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# Improving Rural Livelihood through NERICA Farming: An Inquiry into Najja Sub-county in Central Uganda

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**Abstract**

New Rice for Africa (NERICA) was introduced in Uganda to help rural farmers in improving their livelihood in terms of income and food security. Using the livelihood impact analysis technique, this study sought to assess the role of NERICA in improving rural livelihood by (i) understanding the production environment (ii) exploring the marketing opportunities and challenges and (iii) highlighting the changes in livelihood outcomes. The findings indicate that upland varieties are cultivated mainly in lowland areas and rural farmers prefer early maturity attribute to high productivity. Milling places also double as selling points where buyers and sellers meet. Selling milled rice fetches more profits than paddy. The most popular asset purchased from NERICA proceeds is land. The main challenges to production and marketing are inadequate extension service and high transport costs respectively.

**Keywords:** NERICA farming, Uganda, rural livelihood, rice marketing, livelihood impact analysis

## Introduction

Like in the rest of the developing world, Ugandan farmer's livelihood remains in a miserable state. Agriculture, a main source of livelihood, is subsistence characterized by use of rudimentary tools, poor quality seeds, inadequate supply of agricultural chemical inputs, no irrigation and poor marketing channels. As a result, this has led to low yields, low household incomes, food insecurity, malnutrition and poor livelihood in general. The situation is worse in rural area which is home to over 80% of the entire population. For the last fifteen years the Government of Uganda has been implementing macroeconomic and civil service reforms aimed at improving the livelihood of people in terms of income, food security and socio-economic status (MAAIF, 2005). Promotion of NERICA (New Rice for Africa), which was first developed by African Rice Center, is one of the initiatives adopted in this context. Dubbed a 'food cash crop', NERICA has attracted a lot of public and international attention in the country. Locally, the effort to boost NERICA rice production and marketing is jointly pursued by the Office of the Vice President (OVP), the National Agricultural Advisory Services (NAADS), partner NGO`s such as Sasakawa Global 2000 and the private sector with the view to improving rural livelihood (Odogola, 2006). Against this backdrop, whether the NERICA promotion initiative is yielding results is a matter of interest. According to the Ministry of Trade, rice production in Uganda has

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increased 2.5 times over the five years since 2004 (Savitri, 2009). In the same period, NERICA varieties increased yields by 0.5 tons (incremental effect) although it wasn`t clear whether this increase would translate into higher profits and improvement of welfare (Kijima, 2008). In a separate research, Kijima *et al.* (2008) concluded that NERICA has the potential to increase per capita income by 10% and to decrease the poverty incidence by 4 percentage points as measured by the head count ratio

Generally speaking, the previous impact assessment studies have been mostly assessing adoption, yet adoption explains only part of the impact picture which assumes real (direct) impacts (La Rovere *et al.,* 2008). Since agricultural technology has both direct and indirect impacts, there is need to capture both of them (De Janvry and Sadoulet, 2002). Agricultural technology and particularly rice may have a much wider impact on livelihoods than simply improving crop yields or household food security. Unfortunately the linkages between technology and livelihoods are not always captured in technical evaluations. As a result, the dynamic role that agriculture may play in eliminating rural poverty is easily overlooked (Megor *et al.,* 2007).

This paper assesses the livelihood of rural farmers in relation to NERICA rice farming using a livelihoods approach. Specifically the research sought to (1) understand the NERICA production environment, (2) explore marketing opportunities and challenges and (3) highlight the role of NERICA in rural livelihood. As a result this study will serve as a guide to how NERICA project may be reshaped to improve rural livelihood without negatively impacting on other critical enterprises. A livelihood approach takes into account several of the factors that affect household well-being, and provides a way of examining diverse influences, thus ensuring that key issues are captured (La Rovere *et al.,* 2008). Ashley and Hussein (2000) also concurs with this argument by asserting that measurable changes such as cash and yield must be assessed not in their own right, but in terms of the contributions they make to livelihood. They (Ashley and Hussein, 2000) further stress that wellbeing is not only about improved income. Since livelihood priorities vary, putting central focus on peoples` lives by taking time to understand their livelihood objectives and opinions of how to best achieve them is a great step towards addressing the problem of rural poverty. The weakness with this approach is that it is descriptive and not explanatory. It is also unlikely that a single project may change the livelihood of a given community. However, going by Ashley and Hussein`s (2000) statement 'a single project may not substantially change the livelihood in quantifiable terms. Nevertheless livelihood impact assessment can highlight how it fits with livelihoods, any incremental changes and how impacts can be enhanced'.

## Methodology

### Study area

The survey was conducted in Najja sub county Buikwe district which is about 20 km from Njeru town council along Jinja-Kampala highway. Formally in Mukono district, Buikwe became independent in 2009. Najja sub-county is bordered by Lake Victoria in the east and south, Nyenga and Najjembe sub counties in the north and Buikwe and Ngogwe sub counties in the west. The area is under tropical rainforest (equatorial) climate and therefore no distinct seasons over the year.

The vegetation is savannah with a mixture of grasses and scattered shrubs and trees in almost equal proportion. With average minimum temperature of $17.5^0$C and average maximum of $27^0$C, the area is warm throughout the year. The rainfall pattern is bimodal with March-May and October-December rainy seasons bringing the annual average to 1200ml. According to the sub county report (2011), it was established that

Najja sub county has a population of 38200 people of whom 17700 are males and 20500 are females with the average household size of 6. The households are spread into 7 parishes of: Namatovu, Mawotto, Kisimba, Kiyindi, Gulama, Busagazi and Tukulu.

Fishing, livestock rearing and crop farming are the main sources of livelihood to the community. The source of livelihood to Najja-sub county community varies with the distance from Lake Victoria. People in the neighborhood of the lake are majorly fishermen and as you move further crop farming intensifies. Among crops, sweet potatoes, cassava, maize, beans and rice are the most commonly grown. Currently, maize and rice (NERICA) are main crops grown for cash income. Coffee, which was a main source of livelihood until the late 1990's, was destroyed by coffee wilt. The emergency of vanilla in the early 2000 was a relief to the people of Najja as a livelihood source. Unfortunately, this was short lived following the loss of vanilla market to Madagascar (the main producer) which left this community with no alternative. At the same time, banana bacterial wilt disease emerged and destroyed all the banana plantations. The introduction of NERICA rice in 2004 came at an opportune time to this community who viewed it as a food cash crop for their livelihood. They were therefore among the early adopters following the introduction of NERICA rice varieties by Sasakawa Global 2000 through Buwagajjo Agro processors and Marketers Association (BAMTA). To see how this community is coping up with the new crop, the challenges they are encountering and the possible improvement strategies were some of the interesting points which motivated this study.

**Research design**

Multi-stage purposive sampling method was used. Within Najja sub county three parishes of Kisimba, Mawotto and Namatovu were selected because of their high concentration of NERICA farmers. The data was mainly collected using primary sources which were complimented with secondary sources through review of literature both online and printed materials. Primary data was collected between 22$^{th}$ August and 9$^{th}$ September 2012 using a variety of techniques. For this period the researchers were on site traversing the area while making observations of such things as housing status, availability and accessibility of shopping centers, rice milling machines, state of roads, land preparation and planting methods. For the purpose of quick memory, photography was employed in this exercise. To capture the profile information of the study area, key informant interviews with sub-county extension and administrative staff were conducted.

Thereafter, three group meetings in the form of dual moderator focus group discussions with 12 participants each were conducted at parish level. The exercise was conducted according to the Participatory Assessment of Livelihood Impacts (PALI) suggested by Ashley and Hussein (2000). To allow for smooth flow of information, male and female groups were separated. The topics of discussion included: Input requirements and their prices, cropping calendar, perception and importance of NERICA attributes, challenges encountered in NERICA farming, relevance of NERICA in their livelihood and their opinion on curbing the challenges. Each discussion was moderated by one researcher while the other made sure all topics of interest were covered within 2 hours period. As a way of confirming the collected data, well-designed survey forms were administered by the researchers to the household heads. A total of 18 such structured interviews were conducted covering detailed information on production and marketing of NERICA and its role to the livelihood of respective households.

This survey was structured according the livelihood impact analysis procedures described in Ashley and Hussein (2000). Data on attributes such as perceptions and

preferences was captured and organized with the help of likert scales. Profitability was estimated through gross margin analysis. Using descriptive statistics, the survey employed both qualitative and quantitative analyses in a triangulation manner to ensure meaningful conclusions.

## Results and discussion

### Production environment of NERICA rice in Najja sub-county

**Rain-fed rice farming: a fragile business**

The farming pattern in Uganda is entirely dependent on rainfall. Comparing the NERICA cropping calendar (figure 1a) and the rainfall pattern (figure 1b), it was established that planting starts with the onset of rainfall while harvesting is done during dry periods. Therefore the first rains (March-May) and the second rains (September-November) correspond with the first and second cropping seasons respectively. In this rain-fed farming, delayed rainfall leads to late planting and failure of rainfall means failure of the crop. This makes rice farming under rain-fed conditions to be such a risky and fragile business. With no irrigation facility in place and given their risk aversion nature, farmers are trying to minimize the risk by planting upland NERICA varieties in lowlands. Those who grow it on uplands look for that part of the parcel with high water retention capacity to ensure adequate moisture over a long period of time. Farmers reasoned that lowland soils retain moisture for a longer period which may reduce the yield loss in case of drought. Interestingly, this argument is in line with several studies which have been carried out in Uganda. Basing on the simulation results of cropland optimization, Fujiie *et al.* (2010a) study on potential of NERICA production in Uganda expounds on the yield-rainfall relationship. They stressed that in case of rainfall variability, the probability of obtaining no yield is 29% compared to 0% when NERICA is planted on upland and lowland respectively. In a separate study, they explained that high fluctuations in seasonal yield as a result of unstable rainfall may act as a signal to discontinue NERICA production. Using duration analysis, Fujiie *et al.* (2010b) found that exposure to drought or erratic weather significantly increased the chances of NERICA dis-adoption in Uganda. To contain this situation the NERICA rice promoters will need either to introduce simple irrigation methods or promote moisture conserving farming technologies. For example Goto *et al.* (2012) demonstrated that the introduction of terraces as water catchment instruments into NERICA fields does not only increase volumetric water content but also the average yield. Similarly Larson *et al.* (2010) had stressed that rice yield can be raised by introducing simple water control systems such as bunds, leveling and general crop husbandry.

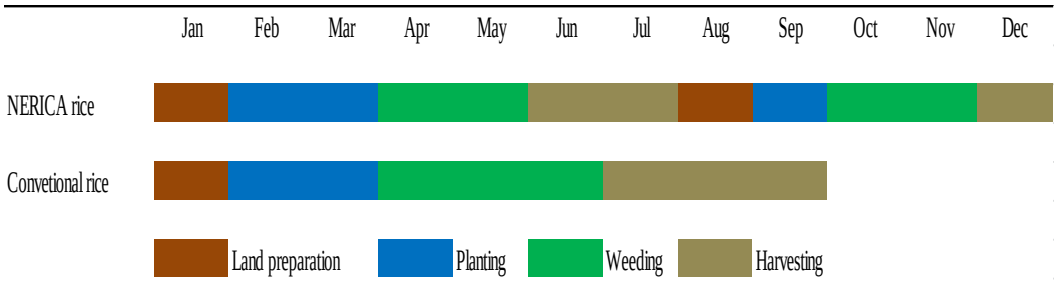



**Figure 1a: NERICA cropping calendar in Najja**
**Source:** Field survey (Aug-Sep, 2012)

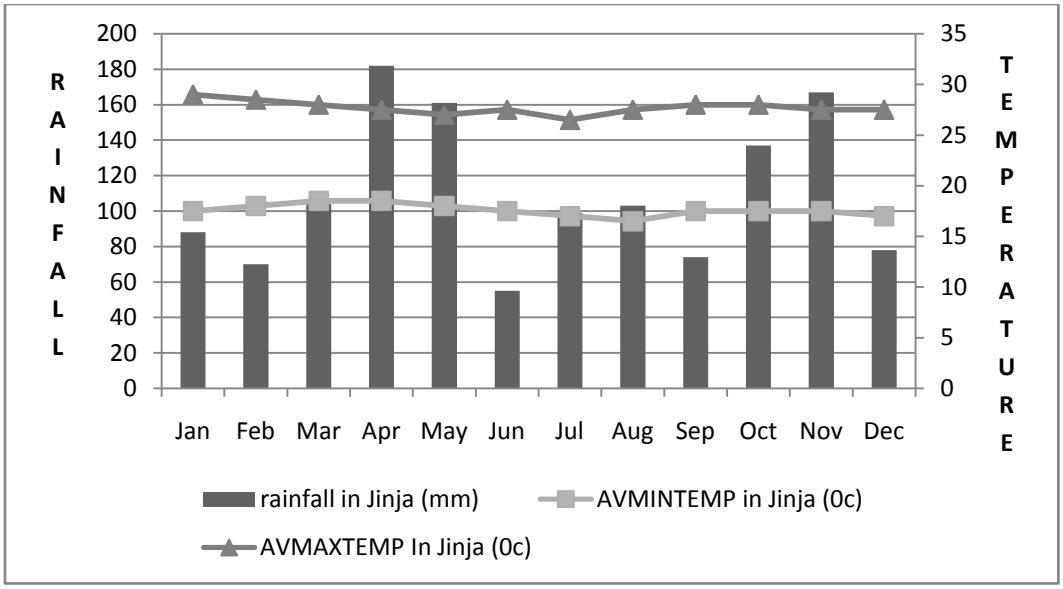



**Figure 1b: Monthly rainfall and temperature in Jinja**
**Source:** Field survey, UBOS statistical abstract (2010)

**NERICA: a strategic crop for Najja**

Table 1a compares yield of key crops in Najja sub-county to the national average. Production (tons/ha) of NERICA, maize and beans were found to be higher than the national average. This was not true for sweet potatoes, cassava and banana which recorded very low yield levels. NERICA has the highest yield (3.3 tons/ha) which is far more than the national rice average of 2.2 tons/ha. The yield is poorest for banana (0.5 tons/ha) which contrasts the national average of 5.8 ton/ha. The interesting general observation was that the yield was relatively higher for grains compared to tubers. The cause of this scenario is unclear though it could be due to agro-ecological (mainly soil) conditions which favor particular category of crops. The low banana yield was due to outbreak of bacterial wilt which has been destroying most of the crop since 2001. Benkunda (1999) also listed Mukono and Masaka as the least productive districts in the country. According to Diagne *et al.* 2011, the average NERICA yield in Uganda is 2.2 ton/ha. The yields however vary with farm size and across regions as summarized by different studies in table 1b.

**Table 1a: Crop yield in Najja versus national average**

| crop | yield (tons/ha) | |
|---|---|---|
| | study area | national average |
| Rice | 3.3 | 1.4 |
| Bean | 0.8 | 0.6 |
| Maize | 1.9 | 1.5 |
| Banana | 0.5 | 5.8 |
| Cassava | 2.6 | 8.2 |
| S/potato | 2.3 | 4.3 |

**Source:** Field survey (2012) and UBOS

**Table 1b: NERICA yield by location and farm size locations**

| NERICA study area | NERICA area per farm (ha) | yield (ton/ha) |
|---|---|---|
| Namulonge (central Uganda)* | 0.27 | 3.30 |
| Najja (central Uganda)** | 0.29 | 3.26 |
| Western and central Uganda*** | 0.39 | 2.60 |
| Northern Uganda**** | 0.40 | 1.80 |
| Namulonge (central Uganda)* | 0.46 | 2.00 |

*Miyamoto et al 2012, ** Research interview (Aug-Sep 2012),
*** Kijima et al 2006, **** Fujiie et al 2010

The yield reported in this study (3.26) was realized with an average planted area of 0.29 ha. This concurs with the findings of the above previous studies. NERICA rice yields for central and western Uganda are generally higher than that of northern region. This is probably due to favorable conditions as indicated in the NERICA rice suitability map (Asea *et al.*, 2010). The variation within region can be attributed to management efficiency as explained by farm size yield inverse relationship. As witnessed in the above previous studies, NERICA yield decreases with increase in acreage hence the higher yield in Najja due to small planted area per farm. Although not considered a priority crop for Buikwe district in the national agricultural zoning, NERICA rice should be promoted in Najja sub-county given its high productivity in comparison to national rice figures and to other crops within the sub-county. Since this high productivity is being realized without applying any fertilizer, there is no doubt that the introduction of such inputs will further improve the yields.

**Early maturity: a powerful NERICA attribute**

Although promotion of NERICA varieties has been biased towards their high productivity attribute, farmers of Najja rated early maturity as the most important reason for adopting it. According to group interview results (right part of table 2), farmers strongly agreed with NERICAs as early maturing varieties which take 90-105 days to mature as opposed to conventional varieties which require more than 120 days. Their perceptions were also in favor of productivity and taste. However, they strongly disagreed with NERICA`s drought resistance feature as well as doubting its resistance to pests and diseases. It is for this reason that they have restricted NERICA to water retaining areas as discussed in the previous section. When it came to ranking their preferences (left part of table 2) for NERICA attributes, they ranked early maturity highest followed by productivity on 1-5 scale with 1 the most preferred. Still resistance to harsh conditions ranked poorly. NERICA`s short growth period means that it is not only labor saving, but also can help in escaping drought effects. Early maturity`s ability to allow double cropping of NERICA was also applauded as a great attribute compared to conventional rice in which single cropping is unavoidable as earlier illustrated in the cropping calendar.

**Table 2: Rank importance and perceptions towards NERICA attributes**

| | Preference (1=most important) | | | | Perception (S=strongly,A=agree,D=disagree) | | | |
|---|---|---|---|---|---|---|---|---|
| Attribute | men | women | mixed | overall | men | women | mixed | overall |
| Early maturity | 1 | 1 | 2 | 1 | A | SA | SA | SA |
| High productivity | 2 | 2 | 1 | 2 | A | A | A | A |
| Good taste | 3 | 3 | 3 | 3 | SA | A | A | A |
| Drought resistance | 5 | 4 | 4 | 4 | SD | SD | D | SD |
| Pest and disease resistance | 4 | 5 | 5 | 5 | D | SD | D | D |

**Source:** Field survey (Aug-Sep 2012)

These findings are consistent with Larson *et al.* (2010) discussion in their study "Can Africa Replicate Asia`s Green Revolution in Rice?" where they explain the relevance of early maturity in NERICA promotion. Bzugu *et al.* (2010) study in Nigeria also confirms that early maturity is considered the most important reason for adopting NERICA 1 variety. The same study places productivity in third place below pest and disease resistance. These results thus provide the concerned stakeholders with an alternative approach to promoting NERICA rice, more especially in areas where the local varieties out-perform it in terms of productivity.

**There is need for strengthening the extension system**

Growing of NERICA in Najja sub-county was started in Najja village in 2006 by Sasakawa Africa Association (SAA) and National Agricultural Advisory Services (NAADS) as shown in table 3. Particularly SAA, through its farmers` association center (BAMTA), has been responsible for spreading NERICA to other villages until 2012 when farmer-to-farmer extension started. Inadequate knowledge of NERICA farming (by NAADS) and lack of adequate human resources (by SAA) have resulted into poor information dissemination and slow adoption of NERICA. Although extension is mainly by SAA, the center is located in Nyenga sub-county (Buwagajjo village) about 20km away and connected with muddy impassable roads during the rainy season. The center also has one extension staff who serves a membership of about 3000 farmers covering four sub-counties.

**Table 3: NERICA introduction in Najja by agency and year**

| | | NERICA introduced | | |
|---|---|---|---|---|
| Farmer | Village | by | year | seed source |
| 1 | Najja | NAADS | 2006 | own saved |
| 2 | Kisimba | SG2000 | 2006 | own saved |
| 3 | Najja | SG2000 | 2006 | other farmer |
| 4 | Najja | NAADS | 2006 | own saved |
| 5 | Buleega | * | * | * |
| 6 | Kobubiro | SG2000 | 2006 | own saved |
| 7 | Makindu | NAADS | 2006 | own saved |
| 8 | Kitabazi | * | * | * |
| 9 | Kitabazi | * | * | * |
| 10 | Buleega | SG2000 | 2008 | own saved |
| 11 | Kisimba | NAADS | 2009 | own saved |
| 12 | Buleega | NAADS | 2010 | own saved |
| 13 | Kitabazi | * | * | * |
| 14 | Najja | SG2000 | 2012 | other farmer |
| 15 | Buleega | SG2000 | 2012 | own saved |
| 16 | Buleega | Other farmer | 2012 | own saved |
| 17 | Kisimba | Other farmer | 2012 | other farmer |
| 18 | Buleega | * | * | * |

*farmer does not grow NERICA

**Source:** Field survey (Aug-Sep 2012)

In turn, the training intensity has been minimal with some farmers not able to access any service at all. This lack of effectiveness and efficiency has caused weaknesses in farmer group activities such as input purchase and output marketing. Sseruunkuma *et al.* (2011) showed that adoption of improved technologies depends on the intensity of participation in trainings. Many other studies (such as Floyd *et al.*, 2003, Mariano *et al.,* 2012) also support this argument that extension related activities have the greatest impact on technology adoption. In line with Bamba *et al.* (2010), this study recommends an integrated approach which involves designing a strong information dissemination system through: enhanced collaborations between various stakeholders, capacity building and or hiring of more extension staff with expertise on NERICA rice and adoption of modern extension approaches such as Farm Field Schools (FFS).

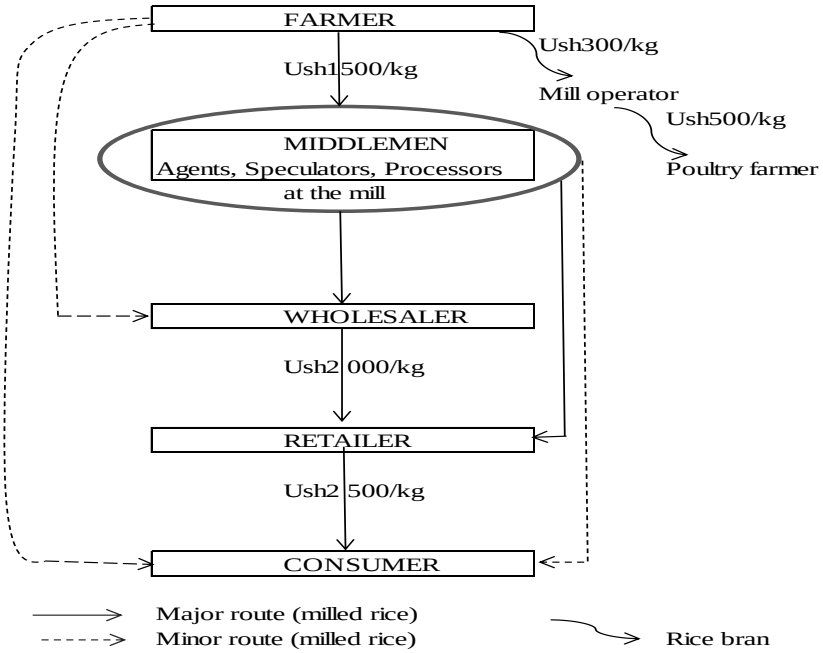
## NERICA marketing: opportunities and challenges

### Rice mills as pivotal selling points

All the NERICA produced by Najja sub-county farmers is sold in processed form as white rice despite mills being a long distance away. With the help of hired or owned motorcycles or bicycles, farmers carry their paddy to the milling machines which double as the selling points. It is at the milling machines that you find buyers waiting for farmers to process their rice before payments are made. As illustrated in figure 2, these buyers are of various categories although locally generalized as middlemen. They include agents who buy on behalf of wholesalers or retailers for a commission, speculators who buy and store the rice with the hope of selling in the near future for a relatively higher price and processors (usually mill owners) who purchase white rice from farmers, add value through packaging in unbranded 50kg gunny bags before selling. Price is collectively set by these middlemen and as such farmers take it up passively due to their lack of bargaining power which is brought about by individual marketing. Occasionally, farmers have the opportunity to sell directly to consumers who are usually public or private institutions such as schools, prisons and hospitals. Interestingly, all the rice produced is readily sold. Besides middlemen, whose dealings are secretive, prices received by other key players increased along the value chain as expected. It was on average Ush1500, 2000 and 2500 per kilogram for farmers, wholesalers and retailers respectively. Since this research`s focus was at farm level, the margins for wholesalers and retailers were not investigated. However, at a price of Ush1500, farmers were able to make a profit of Ush420/kg which could increase to Ush512/kg with the sale of rice bran. This market assurance is an opportunity to NERICA farmers which give them the desire to continue engaging in the crop. Not surprising, the rice producers are not the consumers although most of it is consumed within the region. It is produced in rural areas but consumed in urban areas due to a number of reasons. First, rice is an expensive food which cannot be afforded by the rural population who live on low income. For this reason, the rural people (including rice farmers) would rather sell rice expensively and make savings through buying cheap foods like cassava and sweet potatoes than consume it. Secondly, due to its ease in cooking compared to staple foods such as sweet potatoes, cassava and maize, it is preferred by urban dwellers who value time in terms of opportunity cost. Lastly, the urban population has been exposed to a variety of food culture including rice diet as a result of interaction with both national and international friends. Given that rice is the main food served in schools, it is obvious that the urban people were introduced to it during their school days since they tend to be more educated than their rural counterparts. All the above reasons have created demand in urban areas for rice hence

providing farmers with ready market for their produce. This rice marketing model is slightly different from Kijima *et al.* (2011) study on the development of agricultural markets in Sub-Saharan Africa. In that report they found that price was solely set by the mill operator. According to the same study, mill operators never participated in buying rice which would partly explain why they were entrusted with price setting. Since the mill operators in this study also buy rice, it is reasonable that price is collectively determined by all buyers. This is done at the expense of sellers who are powerless. However, the role of rice mills in rice marketing cannot be underestimated as they provide the marketing opportunity by doubling as selling points besides milling.

**Figure 2: Rice marketing channels in Najja**




**Source:** Field survey (Aug-Sep 2012)

**Value addition: a necessary requirement**

Table 4 compares gross margins from NERICA farming when sold in a paddy and milled form. Most of the surveys on gross margins (EMG 2008, PMA 2009) have been concentrated in the northern part of the country. The margins were lowest (Ush143300/acre) in Lango and highest in Acholi sub-regions. The only study (Mbeine and Ebong 2006) which has been conducted in the eastern region, the country`s highest rice producing area, has put the gross margins to as high as Ush747100/acre. It is evident that irrespective of region, the margins are higher if NERICA is sold in milled form than in paddy form. Although the data on national gross margins is limited, APEP (2006) field survey which covered most parts of the country put it at Ush262500 per acre if sold in paddy form. This figure is almost half the margins reported in current survey of Ush432500 per acre if sold in milled form. It is therefore necessary for key stakeholders to encourage simple value addition mechanisms such as milling which can double the profits from NERICA compared to when sold in paddy form. Unfortunately, the long distance to the

rice mills is a major constraint which raises the marketing cost.

**Table 4: Seasonal NERICA gross margins per acre across different parts of Uganda**

| Study | Region | Gross margin (Ush) | Selling form |
|---|---|---|---|
| EMG (2008) | Northern (Acholi) | 225000 | Paddy |
| PMA (2009) | Northern (Lango) | 143300 | Paddy |
| PMA (2009) | Northern (Acholi) | 315000 | Paddy |
| APEP (2006) | National | 262500 | Paddy |
| Current | Central (Buikwe) | 432500 | Milled |

**Source:** Various sources as indicated the first column in the table

**Increased rice production: a remedy to high transport costs**

Fourteen out of eighteen farmers interviewed were at least 15km away from the rice mill (selling point) which is located in Njeru town council. To transport their rice for milling, farmers had to part with Ush7000 for every 100kg of paddy through hiring of motorcycle which is the most commonly used means. Transport problem was also unanimously cited across all categories during group interviews as their undoing in rice marketing. Seasonal impassable roads during rainy season as well as distance to the mill were responsible for high transport costs. Although there was a rice mill within the study area, farmers rarely used it. They reasoned that it produced poor quality rice with many broken particles. Its milling recovery was also poor (at about 50%). According to Yamano *et al.* (2010), the distance and quality of roads connecting to the markets has great influence on household crop income. They thus recommend investment in rural roads through repair and construction to overcome marketing constraints and enhance crop income improvement. Considering the costs involved however, this study believes road investment should be long term rather than a short term intervention. One viable option therefore is introduction of quality milling services in the village. Since Najja town is connected to electricity, the miller will incur low costs which will transmit into low milling charges to farmers. The closeness of farmers to millers may build trust making it possible to extend credit for rice production. Monitoring and supervision of such credit will also be easy. Having been convinced by introduction of rice mills as a sound option, the main challenge becomes how and by whom? According to Kijima *et al.* (2011), milling business is offered by private entities and is demand driven. It is for this reason that they tend to concentrate in urban areas where they expect to receive rice from different locations. If rice production in a given location increases, the establishment of rice mills will follow suit (Kijima *et al.*, 2008, 2011).

Therefore the immediate solution to transport challenge comes back to increasing rice production. One farmer, who managed to produce 2 tons of rice in two consecutive seasons, has never encountered any marketing problem as testified during the research. According to him, buyers come with trucks to his field after harvesting, offer free transport to the mill and pay for the rice after milling.

In the long term however, investment in roads will be inevitable. Since rice is consumed more in urban than in rural areas, introduction of mills in rural areas will imply more costs to traders in terms of transporting milled rice to the consumption points. This may result into lose-lose situation for farmers and consumers as

traders will react by lowering the buying price and raising the selling price to recover the transport costs. These costs can however be significantly lowered by a good road network.

## The role of NERICA in rural livelihood

### Profitable enterprise and a major contributor to income

NERICA`s role as a key income contributor was witnessed in study area. Analysis of how rice produce is utilized (pie chart not included) revealed that 84% is sold, 9% consumed and the rest is put into other uses. The high percentage of rice sold is explained partly by its high prices and partly by its non-staple nature in the rural setting. Given its high prices, rice consumption has been restricted to public holidays and on special events. Farmers prefer selling it for cash income which can be put into various uses. Comparing the gross margin of NERICA with that of its closest substitute maize (table 5), it was established that every Ush100 in revenue comes along with a profit of Ush32 and Ush23 for NERICA and maize respectively. Although comparing these gross margins is unfair for maize which does not enter the processing stage, the analysis reflects what usually happens in the study area. It is also important to note that the gross margins were constructed using group interview data which relied on consensus. At household level, although not covered by this research, many farmers use unpaid family labor which can considerably improve the gross margin figures for both crops. Given that rice is more labor demanding, however, it is logical to believe that gross margin for NERICA will increase more than that of maize if family labor is removed from the analysis. Also, the gross profit of Ush432500 per acre per season received by NERICA farmers in Najja sub-county is well above the national average of Ush262500 reported in APEP (2006) report. The big difference is attributed to the stage of marketing. Whereas in Najja rice is marketed by farmers after milling, the national average was estimated by marketing before milling. However, this gives Najja sub-county a competitive advantage in NERICA production.

**Table 5: Seasonal gross margins of maize and NERICA (Ush/acre)**

| Gross Margin Analysis | NERICA | Maize |
|---|---|---|
| Yield/acre (kg) | 1300 | 786 |
| Price/kg if milled (Ush) | 1500 | * |
| Milling recovery 65% | 845 | * |
| Price/kg if unmilled (Ush) | * | 700 |
| Sub total revenue | 1267500 | 550200 |
| Rice bran revenue (20%*1300kg@300) | 78000 | * |
| **Total Revenue (Ush) A** | 1345500 | 550200 |
| Costs/acre (Ush) | | |
| Slashing | 120000 | 120000 |
| First ploughing | 150000 | 150000 |
| Second ploughing | 100000 | * |
| Seed (rice:20kg@1500, maize:10kg@1500) | 30000 | 15000 |
| Planting | 50000 | 30000 |
| Weeding | 100000 | 50000 |
| chemical & appln (4L@Ush5000 + labor) | 27000 | * |
| Harvesting & transport to home | 100000 | 60000 |
| Transport to mill (Ush7000 per 100kg bag) | 91000 | * |
| Milling (Ush100/kg) | 130000 | * |
| **Total costs (Ush) B** | 913000 | 425000 |
| Gross profit/acre (Ush) A-B | 432500 | 125200 |
| **Gross Margin (%) {(A-B)/A}*100** | 32 | 23 |

* not applicable

Note: Labor wages are determined on piece rate (usually acre unless stated)

**Source:** Field survey (Aug-Sep 2012)

**Stepping stone to assets accumulation**

The revenues from NERICA have been pivotal in transforming the livelihood of rural community. The farmers' response to key achievements from NERICA farming revealed that 54% of the households considered buying land as their best achievement from NERICA farming. This was followed by building permanent houses and purchasing motorcycle at 15% each.

Payment of school fees was also mentioned (8%) while the rest contributed to 8%. The purchased motorcycles were being hired out as bike taxis (locally called boda boda) for daily income. They were also used for transporting paddy rice to the mills during the marketing period. Although some of the land has been purchased in urban areas for commercial development, most of it has been purchased in rural areas to enable farm expansion. Almost every household has increased its land size. On average NERICA farmers owned 4.68 acres in 2003 compared to 6.72 acres owned in 2011. Land, being a renewable natural resource, has been entrusted as a safe store of wealth whose value never depreciates given its rapidly growing demand. Besides farming, land also provides collateral for agriculture loans and can be used as last resort for settling debts (educational, health and judicial). By their location, rural farmers have limited business opportunities and therefore buying land presents an investment opportunity. For these reasons, it is every farmer`s utmost desire to expand his/her landholding as it forms the apex of asset accumulation.

## Conclusion

New Rice for Africa (NERICA) was introduced in Uganda in 2003 to help the rural farmers in improving their livelihood in terms of income and food security. Using livelihood impact analysis technique, this study sought to assess the role of NERICA in improving rural livelihood by (1) understanding the production environment (2) exploring the marketing opportunities and challenges and (3) highlighting the changes in livelihood outcomes.

Although the NERICAs currently released in Uganda are upland varieties, they have been restricted to lowland cultivation due to unpredictable rainfall. This does not only exert pressure on wetlands, but also leaves the uplands under-utilized. As rainfall becomes more erratic, the rain-dependent rice farming system will become more and more risky. It is therefore necessary that water management practices such as irrigation, leveling and bunding be considered in reducing the risks posed by drought. Another viable approach to containing drought impacts is the release and or promotion of early maturing varieties. These varieties are able to reach reproductive stage before onset of drought thereby managing to escape the adverse effects. Given that farmers prefer early maturing to high yielding varieties, there is an opportunity of promoting NERICA using alternative means. Many farmers who do not adopt NERICA find it to be less productive than other local varieties (mainly the lowland ones). However, if the maturity period is put into consideration, NERICA will be preferred for its ability to allow for double cropping. All the above interventions can only be possible with a good extension network which facilitates quick and accurate technology dissemination in place. Unfortunately, lack of skilled personnel is a limiting factor. It is therefore mandatory that more efforts be put in training and capacity building of extension staff in NERICA agronomy and marketing.

It is evident that NERICA farming is more profitable than its `closest substitute` maize. It even becomes more profitable when simple value addition technique such as milling is done before selling. Unfortunately, lack of milling machine in the community implies that farmers have to move long distances to access the milling services. This comes along with high transport costs. On the other side, mill

operators prefer areas with adequate paddy for continuity of their business. Therefore increased production is necessary for mill establishment which in turn will reduce the transport costs. However, in the long run, investment in roads will be needed.

The high profitability of NERICA has enabled farmers to accumulate assets such as land which in addition to farming acts as a store of wealth and collateral for loan transactions, permanent houses and motorcycles which are hired out as boda bodas (bike taxis) for daily household income. It is however not clear how these changes in land redistribution will affect the livelihood of entire community. The unfortunate scenario will be the one in which low income (non-NERICA) farmers will continue losing land to high income (NERICA) farmers. If that happens to be the case, there will be food insecurity in the community since land for staple foods will have been taken over by NERICA which is not consumed locally.

A number of policy implications can be drawn from these findings: (i) water conserving technologies need to be promoted to reduce the drought risks (ii) early maturity as an attribute should be given more attention during NERICA promotion (iii) training and or hiring of more extension workers who are knowledgeable in rice agronomy is necessary (iv) emphasis to value addition by providing conducive environment to milling services in rural areas is worth considering.

To get a concrete picture, which is necessary in policy formulation, more detailed studies will need to be conducted. For example this study reports increase in landholding by NERICA farmers but does not explain from whom land is bought? Therefore a study on land redistribution in NERICA growing communities by identifying the winners and losers will be appropriate. This should put gender perspectives, age and wealth into consideration to capture the necessary information. Since NERICA farming is entirely rain-fed, studying the vulnerability and adaptation measures to the possible effects of climate change on the farmers' livelihood is also recommended. The marketing section was limited to the farmers and research did not cover in detail the entire marketing chain. Since marketing of rice is a complex process with many players, there is need for a detailed study to get a clear image of possible opportunities. Such issues as the role of middleman in the marketing chain, estimation of demand and supply and changes in rural and urban diets need to be prioritized.

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