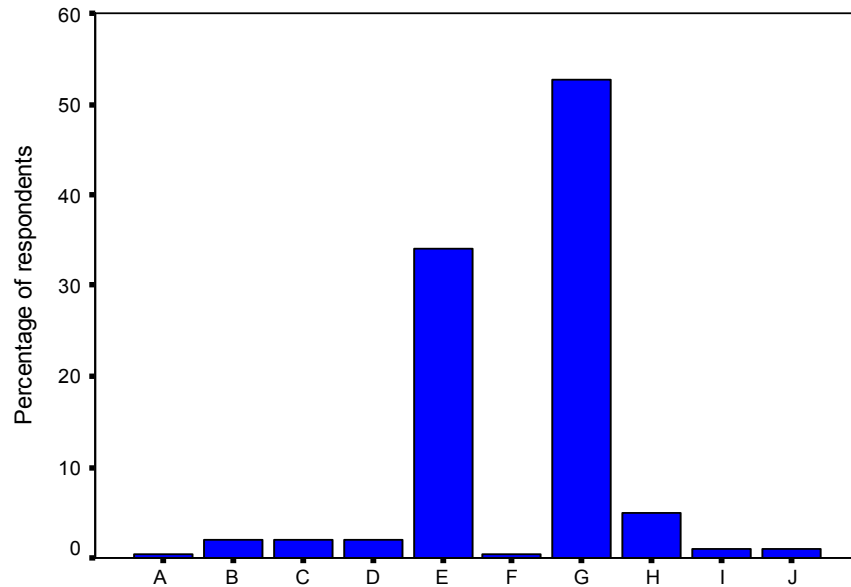
Table 9. The main constraints limiting paddy production as ranked by farmers belonging to Munaka CBO.

Constraint	Ranking		
	First	Second	Third
Lack of finance	62	8	2
Floods	9	11	6
Lack of skills	4	9	6
Irrigation related	4	7	2
Drought	7	43	68
Don't know	3	8	5

6.3.5.3 Agricultural credit

Munaka CBO obtained its credit for the last season from the Krep bank. This study among other aims sought to find out whether the members were aware of this fact by asking them whether they sought credit and if so from what source. Only 34% were found to have this knowledge against 53% who had no idea at all (Figure 13). The remaining 13% gave a variety of sources which they thought their CBO obtained credit

on their behalf from. Generally, agricultural credit is not available to the farmers as individuals and this serious limits the use of production resources such labour where majority (73%) rely on their families.



Legend

Figure 13. Farmers’ sources of credit in Bunyala Irrigation Scheme.

A	Munaka CBO
B	Constituency development fund
C	Local cooperative
D	Friends
E	Krep bank
F	Kuret
G	No credit
H	National Irrigation Board
I	Saga
J	World Vision

7.0 DISCUSSION

It is evident from this study that Bunyala Irrigation Scheme has great potential to increase paddy production and help reduce the rice deficit currently prevailing in the country. However, this potential lies not in the public section of the scheme which is restricted in land but rather in smallholders section to which Munaka CBO belongs. Whereas

Magombe multi-purpose cooperative society which runs the public scheme (in conjunction with NIB) cultivates about 500 acres, potential land in the hands of the CBO is double this figure. Across river Nzoia is found another CBO by the name Ruambwa-Mudembi which has huge tracts of land at its disposal that lie fallow. Therefore the future of this scheme lies with the smallholders.

Technical shortcomings which require strengthening were noted. For instance, insistence on Basmati variety in a hot humid area like Bunyala calls for keen attention to keep pests and diseases at bay. The fungus *Piricularia oryzae* that causes rice blast thrives in such conditions. Seed used in Bunyala is sourced from Mwea whose conditions are quite different. The nearby Dominion Farms Limited is conducting breeding programmes to produce suitable seed for the area, a fact that is likely to enhance the availability of improved seed. Adipala *et al.* (2000) pointed out that lack of improved seed is a major production constraint in Africa. Crop husbandry practices were found wanting among the outgrowers interviewed and requires external intervention. These include spacings, fertilizer application, timeliness of operations and more critically pest and disease control. The best option in this regard is to have a commercial oriented agronomist with a strong crop protection background to be based in the scheme. Such a professional should be assisted by able technical personnel.

The study has demonstrated that smallholder farmers are resource poor (capital and management) due to high levels of poverty, it is therefore unlikely that they can utilize the potential of their land to improve their lot by adopting better agricultural technologies. This finding tallies with a previous report by the ministry of Planning and National Development (Kenya, 1998). In attempting to impart improved technologies, it is important to make it a participatory effort as active farmer participation has been shown to improve the process (Ndolo *et al.*, 2001). Indeed Bohringer *et al.* (1998) argues that active participation of end-users is important for the success of any undertaking meant to tackle grinding rural poverty in Africa.

Financial constraint which translates to lack of adequate credit facilities was found to be the main drawback at Bunyala. This is in agreement with the widely held notion that capital is the most limiting factor to agricultural development in most areas of East Africa, therefore agricultural credit is essential either in kind or in cash. Because capital is both scarce and costly, it should therefore be used to finance the most profitable activities on the farm. Having confirmed that paddy production is the most profitable, then the next step is to source for credit. It is important to develop commercial attitudes of profit making and savings among farmers by regular training on credit management and constantly making follow-ups. It may be recommended that inexperienced farmers be given credit in kind.

It was evident that there was little contact between the extension and farmers on the ground. Outgrower farmers and indeed all the rest are heavily dependent on NIB even for technical agronomic issues, yet this body is primarily staffed with water engineers. Given the existence of a vacuum due to unavailability of crop officers, the NIB performed credibly in lending a helping hand in times of need. The poor extension-farmer linkage in Bunyala may have contributed a great deal in the crop failure observed in the last cropping season. The existence of the said gap justifies entry of potential facilitators such as the Institute for Sustainable Commodities (ISCOM).

Munaka Outgrowers CBO is endowed with an educated group albeit small, but it forms a critical mass of early adopters in order to spur innovations to the majority. The educated class that is based in the area full time such as teachers, traders, retirees and educated but unemployed young and middle aged people are an important resource that can be harnessed for the good of the community in any poverty reduction programme. The role of education was demonstrated by Ntege-Nanyeenya *et al.* (1997) as a factor that positively influences technology adoption and is therefore a plus for the Munaka CBO.

Paddy production is an expensive venture that smallholders cannot afford on their own due to heavy requirements including leveling, excavation of canals (done by government), building of bunds and their maintenance as well as water payment hence

the need for external support (Ochieng, 1992). Indeed this solution was offered by the majority of the farmers who were interviewed. Such external support should be well thought out to avoid project failures as in the past. Support especially financial should not be viewed as handouts like in the past but as borrowed capital that should be repaid after the enterprise takes off and form the basis of a revolving fund. Commercial attitudes ought to take the place of dependence culture. The young generation which has not been exposed to the handout culture is better placed to lead such programmes. The old generation that is educated should be used to woo their reactionary peers. Munaka Out growers CBO is among those with a blend of youth and experience as evidenced by their good organization and clear objectives.

Rice production among out growers in Bunyala resumed last year since collapsing in 1999. Nuclear based farmers resumed a year earlier and had good harvests, however, none of the two groups were spared by blast last year which led to complete crop failure. The schedule of production for out growers is dependent on the NIB programme that is tailored for their farmers. There is need to rectify the situation so that the best cropping seasons can be captured given that they are short in this area. This may also help to escape the vagaries of diseases through early planting.

Kenya is a rice importer and experiences a big deficit of 70 000 tones per year. Much of what is produced comes from Mwea. The rice market is therefore dominated by Mwea rice and imports from Pakistan, Thailand, China, India and Vietnam meant to cover the shortfall. The challenge is to gain entry given that consumers are used to labels associated with the aforementioned.

In Bunyala, rice is mainly sold to the National Cereals and Produce Board and Lake Basin Development Authority, but priority is given to government tenants. The former can therefore source for alternative market outlets which include local traders who ferry to neighbouring urban areas like Busia and Kisumu. In the event of successful large-scale production, it may be necessary to have proper storage facilities. Milling, grading and packaging might allow the farmers to reap more benefits in future. It is therefore

necessary to factor a proper mill that can grade rice while separating bran from husks to enable further benefits by selling the byproducts.

Kumar (1999) observed that the size of land under irrigation is one of the factors that promote marketed output a fact that has come out clearly in this study as all land under irrigation is meant to produce rice for sale with only remnants left for home consumption. Such market oriented production has been shown to increase the use of inputs by farmers in Africa (Strasberg *et al.*, 1998) and this is certain to improve production. Munaka CBO is well organized and thus beyond manipulation by middlemen unless there are adverse conditions, it is therefore likely to reap from economies of scale especially as efficiency is improved. Good organization and pooling of resources together is also likely to improve communication and remove market inefficiencies that middlemen normally exploit.

7.1 Conclusion and recommendations

Paddy production in Bunyala Irrigation Scheme is a viable project but a lot more potential lies with smallholder farmers who have room for expansion and the will to improve their lot. Smallholder farmers are deficient in knowledge and material requirements for paddy production and hence the need for external assistance to realize their potential. Towards this end, qualified personnel should be hired at the start until the project picks momentum.

Marketing may be gradually improved by adding value through processing and packaging and thus move away from sale of the unpolished rice. Out growers are likely to benefit by being more independent to decide their own production calendars in order to appropriately time the ideal cropping and marketing seasons. This can be done by empowering them with production, processing and marketing facilities.

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9.0 APPENDICES

9.1 PROJECTIONS

9.1.1 Revenue generation

Item	Year					
	1 (315 acres)		2 (400 acres)		3 (500 acres)	
	Qt(kg)	Value(Ksh)	Qt(kg)	Value(Ksh)	Qt(kg)	Value(Ksh)
Unpolished rice	590 625	14 175 000	750 000	18 000 000	937 500	22 500 000
Polished rice	-	-	-	-	-	-
Bran	-	-	-	-	-	-
Husks	-	-	-	-	-	-
Total	590 625	14 175 000	750 000	18 000 000	937 500	22 500 000
	4 (600 acres)		5 (800 acres)		6 (1000 acres)	
Unpolished rice	1 125 000	-	1 500 000	-	1 875 000	-
Polished rice	511 363	30 681 780	681 818	47 727 260	852 272	59 659 040
Bran	306 818	3 068 180	409 090	4 090 900	511 364	5 113 640
Husks	306 818	1 534 090	409 090	2 045 450	511 364	2 556 820
Total		35 284 050		53 863 610		67 329 500

Assumptions for the above projections

1. Improved rice variety excluding Basmati
2. yield per acre=1875kg(unpolished)
3. Price per kg of unpolished rice for the first three years=Ksh 24
4. Price per kg of polished rice in the fourth year=Ksh 60
5. Price per kg of polished rice from fifth year=Ksh 70
6. Price of bran=Ksh 10
7. Price of husks=Ksh 5
8. Ratio of unpolished rice to the polished is 2.2:1
9. Ratio of bran to husk is 1:1
10. To be fully operational in the sixth year but increasing efficiency to improve total income

9.1.2 Budget

1. Land

	Ksh
(i) space for structures and machinery, 3 acres@ Ksh 70 000	210 000
(ii) demonstration, 1 acre@Ksh 70 000	70 000
Sub-total	280 000

2. Structures

- (i) drying floor (600m²)
- (ii) store with a roof covering an area of 300m²
- (iii) office and its accessories (e.g. toilets)
- (iv) perimeter fence with gate

3. Machinery and equipment

- (i) 2 tractors
- (ii) 2 rotavators
- (iii) 2 trailers
- (iv) mill and packaging machine later on

4. Materials (values in Ksh)

Item	Year							
	1	2	3	4	5	6	7	8
Seed	551 250	700 000	875 000	1 350 000	1 800 000	2 250 000	2 250 000	2 250 000
Fertilizers	1 102 500	1 400 000	1 750 000	2 400 000	3 200 000	4 000 000	4 000 000	4 000 000
Pesticides	1 449 000	1 840 000	2 300 000	3 300 000	4 400 000	5 500 000	5 500 000	5 500 000
Water charges	1 260 000	1 600 000	2 000 000	2 400 000	3 200 000	4 000 000	4 000 000	4 000 000
Fuel								
maintenance								
Total								

Assumptions

1. cost of seed for the first three years is assumed to be Ksh 70/kg and later Ksh 90.
2. cost of fertilizer per acre for the first three years is Ksh 3500 and later 4000
3. cost of pesticide per acre for the first three years is Ksh 4600 and later 5500
4. cost of water charges to go down at a future date when gravity replaces pumping

5. Personnel (values in Ksh)

Position	Year 1		Year 2		Year 3		Year 4		Year 5	
	Monthly Salary	total	Monthly Salary	total	Monthly Salary	total	Monthly Salary	total	Monthly Salary	total
Manager	100 000	1 200 000	105 000	1 260 000	110 000	1 320 000	115 000	1 380 000	120 000	1 440 000
2 supervisors	60 000	1 440 000	63 000	1 512 000	66 000	1 584 000	69 000	1 656 000	72 000	1 728 000
Office assistant	30 000	360 000	31 000	372 000	32 000	384 000	33 000	396 000	34 000	408 000
6 TAs	20 000	1 440 000	20 500	1 476 000	21 000	1 512 000	21 500	1 548 000	22 000	1 584 000
2 security guards	10 000	240 000	10 300	247 200	10 600	254 400	10 900	261 600	11 200	268 800
Total		4 680 000		4 867 000		5 054 400		5 241 600		5 428 800

6. Budget summary (Ksh)

Item	Year				
	1	2	3	4	5
Land					
Structures					
Machinery and equipment					
Materials					
Personnel	4 680 000	4 867 000	5 054 400	5 241 600	5 428 800
Total					

9.2 Sample questionnaire used in the survey

**INSTITUTE FOR SUSTAINABLE COMMODITIES (ISCOM-KENYA)
BUNYALA RICE PROJECT
BASELINE SURVEY QUESTIONNAIRE**

Name of enumerator.....

1(a) Name of respondent.....

(b) Sex Male.....
 Female.....

(c) Location.....Sub-location.....Village.....Block.....

(d) Level of education

None.....Primary.....Secondary.....College.....University.....

(e) Alternative occupation (specify).....

2 (a) What is the size of your farm?.....acres

(b) What area have you set aside for rice ?.....acres

(c) Name five main crops that you grow

3 (a) What varieties of rice are available to you

(b) Where do you acquire your seed from ?

4 (a) Do you apply any fertilizer? If yes, specify _____

(b) Where do you acquire it from? _____

(c) What amount did you apply last time _____

(d) Where did you acquire pesticides from _____

5 (a) What are the main labour requirements in rice production?

(b) How do you meet them?

6 (a) Mention the main pests and diseases you have experienced in rice cultivation

(b) How do you control them?

(c) Name other constraints or problems

(d) Suggest solutions to the problems

7 (a) Do you keep farm records? _____

(b) How much rice did you harvest last year? _____

(c) Where did you sell the rice? _____

(d) What was the price per kilogram during the last cropping season?

(e) How is the profitability of rice compared to other enterprises on the farm and away?

8 (a) Do you get credit facilities? If yes from where?

(b) Do you know of any other credit facilities in the area? If yes, name them

9 Name any NGOs in your area if any and their roles

9.3 Names of farmers who were interviewed

Name	Sex	Block	Size of land	Size of rice land
1. Abrose Onalo	m	Munaka	.00	1.30
2. Abuya Peter Musumba	m	Munemari	6.00	2.00
3. Adinga James	m	Munemari	1.00	.50
4. Agata Nakuala Musoli	m	Munaka	.	.40
5. Akumu Odolo	m	Munaka	1.00	1.10
6. Alex Adondi Wanda	m	Munaka	1.00	.90
7. Alex Lukuku Ogolah	m	Munemari	.	1.10
8. Alex Okumu Masero	m	Munemari	.	1.00
9. Alfred Ombere Wandere	m	Munaka	.25	.25
10. Alimelda Lukuku	f	Munaka	5.00	1.00
11. Almerida Ambuywa Rakwomi	f	Muluwa	4.00	1.50
12. Almerida Aori Ojiambo	f	Muluwa	1.50	.20
13. Almerida Opala	f	Munaka	1.00	1.00
14. Amerida Ajiambo	f	Muluwa	1.50	.75
15. Anastacia Achieng' Odinya	f	Munemari	1.00	.50
16. Anastacia Sumba	m	Muluwa	1.50	.70
17. Andrew Abina	m	Munaka	.00	1.50
18. Andrew Adidwa Musumba	m	Munaka	3.00	1.20
19. Anjelina Ambuge	f	Munaka	.	.50
20. Anjelina Anyango	f	Muluwa	8.00	2.00
21. Anjelina Anyango	f	Munemari	.50	.30
22. Anjelina Ngayo Omieno	f	Munaka	4.20	2.50
23. Anjeline Apondi Maina	f	Munemari	2.00	.20
24. Anjeline Mukhuri	m	Munemari	1.50	1.00
25. Anjeline Ochieng' Okumu	f	Muluwa	3.00	1.00
26. Anjilina Mulanya	f	Munaka	.50	.50
27. Ann Anyango Lugendo	f	Munemari	4.00	.40
28. Anna Anyango Okello	f	Muluwa	1.50	.40
29. Anthony Onyango Angoma	m	Munaka	2.50	1.20
30. Anzilu Odowa	m	Munemari	.20	.60
31. Austine Nakhabuka Mudui	m	Munaka	8.00	5.00
32. Baos Odhiambo	m	Muluwa	4.00	2.00
33. Barnabas Onalo Ngirinya	m	Munaka	2.00	.50
34. Beatrice Gemester Onalo	f	Munemari	.00	.30
35. Benedictor Madieka	m	Munemari	.	2.70
36. Benjamin Ndayi Obayi	m	Munaka	1.00	1.00
37. Benjamin Opondo	m	Munemari	.	1.20
38. Benson Kadogo	m	Munaka	1.00	.50
39. Bernard Otiato	m	Muluwa	5.00	2.00
40. Boface Maina	m	Muluwa	1.10	1.10
41. Calisina Mung'ala Makhulo	f	Munaka	.00	.60
42. Catherine Nabwire Nakudi	f	Munaka	1.50	.50
43. Cecelia Ajiambo	f	Munaka	3.25	.40

44. Charles Apiyo Onire	m	Muluwa	2.00	1.00
45. Charles Nafhani Namia	m	Munaka	.80	.80
46. Charles O. Oyagi	m	Munaka	.80	.60
47. Charles Oduor	m	Muluwa	4.00	2.50
48. Charles Ogayi Ochieno	m	Munaka	1.50	1.00
49. Charles Okada	m	Muluwa	.	.50
50. Charles Omengo	m	Munaka	1.00	1.00
51. Charles Otieno Kechula	m	Muluwa	2.00	.60
52. Charles Wandera Murauni	m	Muluwa	1.25	.40
53. Christine Akoch Okondo	f	Munaka	1.30	1.30
54. Christopher Okumu	m	Munaka	.	.80
55. Clare Okada	f	Munaka		1.10
56. Clement Akong'o Awuor	m	Muluwa	6.00	3.00
57. Clement Oduor Muyindi	m	Muluwa	3.00	2.00
58. Clement Ombera	m	Munaka	.00	.60
59. Clementina Apondi	f	Muluwa	3.00	1.50
60. Consolata Aello Wanjala	f	Munaka	.30	.30
61. Consolata Ajiambo Okumu	f	Muluwa	3.00	.50
62. Consolata Auma	f	Munemari	3.00	1.50
63. Cornel Magero	m	Muluwa	3.50	2.20
64. Cornel Namodi	m	Muluwa	2.00	.70
65. Daniel Masero	m	Munemari	2.00	.50
66. Daniel Omeyo Maseru	m	Munemari	.	2.90
67. Daniel Omondi Ndeda	m	Muluwa	1.00	1.00
68. David Okello Rabwori	f	Muluwa	2.00	.50
69. David Wambani	m	Muluwa	2.00	1.50
70. Demtula Nabwire Okelo	f	Munaka	.	.50
71. Desta Mdogo	f	Munemari	.90	.40
72. Desterious Onyango Musolo	m	Munaka	2.00	.60
73. Dismus Jaoko Jaoko	m	Muluwa	3.00	1.00
74. Dismus Odhiambo	m	Munemari	2.00	1.00
75. Dora Sigana	f	Muluwa	2.50	.75
76. Dorcas Oninga	f	Munemari	.	1.30
77. Earnest Kechula Odongo	m	Muluwa	1.00	.90
78. Ebrahim Auma Okollo	m	Munemari	.00	.50
79. Elda Onyiso	f	Munemari	.	1.80
80. Elish Hadundu Okondo	f	Munaka	2.50	.60
81. Elizabeth Akinyi Kutolo	f	Muluwa	3.25	.30
82. Emmanuel Anyonga	m	Munemari	6.00	.80
83. Emmanuel Apudo	m	Muluwa	3.00	.80
84. Emmanuel Osembo Obambo	m	Munaka	.50	.50
85. Emmanuel Ouma Akhoma	m	Munemari	.	.20
86. Emmuel Ndeda	m	Muluwa	7.00	6.00
87. Esther Nyandiani	f	Munemari	4.00	.40
88. Evans Ng'ondi	m	Muluwa	.40	.80
89. Everline Oundo Okelo	f	Munaka	9.00	2.00

90.	Felista Auma Ong'odi	f	Munaka	2.20	.80
91.	Felista Ngolobe Andunga	f	Munaka	.	.
92.	Felistas A. Oguto	f	Muluwa	2.50	.30
93.	Felistas Oduol	f	Muluwa	2.40	.30
94.	Ferista Auma Daura	f	Munaka	1.50	1.90
95.	Ferister Ngolobe	f	Munaka	.00	1.30
96.	Fidelis Namodi	m	Muluwa	2.00	.70
97.	Fleria Weria	m	Munemari	2.00	.60
98.	FleriaMusando Onjalo	f	Munaka	2.00	1.00
99.	Flora Akumu Simon	f	Munaka	.50	1.20
100.	Flora Aori Buonya	f	Muluwa	1.00	.50
101.	Flora Nafula	f	Munaka	.00	.40
102.	Florence Nabwire	f	Munaka	2.50	1.10
103.	Francis M. Nyangweso	m	Munemari	1.90	1.50
104.	Francis Majoni	m	Munemari	3.25	3.25
105.	Francis Ngolobe Okondo	m	Munaka	1.00	1.00
106.	Francis Ochieng'	m	Muluwa	3.00	2.00
107.	Francis Ogoma	m	Muluwa	4.00	2.00
108.	Francis Ojiambo Omayi	m	Munaka	6.10	.70
109.	Fransca Adundo	f	Muluwa	1.00	1.00
110.	Fransica Anyango Wabwire	f	Muluwa	2.00	.70
111.	Fredick Oduor	m	Muluwa	5.00	4.00
112.	Fredric Odiko	m	Munaka	7.00	3.00
113.	Fredrick Ochieng' Ajwang'	m	Muluwa	2.00	.30
114.	Gabriel Odongo Oduori	m	Munaka	1.00	.50
115.	Gabriel Wamalwa Onyango	m	Muluwa	1.00	.50
116.	Gaudensia Were	f	Muluwa	1.50	.30
117.	Gerald Afubwa Otiato	m	Munaka	1.00	.50
118.	Geroge Maina Oluoch	m	Muluwa	3.50	.75
119.	Girigori Nambusi	m	Munaka	.	1.20
120.	Gonzaga Okondo	f	Munaka	1.50	1.50
121.	Hellen Ogwel Achieng'	f	Munemari	.	1.50
122.	Hendrica Achieng Juma	f	Munaka	1.50	.50
123.	Hendrica Khakhubi Murauni	f	Muluwa	2.00	.50
124.	Hendrika Nabwire Ouma	f	Munaka	2.00	.50
125.	Henry Aywak Aboka	m	Muluwa	3.00	2.00
126.	Henry Mukanga	m	Muluwa	7.00	2.00
127.	Henry Ogoti Odiko	m	Munaka	.00	.60
128.	Imelda Ouma	f	Muluwa	6.00	4.00
129.	Imera A. B.	m	Muluwa	2.00	1.10
130.	Jacinta Nabwire Mudenyoo	f	Muluwa	1.75	.70
131.	Jackim Ogola	m	Munemari	4.00	4.00
132.	Jackson Juma Wangira	m	Munaka	3.00	1.50
133.	Jacob Nadebu	m	Munemari	.90	.50
134.	James Abangi Akelo	m	Munaka	1.00	.40
135.	James Awuri Sumari	m	Muluwa	2.00	1.00

136.	James Khagaba Kimba	m	Munaka	2.00	1.30
137.	James Naura Musumba	m	Munaka	3.50	2.25
138.	James Ochieng Aroka	m	Muluwa	3.00	.80
139.	James Ochieng' Nasora	m	Munemari	3.00	1.00
140.	James Ojiambo Busolo	m	Munaka	5.00	5.00
141.	James Sumba Munawi	m	Muluwa	3.00	2.00
142.	James Sumba Ndege	m	Munaka	2.50	1.50
143.	Janifer Akinyi Onyango	f	Muluwa	5.00	3.00
144.	Janiphesa Veronica Anyango	f	Munemari	4.00	.40
145.	Jennifer Okubi	f	Muluwa	2.30	1.00
146.	Joanes Barasa Sulwe	m	Munaka	1.00	1.00
147.	Joanes Onjalo	m	Muluwa	4.00	3.00
148.	John Babu Adinga	m	Muluwa	5.50	3.00
149.	John Hono Mera	m	Muluwa	8.00	4.00
150.	John Musira Opondo	m	Muluwa	3.50	3.50
151.	John Obiero Musebe	m	Muluwa	1.00	.90
152.	John Obura Ochieno	m	Munaka	8.00	4.00
153.	John Ochieng' Amuok	m	Muluwa	4.00	.50
154.	John Odiwo	m	Muluwa	10.00	6.00
155.	John Oduor Ong'onyi	m	Munaka	2.00	1.50
156.	John Oduori Ohanga	m	Muluwa	1.50	.70
157.	John Ouma	m	Munaka	1.00	1.00
158.	John Wanyama	m	Munemari	2.00	.10
159.	John Wesonga Adala	m	Munemari	.	.70
160.	Johnson Lugendo Odhiambo	m	Muluwa	6.00	4.00
161.	Johnson Tabu Apondi	m	Muluwa	4.00	2.00
162.	Jonh Ruru Musola	m	Munaka	2.00	.40
163.	Joseph Achiemo Odino	m	Muluwa	5.00	4.00
164.	Joseph Adundo Mutata	m	Munaka	.25	.50
165.	Joseph Buyekha	m	Munemari	2.00	.50
166.	Joseph Bwire Malimba	m	Munaka	3.00	1.60
167.	Joseph Juma Adikinyi	m	Munaka	2.50	.50
168.	Joseph Lugendo	m	Munemari	1.00	1.10
169.	Joseph Makhulu Onalo	m	Munaka	.00	1.00
170.	Joseph Mugengi Oyijo	m	Munaka	.00	.15
171.	Joseph Nakari	m	Munaka	.75	.50
172.	Joseph Ndanda Oloo	m	Munaka	4.00	2.00
173.	Joseph Odiokho Opondo	m	Muluwa	5.00	3.00
174.	Joseph Oduori	m	Munemari	.	.60
175.	Joseph Okello	m	Muluwa	.75	.40
176.	Joseph Okoth Okumu	m	Muluwa	4.00	2.00
177.	Joseph Ouma	m	Muluwa	1.00	.50
178.	Joseph Sumba	m	Muluwa	2.20	2.20
179.	Josephat Magaba	m	Muluwa	4.60	1.20
180.	Josephina Akello Abuje	f	Munemari	.25	.40
181.	Josephine Ajiambo Oduori	f	Munemari	.	1.00

182.	Josephine Okello	f	Munemari	.	.40
183.	Josphine Achola Oriadi	f	Munaka	5.00	1.50
184.	Joyce Adhiambo Odeya	f	Munemari	.	.90
185.	Joyce Magoye	f	Munaka	2.50	.50
186.	Juliana Jou Jacob	f	Munaka	2.00	2.00
187.	Juliana Maina	f	Muluwa	2.00	1.20
188.	Julius Amwono	m	Munemari	.50	.10
189.	Leokadia Apondi Masero	f	Muluwa	3.00	1.20
190.	Leonida Alufu Onyango	f	Muluwa	3.00	1.00
191.	Longinus Omodo Oluwa	m	Munaka	4.50	1.50
192.	Lovine Akinyi	f	Munaka	.00	.40
193.	Lucas Oduor Okeka	m	Muluwa	3.25	2.00
194.	Lucas Oyogo Okello	m	Muluwa	1.10	.80
195.	Lucas Wandera	m	Munaka	2.10	1.70
196.	Lucy Pamela Onalo	f	Munaka	3.25	.80
197.	Magdalena Osenda Olumbe	f	Muluwa	1.50	.50
198.	Magdalena Adino	f	Muluwa	.00	1.00
199.	Magdaline Were John	f	Munaka	1.00	1.00
200.	Maina Joseph	m	Munemari	3.25	.60
201.	Malania Dongo	f	Muluwa	3.00	2.50
202.	Margaret Akello Araba	f	Munemari	.	.60
203.	Margaret Akoth Asike	f	Munemari	.	.50
204.	Margaret Akoth Oduori	f	Muluwa	2.40	2.40
205.	Margaret Anyango Apio	f	Muluwa	1.50	.50
206.	Margaret Madara	f	Muluwa	3.00	1.70
207.	Maria Achola	f	Munemari	1.00	.20
208.	Mariana Anyango Masero	f	Munemari	1.00	.50
209.	Mark Mukoya Abwoga	m	Munaka	2.75	.75
210.	Mary Goret Ogana	f	Muluwa	.50	.50
211.	Mary Musebe	f	Munaka	.50	.40
212.	Mathias Anyienda Nyiro	m	Munemari	9.00	2.20
213.	Matilda Negesa Simari	f	Muluwa	2.00	1.00
214.	Mbuya Musolo Hainga	m	Munaka	3.00	.50
215.	Michael Ajiambo Katebe	m	Munaka	3.00	1.60
216.	Michael Akumu Otega	m	Munemari	.50	.40
217.	Michael Akumu	m	Munemari	.	.40
218.	Michael Ogutu Oloo	m	Muluwa	6.00	4.00
219.	Michael Ojiambo Obwori	m	Munaka	5.50	1.00
220.	Michael Ombujo Ojwang'	m	Munemari	1.50	.80
221.	Michael Omedo	m	Munaka	1.00	.80
222.	Michael Rangira	m	Munaka	.00	.70
223.	Michael Wamalwa	m	Muluwa	3.80	.75
224.	Morris Negesa Ochieno	m	Munemari	6.00	.20
225.	Nabwire Muganda	f	Munemari	.	.50
226.	Nadongo Oliver	m	Munemari	2.00	1.00
227.	Nichola Opondo	m	Muluwa	6.00	4.00

228.	Nicholas Museve	m	Munemari	.	.50
229.	Nicholas Mwaro	m	Munemari	.	.70
230.	Nicholas Oduor	m	Muluwa	5.00	2.00
231.	Nicholas Okoth	m	Muluwa	2.50	2.50
232.	Nicholas Otini	m	Munemari	.	2.20
233.	Nicholas Sakha	m	Muluwa	2.50	1.00
234.	Nicholus Kaseve	m	Munaka	6.00	3.50
235.	Ochwele Egokhe Peter	m	Munemari	4.00	.30
236.	Oduol Wanjala	m	Muluwa	3.00	1.00
237.	Okello Jackton	m	Muluwa	1.10	1.10
238.	Opondo Opondo	m	Muluwa	8.00	.60
239.	Opondo Sabato	m	Munemari	2.00	.50
240.	Orieba Afubwa	m	Muluwa	3.00	1.00
241.	Owalo Lubia Meso	m	Munaka	7.00	6.50
242.	Pamela Auma	f	Munemari	.	.50
243.	Pascal Okhanya	m	Muluwa	.50	.10
244.	Pascal Omondi Odiya	m	Muluwa	6.00	4.00
245.	Pascalina Ogomba	f	Muluwa	8.00	1.00
246.	Pascar Omodo Obiba	m	Munaka	.	.60
247.	Pascaria Achola Mudondo	f	Munaka	.50	1.40
248.	Patrick Haduli Kaywa	m	Munaka	.70	.70
249.	Patrick Obambo	m	Munaka	.00	1.50
250.	Patrick Oduor	m	Muluwa	1.50	.40
251.	Paul Nanjala	m	Munaka	1.10	.50
252.	Paul Onyango	m	Munemari	.	.80
253.	Pauline Achieng Maloba	f	Munemari	4.00	.75
254.	Pauline Akeyo	f	Muluwa	1.00	1.00
255.	Pauline Akuku Angira	f	Munaka	.00	1.10
256.	Paulo Ogoha	m	Muluwa	4.50	2.00
257.	Peter Kaya	m	Munaka	.00	.70
258.	Peter Mugomi Asembo	m	Munaka	1.50	.30
259.	Peter Ogwindi Musebe	m	Munaka	5.00	.50
260.	Peter Oloko	m	Muluwa	1.50	.80
261.	Peter Omieno Omieno	m	Muluwa	6.00	3.00
262.	Peter Otuoma	m	Muluwa	2.00	1.00
263.	Petro Ogola Okello	m	Munemari	2.00	.60
264.	Phoebe M. Onalo	f	Munaka	7.00	2.00
265.	Pius Adondi Orieba	m	Muluwa	.	1.00
266.	Raphael Wanjala Mbeua	m	Muluwa	1.00	.80
267.	Resila Maringu Okumu	f	Munaka	.50	.50
268.	Resla Gombe	f	Munemari	.	.50
269.	Resula Muyayi	f	Munaka	1.50	.30
270.	Rose Juma Apollo	f	Muluwa	3.00	.90
271.	Rose Nabwire	f	Muluwa	3.00	1.40
272.	Rose Nabwire	f	Munemari	.	2.00
273.	Roseline Ajiambo Nakhabuka	f	Munaka	1.00	.70

274.	Roseline Atieno	f	Muluwa	4.00	1.50
275.	Roseline Majuma Nyaloka	f	Munaka	2.00	2.00
276.	Roseline Odhiambo Maina	f	Muluwa	5.00	3.00
277.	Rosemary Akuku Namia	f	Munaka	1.50	2.60
278.	Rosemary Auma Alaja	f	Munaka	2.50	1.60
279.	Rukia Rakwami Adala	f	Munaka	.00	.90
280.	Sabastian Naburi Asembo	m	Munaka	5.00	3.00
281.	Sabina Jacob	f	Munaka	2.60	1.40
282.	Samwel Auma Luo	m	Muluwa	6.00	1.10
283.	Samwel Osembo	m	Muluwa	4.50	1.50
284.	Sebastian Bwire Makonge	m	Muluwa	11.00	.50
285.	Sebastian Obuor Ongowa	m	Munemari	.	.50
286.	Sebastian Odhiambo	m	Muluwa	8.00	3.00
287.	Sebastian Omuya	m	Muluwa	10.00	7.00
288.	Silas Odowa	m	Munemari	.	.50
289.	Silvano Obira Marenya	m	Munemari	.	.10
290.	Simon Ouma Obayi	m	Muluwa	6.00	4.00
291.	Slyvester Orinya	m	Munaka	.00	1.00
292.	Stephen Adinda	m	Munaka	1.30	.80
293.	Stephen Odera Mukhengi	m	Muluwa	6.00	4.00
294.	Stephen Odowa Ombuje	f	Munemari	.80	.30
295.	Syprianus Olaka aloo	m	Munaka	4.00	.60
296.	Tekela Apiyo	f	Muluwa	4.00	2.00
297.	Teresia Nasike Adondi	f	Munaka	1.00	.50
298.	Teresia Odero Lucasi	f	Muluwa	4.00	1.00
299.	Teresiah Onyiego Lukendo	f	Munaka	1.00	.60
300.	Tidora Ramadhani	f	Munemari	6.00	.50
301.	Tom Dambi Kubadi	m	Munaka	3.00	1.00
302.	Topista Anyango	f	Muluwa	11.00	6.00
303.	Vivian Sebby Oloo	f	Munemari	1.50	.50
304.	Wifrida Opondo	f	Muluwa	2.50	1.00
305.	Wilfrida Nabwire	f	Muluwa	5.00	2.00
306.	William Panyako Murauni	m	Muluwa	10.00	.40
307.	Wilson Sikhakha Kaywa	m	Munaka	1.50	.50