

Paddy Production in Southern Highlands of Tanzania: Contribution to Household Income and Challenges Faced by Paddy Farmers in Mbarali District

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Abstract: This study was carried out in Mbarali district located in southern highlands of Tanzania. It aimed in assessing the contribution of paddy production to household income and challenges faced by smallholder paddy farmers. Cross sectional research design was used and data were collected through interview and documentary review. Data were analyzed by Statistical Package for Social Sciences (SPSS). Descriptive statistics included frequencies, percentages, mean and standard deviation. A Multiple linear regression was used to analyze the challenges facing smallholder farmers in paddy production. ANOVA was used to compare means of various sources of incomes contributing to total annual household income. The findings revealed that the mean farm size was 0.86 acre and paddy yield was 1611kg/acre. The average income earned from paddy per year was TZS670742.7. Mean annual incomes from other crops, livestock production and casual labor were TZS106859.0, TZS157800.0 and TZS113947.4, respectively. Others sources were motorcycle transportation (TZS191000.0), bricks making (TZS117916.7) and petty trade (TZS109861.1). Paddy production was found to contribute 46% to the total annual household income among smallholder paddy producers in the study area. Contributions from other sources were petty trade (7%), bricks making (8%), livestock production (11%), other crops cultivated (7%), casual labor (8%) and motorcycle transportation (13%). Further analysis indicated that paddy and other cultivated crops were highly significant ($P < 0.0001$) contributors to total annual household income. Livestock production also significantly ($P < 0.05$) contributed to household income. High prices of fertilizers ($P < 0.05$), scarcity of area for cultivation ($P < 0.001$) and low market price for paddy ($P < 0.001$) were significant challenges that were faced by smallholder paddy farmers. It was concluded that despite of low market prices for paddy, its contribution to income poverty reduction within household is larger compared to other sources of income in the study area.

Keywords: Challenges, Household income, Non-farm activities, Paddy farming, Smallholder farmers

INTRODUCTION

Background Information

Agriculture is critical to the Tanzanian economy, accounting for 25.8% of GDP and 80% of employment besides providing raw materials to industries and market for the industrial products. The sector is dominated by smallholders, whose activities are largely labour intensive and natural environment-dependent, implying that agriculture in the country is highly vulnerable to vagaries weather and other nature-based adverse effects. Consequently, productivity of both labour and land is low, calling for increased adoption of modern farm technologies such as irrigation, mechanization, fertilizers, improved seeds, pesticides and herbicides [1].

The Government of Tanzania is implementing Agricultural Sector Development Programme (ASDP) which is the major Government instrument for achieving agricultural growth and poverty reduction as outlined in the Agricultural Sector Development Strategy (ASDS) and National Strategy for Growth and Reduction of Poverty (NSGRP). The objective of the

ASDP is to increase productivity, profitability, and farm incomes by improving farmers' use of and access to agricultural knowledge, technologies, marketing system and infrastructure; and promoting private investment in agriculture [1].

The GDP growth rate of Tanzania in the last ten years has been exciting; however, the incidence of income poverty has not changed significantly. An estimated 34% of Tanzanians are poor. Poverty is more endemic among households engaged in crop farming, livestock keeping, fishing and forestry. This calls for an extra effort in fighting poverty especially among the rural communities [1].

Agriculture is mainly rain-fed and production is currently threatened by several factors including climate change and variability as well as progressive land degradation associated with human-induced activities. This poses a serious challenge to agricultural, irrigation and water sectors, which requires specific interventions to increase and sustain productivity.

In crop production the aim is to increase the use of modern methods (e.g., tractors and power tillers, improved seeds, irrigation, agro-chemicals), improve farming knowledge and support large scale farming investments. The Tanzanian government view rice as a cash crop due to its export opportunity, so the export ban on rice was lifted in 2012, though exporters still require export licenses.

Farmers in Tanzania receive government support in terms of farm inputs (industrial fertilizer, improved seeds, agro-chemicals and seedlings). The inputs are provided to crop farmers through voucher system supported jointly by the Government and World Bank since 2008 [2].

The farm inputs subsidy primarily involves six crops: maize, paddy, tea, coffee, cotton and cashew nuts. Maize and paddy are supported in terms of fertilizer and improved seeds while the rest of the crops are supported through agro-chemicals and seedlings.

However, growth in the sector has persistently been lower than the levels required to reduce poverty significantly and improving the livelihoods as well as living standards of the majority of the population. Moderate agricultural growth has been registered in certain areas, evident from a number of indicators, such as trade opportunities (e.g. cross-border trade outlets), livestock production, warehouse receipt schemes, performance of non-traditional exports, changes in agriculture-related technology, prices of certain cash crops, changes in volumes of outputs of certain crops and acreage under crops over time.

However, this growth has not been translated adequately into poverty reduction and changes in people's paddy production. Therefore this study intended to assess the contribution of paddy production in income poverty reduction at household level and problems facing smallholder farmers undertaking paddy production in Mbarali district, Tanzania.

RESEARCH METHODOLOGY

The Study Area

Study was conducted in Mbarali district, Mbeya region which is located in the Southern highlands of Tanzania. Particularly the study involved two villages namely Mbuyuni and Mabadaga. The area is characterized by flat land and the major economic activity is irrigated agriculture where the farmers mostly depend on the production of paddy. Paddy is mostly produced as cash and food crop in this area.

Research Design

This study employed non experimental design by using cross section research design which involved the collection of data from different respondents at one point at a time. The study used this design because it

minimizes bias and maximize reliability of the evidence collected [3].

Data Collection Methods and Tools

The study employed structured and semi-structured interview. The structured interview was employed because it allows the collection of information from the large sample of the respondents. The selected smallholder farmers were given questionnaires which were prepared beforehand.

The study also used documentary review method to gather secondary data. Documentary evidence acted as a tool to cross validate information gathered from interview given that what people say might differ from what people do [4]. The data which was obtained from these documents also helped to get other information which was relevant to this study.

Sampling Design, Sample Size and Sampling Procedure

The sampling frame for this study was the paddy farmers from Mbuyuni and Mabadaga villages in Mbarali district while sample unit was the smallholder farmer at Mbuyuni and Mabadaga Villages in Mbarali district who produces paddy.

There were a total of 1105 households dealing with paddy production in the study area. By employing a formulae developed by Noor [4] the study used a sample size of 78 smallholder farmers. On top of that 10 respondents from the district, ward and village levels were also used as key informants.

The sample of the smallholder farmers was obtained by using the formula;

$$n = \frac{N}{1 + N(e)^2}$$

Where, n represented the sample size, N represented the sampling frame which was 1105 households and e is the error of estimation which was 0.1.

The study used probability and non-probability sampling technique; specifically, simple random sampling and purposive sampling, respectively. Probability sampling was used to ensure that every smallholder farmer from all 1105 households has an equal chance of being selected in the study. Non probability sampling was employed in order to obtain the people who were crucial in the study, for instance the district agricultural and livestock officer, ward executive officer, village executive officers, ward agricultural extension officer and the village agricultural extension officers.

Data Processing and Analysis

The data were processed by using the Statistical Package for Social Sciences (SPSS). This

involved cleaning, verifying, coding and creating templates by defining the variables and providing value labels.

Data were analyzed by employing SPSS. Descriptive statistics included frequencies, percentages, mean and standard deviation. Multiple linear regression analysis was used to analyze the challenges facing smallholder farmers in paddy production, whereby the following model was applied;

$$Y = A + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Whereby;

Y = production of paddy

A = Constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ is unknown parameters (constants to be estimated from the data)

X_1, X_2, X_3, X_4, X_5 are independent variables (High prices of fertilizers, Unreliable rainfall; Scarcity of area under paddy cultivation, grazing animals on paddy farms, Low market prices for paddy)

ε = Error of expectation

Furthermore, ANOVA was used to compare means of various sources of incomes contributing to total annual household income.

RESULTS AND DISCUSSION

Characteristics of the Respondents

Socio-economic characteristics of the respondents

Findings from this study revealed that majority (48.7%) of smallholder farmers are aged between 40 and 50 years, followed by the age group from 18 to below 40 years and those above 50 years which were 33.3% and 17.9, respectively (Table 1). The large number of farmers having more than 40 years of age is in agreement with Skarstein [5] who reported that due to urbanization in most areas in African countries young crop producers from rural areas go to urban areas leaving the old people to produce.

On sex of the respondents, majority (67.9%) was male and female were 32.1%. This however does not reflect that majority of those engaging farming activities are males. According to Sarris [6] in most of the African agricultural societies the families are headed by males.

Also on marital status, the findings show that, 93.6% of the smallholder farmers are married while only 6.4% are widow. According to Defoer [7] most of African crop producer lives in families to facilitate the production of their farm crops. The members of the

families provides workforce on farm activities. On level of education of the respondents, it has been shown that 93.6%, of the farmers were found to have primary education and 6.4% had secondary education. Defoer [7] shows that majority of Africans who depends on agricultural activities has the low level of education. According to Haggblade [8] in African countries most of the crop growers have no or very low education because they take most of their time in producing crops. Very few have attended only the primary level of education.

It was also revealed that 53.8% of smallholder farmers are engaged in small business followed by 24.4% who are engaged in casual jobs. Other occupations include livestock keeping (24.4%), motorcycle transport activities (34.6%) and bricks making activities (10.3%). Across the developing world, as much as 25% of the rural population working full-time is employed outside agriculture, and accounts for 35–40% of rural incomes [8].

Household Size of the Respondents

The size of the households among the smallholder farmers ranges from three to eleven people. The mean household size was five persons and the standard deviation was one person. Eastwood [27] have reported that, small to medium sized farm households typically spend a relatively high proportion of any additional income on locally manufactured goods and services. This provides an important stimulus to overall demand that is less likely to be provided by growth in output achieved from larger, capital-intensive farms, or indeed other capital-intensive economic activities.

Farm Size of the Respondents

The size of the farms ranges between 0.5 and 1.5 acres, where the mean size was 0.86 acre and the standard deviation was 0.24 acre. To some extent this finding similar to the report by Sicular [9] who reported that in Asian countries, paddy is mainly grown on small farms, and average farm sizes range from less than a hectare in China, to over 3 hectares in Thailand. However, the size reported in this study is larger than the one reported by Vien [10] in Vietnam who revealed that paddy production in Vietnam is characterized by multiple cropping, small irrigated farms, labor-intensive practices, and widespread use of fertilizer. Although Vietnam is a major rice producer, only a small proportion of its territory is suitable for paddy cultivation. The farms are quite small, averaging 0.625 acre. Paddy is grown by 95 percent of the rural households and accounts for 81 percent of agricultural land [10].

Table 1: Socio-economic Characteristics of the Respondents

Variable	Frequency	Percent
Age (Years)		
18-39	26	33.3
40-50	38	48.7
50+	14	17.9
Sex		
Male	53	67.9
Female	25	32.1
Marital Status		
Married	73	93.6
Widow	5	6.4
Education Level		
Primary education	73	93.6
Secondary education	5	6.4
Other Occupations of farmers*		
Petty businesses	36	46.2
Brick making	12	15.4
Livestock production	25	32.1
Motorcycle transportation	10	12.8
Casual labour	19	24.4

NB: * Multiple Response

Paddy yield per year

Results revealed that the mean yield of paddy was 1611kg per acre. This is a bit higher than what was reported by Vien [10] who revealed that in some regions which produces paddy in Vietnam, the average production per year ranges between 1000 to 1500kg per acre depending on the availability of water from the river.

Income earned by farming households from paddy and other sources per year

Table 2 shows the average income which were obtained from paddy and other sources per year. The average income from paddy per year was TZS670742.7, while the minimum income was TZS356000 and the maximum income was TZS1371040.

Table 2: Descriptive statistics of annual total household income and all sources of income for smallholder paddy farmers (income in Tanzanian shillings [TZS])

Variable		Minimum	Maximum	Mean	Std. Error	Std. Deviation
Paddy	8	356000	1371040	670742.7	27096.5	239309.4
Other crops	8	55000	195000	106859.0	3954.5	34925.4
Livestock	5	100000	240000	157800.0	7627.1	38135.7
Casual labour	9	35000	200000	113947.4	9370.4	40844.5
Motorcycle transportation	0	120000	250000	191000.0	14333.3	45325.0
Bricks Making	2	80000	165000	117916.7	6948.4	24069.8
Petty trade	6	80000	200000	109861.1	3555.0	21330.3
Total income	8	485000	2070000	986576.0	46856.3	413824.0

Contribution of paddy and other sources to the household income

The results in Table 2 above revealed that the mean total annual household income was TZS986576 in the study area. The minimum income was TZS485000 while the maximum income was TZS2070000.

The findings in Figure 1 revealed that the paddy production is contributing much of income which accounts to 46% of the total annual household income among smallholder paddy producers in the study area. Contributions from other sources include petty trade (7%), bricks making (8%), livestock production (11%), other crops cultivated (7%), casual labor (8%) and motorcycle transportation activities (13%).

Further analysis indicated in Table 3 revealed that paddy and other cultivated crops were highly significant ($P < 0.0001$) contributors in annual total household income. Livestock production also significantly ($P < 0.05$) contributed to household income. The contributions from remaining other sources of income to the total annual household income were not significant ($P > 0.05$).

In many West African countries, farmers play a significant role in paddy production and other production activities, through which they earn a substantial proportion of their living. For example, the Irrigation Development Authority in Ghana reported that paddy farmers are engaged in both paddy production and other income generation activities [15]

The small-scale irrigation project implemented by GIDA (Ghana Irrigation Development Authority) estimates that about 40% of the income obtained by paddy farmers is from other sources [15]. This is contrary to the findings from current study, whereby 54% of income is obtained from other sources. However, findings from this study concurs with the

observation made Minow [16] who reported that in most areas which produces paddy in Ghana, it has been revealed that the incomes from paddy production is much bigger than that obtained from other individual production activities. In addition findings from this study correspond to that of Farrington [29] who reported that in the Indian states of Andhra Pradesh and Madhya Pradesh it shows that, almost 40% of rural income in surveyed villages came from outside agricultural activities.

Estimates from Africa show that every additional \$1 of farm income leads to a further income of between \$0.96 in Niger and \$1.88 in Burkina Faso elsewhere in the economy [18]. Models of the Kenyan economy show these ‘multipliers’ from agricultural growth are three times as large as those for non-agricultural growth [17]. In Zambia, estimates suggest that every \$1 of additional farm income creates a further \$1.50 of income outside agriculture [18].

Evidence consistently shows that agricultural growth is highly effective in reducing poverty. Gallup[30] reported that every 1% increase in per capita agricultural output led to a 1.61% increase in the incomes of the poorest 20% of the population. Thirtle [20] concluded from a major cross-country analysis that, on average, every 1% increase in agricultural yields reduced the number of people living on less than US\$1 a day by 0.83%.

In addition, when the conditions are right, increasing agricultural productivity has increased the incomes of both small and large farmers and created employment opportunities. These increases in income are remarkably important because large percentage of population to great extent still depend on agriculture for their income; for example it was reported to range from 45% in East and South East Asia, to 55.2% in South Asia and 63.5% in sub-Saharan Africa [21].

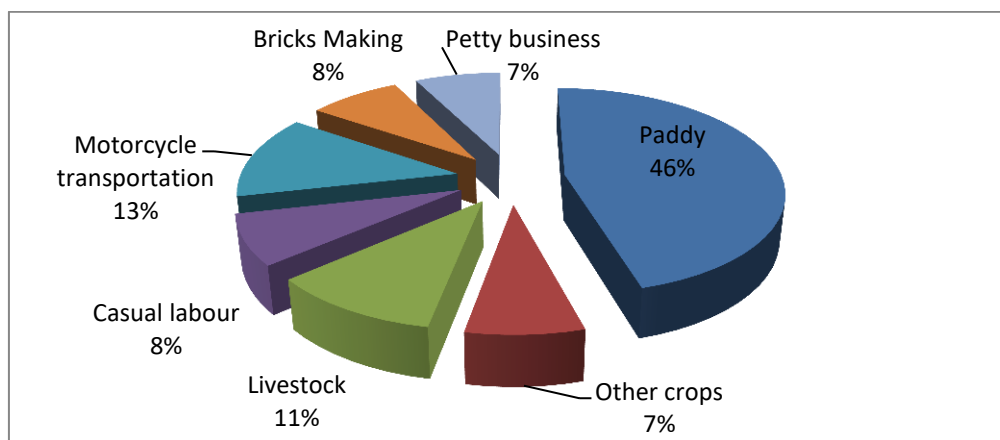


Fig 1: Contribution of Mean Incomes from Paddy Production and Other Sources to the Total Household Income per Year

Table 3: Analysis of contributions of various sources to household income

Source of income	Df	F	Sig.
Paddy	77	12.548	.000
Other crops	77	5.521	.000
Livestock	24	3.485	.027
Casual labour	18	2.479	0.119
Motorcycle transportation	9	0.912	0.580
Bricks making	11	0.716	0.687
Petty trade	35	1.253	0.308

Challenges Faced by Paddy Producers in the Study Area

High prices of fertilizers

Table 4 revealed that high prices of fertilizers significantly ($P < 0.05$) affected paddy production. This is probably due to low income for the most of smallholder farmers in study area. Agricultural markets are dominated by a few private traders who are free to practice unfair competition thus burdening smallholder farmers. The existing market structure does not favour local economies, sometimes because of inflation. The Warehouse Receipt System (WRS) is one market instrument which can be used to correct these market distortions. The scheme can be organized in such a way that it enables farmers to sell indirectly to external markets. To scale down the effect of inflation, support services need to be directed to the production of food crops to ensure food security, improve farmers' income and reduce food inflation, which is too high. However, the process of market liberalization, however, has not been free of controversy. The most common criticism is that market liberalization is said to have had adverse effects on the poor through layoffs in formerly-state-owned industries, higher food prices, and the erosion of social safety net programs.

Although the change in the proportion of households using chemical fertilizers between 2002/03 and 2007/08 was small, the amount of fertilizer made available to farmers has been increasing since 2007/08 because the Government of Tanzania initiated the so called National Agricultural Inputs Voucher Scheme (NAIVS), which provide inputs subsidy in form of improved seeds and fertilizers to rice and maize farmers. However, a considerable proportion of farmers sometimes failed to pay the required 50% of the price of subsidized fertilizers.

Unreliable rainfall

Results from Table 4 revealed that unreliable rainfall which is due to climatic change was not a significant ($P > 0.05$) challenge and negative standardized coefficient shows that probably there is no relationship between paddy production and unreliable rainfall. Existing climatic variability is likely to be exacerbated by longer-term climate change. Although its impact is hard to quantify, climate change is likely to increase the unreliability of farming systems, particularly in rain-fed areas [21]. In additional the

statistics from FAO has shown that, weather conditions especially rainfall amount and reliability have significant influences on productivity of both maize and paddy. The production of crops depends much on the availability of rainfall which makes seeds to germinate. The unreliability of rainfall has greatly affected the production of crops as the crops depend much on water.

The extent and implications of climate change remain uncertain, but models indicate that if temperatures increase towards the higher end of the predicted range, crop yields could fall by up to 20% over the next 50 years. In addition, any increase in the incidence of extreme weather events, such as drought, will have a major impact on vulnerable households that already have trouble coping with existing levels of climatic changeability. The impacts will be most severe where production systems are rain-fed and most vulnerable to drought [22].

Grazing animals on paddy farms

Findings in Table 4 show that the challenge due to existence of grazing animals on paddy farms was not significant ($P > 0.05$) and the negative standardized coefficient shows that probably there is negative relationship between grazing animals on paddy farms and production of paddy. Probably this challenge has been reduced due to Government interventions, which aimed at removing large herds of cattle in the Usangu plains which is the main source of water for various rivers generating hydroelectric power in the country.

Scarcity of area for paddy cultivation

Table 4 disclose that the scarcity of area for cultivation was a significant ($P < 0.001$) challenge in the study area and it has a positive standardized coefficient which shows that there is positive relationship between scarcity of area for cultivation of paddy and production of paddy. Furthermore findings also indicate there might be an increase in paddy by 41 % as the farmer increases his farm size by 100%. These findings concur with that of Basorun and Fasakin [23]. Scarcity of area for cultivation is strongly linked with invasion of agro-pastoralists (i.e. Sukuma tribe) and presences of large investors in paddy production in the study area. This to large extent affected indigenous smallholder farmers.

Low market price for paddy

The low market price for paddy was among significant ($P < 0.001$) challenges faced by smallholder farmers and it has a positive standardized coefficient which shows that there is a positive relationship between low market price for paddy and production of paddy. Additionally, paddy production could be increased by 39.4% if the present prices of paddy increased by 100%.

The change in farm income depends on the path of prices, production, and cost of production. Some of the factors that make increasing agricultural productivity difficult have always challenged agricultural development. According to FAO [21], some of challenges include poorly functioning markets, poorly developed infrastructure and prices.

Poor farmers are also finding it harder to sell their produce as food processing, distribution and retailing becomes increasingly globalised [24]. The appearance of large, international supermarket chains in

many developing countries is leading to new demands on quality, quantity and delivery schedules. Supermarkets already dominate the retail food markets in most developed countries, and they are increasingly penetrating markets in developing countries. This trend has been greatest in Latin America, where supermarkets now account for 75% of all retail food sales, in Africa, supermarkets now account for around half of all food sales in South Africa, and 20% of urban food sales in Kenya [25].

Since the 1960s, world prices of most important agricultural commodities including food staples have steadily fallen and this trend is expected to continue [24]. Between 1980 and 2003, the prices of agricultural raw materials and food and beverages fell by 60% and 73%, respectively [26]. The fall in prices has happened because demand for these commodities grows relatively slowly, while supply has increased rapidly as a result of new technologies and government subsidies given primarily, but not exclusively, to farmers in developed countries [21].

Table 4: Regression analysis for problems facing paddy production

Problem	Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
	B		Beta		
1(Constant)	.398	.191		2.088	.040
High price of fertilizers	.249	.065	.275	3.851	.000
Unreliable rainfall	-.110	.059	-.105	-1.887	.063
Grazing animals on paddy farms	.051	.061	.046	.837	.406
Scarcity of area for cultivation	.224	.036	.410	6.282	.000
Low market price for paddy	.199	.035	.394	5.673	.000

a. Dependent Variable: Production of paddy

R = .893(a) R Square = .797 Adjusted R Square = .783 Std. Error of the Estimate = .23262

CONCLUSION AND RECOMMENDATIONS

The findings from the study have revealed that the contribution of paddy production in income poverty reduction is larger compared to any other source of income in the area. However, the contributions from other sources have been also substantial.

Among challenges facing paddy production in the area, it has been found that the significant ones are scarcity of area for cultivation, low market price for paddy and high price of fertilizers. Other problems included unreliable rainfall and grazing animals on paddy farms which did not significantly affect paddy production.

Since paddy production has been revealed to contribute much to the household income of the smallholder farmers it is recommended that government through district and ward agricultural officers and financial institutions to provide technical and financial

supports, respectively. It is anticipated that this will improve the production coupled with good market price; this will most probably lead to increase in paddy profitability which in turn could help farmers to get out from the income poverty.

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