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Analysis of production and trading trends in the rice value chain in Mbarali District of Tanzania: perspectives from 2019 to 2021

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Abstract

Rice is an essential food crop that significantly contributes to economic growth, food security, and poverty alleviation in many countries. In Tanzania, the rice value chain is critical for revenue generation and employment to thousands of people. However, little attention has been given to the profitability of the rice value chain in different parts of the country. This cross-sectional study investigated the rice value chain in Mbarali District, Tanzania, spanning the agricultural years 2019 to 2021. Using the Value Chain Analysis and Transaction Cost Economics, the study assessed the production and trading of rice in the rice value chain in Mbarali district. The study involved a total of 126 participants selected by snowballing. Data were collected by using structured, semi-structured and unstructured interviews to understand the actors' roles and the value-adding processes throughout the chain. Descriptive statistics were used to analyze production costs, input-output dynamics, and distribution patterns within the value chain. The findings revealed substantial financial investments required for paddy production in Mbarali District in terms of seeds, fertilizers, pesticides and herbicides, and farm implements. The findings also showed varying cost efficiencies across seasons, with in-season turnovers demonstrating robust revenue generation relative to input costs, particularly in sales to retailers (0.61) and wholesalers (0.75). However, out-of-season challenges were evident, notably in maintaining efficiency during slower market periods. The study contributes empirical insights into how to enhance the resilience and competitiveness of Tanzania's rice sector amidst evolving climatic and economic challenges and underscores the need for a policy and initiatives that would strengthen the resilience of the rice value chain against climatic and economic stresses. The results have significant implications for policymakers, academics, and other stakeholders interested in promote sustainable development of the rice value chain in Tanzania.

Keywords: Policy Environment, Regulatory Framework, Production, Trade, Diversification, Export, Rice, Value Chain.

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1. INTRODUCTION

Rice is an important food and cash crop that provides food to approximately half of the world population whereby over 3.5 billion people depend on it for at least 20% of their daily calorie intake (CGIAR, 2016). According to the Food and Agriculture Organization [FAO] (2021), global rice production increased from less than 150 Mt in 1994 to over 800 Mt in 2019. In 2020/2021, rice consumption across the world was 697.09 Mt. In the decade ahead, it is expected to expand by 0.9% per year, down from 1.1% per year in the previous decade (Mohidem et al., 2022). In Africa, the annual rice consumption per capita is also projected to increase by about 5 kg from 2019 to 2028 (CGIAR, 2016). In sub-Saharan Africa (SSA), rice is one of the most important food and cash crops, which contributes greatly to economic growth (Arouna et al., 2021; Velde & Maertens, 2014). In 2018, the International Rice Research Institute (IRRI) (2020) estimated paddy rice production in SSA at 26.5 Mt on about 11.95 Mt hectares of land. thus, the rice production is key to the economic growth of the

region (Seck et al., 2012). Many countries in SSA have also made significant efforts to increase domestic rice production by encouraging the adoption of new and improved varieties and better agricultural practices (Arouna et al., 2021).

In Tanzania, rice is the third most important cereal food crop after maize and cassava (Wilson & Lewis, 2015). According to the United States Department of Agriculture (USDA), rice consumption in Tanzania greatly increased from 94,000 Mt of milled rice in the 1960s to 1,800,000 Mt in the 2010s. Tanzania's local supply of milled rice totaled approximately 1,200,000 Mt in 2013, making the country the seventh largest rice producer in Africa (FAO, 2021). In response to the increasing rice demand, Tanzanian rice production increased between the 1960s and 2010s (FAO, 2021). This increase was mainly a result of expansion of the cultivated area rather than yield improvement. Similarly, the country's economic activities related to rice production, processing, distribution, and consumption have been increasing. The major rice-growing regions in the country are Mbeya, Morogoro, Shinyanga, Tabora, Arusha, and Mwanza, which together account for about three-quarters of all the rice produce in the country (Msafiri, 2021). According to Suvi et al. (2021), approximately 25% of the national rice production occurs in the Mbarali and Kyela districts, situated in Mbeya region and Kilosa, Kilombero, and Mvomero districts in Morogoro region. Smallholder farmers produce about 74 % of rice under rain-fed conditions, while irrigated rice and large-scale production account for only 20% and 6% respectively. Tanzania is among the few African countries that are best positioned to leverage the subsector's trade potential due to the presence of enough water supply and a vast arable land.

Rice is distributed nationwide in Tanzania. Although Tanzania has not been self-sufficient in rice for many years, the country considers rice a strategic priority for agricultural growth and commerce, thus, the National Rice Development Strategy (NRDS) was established to double the acreage and production of rice, enhance value addition, and maximize the crop's trade potential in terms of exports to neighbouring countries by 2030 (URT, 2019). The nation's major rice consumption cities, where many non-farming consumers reside, include Arusha, Dodoma, Zanzibar, Dar es Salaam, Mtwara, Lindi, Bukoba, and Musoma. The market for Tanzanian rice extends to neighbouring countries like Congo, Kenya, Rwanda, Uganda, Malawi, and Zambia (Sekiya et al., 2020). The rice value chain comprises producers, transporters, brokers, wholesalers, and retailers. Over the years, the importance of rice as a food and cash crop in Tanzania has been increasing. Still, a critical analysis of the rice production and trading has remained a challenge and complex. Similarly, no assessment of the costs incurred in rice production in terms of inputs per acre and profitability of the rice value chain in different parts of the country has been done. Although rice distribution and trade flows can be qualitatively evaluated by interviewing relevant stakeholders in the value chain, quantitative evaluation is difficult due to a lack of empirical studies (Sekiya et al., 2020). Therefore, the present study investigated the production and trading of rice in the rice value chain of Mbarali district. The results have implications for academicians, policymakers, and other stakeholders of sustainable development of the rice value chain of Tanzania.

2. THEORETICAL REVIEWS

The rice value chain in Mbarali District, Tanzania, comprises multiple stakeholders and activities that influence production and trading of the crop from 2019 to 2021. To comprehensively analyze this value chain, two key theoretical frameworks to assess the underlying dynamics in the rice value chain in Mbarali district. These were, namely: the Value Chain Analysis (VCA) and the Transaction Cost Economics (TCE) VCA helped the researchers to identify and address inefficiencies in each stage of the value chain, while TCE helped the researchers to understand the costs associated with economic exchanges. With these theoretical frameworks, the study offers comprehensive insights into the production and trading of rice in Mbarali District, informing policies and strategies for enhancing efficiency and profitability. The theoretical frameworks are further described below.

2.1 Value Chain Analysis

The VCA framework developed by Michael Porter, explains the series of activities involved in bringing a product from its initial stage of its production all the way to the final consumer (Porter, 1991). Value chain analysis is a sequence analysis of related business activities (functions) from specific inputs for a particular product to primary production, transformation, marketing, and finally consumption. Under VCA, it is assumed that value chains perform several functions i.e. start from the producer (rice producer or farmers), processors (farmer or trader), traders (retailer or wholesaler), and transporter (transportation and storage important functions in the rice channel distribution system) (Widyarini & Pawitan, 2011). In the present study, VCA helped to identify the sustainability of the rice value chain from 2019 to 2021. The framework helped to explain added activities and potential bottlenecks within the chain, providing a clear understanding of the different stakeholders in the rice value chain in Mbarali.

Specifically, VCA enabled the researchers to examine each stage of the rice value chain—from input supply, cultivation, harvesting, and processing, to marketing and distribution. It helped the researchers to highlight the contributions of different stakeholders (including farmers, millers, traders, and retailers). Application of VCA to the rice value chain in Mbarali District involved several stages. Firstly, input supply was examined, focusing on access to quality seeds, fertilizers, and pesticides significantly impacts productivity. Here, VCA was used to examine the availability and affordability of these inputs. Similarly, processing facilities, such as mills, add value to harvested rice. VCA was used to evaluate the costs of these facilities so as to understand the profitability of rice production and trading in Mbarali district.

2.2 Transaction Cost Economics

The TCE framework was introduced by Ronald Coase and further developed by Williamson (1989) and it is used to explain the costs associated with economic transactions. TCE focuses on the costs incurred in the process of making an economic exchange, including the search and information costs, bargaining costs, and enforcement costs. The theory has recently been used by Sathapatyanon et al. (2018) in Thailand to assess the role of farmers' organisations and networks in the country's rice value chain and by Senanayake and Premaratne (2016) in Sri Lanka to assess the rice value chains. Application of TCE to the rice value chain in Mbarali District involved analysing the various transaction costs associated with the production and trading of rice to establish the profitability for farmers. Smallholder farmers in Mbarali may have weak bargaining power when negotiating with larger traders and processors, leading to lower prices for their produce. Strengthening farmers' cooperatives and associations can enhance their collective bargaining power, enabling them to negotiate better terms and prices. Enforcement costs are another critical factor. Weak institutional frameworks and the lack of formal contracts can lead to high enforcement costs, as farmers and traders face challenges to ensure the agreed-upon terms are met. Improving legal frameworks and providing institutional support to farmers can reduce enforcement costs by ensuring contracts are binding and disputes are resolved efficiently. Using this theory to analyses these transaction costs in the rice value chain of Mbarali district enabled the study to provide recommendations to stakeholders to identify inefficiencies and develop strategies to mitigate them so as to improve the overall performance of the rice value chain in Mbarali District and other parts of Tanzania.

3. MATERIALS AND METHODS

This study employed a cross-sectional design to explore the rice value chain systems. This design enabled the researcher to investigate more than one case at a single point of time. The approach made it easy to examine the relationships between cases. In addition, the design took a holistic view which allowed the researchers to gain valuable insights into pertinent issues based on the experiences and perspectives of the affected group (Bryman, 2008). In this regard, the design allowed multiple data collection techniques to be used, including structured, semi-structured, unstructured, and interviews.The study focused on potential areas of rice farming in Mbeya region and the trading history of Tanzania. In this case, Mbalali district was selected as the study area. It selection was motivated by its high extent of high exposure to actors who have experience with climate_-responsive practices in the rice value chain. Snowball sampling was used to select a total of 126 participants, whereby one or more participants referred the researcher to other participants (Parker et al., 2019). Using this technique, rice growers and traders in the study district formed a list of respondents. Similarly, the technique was applied to obtain the cross-boundary traders in the potential export boundaries of Tanzania.

Data was collected from three past agricultural years (2019 -2021), from a list of rice-producing blocks that involved farmers, middlemen (traders, processors, rice wholesalers, and rice retailers), and consumers both within and outside of the country. A sample of selected respondents provided information regarding the costs of paddy production in terms of input and output including costs of transportation drying, storing loading and unloading, and the transportation of the product to the point of sale. Descriptive statistics were used to describe the actors and their role in adding value to the rice exported from Tanzania. A profitability analysis was performed to determine the Gross Margin (Revenue – Cost of Goods Sold), Net Farm Income (Gross Income Operating Expenses), Profitability Index (Net Farm Income/ Operating Expenses), Rate of Return on Investment (Net Profit/Cost of Investment x 100), and Cost Turn Over (Operating Expenses/Total Sales x 100) as described by Obinna et al. (2020).

4. RESULTS AND DISCUSSION

4.1 Demographic Characteristics of the Respondents

The demographic characteristics of the respondents are shown in Table 1. The majority of them were married, accounting for 73.8% of the sample. Similar results have previously been reported for Mbarali and Kyela districts by Kulyakwave (2020) where the majority (95.8%) of the farmers (n =

Table 1. Demographic analysis of the respondents

	Frequency	Percent
Marital Status		
Single	8	6.3
Married	93	73.8
Divorced	2	1.6
Widowed	16	12.7
Separated	7	5.6
Total	126	100.0
Educational Level		
Non-formal	22	17.5
Primary	75	59.5
Secondary	24	19.0
College	5	4.0
Total	126	100.0
Age of respondents		
15 – 25	3	2.4
26 – 35	11	8.7
36 – 45	55	43.7
46 – 55	41	32.5
56 and above	16	12.7
Total	126	100.0
Respondent's occupation		
Farming	102	81.0
Petty business	11	8.7
Employee	5	4.0
Casual labour	8	6.3
Total	126	100.0

240) were married. Single respondents comprised 6.3% of the sample while divorced individuals made 1.6%, widowed respondents constituted 12.7%, and separated respondents were 5.6%. The high percentage of married respondents might have implications for the processes of making on farming activities, as family dynamics and responsibilities can influence agricultural practices and economic decisions (Mwangi et al., 2022). In terms of education, the respondents had varied levels, with the majority having primary education (59.5%). Other respondents had attained non-formal education were (17.5%), secondary education (19.4%), and college education (4.0%). This suggests that a significant proportion of the farming population in Mbarali District had low level of formal education, which might impact their farming practices (Manda et al., 2020). The low percentage of the respondents with higher education highlights the need for targeted educational programs to enhance agricultural productivity and market access.

The age distribution of the respondents shows that the majority were aged between 36-45 years (43.7%) and 46-55 years (32.5%). Respondents aged 56 and above constituted 12.7%, those aged 26-35 were 8.7% and the youngest group aged 15-25 made up 2.4%. This age distribution means the primary participants in farming activities in the region middle-aged and older individuals. This implies a low participation of younger people in paddy farming, which could be attributed to rural-urban migration or a preference for alternative employment opportunities (Tabe-Ojong Jr & Molua, 2017). The ageing farming population may pose challenges to the sustainability of

Table 2. Costs incurred in the inputs of rice production per acre

Descriptive Statistics								
	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Seeds	123	2	2	4	296	2.41	.663	.440
Fertilizers	116	3	2	5	559	4.82	.641	.410
Pesticides and Herbicides	113	3	1	4	195	1.73	.504	.254
Implements	112	3	2	5	529	4.72	.557	.310

agricultural practices if younger generations are not adequately integrated into farming. This is a call for efforts to attract younger individuals into the farming sector to ensure the sustainability of agricultural production.

The occupational distribution of respondents revealed that the majority were farmers (81.0%). Then there were those who engaged in petty businesses (8.7%), those who were employed (4.0%), and those who engaged in casual works (6.3%). The predominance of farming as the main occupation underscores the importance of agriculture as the primary livelihood source in Mbarali District. Meanwhile, the presence of petty businesses and casual labour indicates diversification of income sources, which can be crucial for household resilience against agricultural risks as is the case in other districts in Tanzania (Christopher & Helena, 2018). The relatively low percentage of respondents who were in formal employment suggests limited access to job opportunities outside the agricultural sector. The demographic characteristics of the respondents in Mbarali District provide important insights into the socio-economic context of the rice value chain. Overall, the demographic profile of the respondents underscore the importance of tailored interventions to address the specific needs and challenges faced by different demographic groups within the farming community.

4.2 Rice Production in Mbarali District from 2019 to 2021

4.2.1 Costs incurred in rice production in Mbarali district

The analysis of the costs associated with rice production in Mbarali district from 2019 to 2021 is shown in Table 2. The descriptive statistics for the costs incurred for various inputs of paddy production per acre offer intriguing insights. The mean cost per acre 2.41, with a standard deviation of 0.663 and a variance of 0.440, indicating moderate variability in seed costs incurred by farmers. The total cost for fertilizers is 559, which translates into a high mean cost of 4.82 per acre. The standard deviation is 0.641, and the variance is 0.410, reflecting the significant investment required for fertilisers, which is relatively consistent across the sample.

The costs for pesticides and herbicides as provided by 113 respondents. The variance for these costs was 0.254, indicating less variability in expenditure among farmers on these inputs. The total sum of costs for implements is 529, which translates into mean score of 4.72, suggesting some variability in the investment required for farming implements. The mean cost of seeds per acre is relatively low at 2.41, indicating moderate variability among farmers. This suggests that seed costs were fairly consistent, likely due to the availability and accessibility of seeds within a narrow price range. However, even small variations in seed costs can significantly impact the overall expenditure on inputs, especially for smallholder

Table 3. Amount Spent on Agricultural Inputs in Paddy Production per Acre

Amount spent (TZS)	Seeds		Fertilizers		Pesticides		Implements	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
10,001-40,000	85	69.1	4	3.4	33	29.2	1	.9
40,001-70,000	26	21.1	3	2.6	79	69.9	3	2.7
70,001-100,000	12	9.8	3	2.6	1	.9	22	19.6
			106	91.4			86	76.8
Total	123	100.0	116	100.0	113	100.0	112	100.0

Table 4. Other production Costs for Rice in Mbarali District from 2019 to 2021

Cost Category	Mean	Median	Mode	Skew-ness	Kurtosis	Range	Min	Max	Sum
Storage	2.99	3.00	4	-0.568	-0.676	3	1	4	287
Transpor-tation	1.59	1.00	1	1.299	0.715	3	1	4	156
Loading or Offloading	1.31	1.00	1	1.852	2.175	2	1	3	110
Transfer-ring	1.08	1.00	1	3.052	7.529	1	1	2	77
Merchan-dising costs	1.16	1.00	1	1.865	1.515	1	1	2	93
Millling costs	4.85	5.00	5	-1.969	1.918	1	4	5	446
Packaging	1.88	1.00	1	0.859	-0.419	4	1	5	205
Levy	1.68	1.00	1	0.674	-1.221	2	1	3	201
Watchmen	1.89	2.00	2	0.131	-0.768	2	1	3	193
Handling costs	1.62	1.00	1	1.473	0.696	3	1	4	168

farmers with limited financial resources. There was no empirical evidence showing that the transaction cost for rice seed acquisition in Tanzanian agriculture is an added cost incurred by the farmers in the process of purchasing seed (Lwezaura et al., 2017). Thus, ensuring affordable seed prices and improving access to high-quality seeds could enhance productivity and reduce the financial burden on rice farmers.

The fertiliser costs, represented a significant expense in paddy production, with a mean value standing at 4.82 per acre. The relatively narrow range and standard deviation indicate consistent pricing or usage patterns among farmers. As fertilizer are crucial for maintaining soil fertility and ensuring high yields (Sheahan & Barrett, 2017), measure to address issues related to fertiliser availability and affordability might be necessary in order to improve crop productivity and farmers' incomes. Similarly, the costs for pesticides and herbicides, with a mean of 1.73 and relatively low variability, suggested minimal usage in the district. Effective use of pesticides and herbicides is essential for protecting crops and ensuring high yields. So it is important to ensure that farmers have access to affordable and effective pest management solutions (Sheahan & Barrett, 2017). The high mean cost of implements, at 4.72 per acre, reflected the significant investment required for machinery and tools in paddy production. However, the variability in costs suggested differences in the types and quality of implements used by farmers. Improving access to affordable implements through subsidies or cooperative models could enhance productivity and reduce labour costs, which is crucial for smallholder farmers with limited capital (Daum et al., 2020). Overall, the analysis of input costs highlights the substantial financial investments required for paddy production in Mbarali District.

Table 3 shows the distribution of production costs in the rice value chain in Mbarali. The results revealed varied spending patterns among farmers, reflecting different financial capacities and investment priorities. Across the categories analysed—seed, fertilizer, pesticides, and implements—distinct trends emerged, which shed light on the economic landscape of farming in the region. Starting with seed expenditures, the majority of farmers (69.1%) spend between 10,001 and 40,000 TZS per acre. This suggests that a significant number of farmers managed their seed costs within a relatively modest range, likely reflecting efforts to control expenses amidst other essential investments in farming inputs (Chamberlin et al., 2014). Meanwhile, a smaller proportion of farmers allocated higher sums, with 21.1% spending between 40,001 to 70,000 TZS and 9.8% spending between 70,001 to 100,000 TZS. This underscores the diverse strategies employed by farmers in balancing cost-efficiency with the quality and quantity of seeds, which is crucial for achieving optimal yields in paddy production.

Findings on fertilizer expenditures showed a contrasting pattern, with a significant majority (69.9%) of the farmers investing between 40,001 to 70,000 TZS per acre. Fertilizers are vital in enhancing soil fertility and crop productivity, which explains the substantial investment made in this input category (Sheahan & Barrett, 2017). The high expenditure on

fertilizers is an indication that farmers prioritise maintaining soil health and maximizing the yield potential of their farms, which is critical for sustainable agriculture. In contrast, a smaller percentage of farmers allocated lower (3.4%) or higher (2.6%) amounts, which suggests variation in farm sizes and management strategies associated with fertiliser use. According to Rashid (2020), increasing fertilizer and seed use by 1 kg leads to a yield increase of 6.2 kg ha-1 and 9.2 kg ha-1 respectively. However, the high prices of fertilisers significantly reduce profitability. Thus, reducing input costs through well-managed subsidy programs, timely accessibility of inputs coupled with irrigation facilities, and good agronomic practices are crucial for sustainable and profitable agricultural development.

Pesticide expenditures exhibited a similar trend, with the vast majority (91.4%) of the farmers spending between 40,001 to 70,000 TZS per acre on pest management. This high expenditure underscores the importance of pest control in safeguarding crop yields against losses from pests and diseases, which is crucial for food security and income stability. The distribution also highlighted the widespread adoption of pesticide applications among the farmers, with fewer investing lower (29.2%) or higher (0.9%) amounts, which is a sign of varying pest pressures and management practices. For implements, the majority of farmers (76.8%) invest between 40,001 to 70,000 TZS per acre, which points to the significant role of mechanisation in modern farming practices. Agricultural implements enhance efficiency in land preparation, planting, and harvesting, contributing to an increase in productivity and a reduction in labour costs (Daum et al., 2020). However, only a few (19.6%) of the respondents allocated higher sums to advanced or specialised equipment, while a samall proportion (0.9%) spent less, likely due to smaller farm sizes or reliance on manual labour. Overall, the distribution of expenditures on agricultural inputs underscores the complex interplay of economic factors, technological adoption, and agronomic practices in influencing paddy production in Mbarali District. The findings suggest opportunities for enhancing productivity and sustainability through targeted interventions intended to improve access to affordable and effective inputs, promote sustainable farming practices, and support smallholder farmers in optimizing their agricultural investments.

Other production costs were assessed based on the mean values in various stages of the rice value chain in the district. The key findings are presented in Table 4. The findings indicate that the highest mean cost was for milling, which averaged 4.85 units. The average cost of milling rice in Tanzania ranges from TSh 50 - 70 per kg of milled rice (equivalent to TS 35 - 49 per kg of rice paddy (Nkuba et al., 2016). This suggests that milling costs constitute a significant proportion of the overall rice production expenses, sufficing to be a critical area where cost-saving measures are needed to ensure substantial savings. In contrast, the transportation costs were notably lower, with a mean of 1.59 units, indicating shorter transportation distances within the value chain. The loading or offloading costs averaged 1.31 units, indicating moderate expenses associated with handling goods at these points. The transferring costs were the lowest standing at 1.08 units, which implies efficient practices in transferring goods between different stages of production or processing. The merchandising costs had an average of 1.16 units, reflecting expenditures related to promoting and selling rice products.

The packaging costs averaged 1.88 units, indicating a moderate investment in packaging materials and processes while levy costs averaged 1.68 units, representing fees or taxes imposed on production activities, contributing to the overall

Table 5. Comparison of the production from 2021-2019 in Mbarali District

Year		Correlations		
		Year_2021	Year_2020	Year_2019
2021	Pearson Correlation	1	-.059	.954**
	Sig. (2-tailed)		.536	.000
	N	127	113	127
2020	Pearson Correlation	-.059	1	-.114
	Sig. (2-tailed)	.536		.227
	N	113	115	113
2019	Pearson Correlation	.954**	-.114	1
	Sig. (2-tailed)	.000	.227	
	N	127	113	127

**. Correlation is significant at the 0.01 level (2-tailed).

cost structure. Watchmen cost an average of 1.89 units, indicating expenditures on security services to safeguard production facilities or storage areas. The handling costs had an average of 1.62 units, encompassing expenses related to manual labour or the equipment used in handling rice throughout the value chain. These mean values provide insights into the distribution of production costs across different stages of the rice value chain in Mbarali. They highlighted the relative importance of each cost category in the overall cost structure of rice production. According to Sekiya et al. (2020), the various transaction costs in the rice value chain are one of the factors that contribute to the high market prices of rice.

4.3 Rice Production Trends in Mbarali District from 2019 to 2021

Mbarali is one of the main rice-growing districts in Tanzania alongside Kyela district. Nearly 25% of the rice in Tanzania is produced in Mbarali district (Suvi et al., 2021). The present analysis of rice production in Mbarali District in 2019, 2020, and 2021 reveals several noteworthy patterns as shown in Table 5. Firstly, there is a very strong and significant positive correlation between rice production in 2021 and 2019, with a Pearson correlation coefficient of 0.954 and a p-value of 0.000. This indicates that the production levels in these two years were highly similar, suggesting consistency in agricultural conditions and practices across the years. In contrast, the correlation between rice production in 2021 and 2020 is weak and negative, with a Pearson correlation coefficient of -0.059 and a p-value of 0.536, indicating no significant relationship between these years. Similarly, the correlation between 2020 and 2019 is weak and negative, with a Pearson correlation coefficient of -0.114 and a p-value of 0.227, further highlighting the differences in rice production in 2020 as compared to the other years.

The strong positive correlation of rice production between 2021 and 2019 suggests that these two years had similar conditions that supported stable rice production. This could be attributed to consistent environmental factors (such as rainfall and temperature), stable access to agricultural inputs and effective farming practices. According to Zhang et al. (2023), stable climatic conditions and reliable input supplies are crucial for maintaining agricultural productivity. Therefore, the similarity in production levels between 2019 and 2021 in Mbarali District reflects such stability. On the other hand, the weak and non-significant correlations between 2020 and the other years (2019 and 2021) suggest that rice production in 2020 deviated from the trends observed in 2019 and 2021. The negative correlations between 2020 and the other two years, although not statistically significant, hint at disruptions that might have adversely affected rice production. Several factors could explain this anomaly. The COVID-19 pandemic, which significantly impacted the global economy in 2020, might have contributed to this reduction. The pandemic caused disruptions in supply chains in Mbarali, labour shortages, and restricted movement, all of which negatively affected agricultural activities in a manner similar to what happened in Malaysia (Adnan & Nordin, 2021) and West Africa (Arouna et al., 2021). These disruptions reduced access to essential inputs, limited the availability of the labour needed for farming operations, and lowered productivity. A similar anomaly has been reported by Ambindwile (2021) who established that the expansion of market-driven rice farming in the district from 25,906ha in 1985 to 45,000 ha in 2000 and 65,547 ha in 2016 was in response to an economic liberalization drive which began in the mid-1980s (Ambindwile, 2021).

The recovery observed in 2021(marked by the strong correlation with 2019) suggests that the agricultural sector in Mbarali District rebounded from the disruptions experienced in 2020. This resilience could be attributed to several adaptive measures that were taken by farmers and stakeholders. For instance, improved access to inputs, adoption of resilient farming practices, and support from government and non-governmental organizations might have contributed to the stabilization of the production levels (Sanga, 2016). The sector's quick recovery from the challenges of 2020 underscores the importance of having robust support systems and adaptive strategies to mitigate the impacts of unexpected disruptions. Overall, the results of the correlation analysis highlight the significant impact of the COVID-19 pandemic on rice production in Mbarali District in 2020, as well as the sector's recovery resilience in 2021. These

Table 6. Selling Seasons for rice in Mbarali District

Response	Frequency	Percent
Yes	97	87.4
No	14	12.6
Total	111	100.0

Table 7. Amount of income generated from the sale of rice per acre in and out of season

Amount Generated from sale of Rice (TZS)	Yes (Count)	Yes (%)	No (Count)	No (%)	Total (Count)	Total (%)
40,000 to 60,000	11	17.2	3	23.1	14	14.3
70,000 to 90,000	29	45.3	4	30.8	33	37.7
100,000 and above	24	37.5	6	46.2	30	31.2
Total	64	83.1	13	100.1	77	100.0

findings imply a need for continued support and implementation of adaptive strategies to ensure stability and sustainability of agricultural production in the face of future challenges.

4.4 Rice Trading in Mbarali District from 2019 to 2021

4.4.1 Rice Selling Seasons in Mbarali District

Table 6 presents findings on the patterns of rice sales during the season and out of the season among farmers in Mbarali District. The majority (87.4%) of the respondents reported engaging in in-season sales of rice, suggesting the significant role of rice as a cash crop and economic staple for the local farmers in Mbarali, and its importance in generating income and supporting livelihoods in the district. Similar findings have been reported by Rashid (2020). The consistent sales of rice suggest active seasonal participation in local and possibly regional markets, where farmers leverage their production to meet consumer demand and secure financial returns. However, a smaller proportion (12.6%) of the respondents did not sell rice during the season. This group included farmers who prioritise subsistence farming of rice for household consumption rather than commercial purposes. Additionally, factors such as storage for future consumption, adverse market conditions, or personal preferences might have influenced the decision not to sell rice immediately after harvesting it as reported by farmers in Myanmar (Soe et al., 2015).

Rice is a seasonal crop that matures in 3 to 4 months. The high rate of rice sales in the season aligns with the broader trends in the agricultural sector of Tanzania where several crops are cultivated seasonally (Sheahan & Barrett, 2017). According to Yohana and Yunxian (2019), seasonal variations may influence price changes, as some crops can only be harvested once or twice a year and, for some, the possibility that the rice will be stored is impractical. Thus, improving markets and enhancing storage facilities can further empower farmers to make informed decisions about when and where to sell their produce, thereby maximizing their economic benefits and promoting sustainable agricultural practices. Overall, the study highlights the dual role of rice production in Mbarali District: as a vital economic activity driving the local economy through commercial sales and as a fundamental source of livelihoods for households.

4.4.2 Income from Rice sales in and out of season

The study established that the rice was sold to farmers as seeds by intermediaries, retailers, and wholesalers. The cross-tabulation in Table 7 shows the relationship between the sale of rice during the season and the amount of money generated from these sales by farmers in Mbarali District. Among those who engaged selling rice, varying income brackets were observed based on the amounts generated in season and out of season. In the income range of 40,000 to 60,000 Tanzanian Shillings (TZS), 17.2% of the respondents generated sales within this bracket in season while 23.1% generated the same amounts out of season, suggesting a variation in income generation strategies between farmers who sell rice in season and those who sell it out of season.

The next income bracket of 70,000 to 90,000 TZS was generated by 45.3% of sellers who sold rice in season and only 30.8% of sellers who sold it out of season. This indicates a strong propensity among farmers to accumulate substantial revenues from rice sales made in season and highlights potential economic opportunities that are missed or different agricultural strategies used by these farmers. Furthermore, the results showed that 37.5% of the respondents who sold rice in season generated incomes worth 100,000 TZS and above. Also, 46.2% of the out-of-season rice sellers also fell into this highest income category. These results suggest that, while some farmers engaged in commercial in-season sales of rice, those who stored rice and sold it out of

Table 8: Cross Tabulation of Income from the Sale of Rice to Farmers as Seed

Season	Amount (TZS)	10,000 to 30,000	40,000 to 60,000	70,000 to 90,000	100,000 and above	Total
Yes	Count	4	9	32	30	75
	% within sale_of_rice_in_season	5.3%	12.0%	42.7%	40.0%	100.0%
	% within farmers as seed	57.1%	81.8%	86.5%	93.8%	86.2%
	% of Total	4.6%	10.3%	36.8%	34.5%	86.2%
No	Count	3	2	5	2	12
	% within Sale_of_rice_in_season	25.0%	16.7%	41.7%	16.7%	100.0%
	% within Farmers as Seed	42.9%	18.2%	13.5%	6.3%	13.8%
	% of Total	3.4%	2.3%	5.7%	2.3%	13.8%
Total	Count	7	11	37	32	87
	% within Sale_of_rice_in_season	8.0%	12.6%	42.5%	36.8%	100.0%
	% within Farmers as Seed	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	8.0%	12.6%	42.5%	36.8%	100.0%

season were more likely to generate more income from the business.

These findings underscore the complex interplay between income levels from in-season and out-of-season sales of rice in Mbarali District. The observed higher-income categories signify a greater likelihood of accruing higher revenues from out-of-season sales. Understanding these income-related dynamics is crucial for policymakers aiming to enhance rural economic development and agricultural productivity because targeted interventions such as improving market infrastructure, facilitating access to financial services, and promoting diversification of the agricultural sector can be implemented to mitigate income disparities and enhance the economic resilience of farmers.

4.4.3 Income from the sale of rice to different buyers in and out of season

The study findings indicated that the rice farmers sold their rice to different types of buyers in and out of season. Table 8 presents a cross-tabulation of the income generated by farmers from selling rice to other farmers as seed, categorised into different income brackets in and out of season. The table 8 shows whether farmers engaged in selling rice

Table 9. Cross-tabulation of Income from the Sale of Rice to Intermediaries

Response	Amount (TZS)	10,000 to 30,000	40,000 to 60,000	70,000 to 90,000	100,000 and above	Total
Yes	Count	1	9	39	30	79
	% within Sale_of_rice_in_season	1.3%	11.4%	49.4%	38.0%	100.0%
	% within Intermediaries	100.0%	75.0%	86.7%	88.2%	85.9%
	% of Total	1.1%	9.8%	42.4%	32.6%	85.9%
No	Count	0	3	6	4	13
	% within Sale_of_rice_in_season	0.0%	23.1%	46.2%	30.8%	100.0%
	% within Intermediaries	0.0%	25.0%	13.3%	11.8%	14.1%
	% of Total	0.0%	3.3%	6.5%	4.3%	14.1%

Total	Count	1	12	45	34	92
	% within Sale_of_rice_in_season	1.1%	13.0%	48.9%	37.0%	100.0%
	% within Intermediaries	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	1.1%	13.0%	48.9%	37.0%	100.0%

during the season and whether they sold it to other farmers as seed. Among farmers who sold rice as seed to other farmers during the season, 5.3% earned 10,000 to 30,000 TZS, 12.0% earned 40,000 to 60,000 TZS, 42.7% earned 70,000 to 90,000 TZS, and 40.0% earned 100,000 TZS and above. Notably, most farmers across all income brackets sold their rice as seed to other farmers, from 57.1% in the least bracket to 93.8% in the highest bracket. These results mean that the farmers generated a lot of income from selling rice to other farmers as seed in season.

For farmers who did not sell rice as seed to other farmers in season, their incomes were lower: 42.9% in the 10,000 to 30,000 TZS bracket, hitting a decrease by 6.3% from the highest income bracket of 100,000 TZS and above. These results suggest that farmers who sold rice to other farmers as seed during the season earned higher incomes compared to those who did not. Generally, selling rice to others as seed is a common practice in Tanzania (David et al., 2022). Consequently, promoting effective seed-saving practices and enhancing market access during peak periods could further empower farmers economically and contribute to agricultural sustainability in Mbarali District.

Table 9 presents a cross-tabulation of the incomes generated by farmers from selling rice to intermediaries in Mbarali district. Among farmers who sold rice to intermediaries during the season, 1.3% earned 10,000 to 30,000 TZS, 11.4% earned 40,000 to 60,000 TZS, 49.4% earned 70,000 to 90,000 TZS, and 38.0% earned 100,000 TZS and above. Within this group, the majority of farmers across all income brackets used intermediaries. Conversely, among farmers who did not sell rice to intermediaries, percentages within income brackets indicate lower engagement in intermediary transactions and correspondingly lower percentages across income brackets: from 0.0% to 30.8% in the highest income bracket of 100,000 TZS and above. According to Kumse et al (2021), farmers who sell rice to intermediaries are likely to sell it at a higher price than those who sell rice in other areas. This corroborates the findings of the present study.

These results suggest that farmers who sold rice to intermediaries during the season earned higher incomes compared to those who did not. Intermediaries often provide access to broader markets and potentially higher prices, which could

Table 10. Cross-tabulation of Income from Sale of Rice to Retailers

Response	Amount (TZS)	10,000 to 30,000	40,000 to 60,000	100,000 and above	Total
Yes	Count	47	16	1	64
	% within Sale_of_rice_in_season	73.4%	25.0%	1.6%	100.0%
	% within Retailers	85.5%	84.2%	100.0%	85.3%
	% of Total	62.7%	21.3%	1.3%	85.3%
No	Count	8	3	0	11
	% within Sale_of_rice_in_season	72.7%	27.3%	0.0%	100.0%
	% within Retailers	14.5%	15.8%	0.0%	14.7%
	% of Total	10.7%	4.0%	0.0%	14.7%
Total	Count	55	19	1	75
	% within Sale_of_rice_in_season	73.3%	25.3%	1.3%	100.0%
	% within Retailers	100.0%	100.0%	100.0%	100.0%
	% of Total	73.3%	25.3%	1.3%	100.0%

Table 11: Cross-tabulation of Income from the Sale of Rice to Wholesalers

Response	Amount (TZS)	10,000 to 30,000	40,000 to 60,000	70,000 to 90,000	100,000 and above	Total
Yes	Count	4	8	36	22	70
	% within Sale_of_rice_in_season	5.7%	11.4%	51.4%	31.4%	100.0%
	% within Wholesalers	66.7%	80.0%	94.7%	84.6%	87.5%
	% of Total	5.0%	10.0%	45.0%	27.5%	87.5%
No	Count	2	2	2	4	10
	% within Sale_of_rice_in_season	20.0%	20.0%	20.0%	40.0%	100.0%
	% within Wholesalers	33.3%	20.0%	5.3%	15.4%	12.5%
	% of Total	2.5%	2.5%	2.5%	5.0%	12.5%
Total	Count	6	10	38	26	80
	% within Sale_of_rice_in_season	7.5%	12.5%	47.5%	32.5%	100.0%
	% within Wholesalers	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	7.5%	12.5%	47.5%	32.5%	100.0%

explain the higher percentages of farmers opting to sell through them, especially in those who fall in higher income brackets (Mgale & Yunxian, 2020). According to Bizikova et al. (2020), interactions with intermediaries in agricultural markets can enhance market access and income stability for smallholder farmers. The results highlight the importance of intermediary channels in agricultural markets, particularly for enhancing income opportunities for farmers in Mbarali District. Thus, promoting efficient market linkages and improving farmers' access to intermediaries could further strengthen agricultural livelihoods and economic resilience in rural communities.

Table 10 provides a cross-tabulation of incomes generated by farmers who sold their rice to retailers in Mbarali district. Among farmers who sold rice to retailers during the season, 73.4% earned 10,000 to 30,000 TZS, 25.0% earned 40,000 to 60,000 TZS, and only 1.6% earned 100,000 TZS and above. A high percentage of these farmers sold directly to retailers: 85.5% in the 10,000 to 30,000 TZS bracket, 84.2% in the 40,000 to 60,000 TZS bracket, and 100.0% in the highest income bracket. Conversely, farmers who did not sell rice to retailers had lower engagement in direct retail sales, and had correspondingly lower percentages across income brackets: 14.5% in the 10,000 to 30,000 TZS bracket and 15.8% in the 40,000 to 60,000 TZS bracket.

These results indicate that farmers who sold rice directly to retailers during the season potentially earned higher incomes compared to those who did not do so transactions. Selling crops directly to retailers can provide farmers with better prices and faster market access, which is reflected byte higher percentages of farmers opting for this sales channel, particularly in lower and middle-income brackets. According to Barret et al. (2022), a direct marketing channel tends to be attractive to producers because producers receive all of the profit which would otherwise be shared with intermediaries. Many smallholder farmers avoid this type of marketing channel because they do not want to incur extra transaction costs associated with selling to final users (Abdul-Rahaman et al., 2023). The results underscore the significance of direct retail sales as a viable income-generating strategy for rice farmers in Mbarali District. Thus, promoting direct market linkages and improving farmers' capacities to negotiate fair prices with retailers could further strengthen local agricultural economy and contribute to sustainable rural development.

Table 11 presents a cross-tabulation of farmers' income from selling rice to wholesalers in Mbarali district. Among farmers who sold rice to wholesalers during the season, 5.7% earned 10,000 to 30,000 TZS, 11.4% earned 40,000 to 60,000 TZS, 51.4% earned 70,000 to 90,000 TZS, and 31.4% earned 100,000 TZS and above. A high percentage of these farmers sold their rice directly to wholesalers: ranging from 66.7% to 94.7% across income brackets. Conversely, among farmers who did not sell rice to wholesalers, percentages within income brackets show lower

Table 12: Profitability Analysis of Rice Production and Trading in Mbarali District

Sales Category	Gross Margin (TZS)	Net Farm Income (TZS)	Profitability Index (%)	ROI (%)	Cost Turnover (%)
Sale in Season					
Sale to farmers as seed	12,290,000	9.070,000	24.5	21.2	0.76
Sale to retailers	18.120,000	13,720,000	32.8	28.6	0.61
Sale to wholesalers	14,860,000	11,140,000	28.1	24.4	0.74
Sale to intermediaries	14,430,000	10,700,000	27.4	23.6	0.75
Sale out of season					
Sale to farmers as seed	9,330,000	6,930,000	22.1	18.9	0.85
Sale to retailers	12,090,000	9.360,000	29.6	25.7	0.68
Sale to wholesalers	9,940,000	7.770,000	25.2	21.8	0.76
Sale to intermediaries	10,510,000	7.940,000	26.3	22.5	0.79

engagement in wholesaler transactions, with correspondingly lower percentages across income brackets. These results indicate that farmers who sell their rice directly to wholesalers during the season may potentially earn higher incomes compared to those who do not engage in direct wholesaler transactions.

Direct sales to wholesalers can provide farmers with larger market outlets and potentially better prices, as reflected by the higher percentages of farmers who opted for this sales channel, particularly in higher income brackets. According to Mgale and Yunxian (2020), wholesalers are the farmers' preferred trading partners, who offer a variety of services to smallholder farmers, such as supplying inputs, milling, buying paddy, or providing credit. Overall, the results underscore the importance of direct wholesaler sales as a significant income-generating strategy for rice farmers in Mbarali District. Thus, strengthening linkages with wholesalers and supporting farmers in negotiating fair prices could further enhance the economic resilience of local agricultural communities.

4.4.4 Profitability Analysis of the Rice Production and Trading Value Chain in Mbarali District

The financial performance metrics for sales of rice to different buyers in and out of season in Mbarali district from 2019 to 2021 were calculated and the results are shown in Table 12. The Gross Margin, which represents the difference between revenue and the cost of goods sold, shows varying levels across different sales categories. Sales to retailers during the in-season period yield the highest Gross Margin of approximately 18,120,000 TZS, implying that this stage added significant value to the rice as it moves toward the final retail markets. This suggests that direct access to retail markets offers substantial value addition to rice products, likely due to consumer demand and higher retail prices. Similarly, sales to farmers as seed during the out-of-season period had a lower Gross Margin of 9,330,000 TZS, This is an indication of reduced market demand and possibly higher storage costs.

Similarly, sales to wholesalers and intermediaries had notable Gross Margins, underscoring the profitability of bulk transactions. In-season sales to wholesalers had a Gross Margin of 17,520,000 TZS per acre, highlighting the economic benefit of selling in bulk quantities. For out-of-season, the margin dropped to 14,260,000 TZS per acre, indicating sustained profitability but with seasonal variability in market demand and pricing. Sales to farmers as seed had a moderate Gross Margin, with in-season profits at 9,420,000 TZS per acre and out-of-season at 9,330,000 TZS per acre. This suggests a stable profitability but limited market demand outside the peak seasons.. These results indicate higher Gross margins for rice trading by small-scale farmers in Mbarali and Kyela districts (Kulyakwave et al., 2020). This might be a result of increased production and trading of rice following policy improvements made in the country.

The Net Farm Income, which represents the actual earnings obtained by farmers after accounting for production costs (such as the cost of seeds, fertilisers, pesticides, and implements) was computed. In-season sales to retailers again lead with a Net Farm Income of 13,720,000 TZS, indicating robust profitability and efficient cost management at this stage. On the other hand, sales to farmers as seed during the out-of-season period had a lower Net Farm Income of 6,930,000 TZS. This suggests challenges in maintaining profitability during off-peak market times.

Sales to wholesalers and intermediaries also demonstrated robust Net Farm Income, underscoring

efficient cost management and profitability in bulk sales channels. In-season Net Farm Income for wholesalers was 13,230,000 TZS per acre, while intermediaries yielded 10,450,000 TZS per acre. Out-of-season, these incomes decrease to 10,790,000 TZS per acre for wholesalers and 9,840,000 TZS per acre for intermediaries, indicating reasonable profitability but with seasonal variations in market conditions. On the other hand, sales to farmers as seed were associated with consistent but lower Net Farm Income compared to sales through other channels, reflecting stable profitability. Unfortunately, such profitability was enshrined in potential challenges that keep farmers down the high margins due to market dynamics and input costs. The results generally depict a higher Net Farm Income earned by small-scale farmers in Mbarali and Kyela districts (Kulyakwave et al., 2020). This is probably because of increased production and trading of rice influence by several policy improvements made in the country.

The Profitability Index measures the efficiency of each stage relative to its costs, expressed as a percentage. Sales to retailers during the in-season period had the highest profitability index of 32.8%, indicating strong returns relative to the costs incurred. According to Barret et al. (2022), the direct marketing channel tends to be attractive to producers because producers receive all of the profit which would otherwise be shared with intermediaries. Many smallholder farmers avoid this type of marketing channel because they do not want to incur extra transaction costs associated with selling to final users (Abdul-Rahaman et al., 2023). This suggests that focusing efforts on expanding retail market channels could enhance the overall profitability of rice in the value chain. Conversely, sales to farmers as seed during the out-of-season period had a lower profitability index of 22.1%, indicating the need for strategic adjustments to improve efficiency in less favourable market conditions. Sales to wholesalers and intermediaries also had a strong Profitability Index, highlighting efficient returns in bulk transactions. In-season Profitability Index for wholesalers was 31.2%, while intermediaries yield 27.3%. Out-of-season, these indices decreased to 26.1% for wholesalers and 26.0% for intermediaries, indicating a sustained but slightly reduced profitability during slower market periods. Sales to farmers as seed exhibit a moderate Profitability Index, reflecting stable but lower returns relative to input costs and market conditions. these results portray a higher Profitability Index for rice trading by small-scale farmers in Mbarali and Kyela districts (Kulyakwave et al., 2020). This is probably because of increased production and trading of rice due to several policy improvements in the country.

The ROI which assesses the efficiency of capital invested in each stage revealed that sales to retailers during the in-season period had the highest ROI at 28.6%. This underscores the profitability and capital efficiency of direct access to final retail markets. Conversely, sales to farmers as seed during the out-of-season period had a lower ROI of 18.9%. This calls for additional investments or market diversification strategies to improve returns during slower market periods. In-season sales to intermediaries had the highest ROI at 29.5%, indicating efficient capital utilization and high returns from intermediary transactions. Out-of-season, this ROI decreased to 24.7%, which reflects seasonal market fluctuations but maintaining efficient returns on investment. Sales to wholesalers exhibit efficient ROI, with in-season returns at 27.7% and out-of-season at 22.3%, highlighting effective capital utilisation in bulk sales transactions. Sales to farmers as seed had a moderate ROI that was indicative of stable but slightly lower returns compared to the returns from sales made through other channels. This is attributable to market dynamics and input costs. The results portray a higher ROI for the rice sales of small-scale farmers' in Mbarali and Kyela districts (Kulyakwave et al., 2020). This is probably because of increased production and trading of rice due to several policy improvements in the country.

Analysis of the Cost Turnover, which measures how efficiently costs are converted into revenue, indicated that Sales to retailers and intermediaries also had an efficient Cost Turnover. This signifies effective cost management and revenue generation. In-season turnover was 0.61 for retailers and0.67 for intermediaries. This suggests that investments in reaching and selling through retail markets effectively generate revenue relative to input costs. During the out-of-season period, these turnovers increased to 0.78 for retailers and 0.78 for intermediaries, indicating sustained but variable cost efficiency across different market conditions. In-season Cost Turnover for sales to wholesalers was the highest at 0.75, indicating efficient conversion of production costs into sales revenue in bulk transactions. Out-of-season turnover increased to 0.86, reflecting challenges in maintaining cost efficiency during slower market periods but still indicating effective cost management. Conversely, sales to farmers as seed during the out-of-season period have a higher cost turnover of 0.85, which implies challenges in converting costs into revenue during the period of less active markets. Generally, these results portray higher Cost Turnover for rice trading by small-scale farmers in Mbarali and Kyela districts (Kulyakwave et al., 2020). Again, this might be due to increased production and trading of rice due to policy improvements made in the country.

These financial metrics provide a comprehensive assessment of the economic viability and efficiency of different stages within the rice value chain in Tanzania. The results highlight opportunities for enhancing profitability by focusing on high-margin sales channels, particularly in-season sales to retailers, also, they suggest potential areas for improvement, especially in managing costs during the out-of-season periods and diversifying market strategies to optimize returns on investment.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings on rice production and trading in Mbarali District from 2019 to 2021, several key conclusions are drawn. First, the demographic profile of farmers, predominantly middle-aged individuals with limited formal education, underscores the need for targeted interventions to enhance agricultural productivity and promote engagement of the youth in farming. Second, while rice production showed stability over the study period, the disruption observed in 2020 due to external factors like the COVID-19 pandemic reflect not only the sector's resilience but also the importance of adaptive strategies to mitigate future shocks. In terms of costs, the findings revealed that rice farmers are compelled invest substantially in agricultural inputs, particularly fertilizers, which would explain the financial challenges they face. Profitability analysis indicated varied financial dynamics and income earning across different channels of sales preferred by farmers within the rice value chain in Mbarali District. Particularly, sales made directly to retailers were found to be highly profitable, offering substantial Gross Margins, Net Farm Income, and efficient returns on investment. This underscores the economic opportunities associated with direct market engagement. Sales to wholesalers and intermediaries also proved to be profitable but with variations influenced by seasonal market dynamics. The study recommends that targeted interventions have to be made to improve access to agricultural inputs, especially fertilizers, and other necessary resources. The interventions may include enhancing extension services to farmers to reach them with up-to-date knowledge and techniques for improving productivity sustainably. Also, policies aimed at improving input access, promoting sustainable practices, and strengthening market linkages are crucial for enhancing the sector's resilience and economic contribution in Mbarali District. With these interventions in place, the agricultural sector will become more resilient and economically viable, supporting sustainable development and enhancing the livelihoods of the community of farmers in Mbarali District and other agricultural communities.

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