RICE FARMING IN THE SOUTHERN HIGHLANDS OF TANZANIA: MANAGEMENT PRACTICES, SOCIO-ECONOMIC ROLES AND PRODUCTION CONSTRAINTS

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ABSTRACT

This study was conducted in two districts of Mbarali and Kyela famous for paddy production in Mbeya Region, in the Southern Highlands of Tanzania (SHT). The study aimed at evaluating management practices, socioeconomic roles and production constraints of rice crop. A cross-sectional design was employed whereby data were collected at a single point in time. The two districts were purposively selected based on the fact that they are the most important for rice production in the SHT. In each district, four wards were randomly chosen and thereafter four (4) villages per ward were selected making a total of eight study villages. In Kyela District the villages were Ipande (Ipande ward), Muungano (Ikolo ward), Kisale (Ipinda ward) and Katele (Makwale ward) whereas in Mbarali; Mahango (Madibira ward), Kapunga (Itamboleo ward), Mbuyuni (Mapogoro ward) and Ukwama (Mapogoro ward) were studied. Thirty (30) farmers were randomly selected from each village for interviews, making a total of 240 farmers (120 farmers per district). In both districts data were also collected from both primary and secondary sources. Results showed that very few (<40%) farmers did apply integrated soil fertility management (ISFM) technologies for increased crop production, levels of awareness on the application of farmyard manure (FYM) and Minjingu Rock Phosphate (MRP) fertilisers in farms was very low. This study has shown that rice was the leading revenue source in both study districts. The mean annual incomes per household were Tsh 1.8 million and Tsh 133, 333 from rice and livestock, respectively. However, the key drivers for increased rice productivity in the farming system were found to be the availability of improved seeds, fertilizer use, and best farming methods related to water management, availability of insecticides and herbicides, mechanization and reliable market. The study concludes that the rice market is the main constraint and therefore reliable marketing channels needs to establish.

Keywords: Rice; management, socioeconomic, constraints.

INTRODUCTION

Agriculture in Tanzania is an important occupation for over 75 per cent of inhabitants. It is the mainstay of the majority of the households in the Southern Highlands where weather conditions are favourable for growing various food and cash crops. Paddy, maize and sorghum are the most important cereal crops in this zone. Root and tuber crops like cassava, round and sweet potatoes, horticultural crops and fruits are also grown in some parts of the zone. Maize, beans, rice, potatoes are the main food crops while major cash crops are coffee, tea (green leaves), pyrethrum, cardamom, sunflower, cocoa, tobacco, vegetables. As for rice, statistics indicate that approximately 24% of the national total production area is in the Southern Highlands and produce about 33% of the national rice produce (RLDC, 2009). Mbeya Region alone has about

135,215 ha under rice production, which is about 8.5% of the total national land under rice production (NSCA, 2006). Areas that are suitable for paddy production are the low altitude areas (below 350metres above sea level) of Usangu basin in Mbarali, Kamsamba in Momba and Msangano, Lake Rukwa valley, shores of Lake Tanganyika (Kirando to Kasanga) and Lake Nyasa (Kyela and Mbamba bay). In many of these areas, average yields at small scale farmers' levels are low and range between 1.6 to 2.4 T/ha, although an average production of 5 to 6 T/ha has been recorded in irrigated schemes (Ngailo et al., 2011). Under optimum conditions potential yields of rice range from 4 to 6 t/ha for uplands and 6 to 10 t/ha for lowlands irrigated ecosystems of cultivation, however this always depend on varieties of rice grown and management levels. The major factors contributing to the low yield include low soil fertility due to excessive nutrient mining coupled with low use of fertilizers, monocropping, poor agronomic practices, use of unimproved seeds, and poor access to output markets (Ngailo et al., 2013).

Several global and national initiatives have been in place to emphasise on the improvement of paddy production and therefore eradicate hunger and food insecurity. The Millennium Development Goals (MDG, 2000) which Tanzania also adopted were like in many other Third World countries were meant to address the question of low crop productivity amongst others. As a nation also Tanzania adopted the Kilimo Kwanza (Agriculture First) and Big Results Now (BRN, 2012) thrusts to put more emphasis on agricultural development and increased productivity of all crops including rice. Such strategies have been successful in part because under such initiatives agricultural inputs at subsidised prices were made available to farmers which helped to curb the problem of poor availability of fertilisers and other inputs not only for production of paddy but also for other crops such maize.

Over the years the general problems causing low productivity of rice farming system in the SHT have been documented. However, specific information on characteristic of the rice farming system and problems attributing to low productivity at household level have not exhaustively been revealed. For that matter, this study was a prerequisite in order to properly address the most common predicaments that hinder rice productivity at household levels in Mbarali and Kyela districts.

METHODOLOGY

Description of the study areas

This work was carried out in Kyela and Mbarali districts that are famous in paddy production, in Mbeya region, in the SHT. The total population of the two districts amounts to 710,728 people.

Rice is one of key crops in the farming system of the two districts and serves a dual purpose as a major source of households' income and food security. The total area under rice production in the two districts is about 20,453 ha and the acreage is on the increase each year. To improve agricultural production, the agricultural extension work in each district is under the respective district council headed by District Agriculture, Irrigation and Cooperative officers (DAICOs). The lower administrative units are the wards and villages, each having a government employed agricultural extension officer. In some cases Non-Governmental Organisations (NGO) also provide assistance to extension services by employing personnel to assist in the rice fields. This support greatly agricultural development and farm productivity.

Research design

The study used cross-section design under which data were collected at one point in time. Both qualitative and quantitative data were collected and analyzed.

Sampling procedure and data collection

The desired data for this study were obtained by employing purposive sampling in which four wards from each district were randomly chosen. In each ward one village was further purposively selected, making a total of study villages to be eight. The study villages in Kyela district included Ipande (Ipande ward), Muungano (Ikolo ward), Kisale (Ipinda ward) and Katele (Makwale), while in Mbarali district they were Mahango (Madibira ward), Kapunga (Itamboleo ward), Mbuyuni (Mapogoro ward) and Ukwama (Mapogoro ward).

Selection of sample size

In each village, a total of thirty (30) respondents were randomly selected from a list of households for interviews, making a total of 240 respondents (120 respondents per district). In both districts data were collected from both primary and secondary sources to enrich the study and to increase precision. Secondary data were also sourced from Uyole Agricultural Research Institute (ARI), Mbarali and Kyela District Agricultural and Irrigation (DAICO) archives in the respective districts.

Research tools applied and data collection

Primary data were collected from selected rice farmers through individual interviews using pre-tested questionnaires. Questionnaires had both open and close ended questions for data collection. From the district databases, the research team managed to collect data on rice, farm sizes, management systems, types of agro-inputs used, quantities of inputs applied in farms, crop management systems, and type of crops grown, market channels s and prevailing farming and marketing constraints.

Data analysis

Collected data were coded and analysed using Statistical Package for Social Sciences (SPSS version 16.0). Quantitative data were analysed in order to generate descriptive statistics and compare means between districts. Similarly, qualitative data were analysed to generate frequencies or percentages. The Chi-square tests for independence were run to compare the proportions of respondents between districts with respect to a particular response and the variables studied.

RESULTS
The Rice Farming Systems in the study area

The study has shown that the rice farming system is diverse. It consists mostly of soils from sediments brought to the valleys by flooding rivers. Ngailo et al., (2014) studied various soils and found that the many soils were deficient in nitrogen, phosphorus, potassium and sulphur. Soils were characterised by moderate fertility this was also observed by Ngailo et al., (2011) while studying the rice farming system of the SH such soils require additional inputs to increase

their productivity. Tables 1 provide some data for the SHT. Demographic data show that Mbarali district is highly populated that Kyela. It is the district where many irrigation schemes are located and are well planned. Rainfall amount is less in Mbarali and highest in Kyela. But the highest amount of irrigation water used in the rice fields is harvested as runoff from the highlands.

Table 1. Some characteristics of the SHT

Characteristics	Observations or descriptions			
Major soil types	Sandy clays < 30% clays and clays			
Climate	Rainfall <650 mm Mbarali and >650 mm in Kyela) Average annual temperature 22 – 27 ^{0}C in both			
Farm sizes per household	1-5 ha in both districts			
Soil fertility status	Moderately acid, medium organic carbon, medium total nitrogen, nitrogen, low phosphorus, low potassium and and medium CEC			
Demographic characteristics	**District**	Male	Female	Total
	Kyela	106,613	115,478	221,490
	Mbarali	145,867	154,650	300,517
	Total	**252,480**	**270,120**	**522,007**

Livelihoods and crop management practices

During the study rice was found to be the main crop for peoples' livelihoods in the farming system having the ability to address both food and income securities of the households. Farm sizes varied from small (<2ha) to large over 10 hectares per household. But many farmers' fields are <10 ha. A significant number of respondents attributed improvement of livelihoods as due to the use of improved farming practices (Table 2). On the other hand drivers for rice yield improvement in many farmers fields included use of improved seeds, fertilizer use, adequate water management, enough and appropriate use of insecticides, use of herbicides and mechanization these were also observed by Ngailo et al., (2013) during their study in the some of the areas in the Southern Highlands. Other crop commodities that contributed to the livelihoods were found to be maize, beans, groundnuts and activities such as fishing along lakes, rivers, beekeeping and livestock keeping, various off farm activities.

Table 2: Proportions (%) of farmers using improved technologies in rice production in Kyela and Mbarali districts

Levels of using improved technologies on rice (%)	Mbarali (n = 120)	Kyela (n = 120)	Overall (N = 240)	χ2 test
Yes	82.5	72.5	77.5	(df = 1),
No	17.5	27.5	22.5	3.441*
Proportions (%) of farmers using different improved technologies				
Improved technology used				
Weed control strategies	82.0	87.2	84.4	
Fertilizers	66.0	43.0	55.4	
Rice varieties (improved)	26.0	23.3	24.7	
Row planting	44.0	16.3	31.2	

Appropriate spacing	38.0	15.1	27.4
Rice bunds preparation	41.0	5.8	24.7
Pest management practices	32.0	1.2	17.7
Disease control and IPM	19.0	1.2	10.8
Planting machines	20.0	0.0	10.8
Weeding machines	12.0	0.0	6.5
Threshers	13.0	0.0	7
Combine harvesters	17.0	0.0	9.1

Note: N= number of respondents; *significant at P > 0.05

For many years farmers have grown local crop varieties in their fields. However, the traditional rice varieties in use by farmers produce low yields of less than 2 $MTha^{-1}$ compared to improved varieties which are able to produce over 7 $MTha^{-1}$ under optimum field management. These findings concurred very well with those of Mussei et al., (2013). These days there are efforts by the government of Tanzania and other partners in development to train farmers on the importance of use of improved varieties which provide better yields, have desirable properties and are disease resistant than local ones. Results show that through the use of high yielding varieties of rice that the goal of achieving a food and income secure community can be achieved. Some local varieties have good qualities such as taste and aroma but such good qualities can be incorporated in the breeding programs to improve productivity in the rice subsector.

According to present study, farmers prefer some improved technologies, for instance, households used oxen for land preparation, and these days the use of motorised farming equipments such as power tillers and tractors for carrying out farm operations of tilling the land to harvesting the crop have gained momentum. During the current study, it was observed that there was an increase of efforts by many farmers to use medium scale combine harvesters for rice harvesting. This was one of activities that in the part increased costs in the absence of machinery because majority of farmers would have harvested rice using human labour which in actual fact greatly decreased labour productivity but on the other hand increased drudgery. This farming system has a high potential for irrigation and can produce high quality rice. The use of modern ways of soil and water management to improve rice of productivity area on the increase. Observations indicated that the potential for irrigation was highest in Mbarali than in Kyela district where upland rice cultivation is common.

Present results showed that a large proportion (84%) used herbicides to control weeds than it used to be during the last decade. Nowadays, use of fertilisers is also a priority for many (54.4%) farmers, in the past fertilisers were not applied in rice because it was thought by farmers that fertilisers encouraged logging of plants. The number of farmers who are broadcasting rice seeds during planting is now decreasing. During this study over 20% of respondents attempted to transplant their seedlings. Transplanted plants are found to yield higher however; broadcasting of seeds was common practice in Kyela than in Mbarali district.

Household socioeconomic characteristics of the study areas

Detailed picture of socio-economic characteristics of the households in the study area is presented in Table 3. The majority (89.6 percent) of the respondents were males while a few (10.4 percent) were females. There were more (92.5 percent) male respondents in Mbarali than in Kyela district (86.7 percent). The reverse was true for the female respondents. In general, there were almost similar levels of male and female respondents across the study districts.

These observations are in agreement with those of Maeda-Machang'u et al. (2000) who previously reported similar male headed household levels in agro-pastoral communities in Tanzania.

The average age of the respondents was about 43 years. In fact, a similar mean age was recorded in both districts. This implies that many young people are engaged in rice farming, and therefore suggesting that the future sustainability of the crop production in the study areas is not something to be worried about. Most of the respondents were also in the active working age group and could therefore continue for a longer time to be involved in the sustainable production and marketing strategies of the rice crop.

Survey results also indicated that the majority of the respondents had received primary education, and therefore, many of them had the ability to read and write without difficulty. There were almost same averages of respondents with similar education levels between Mbarali and Kyela district. Most of the respondents therefore, had formal education that could be capitalised for rational decision-making regarding rice production and marketing without much difficulty. The preceding fact shows that a decision to engage in improved farming was related to the level of education that respondents had.

Of the respondents interviewed, majority (84.6%) of them were married but a little more in Mbarali (89.2%) than in Kyela district (80.0%). However, marital status was insignificantly different ($P > 0.05$) between the study districts. The average household size across the entire sample was 5.12. The mean household sizes were almost similar across the study districts.

Table 3. Socio-economic characteristics of the households in the study area

Characteristics	**Mbarali (n = 120)**	**Kyela (n = 120)**	**Overall (N = 240)**	**$\chi 2$ test**
Sex of respondents (%)				
Male	92.5	86.7	89.6	(df = 1), 2.188^{ns}
Female	7.5	13.3	10.4	
Age (years) of respondents (mean ± SE)	41.81±1.19	43.88±1.26	42.85±0.87	
Education level-years of respondents (mean ± SE)	7.14±0.21	7.09±0.21	7.12±0.15	
Marital status (%)				
Married	89.2	80.0	84.6	(df=4), 7.200^{ns}
Single	4.2	5.8	5.0	
Widowed	5.0	9.2	7.1	
Separated	0.8	3.3	2.1	
Widower	0.8	1.7	1.2	
Household size (mean ± SE)	5.03±0.21	5.35±0.21	5.12±0.15	
Fulltime number of household members (mean ± SE)	2.37±0.13	2.42±0.16	2.39±0.11	
Full time male member involved in farming (mean ± SE)	1.38±0.09	1.36±0.08	1.37±0.06	
Full time female member involved in farming (mean ± SE)	1.34±0.07	1.35±0.07	1.35±0.05	

Part time number of household members (mean ± SE)	1.94±1.17	2.23±0.15	2.11±0.05
Part time male member involved in farming	1.53±0.14	1.63±1.13	1.59±0.10
Part time female member involved in farming	1.35±0.13	1.40±0.10	1.39±0.08
Types of occupation (%)			
Farming	100	100	100
Petty business	25	28.3	26.7
Employment	0	4.2	2.1
Masonry	2.5	1.7	2.1
Casual labourer	5.8	6.7	6.2

Note:N, number of respondents; means without superscripts along the row are not significantly different at $P > 0.05$; ^{ns} not significant ($P > 0.05$); *significant at $P < 0.05$.

Among many occupations that are available in the study areas, farming occupied many of respondents. However, although many (>70%) of the Tanzania's population are engaged in farming, this present response is probably biased because most of those interviewed were rice farmers. Some of the respondents besides being farmers were also engaged in other activities such as petty business (26.7%), casual works (6.2%) and masonry works (2.1%) These activities besides were taken by respondents to diversify sources of households' income.

Socio-economic roles of rice

In general the average household income was not only earned from rice sales but also from other commodities (Table 4). However, the leading source of revenue in the surveyed areas in both districts was rice (Tsh 2,862,389.83 overall) followed by revenue from off-farm activities (Tsh1,556750.00), other crops such as maize, groundnuts and sunflower (Tsh1,481,700.00) and livestock production (Tsh 343,000.03) for Mbarali district.

On the other hand, in Kyela the most leading revenue sources were from other crops such as cocoa, palm oil (Tsh 1,073,069.23) followed by off-farm activities (838,156.86), rice (758,088.50) and livestock production (326,354.84). Nevertheless, the overall situation in the two districts shows that rice is the leading revenue source (Tsh 1,833,012.99), followed by other crops (Tsh 1,155,397.87), off-farm activities (Tsh 1,128,800), and livestock production was least (Tsh 335,181.83). Mbarali depends solely on rice as a major cash crop while Kyela depends on cocoa, oil palm and rice as cash crops. Livestock became the least source of revenue probably because this present study emphasised more on rice production only than other activities.

Table 4. Household sources of revenue (Tsh)

District		from- rice Tsh	from-other crops Tsh	from- livestock Tsh	Off- farm Tsh
Mbarali	N	118	16	35	42
	Max	9,840,000*	8,000,000	2,700,000	2,000,000.00
	Min	100000	80000	1	22300.00
	Mean	2,862,389.83	1,556,750.00	343,000.03	1,481,700
Kyela	N	113	78	31	51

	Max	5,010,000	4,000,000	1,430,000	5,000,000.00
	Min	100000	20000	14000	50000.00
	Mean	758,088.50	1,073,069.23	326,354.84	838,156.86
Total	N	231	94	66	93
	Max	9,840,000	4,000,000	2,700,000	2,000,000.00
	Min	100000	20000	1	22300.00
	Mean	1.833,012.99	1,155,397.87	335,181.83	1,128,800

Note: N, number of respondents, * 1 Tsh is equivalent to US $ 2,000

Table 5 shows levels of membership to different farmer groups or societies and the involvement of farmers in different socio-economic activities. For this study majority (68.8%) of the respondents were not members of any rice farmer groups, more significantly ($P < 0.05$) in Mbarali than in Kyela district. The reverse was true for the proportions of the farmers who were members of rice farmer groups. But many (85.3%) farmers across the entire study areas were involved in rice production. They were also engaged in savings and credit services; particularly through their own savings and credit cooperative society (SACCOs) most of these were established by farmers. However, a few of them (5%) in Kyela district were involved in cocoa production and marketing.

Table 5: Involvement in other socio-economic activities by respondents

Characteristics	Mbarali (n = 120)	Kyela (n = 120)	Overall (N = 240)	$\chi 2$ test
Membership to farmer groups (%)				
Yes	25	37.5	31.2	(df = 1)
No	75	62.5	68.8	4.363*
Involvement in economic activities (%)				
Saving and credit	36.7	33.3	34.7	
Rice production	86.7	84.4	85.3	
Livestock production	-	4.4	2.2	
Cocoa production	-	8.9	5.0	

Note: N, number of respondents; *significant at $P < 0.05$.

Types and amounts of agro-inputs used by farmers

Over 50% are aware of the importance of using agro-inputs in rice farming but practically many of them are not adequately using them due to the inability to purchase (Table 6). Levels and types of major agroinputs used were studied. The high costs of inputs have affected productivity although not all farmers did indicate that this problem was the most constraining. Although farmers are aware of the importance of input use, the main problem was the availability of right types required for application in the fields per crop and how much they should be applied to meet the rice crop requirements**.**

Table 6: Levels and amounts of agro-inputs e.g. fertilisers used in fields

	Mbarali (n = 120)	Kyela (n =120)	Overall (N = 240)	χ2 test
Farmers (%) applying fertilizer in rice farms				
Yes	66.7	43.3	55	(df = 1), 13.20***
No	33.3	46.7	45	
Farmers using different inorganic fertilizers (%)	21.2	15.4	18.9	
Diammonium phosphate (DAP)	95.0	67.3	84.1	
Urea	2.5	57.7	24.2	
Minjingu	2.5	-	1.5	
Nitrogen, phosphorus and potassium (NPK)	2.5	-	1.5	
Liquid fertilisers e.g. booster	2.5	1.9	2.3	
Calcium nitrate (CAN)	10	-	6.1	
Sulphate of ammonia (SA)				
Amount (kg) of inorganic fertilizers used per acre of rice at present				
DAP (mean ± SE)	50.00±2.14	46.88±1.13	49.00±1.76	
Urea (mean ± SE)	55.50±2.21	48.81±3.35	53.39±1.86	
Minjingu (mean ± SE)	42.50±17.50	61.94±4.84	60.73±4.68	
NPK (mean ± SE)	32.50±7.50	0	32.50±7.50	
Liquid fertilisers e.g. booster (mean ± SE)	25.40±24.60	0	25.40±24.60	
CAN (mean ± SE)	50.00±0.00	50.00±0.00	50.00±0.00	
SA (mean ± SE)	44.38±3.7	0	44.38±3.71	
Farmers using different organic fertilizers (%)	4.2	7.5	5.8	
Farm yard manure	-	1.7	0.85	
Rice husks	-	0.83	0.42	
Ashes from different sources				
Amount of organic fertilizers applied (kg) per acre	429.60±10	358±69.02	383.57±56.	
Farm yard manure (mean ± SE)	3.63	440.0 ±	17	
Rice husks (mean ± SE)	-	400.0	440.0 ±	
Ashes (mean ± SE)		200.00	400.0	
			200.0 ±	
			200.0	

Note: N, number of respondents; means without different superscripts along the rows are insignificantly different at P > 0.05; ^{ns} not significant (P > 0.05); *significant at P < 0.05. *** Very highly significant at P<0.001.

However, the differences between the number of respondents using fertilizers and those who do not adequately use them was highly significant (P>0.05).

Majority (>84%) of farmers easily used topdressing fertilisers such as urea (46%N) than application of basal fertilisers such as DAP, MRP or TSP. This observation ascertains the fact

that yields of rice will not increase substantially unless combinations of fertilisers are applied in the field and this fact must be emphasised to farmers through various training like field days, demonstration or scientific field trials.

The study also showed that although organic fertilisers are important for rice production farmers were not using them in the fields. The preceding fact was very clearly observed even in Mbarali district where there was a large number of livestock able to produce large amount of farm yard manure that can profitably be used to boost rice production. On the other hand, according to the few farmers interviewed during the study, the application of rice husks in the fields was also carried out but not systematically by very few farmers. The common practice is that after threshing, the left-overs are burnt within the fields leaving most of nutrients especially nitrogen imbedded within the residues to be wasted. If such wastes could have been utilised properly soil nutrient improvement would easily be achieved to a greater extent.

Marketing constraints in rice

Results of some of the common constraints including those involving markerting of rice are indicated in Table 7. Some of these problems faced by two districts contribute to low productivity. The problems however, tend to be same in the study areas. Overall common production constraints are ranked in order of importance reported by the farmers from both districts these included unreliable rainfall (29.5%), disease/pests (25.6%), high price of agro-inputs (23.3%), inadequate capital (21.1%). Rice farming is rainfall dependent in all two districts therefore where there is no rain it means yields will be poor or none. Moreover, rainfall was not always evenly distributed and the problem was more prevalent in Kyela District because in some years the rains brought about heavy flooding that ended up destroying the crop. In certain cases the rains were reported to be not enough to sustain a fully developed crop. Irrigated farming was prevalent in less than 6% of Kyela district. On the other hand this problem was less important in Mbarali District because irrigation agriculture was common and crop failure was less common because many >70% of the farmers irrigated the crop.

Often times, large areas of rice crop were devastated by diseases. The rice yellow mortal Virus (RYMV) was a disease that constantly decimated large areas of the rice crop leading to substantial crop losses. A study by Shao-Mwalyego et al., (2011) came up with proposals to minimise the problem but the disease is reported to be still persistent in both districts. The disease is transmitted through contact by insects such as grasshoppers and by human beings during spraying and mechanical weeding operations of the rice crop. RYMV resistant rice varieties are few and that is why in bad years when the insects have not been properly controlled the damage to the crop leading to low yields is huge.

Table 7: Main production constraints in rice production

Constraints (%)	Mbarali (n =120)	Kyela (n =120)	Overall (N =240)	Ranking
High weeding costs	6.1	31.0	18.5	
Low yields	18.4	18.6	18.5	
Unreliable rains	28.9	30.1	29.5	1
Diseases/pests	10.5	40.7	25.6	2
High price of inputs	28.1	18.6	23.3	3
Inadequate capital	26.3	15.9	21.1	4
Lack of implements	7.9	16.8	12.3	

Inadequate water from (scheme)	36.0	0.0	18.1
Floods	11.4	9.7	10.6
Drought	2.6	23.9	13.2
Poor soil fertility	8.8	0.0	4.4
Poor extension services	8.8	0.0	4.4
Poor access to improved seeds	10.5	1.8	6.2

Note: N= number of respondents

A survey carried by Ngailo et al., (2013) also found out that farmers do not apply enough fertilisers in the farming system culminating in reduced crop.

Rice marketing problems

One single production constraint in the rice value chain is market. The main rice marketing constraints are shown in Table 8. Three major constraints included low price of purchasing rice (51.1%), unreliable market (42.4%) and use of unstandardised measurements (23.9%). Organised markets channels are not firmly in place, making buyers to capitalise on the situation to offer low prices of the produce to farmers. Attempts to have organised markets that can dictate price of the rice commodity had met stiff resistance from private buyers, middlemen and brokers. However, efforts are still under way to sensitise farmers to join up together and strengthen their bargaining power and various projects including the Alliance for Green Revolution in Africa (AGRA) are training farmers on how profitably they can dispose off their rice crop when they are together. The government of Tanzania on its part is contributing in marketing solution by purchasing some of the rice crop through the National Food Reserve Agency (NFRA). Many of such marketing problems depend on the willingness of policy makers to assist farmers. Barring or reducing importation of rice and its products will partly address the common marketing problems.

Table 8: Main marketing constraints in rice production

Constraints (%)	**Mbarali (n = 120)**	**Kyela (n = 120)**	**Overall (N = 240)**
Unreliable market	42.4	42.4	42.4
Fake measurements	32.6	15.2	23.9
Low price of selling rice	39.1	63.0	51.1
Farmers are price takers	14.1	8.7	11.4
Poor infrastructure	20.7	4.3	12.5

Note: N= number of respondents

In this section please present the results including tables, figures, numbers and graphs (if any). Font Size 12, Times New Roman, single spaced.All the subheadings in this section should be in font size 12 Bold, Times New Roman, single spaced. The first letter of each word in subheading should be capital. For tables please use font size 10. Tables/graphs or figures should be named as Table 1/ Figure 1/ Graph 1 and be given in center of the page.

CONCLUSIONS

From this study the following major conclusions are made:

- Few farmers do apply integrated soil fertility management technologies (ISFM) for increased crop production, levels of awareness and application of both inorganic and

organic sources of fertiliser such as farmyard manure (FYM) and other fertilisers in rice farms is particularly lacking, this needs to be rectified.

- Though there are other sources of income for respondents in the study areas but, the overall picture shows that rice was the leading revenue source mostly in Mbarali but not in Kyela where cocoa and oil palm also fetch attractive incomes to farming households in the surveyed districts
- In general, rice yields are low in both districts although they are relatively much higher in Mbarali District.
- Key drivers for increased productivity in the rice farming system are use of improved seeds, adequate use of fertilisers, and application of best a management farming methods, water management, mechanised farm operations and reliable profitable market.
- Unreliable rainfall, diseases/pests, high prices of inputs and inadequate capital were the main production constraints

RECOMMENDATIONS

- Reliable marketing channels should be established in place coupled with intensive farmer training on marketing issues.
- Inputs required by farmers such as improved seeds and fertilisers need to be available at affordable rates and be timely
- Intensive training on ISFM to both farmers and extension personnel should be emphasised, such training is a necessary ingredient in improving agricultural productivity in the rice farming system.

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