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Profitability Analysis of Rice Production, Constraints and Consumption Shares by Small-scale Producers in Tanzania

Peter, D. Kulyakwave[1,2], Shiwei Xu[1*], Wen Yu[1], Sar Sary[1] and S. Muyobozi[1]

[1]Agricultural Information Institute, Chinese Academy of Agricultural Sciences, 100081 Beijing, China.
[2]Department of Research, Training and Market Development, Tanzania National Service Headquarters, P.O.Box 1694, Dar Es Salaam, Tanzania.

Authors' contributions

This work was carried out in collaboration among all authors. Authors PDK and SX designed the study. Author PDK performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors PDK and WY managed the analyses of the study. Author PDK managed the literature searches and compiled the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study examines the profitability of rice production, its key factors, and the consumption shares at household level.
Study Design: A cross-section study design was used in this research.
Place and Duration of Study: The study was conducted in the two Districts of Mbarali and Kyela in the Mbeya Region of Tanzania from January to March 2018.
Methodology: Structured questionnaires were used to collect primary data from 240 small scale rice producers. Data analysis was performed by descriptive statistics and Farm Budgetary Techniques was used to calculate farm economic viability variables including profitability index, return on investment, capital turn over and benefit cost ratio. The Kendall's coefficient of concordance was used to pinpoint and examine the key factors affecting rice profitability by farmers in the study area.

**Corresponding author: E-mail: xushiwei@caas.cn;*

Results: Descriptive statistics revealed that majority farmers have 45 years and below, 95.8% of the farmers are married. Majority (83.3%) households have family size of 2-4 individuals indicating shortage of family labor. About 80.8% of the respondents allocated farm size of 1-3 hectares. The budgetary farm technique revealed that average total cost, gross margin, and net farm income was 846450 (~ US $ 368.08), 1484175 (~US $ 645.41) and 1357975 (~US $ 590.73) Tanzania Shillings respectively. The profitability index, return on investment, capital turn over and benefit cost ratio for producers were 9.5%, 160, 2.6 and 3.1 respectively. According to Kendall's coefficient of accordance, the identified main constraints for economic viability of rice production were weather variability, lack of access to irrigation services, rice price instability, lack of access to agricultural information and technology, and poor access to the key production inputs.

Conclusion: It indicates that rice production is a profitable business in the study area and still there is potential for improving from the current yield. It was demonstrated that most of rice outputs are for commercial purposes with regards to consumption shares. This shows that rice is highly growing as commercial food crop in the Tanzania.

Keywords: Rice; profitability; gross margin; capital turn over; consumption; Tanzania.

1. INTRODUCTION

Rice production is among the dominant agricultural activities by rural families for almost half of the world's population. It's production account to approximate 482 million metric tons of milled rice per year. Globally, China and India account for approximate 50% of all rice outputs as well as consumption share. Rice is staple food for majority population [1] and source of income and employment for more than 200 million households from the developing countries [2]. Regardless of the reported production status, aggregate demands still overshadow the supply side to match with the growing world's population food demand [3]. In Tanzania, rice is one the important staple cereal food and it is ranked the second in terms of production and consumption by majority after maize [4]. Rice production is conducted traditionally in the rural areas but provides food, income, and employment to over 60% of rural population [5]. Most of farmers cultivate from 1-3 hectares of rice fields in average in the rural areas [6]. According to production statistics, Tanzania, which is ranked the second after Madagascar in the Sub-Saharan countries, is greatly held back by low yields [7]. The major reasons for such low yield are poor resource utilization, high cost of inputs including labor and dependency on rainfed ecosystem [8].

The focus is given to rice production because of the growing rice demand especially with an increasing household's income in the cities. Population increase and shifting in consumption status of most rural and urban families to prefer rice over other staple foods has led the increase in demand and price. Unfortunately, in Tanzania rice production is yet to be commercialized thus supply cannot match with the demand. Several factors including natural and non-natural have already been identified to be behind the low production [8]. Factors such as the lower yields and profitability, price variability, low level of technology transfer, use of local seeds, high cost of fertilizer, and lack of modern agricultural implements are among the key challenges holding back productivity in the country (URT, 2016). Imbach, et al. (2017) identify impacts of climate change and weather variability as the most prominent factors affecting rice production. To address this demand gap, the government resorted to import rice from other rice producing countries including Pakistan, India, Vietnam and Thailand to compensate the supply gap [6,9].

The country has high potentials for increasing rice production ranging from the increased population, availability of suitable rice production ecosystems, adequate land, increased internal and external markets demand, expansion of other sectors including the food processors, and tourist industry [10]. Several efforts have been repeatedly initiated and implemented by the government aiming at revamping the rice sector including introduction of adaptable seeds, introduction of some programs to support rice subsectors, introduction of financial support through small credits, and price control especially with the imported rice to protect local rice producers. The major purpose of the government interventions is to enhance rice productivity and benefit the rural farmers through the increased income and food security. However, regardless of all these efforts the subsector is still facing the biggest challenges posed by Climate Change and weather variability (Global Agriculture and Food Security Program) [11]. Therefore, the

current study was designed to determine profitability accrued by the small scale rice farmers; to identify the key constraints perceived by farmers to affect their farm income and to analyze the consumption status by the households.

2. MATERIALS AND METHODS

2.1 Study Area and Location

This study was conducted in two Districts of Mbarali and Kyela of the Mbeya region whereby rice is the principal crop produced in the two districts. Mbeya Region is located in Southern Highlands of Tanzania situated between latitudes 70 and 90 30' to the South of equator and longitudes 320 and 350 east of Greenwich. Mbarali District is located at latitude: 8º51' (8.85º) South, longitude: 33º51' (33.85º) East. The district is among the major rice producers in the region and it receives an average rainfall of 300 mm-900 mm per year from early December to late April. Kyela Districts lies between longitudes 350 41″ and 300 00″ East and latitudes 90 25″ and 90 40″ South and it receives an average rainfall ranging from 350 mm-800 mm per year which starts in early December to late April.

2.2 Data Collection and Sampling

Primary data were collected from Mbarali and Kyela Districts of the Mbeya Region from January to March of 2018. Multi-stage sampling technique was adopted to arrive to the required sample size. Purposive sampling technique was applied for both selecting the districts and selecting two wards from each district. Thereafter, a selection of four villages based on rice production performance from each ward was done. In order to obtain the required sample size, 240 rice producing households including 122 and 118 households from Mbarali and Kyela respectively were selected randomly from the 16 villages. Data were collected using structured questionnaires, face to face interview and focus groups discussion (FGD). The interviews and FGD were done to the selected leaders and experienced individuals in the respective districts. The main information solicited was on the households' socio-economic characteristics, rice farming and management, costs information, and prices for the farming season 2016/7. Since authors intended to address the main challenges affecting rice production and profitability, farmers were also asked to highlight the challenges they consider to be the biggest obstacle to rice production in their locality. Thereafter, the identified factors were assigned number from 1 (the most prominent factor) to 5 (least prominent factor) according to farmers' preferences. Edward [12] and Mattson's [13] ideas were used to calculate the rank scores for each factor.

2.3 Analytical Technique

The main analytical tools used in profitability analysis is the Farm Budgetary Technique "FBT" which involves determination of Gross Margin "GM", Net Farm Income "NFI", Profitability Index "PI", Rate of Return on Investment "RRI", and Cost Turn Over "CTO". To evaluate the production constraint and their preferences by farmers, the Kendall Coefficient of Concordance was used. Lastly, the consumption shares analysis was performed to deduce households' usage share of rice output with reference to direct households' food, market share, animal feeds share, and stocks.

2.3.1 Budgetary farm technique

The techniques have been widely used in estimating costs, returns, and net income of farm enterprises to facilitate production decisions based on the worthiness. Its usefulness and simplicity help to demonstrate the relationship between costs and return of the agricultural projects as compared to the complicated and sophisticated techniques such as linear programming and multi-period budgeting [14]. Different tools can be adopted in reaching the farm projects' decisions including Gross Margin, Net Farm Income, Profitability Index, Cost Benefit Ratio, Return on Investment, and Capital Turn Over. The technique has been adopted in various studies to analyze profitability and making decisions for agricultural farming investments (Sekumade, et al. 2014, Tusekelege, et al. 2014, Enim, et al. 2018, Okam, et al. 2016, Umar, et al. 2017 and Turco, et al. 2017). For example; specifically, Tusekelege, et al. (2014) used the technique to compare performance of Rice Intensification System in Morogoro Tanzania. In addition, Okam, et al. (2016) used profitability analysis methods to compare profitability of rice production among men and women farmers in Ebonyi State, Nigeria. Likewise, recently the technique has been used in the analysis of profitability of cassava production in Nigeria by Enimu, et al. (2018) and the results showed the project was worthy to be undertaken. Further, Madu, et al. (2018) applied the techniques in estimating profitability of paddy production in

Nigeria. Thus, profitability estimation is an essential ways for making decision in various small scale farm investments.

2.3.2 Models specifications

Gross Margin (GM) analysis is an essential primary approach for determining the economic health of micro-enterprises which is performed with an assumption that Fixed Cost (FC) is negligible. Therefore, it is deduced as a difference between the Total Revenue (TR) or the Gross Farm Income (GFI) and the Total Variable Cost (TVC) as given by Olukosi & Erhabor [15]

$$GM = GFI - TVC \quad (1)$$

Where, GFI is the Gross Farm Income which is calculated as product of price of a one kilogram of rice (TZS/Kg) and total rice output (Kg). Total Variable Cost (TVC) is the sum total of all operating costs incurred by a farmer in a day to day in rice production.

Net Farm Income (NFI) analysis is calculated as difference between the Gross Farm income and the Total cost incurred in production process as shown in equation 2. The overall total cost include the TVC and total fixed cost (TFC) incurred by rice farmers in the farming process.

$$NFI = GFI - TC \quad (2)$$

Profitability Index is (PI) analysis calculated as ratio of the Net Farm Income to Total Variable Cost.

$$PI = \frac{NFI}{TVC} \quad (3)$$

Benefit Cost (BC) ratio of rice farm production is obtain as a ratio of gross farm return to the total variable cost incurred in rice production.

$$BC = \frac{GFI}{TVC} \quad (4)$$

Rate of Return on Investment (IRR) is obtained as a ratio of Net Farm Income to Total Cost of investment in rice production. It is basically used to measure how efficiently the rice farm utilized its total costs which covered the investment to produce revenues [15]

$$RRI = \frac{NFI}{TC} \times 100 \quad (5)$$

Also the Capital Turn Over (CTO) is obtained as ratio of total revenue to total cost of rice production by farmers;

$$CTO = \frac{TR}{TC} \quad (6)$$

2.2.3 Rice consumption share

The rice output consumption shares by the households were calculated as a ratio of consumption status by the family to total rice outputs accrued by farmers. Three categories of consumption share were considered in this study including the direct food consumption share, selling or marketing share, animal feeds share, and stocking share. The shares were expressed as a percentage by multiplying each with one hundred.

$$FC_s = \frac{\text{Amount of rice (Kgs) used for Food}}{\text{Total Rice Outputs (Kgs)}} \times 100 \quad (7)$$

Where FCs is the rice used as food share expressed in percentage

$$M_s = \frac{\text{Amount of rice Sold (Kgs)}}{\text{Total rice outputs (Kgs)}} \times 100 \quad (8)$$

Whereas M_s is the amount of food sold to various market channels expressed in percentage

$$AF_s = \frac{\text{Amount of rice aloted to animal feeds (Kgs)}}{\text{Total rice outputs (Kgs)}} \times 10 \quad (9)$$

Whereas, AFs is the amount of rice grains allocated for animal feeds expressed in percentage

$$S_s = \frac{\text{Amount of rice in Stock (Kgs)}}{\text{Total rice outputs (Kgs)}} \times 100 \quad (10)$$

Whereas Ss is the amount of rice outputs retained in stock expressed as percentage

2.3.4 The Kendall's coefficient of concordance to test for factors affecting rice profitability

The Kendall's coefficient of concordance analysis was used to test respondents' agreement between factors affecting profitability in the study area. Basically, it established the extent of association among responses. The Kendall's coefficient of concordance '*W*' is the measure of the degree association and relationship among *m* set of *n* ranks. This test is conducive to measure the degree of association among the three or more set of ranking variables. It computes the total rank score for each factor where the factor with the least score is ranked as more preferable factors while one with higher ranked score is less preferred. The sum of the score was used to compute for the *W* [12]. The formula for the

coefficient of concordance *W* is then given by Mattson [13] as explained in equation 11.

$$W = \frac{12(\sum T^2 - (\sum T)^2 1/n)}{nm^2\{n^2-1\}} \quad (11)$$

From equation 11; T = sum of ranks for each factor, m = number of rankings (respondents) and n =number of factors being ranked. Additionally, the hypothesis being tested regarding to agreement of factors by the respondents was stated as follow:

H0: There is no significant agreement among the farmers on the factors affecting their rice profitability.

H1: There is a significant agreement among the farmers on the factors affecting their rice profitability.

The Coefficient of concordance *W* was tested for significance using the X^2 distribution.

3. RESULTS

3.1 Socio-economic Characteristics

Table 1 presents socio-economic characteristics of the respondents. The study was composed of both male and female, aged less or 45 years. Although, most respondents were males, the data demonstrate that majority (95.8%) of the respondents were married.

In term of education status, the majority farmers have acquired basic education as only 2.5% were identified as illiterate. Though, Table 1 illustrate that majority (91.2%) farmers have 2-7 members in their families, only 2.5 % of the respondent owned that farms above 6 hectares. Lastly, the analysis on off-farm incomes as demonstrated in Table 1 indicates that majority farmers (72.5%) earn up to 200,000 TZS from off-farm incomes. Generally, these results indicate the real behaviour of subsistence farmers in many developing countries that are characterized with rudimentary implements, lack of enough extension services, and poor allocation of resources. These characteristics have been associated with poor yields and income.

3.2 Profitability Analysis of Rice Farmers

The results in Table 2 demonstrate the relationships between costs incurred in rice production and the returns accrued by rice farmers in the study region. The relationships help in the determination of the profitability earned by rice farming households per ha. The result shows the average Total Variable Cost was TZS 720250 (~US 313.07) which account for 85.1% and Fixed Cost per ha was and TZS 126200 (~US 54.86) which account for 14.9% (Where 1 US$ ~ 2301 TZS). Among the variable cost components, labor cost was higher consisting 25.4% compared to other costs such as fertilizer, seeds, water, etc. This shade lights that labor availability is scarce in the study area [16]. The average price of a kilogram of rice was TZS 607.4 (US $ 0.26) while gross margin and net farm income obtained by respective farmers was TZS 1484175.3 (~US $ 645.7) and TZS 1355795.3 (~US $ 589.69) respectively (Table 3). The results in Table 3 indicate that profitability index, benefit cost ratio, and capital turn over and return on capital was 91.5%, 3.06, 2.6, and 160.4 respectively.

3.3 Households' Rice Consumption Shares

Based on the expressions analyzed in the methodology section with equations 7 to 10, the consumption status in the families was found in three sections including; marketing, stocking and direct rice consumption as food. For example, the study found that the 2016/2017 faming season's rice outputs about 22% of the outputs were directly consumed as food at households' level, 62% was sold at various market channels, and 16% of the outputs were retained as stocks for different purposes. This finding is in agreement with Antony [17] and in opposition with Kijima's [18] findings who report that majority of rice products are still consumed at household level in Uganda.

3.4 Factor Affecting Rice Productivity

Famers have identified various key factors which hold back their farm performance as presented in Table 4. The factors include weather variability, lack of access to information and technological services, price instability, and poor access to farm inputs. The Kendall's coefficient of concordance *W* was found to be 0.24 and significant at 1% level. From the results the null hypothesis was rejected ($P < 0.05$) in favour of alternative hypothesis that there is fairly (24%) level of agreement among the farmers on the rankings of the factors affecting rice profitability. These outcomes corroborate the findings of Kulyakwave, et al. [19] who observe that weather variations including rainfall, sunshine, and temperature are among the key factors affecting crops productions in Tanzania.

Table 1. Household's socio-economic and demographic characteristics

Variable name	Characteristics	N	%	Mean
Age	Equal or less than 45	126	52	142
	above 45	114	48	98
	Total	240	100.0	
Sex	Male	186	77.5	119.0
	Female	54	22.5	121.0
	Total	240	100.0	
Marital Status	single	10	4.2	106
	Married	230	95.8	121
	Divorced	0	0.0	0
	Others	0	0.0	0
	Total	240	100.0	
Education	Illiterate	6	2.5	143
	literate	41	17.1	111
	Primary	169	70.4	120
	Secondary	22	9.2	134
	University	2	0.8	132
	Total	240	100.0	
Family size	less than 2	22	9.2	1
	2-4	200	83.3	2.7
	5-7	18	7.5	5.4
	Above 7	0	0.0	0
	Total	240	100	
Farm size	1-3	194	80.8	1.75
	4-6	40	16.7	4.65
	Above 6	6	2.5	8.12
	Total	240	100.0	
Off-farm income	0-200000	174	72.5	30996.84
	Above 200000	66	27.5	606280.55
	Total	240	100	

Table 2. Cost analysis for rice production per ha

Item	Cost TZS/ha	Percentages % of TC
a. Variable costs		
Fertilizer cost	189000	22.3
labour cost	215000	25.4
seed cost	57500	6.8
water cost	31250	3.7
Insect/pesticides	52500	6.2
land preparation	100000	11.8
harvest	75000	8.9
Total Variable Cost (TVC)	720250	85.1
b. Fixed cost		
Land rent	100000	11.8
Farm asset depreciation		
Knapsack Sprayer	12000	1.4
Water-cane	2400	0.3
Shovel	1200	0.1
Hoes	1800	0.2
Wheelbarrow	8800	1.0
Total Fixed Cost (TFC)	126200	14.9
Total Cost "TC" (TVC+TFC)	846450	

Table 3. Return analysis for rice production (TZS)

Item	Response value
i. Total Revenue "TR" (Py.Y)	
Production "Y" Kgs	3629.3
Price "Py" TZS/Kg	607.4
ii. TR/Gross Farm Income"GFI"	2204425.3
iii. Gross Margin	TR/GFI - TVC
GM	1484175.3
iv. Net Farm Income "NFI"	TR-TFC
NFI	1357975.3
v. Profitability Index "PI"	NFI/GR
PI	91.50
vi. Benefit Cost Ratio "BCR"	GR/TVC
BCR	3.06
vii. Return on Investment "ROI"	NFI/TC
ROI	160.4
viii. Capital Turn Over "CTO"	TR/TC
CTO	2.6

Table 4. Key factors for rice profitability by small scale farmers

Factor	N	Mean
Weather factors variability	240	2.28
Lack of Access to Irrigation technology	240	2.48
Price Instability	240	2.72
Lack of access to Information and Technology	240	3.28
Poor access to farm inputs	240	4.21
Number of Observation	240	
Kendall's W Coefficient of concordance		.241
Chi-Square		231.517
df		4
Asymp. Sig.		6.2225E-49

As presented in Table 4, weather variability is highly rated (mean of 2.28) by farmers as the most influential risk factor affecting rice yields while the least rated was poor access to farm inputs with a mean of 4.21. However, at household's level other factors identified include technological factors such as lack to irrigation services, poor access to important farm inputs such as seeds, machinery, fertilizer, and infromation services to curb weather variability risk including shortage of rainfall [20] and also drought shocks [21]. Others factors include price instability which defines the market costs for both inputs and outputs in the rice production industry.

4. DISCUSSION

4.1 Socio-economic Characteristics

Rice production requires close monitoring from planting to harvesting in order to attain the expected yields and profits. This requires full commitment of the farmers at all the time. It is observed that most of the rice practices are tedious and laborious thus demands fresh and quality minds from the young farmers [22]. This observation reflects the trend presented in Table 1 where most farmers are young, energetic, and economically active to get involved in rice production. In addition, young farmers are believed to easily accept and adopt new technologies and extension services to facilitate rice production [16], contrary to older farmers who are relatively rigid on accepting new technology [20]. The significant numbers of farmers are married which is beneficial for agricultural activities. The fact is, being couples increase family labor which helps to cut down production costs associated with labor. Provision of education to households brings higher benefits in agricultural production. It is very useful especially in the current period where agricultural practices are plagued by several environmental and non-environmental challenges. For the farmers to survive out of these challenges, they have built their resilience with the help of the

acquired knowledges [23]. Therefore, efforts to sensitize farmers to learn more knowledge about rice farming are required which is beneficial for rice production. More importantly, it implies that advanced knowledge has trickle down benefits for farmers in boosting rice production and farm income [23]. Such knowledge is required in the adoption of modern technology, application of extension services, searching for new markets and price negotiations. Thus, education factors, is among the factors to be considered not only by households but also by the government during policy making as it accounts for farm productivity [24].

Most families rely on family labors; however, due to small family size dominating in the study area, hired labors become the main sources of labor which increase the costs of production. On a very similar concern, many of energetic young generations are running from farming activities for what they perceived that is not profitable. This tendency contributes on labor deficit the rural area. Therefore, we urge the responsible institutions including government and non-government organizations to work on various bottlenecks which hold back agricultural production. Sensitization programs, like improving access to credit facilities, subsidies to inputs, and improving market prices for their produces, would encourage people to invest in the farming activities [25]. Additionally, socio-diversifications like having opportunities for employments provide extra income to the families [26]. The advantages of off-fam income extend to increase family well-being and minimize food insecurity. Likewise, off-farm income helps to facilitate technology adoption by farmers including purchases of implements, seeds, fertilizers and buy and or rent extra land for farming activities [27].

4.2 Profitability Analysis of Rice Farming

4.2.1 Cost structure components

In order to realize the returns from faming investment, the relationship between different input costs, outputs, and market prices have to be considered. Therefore, the main cost components included are variable cost and fixed cost. Small scale famers normally suffer from failure to achieve the economies of scale due to the low scale of production. These costs are directly transmitted to the total cost components which affect their farm profitability. However, the finding in the current study concord with the previous findings by David (2015) that these costs can be grouped into inputs and outputs marketing costs. The traditional that includes seed cost, irrigation cost, consultation costs, fertilizer, and pesticides costs is among the costs incurred by farmers. However, among the costs, labor cost is reported to be higher than other components. This trend conform to the previous one reported by Lamba, et al. [28] Nonetheless, to carter for labor deficit most farmers use hired labor which is scarce and expensive.

4.2.2 Rice farm returns analysis

The gross return obtained from selling rice grains less variable costs was TZS 1484175.3 which is equivalent to US $ 162.54 (Exchange rate 1TZS~ US $ 2301). This highpoints that rice production is profitable in the study area and farmers could cover the operation costs invested in the rice farming. Majority farmers in the study area sell rice outputs at farm gate prices but still receive significant gross profit. Besides, the fact that 70% of the farmers cultivate rice in the rainfed ecosystems but the realized profit is relatively high. It adds that if the farmers are given better environments such as irrigations services, linkages to markets and financial credits services, reliable extension services, and others important inputs could boost their farm income and profits. Additionally, if farmers are able to add value to the harvested rice, the accrued returns could be higher than the reported figures. This finding corroborate with the findings reported by Mir, et al. [29]. Similarly, the NFI obtained confirmed that rice production is profitable for the small scale farmers in the area since NFI account for the deduction of the overall total cost (TC) incurred in the production process. Furthermore, it is accounted that farmers could retain more than 90% (PI) as net profit generated from every one Tanzania Shilling reaped as revenue from selling rice. This result is consonance with the findings by Srean, et al. [30]. Meanwhile, the realized BC ratio indicates the solvency capability of the investment, and the relative benefits accrued per unit cost incurred in the farming business. It further expresses the benefits a farmer would earn by spending a unit cost in the rice farming. Similarly, for the capital turn over (CTO) a total of TZS 2.6 a farmer could be generated from each one Tanzania Shilling invested in one ha. Basing on the Rate of Return on Investment (RRI), it has also been proved that farmers could obtain a sound margin for each Tanzanian Shillings invested in rice

farming. Economically, rice practices yielded good returns of TZS 160.4 (US $ 0.07) to farmers as return. These findings corroborate with Ettah, et al. [31] who demonstrate that rice farming can benefit farmers and intensify food security.

4.3 Households' Rice Consumption Share

Farmers and none farming communities have different forms of utilizing rice outputs. The findings have revealed that farmers dispose rice outputs at very early stages. It is particularly true that in Tanzania, like many other developing countries, majority farmers have less tendency of adding value to their farm outputs. Normally, a bigger portion is consumed at households and or sold shortly after harvesting, while, another portion is stored for different purposes such as seeds for the next farming season. A similar comment was claimed by Kijima [18] that the majority portion of the rice outputs received by small scale farmers are consumed at home and remaining shares are sold to the available sports markets. This implies that none of the rice share was used for animal feeds as was expected by researchers prior to these findings. Additionally, farmers in the study area consider rice straws as waste because they lack knowledge for converting rice straws into an alternative uses such as animal feeds, erosion control aid, medicines, healthy products, and fertilizer as was reported by Antony [17].

4.4 Factors Affecting Profitability for Rice Farmers

Most of the faming households in Tanzania similar to other developing countries are faced with various challenges which hold back farming productivities. These challenges are very enormous and require well institutional set ups to deal with. However, this has not been possible since majority of the countries are poor and farmers are using rudimentary farming practices. Most of the environmental factors that control crops production are very difficult to deal with especially with the impact of climate change and weather variability. The effects are huge to be handled by the subsistence farmers. The results of poor rainfall distribution, high and sustained sunshine, and severe temperature contribute to the poor yield as identified by rice farmers [19]. Most of the efforts to curb and increase resilience to the effects of weather variability are very expensive to be accommodated by subsistence farmers [17]. This implies that collective efforts are required especially from the government and non-governmental institutions to minimize the risk burden facing famers from weather which has jeopardized rice profitability and food security. Farmers need updated agricultural extension services, new technologies, timely information pertaining to weather forecasts, new seeds, fertilizer, markets and market prices, etc which are important for farming production.

Additionally, majority farmers dispose their crops at very premature stage to a lower farm gate price. This means that no value addition is done for their produces thus ending up getting little income as a result of unsatisfactory prices [32]. Even those who managed to deliver their produces to the sport markets maintained that the prices are too volatile that affect revenues. Some farmers asserted that they have never benefited from selling their produces and could have quitted rice farming if there was an alternative job to make living. Few farmers have already adopted small scale irrigation practices but the challenge is inadequate water required for irrigation activities. The fact is farmers depend on the rivers and swamps water sourced from rainfall to irrigate the rice fields. Therefore, if rainfall is inadequate their rice fields are jeopardized and even some distant fields do receive less water due to water scarcity. This alerts that the government has to make sure good irrigation infrastructure are installed to match with water demand [10]. The interventions should go in line with the availability of others imperative inputs such as fertilizers, quality seeds, pesticides and tractors which are all necessary to revamp the rice industry to blossom profitability [33]. Additionally, with these interventions, it could be possible for farmers to produce rice throughout a year and other crops such beans, maize, and vegetables to boost their households' economy and wellbeing [34].

5. CONCLUSION AND RECOMMENDATIONS

The aim of this study was to pursue on the profitability accrued by small scale rice farmers, identifying the keys challenges, and determining outputs allocation at family level**.** In this regards, farmers' socio**-**economics endeavors was deduced showing that they are essential with respect to rice farming and outputs. The study highlighted that rice production is a profitable

business in the study area. In this respect, the study's results revealed to have some policy implications; the socio-economics analysis plays a major role on enhancing community development. Thus, government and other stakeholders should invest on education provision to the farming communities since it has positive trickle-down effect on rice production and profitability. The accessibility to financial services by young and energetic farmers should be improved because the results have proven on their positive engagement in rice production. The availability and accessibility to financial services could help farmers to resolve some of the impending challenges including labor and adoption of new technologies. The government should formulate workable programs and policies to control rice market price and other crops which are very sensitive and volatile. The policies should target on subsidizing farmers to covers the important principle inputs such as quality seeds, fertilizers, and pesticides as well as crop insurance especially on the risk caused by weather variability. In addition to that, some limitation such as poor farm record keeping by farmers could be reduced by education from the committed extension officers. To this end, we suggest a further research to find out the profitability difference between rainfed and irrigated rice ecosystem in the study area.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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