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The Characteristics and Functioning of Rice Markets and Trade in Tanzania: A Survey of the Major Rice Markets

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Abstract

The analysis of market practices is an essential part of examining marketing efficiency. This article examines the characteristics and functioning of rice markets and trade in Tanzania. It uses primary and secondary data collected through a survey of major regional rice markets in Tanzania. Descriptive statistics, the Herfindahl-Hirschman index and monthly seasonal indices were used for the analysis. According to the findings, the distribution and sale of the rice are made through a network of brokers, wholesalers and retailers who ensure that the product reaches the final consumer through local shops and retail markets. The country's surplus and deficit markets for local rice appear to be separate as the availability and trade of local rice are primarily concentrated in markets closer to the main rice-producing regions. Rice prices vary depending on the season, region, buyer-seller relationship, transport/distance and handling costs. The rice value chain is very short, which can be extended by establishing relevant industries and seizing opportunities in existing niche markets. Likewise, although the size distribution of traders tends towards a competitive market structure, they still face several constraints that affect their ability to compete effectively. On the other hand, cultural and socio-economic factors, price and quality characteristics are major determinants of consumer purchasing decisions. The study also highlighted the vital role of transporters, handlers, brokers and financial institutions in the smooth functioning of rice markets.

Keywords

Structure of Rice Markets, Conduct of Rice Markets, Price Behaviour, Rice Market Concentration, Tanzania

1. Introduction

Rice is one of the essential grains in terms of food that people usually consume worldwide (Nwanze et al., 2006). It can be said that it is a strategic crop for food security and economic development (Rugumamu, 2014). In Tanzania, rice is the second most important crop after maize, mainly grown by farmers as a cash crop for local and regional markets (URT, 2017). The crop has a per capita consumption of 36.9 kg/year (USDA, 2019), accounting for almost 19.5 percent of the country's annual grain production (URT, 2017). Rice cultivation, trade, and value addition have been a major source of income for various actors along the rice value chain and sometimes foreign exchange earnings and trade balance (Wilson & Lewis, 2015; Nkuba et al., 2016).

Understanding the structure and characteristics of rice markets and trade is an important aspect of developing and improving the competitiveness of the Tanzanian rice sector. Its analysis is of great interest to farmers, policy-makers, and other actors in the rice value chain. Using this understanding, rice stakeholders can test, validate and integrate different models to go beyond improving productivity and focus more on the competitiveness of the entire value chain to tap domestic and regional markets. According to Scott (1995), as most developing countries shift to more commercial agriculture, the relative importance of subsistence agriculture has declined, increasing the importance of markets and making the analysis of markets a long-term concern for many years. Therefore, based on the importance of rice to the country's food security and economic development, it seems imperative to look at the characteristics of the rice markets and trade (rice marketing system) in Tanzania.

Various methods can be used to analyze the agricultural marketing system based on theories of industrial organisation and institutional economics (Kouassi et al., 2006). Kohls & Downey (1972), Meulenberg (1986), Kotler (1992), and Kouassi et al. (2006) proposed four methods. According to these authors, there is a distinction between 1) the product approach focused on product transfer flows from producer to consumer; 2) the functional approach focused on services offered by traders and marketing institutions such as trading and facilitation functions; 3) the institutional approach that deals with the study of structure, role, and performance of marketing institutions; 4) and the marketing approach which emphasises that at least one of the parties must take the initiative to meet the expectations of the other parties. The second and third approaches appear to be the most appropriate for analysing the rice markets and trade characteristics and functioning in Tanzania. In this context, Scarborough & Kydd (1992) propose a Structure-Conduct-Performance (SCP) model. The model assumes that, under certain basic conditions, the performance of a particular market depends on the behaviour of sellers and buyers, which is strongly influenced by the structure of the relevant market (Scarborough & Kydd, 1992). Although this model has been the subject of several criticisms which have occurred over time (Kouassi et al., 2006; Mauyo et al., 2003), the model appears to be an important in-

strument for understanding several essential characteristics of markets and trade, making it possible to identify the causes of imperfections (Kizito, 2008). According to Scarborough & Kydd (1992), the market structure includes elements such as buyer/seller concentration, product/service differentiation, and barriers to entry. Market conduct refers to the pattern of behaviour that enterprises follow in adapting to the markets that they sell or buy. In terms of market performance, Bressler & King (1970) point out that it represents the outcome of structure and behaviour, measured in terms of price, cost, volume and quality of the product, and margins at different trading levels.

For this study, the criteria used to analyze the characteristics and functioning of the rice markets and trade in Tanzania include the structure of the marketing system, the dynamics of supply and demand, and the characteristics and conduct of market players. The other indicators were price formation and seasonality, market concentration, and barriers to entry into the rice trade. The rest of the document is structured as follows: Part 2 provides an overview of data and methods. The third part illustrates the results. Part 4 offers conclusions and recommendations.

2. Data and Methods

2.1. Data

The study used both primary and secondary data. Primary data was obtained from a survey of the seven major rice-producing and consuming regions: Dar es Salaam, Morogoro, Mbeya, Dodoma, Arusha, Shinyanga, and Lindi. The choice of the studied markets was made to take into account the main surplus and the deficit markets for locally produced rice. Secondary data (cross-sectional and time-series) were compiled from annual reports and statistical summaries (abstracts) from the Tanzanian Ministry of Agriculture (MoA), Ministry of Industry and Trade (MIT), and the National Bureau of Statistics (NBS).

The study involved rice wholesalers, retailers, consumers, and key informants. Purposive sampling was carried out, the respondents being selected according to the accessibility that the researcher had to them. A pre-tested semi-structured questionnaire was used for data collection, and 45 of the wholesalers, 70 retailers, and 192 consumers were interviewed during the face-to-face interview.

2.2. Methods

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Descriptive statistics, such as averages, totals, proportions, and compound annual growth rates, were used to analyze the characteristics of rice markets. In addition, market concentration indices were used to assess the degree of compe-

tition in rice markets. According to Ferguson & Ferguson (1995), the indicators used to measure market concentration are mainly related to production capacity, value, and sales volume.

Among the concentration indices, the market share (X_{ij}) and Hirschman-Herfindahl Index (HHI) were chosen due to the following reasons: The market share index allows quantifying rice wholesaler i market share in market j and Herfindahl-Hirschman Index (HHI) allows measurement of the level of concentration in the rice markets.

The market share index is calculated based on the total sales of the industry (Γ) or similar variable, and the sales capacity (or similar variable) of the ith wholesaler $(i = 1, 2, 3, \cdots, n)$, expressed by γ_i, so that $\Gamma = \sum_i^n \gamma_i$. Thus, the market share of the individual wholesaler (X_i) is expressed by an indicator that will vary from zero to 100 (Naldi & Flamini, 2014), determined by Equation (1).

$$X_i = \frac{100 \times \gamma_i}{\Gamma} \tag{1}$$

The Herfindahl-Hirschman Index (HHI) was defined to measure the level of concentration in the rice markets. Following the work of Hirschman (1945), the index is calculated by adding the squares of the market share of each rice wholesaler (X_i), operating in the particular regional rice market as follows:

$$\text{HHI} = \sum_{i=1}^n X_i^2 \tag{2}$$

According to Kvålseth (2018), the value of HHI can range from 0 to 1, with the extremes representing perfect competition and monopoly, respectively. HHI < 0.15 indicates un-concentrated markets, HHI between 0.15 and 0.25 indicates moderately concentrated markets and HHI > 0.25 indicates highly concentrated markets. In this study, the HHI was estimated for individual markets as well as for all markets combined. As there was no exhaustive list of rice traders and their market shares at the national level, the HHI was estimated from the small sample of data collected. However, this can only estimate the degree of concentration in certain wholesale and retail rice markets.

Monthly seasonal indices were constructed using the Centered Moving Average (CMA) method to examine the peak and slack periods. CMA eliminates seasonal and random components of a price series (Makridakis et al., 1998).

$$\text{CMA}^{12} = \left[\frac{\sum_{i=t-6}^{i=t+5} Y_i + \sum_{i=t+6}^{i=t-5} Y_i}{24} \right] \tag{3}$$

The Seasonal Index (SI) was then calculated by dividing the original price series by the CMA values for the period:

$$\text{SVI}_i = \left[\frac{Y_i}{\text{CMA}^{12}} \right] \times 100 \tag{4}$$

where SVI_i is the seasonal variation index for month i, Y_i is the price during month i, and CMA^{12} is the 12-month centred moving average.

According to Chan & Zainudin (2016), the calculations for the lower and upper confidence limits in the period t are obtained through Equation (5).

$$LCL \geq L/CMA \text{ and } HCL \leq H/CMA \tag{5}$$

whereby: LCL = lower confidence limit, HCL = upper confidence limit, L = lowest monthly series value each year, and H = highest monthly series value each year.

3. Results and Discussion

It should be noted that this study explains the characteristics and functioning of rice markets and trade in Tanzania. The study has configured the analysis around the Structure, Conduct, and Performance Model. Whereby the elements of market structure are the rice marketing system and the dynamics of rice supply and demand; those of market conduct are the characteristics and conduct of rice market players; while those of market performance are price formation and seasonality, degree of market concentration, and barriers to entry into the rice trade.

3.1. Structure of the Rice Market

3.1.1. The Rice Marketing System

The study found that the private sector dominates the Tanzanian rice market. However, there are major differences in how rice is marketed in smallholder and large-scale systems. For smallholders, the produced (unprocessed) rice is either sold by auction, individual or group bargaining to rural collectors or medium-scale processors either at the farm gate or formal and informal markets. These actors resell unprocessed rice or processed rice to regional wholesalers. Regional traders either supply the product to retailers in local consumer markets or transport and sell the product to wholesalers in deficit markets. In contrast, the marketing process for large farms is somewhat different, as they prefer to sell their products directly through wholesale distributors (Figure 1). In larger mills, rice is usually graded into different grades, while the grading is unusual in smaller mills.

3.1.2. Dynamics of Rice Supply and Demand

Rice has not always been among the most consumed food in Tanzania. In 2001, the annual per capita consumption was only 20.1 kg, while rice consumption in 2019 was 36.9 kg/year (USDA, 2019). The considerable boom in rice consumption was helped by population growth and urbanisation. For the past 20 years, the urban population has grown at 5.1% per annum, rising from 7.5 million in 2001 to 35.4 million in 2019. In contrast, the total population grew by 3% per annum, from 33.5 million in 2001 to 58 million in 2019 (Figure 2). The increase in population, especially the urban population, means that more people are now asking for food, one of which is rice, as its consumption symbolises increased status.

Figure 3 reports the trend of rice production and consumption in Tanzania. According to the finding, the average self-sufficiency rate (SSR) for rice in the country is around 104.3 per cent. However, a recommended level of SSR that ensures a country's sustainable food supply is supposed to be above 120 per cent (Wilson & Lewis, 2015). Over the period 2000-2018, the average production of paddy rice was 2.06 million tonnes, or 1.34 million tonnes of milled rice, assuming an extraction rate of 0.65 (Figure 3). Tanzania's average annual rice consumption increased from 0.76 to 2.2 million tonnes during the same period. The rise in rice consumption, especially among urban and rural residents, is mainly due to rising people's income. Statistics show that GDP per capita has increased from 411 USD in 2000 to 1122 USD in 2019 (NBS, 2019). The increase in disposable income has made rice more affordable and preferable to other grain and tuber crops, especially among the Tanzanian middle class, who mostly live in urban areas. People tend to change their lifestyles and eating habits with increasing income. Rice is also considered more expensive than other crops such as maise, cassava, sorghum, millets, etc.
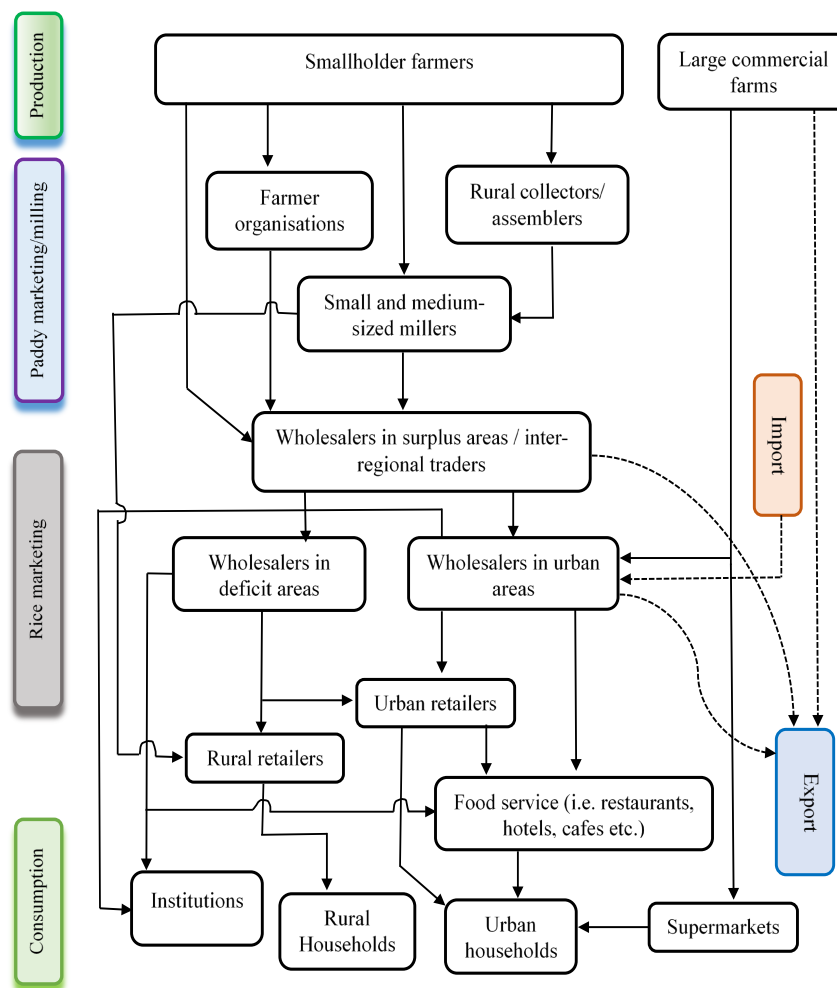

Figure 1. A schematic presentation of the rice marketing system in Tanzania. Source: Authors' survey and information (2020).
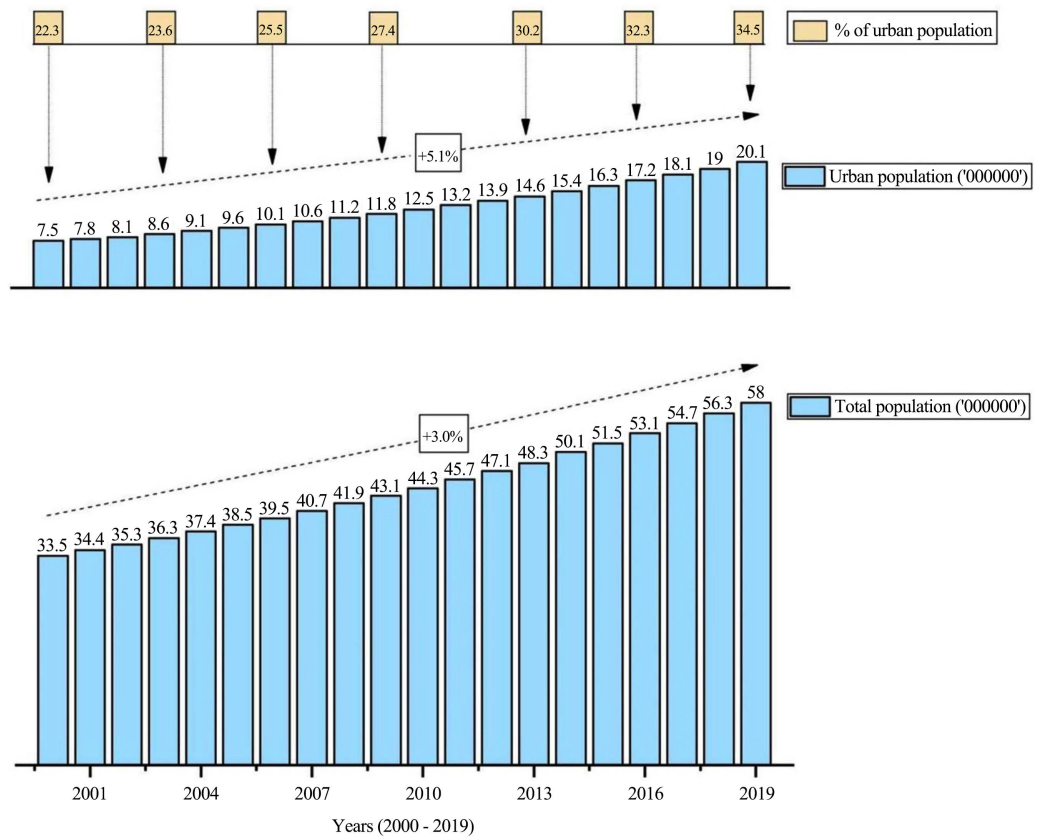
Figure 2. Tanzania national population and urban population ('000000'). Source: National Bureau of Statistics Tanzania (2020).
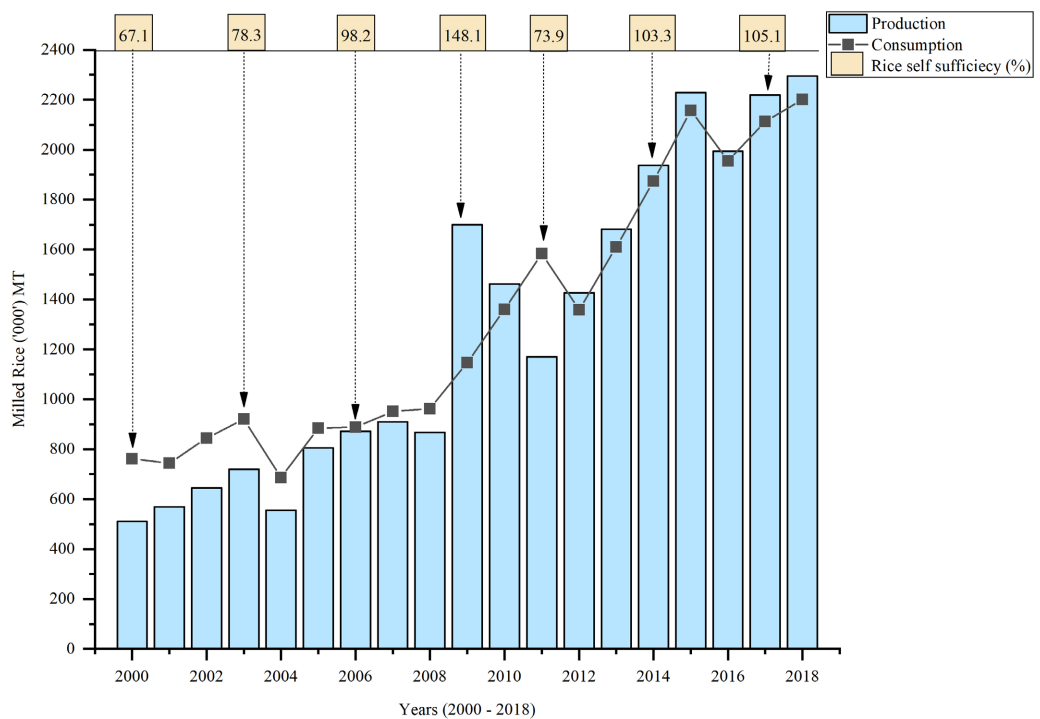

Figure 3. Rice supply and consumption in Tanzania, 2000-2018. Source: Ministry of Agriculture Tanzania, USDA (2019).

The results showed that Tanzania is highly dependent on domestic production in terms of supply. In urban and rural areas, Tanzanian consumers prefer local rice to imported rice because they find it tastier and have better nutritional quality. However, consumers (especially those with the lowest purchasing power) opt for poor rice and sometimes imported rice, which is cheaper than high-quality local rice. In the rice-growing areas, the proceeds from the sale of rice are often used to buy maize, which is the staple food of the country's main working class, and other necessities.

Tanzania imports rice in small quantities, mainly from Pakistan, India, and Thailand. Rice is imported through the ports of Dar es Salaam before flooding the regions. Different rice categories are imported, but the rice dominating the market is 25 per cent broken due to its low cost. Indeed, this type of rice is considered in Asia as a by-product. Asian rice processors make their main margins on the marketing of long grain and flavoured rice and, therefore, can afford to market broken rice at small prices. Tanzanian consumers generally consider imported rice inferior to local rice; however, preferences for local and imported rice vary with the season and, therefore, with the prices and availability of local rice. Local rice is widely consumed during the harvest period and is generally preferred for its freshness and better taste (quality). Conversely, the lean season is a favourable period for selling imported rice because it sells at a lower price than domestic rice. According to our interviews with wholesalers in Dar es Salaam, the estimated time between an order of imported rice and the delivery dates is two months. From 2000 to 2018, the average volume of milled rice imported amounted to 51158.53 tonnes (Figure 4).

On the other hand, Tanzania occasionally exports rice to neighboring countries in the East African region (including Kenya, Uganda, Burundi, Rwanda, and the Democratic Republic of the Congo) and Southern Africa (Zambia and Malawi). Export markets are located in the main production areas and close to neighbouring importing countries. From 2010 to 2018, the average volume of milled rice exported each year was 12045.89 tons (Figure 4), while the average annual volume imported by neighbouring countries was 87684.19 tons (Figure 5). This implies that there is great potential for the Tanzanian rice export market to neighbouring net rice importing countries.

3.2. Characteristics and Conduct of Rice Markets and Market Players

3.2.1. Characteristics of the Markets Surveyed

Table 1 summarises the qualitative and quantitative indicators describing some characteristics of Tanzania's main regional rice markets. All the markets visited are characterised by the presence of wholesalers, retailers, and a daily active consumer market. Dar es Salaam is considered the benchmark market for analysing rice market dynamics in Tanzania. It is the main centre of consumption and accounts for about 60 per cent of national consumption (Wilson & Lewis, 2015). It is also the main port of entry into Tanzania for rice imported from the

international market.

The average price of local rice in all the markets studied ranged from TZS 1427.60 to TZS 2145.07 per kg for high quality and from TZS 1284.38 to TZS 1707.50 per kg for low-quality rice, with the highest price in Lindi and lowest in Shinyanga. The results also revealed that local rice prices are higher than the price of imported rice in all domestic markets except imported brown and long rice, which is mostly sold in supermarkets instead of open markets. An average wholesaler in all the markets studied can sell about 52.28 tonnes of rice per week. Wholesalers in Dar es Salaam have the highest weekly sales volume (an average of 100 tonnes), while those in Lindi have the lowest weekly sales (an average of 15 tonnes of rice).

Table 1. Indicators describing important characteristics of the main regional rice markets in Tanzania.

Variables	Averages for the Individual Regional Rice Markets							General Average/ Percentage
	Dar es salaam	Mbeya	Morogoro	Shinyanga	Dodoma	Arusha	Lindi	
Quantitative variables								
Rice movement (Rice Sale) (tones/week)	103.72	65.82	71.33	59.07	22.51	35.33	14.65	52.28
Price of High Quality Rice (Grade 1) (Tsh/kg)	1966.11	1737.61	1617.61	1427.60	1933.79	2001.82	2145.07	1832.95
Price of Medium Quality (Grade 2) Rice (Tsh/kg)	1697.68	1578.84	1552.35	1355.99	1737.17	1830.48	1876.28	1661.26
Price of Low Quality (Grade 3) (Tsh/kg)	1529.24	1410.06	1367.10	1284.38	1540.55	1659.15	1707.50	1499.71
Distance from Dar es Salaam port (km)	NA	922	192	989	451	646	452	NA
Qualitative variables								
Traders Trading: Only Rice, (Rice and Others)	64.12 (35.88)	42.07 (57.93)	32.81 (67.19)	35.54 (64.46)	21.66 (78.34)	25.71 (74.29)	14.08 (85.92)	33.71 (66.23)
Availability of Local Rice: Sufficient, (Insufficient)	96.00 (4.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	93.00 (0.00)	85.00 (15.00)	77.00 (23.00)	91.6 (08.4)
Presence of branded rice: Yes, (No)	10.00 (90.00)	07.00 (93.00)	05.00 (95.00)	05.00 (95.00)	03.00 (97.00)	07.00 (93.00)	0.00 (100.00)	7.28 (92.72)
Change in Demand for Rice: Increased, (decreased), [not changed]	85.41 (04.06) [10.53]	83.25 (16.95) [0.00]	75.92 (24.08) [0.00]	70.25 (26.95) [0.00]	56.17 (35.61) [08.22]	53.85 (34.02) [12.13]	77.14 (17.49) [5.37]	73.71 (20.75) [5.54]
Type of Rice Purchased Under a Price Spike: HQR, (LQR), [IR],	22.63 (41.55) [35.82]	13.45 (78.51) [8.04]	11.64 (73.20) [10.26]	05.92 (94.08) [0.00]	10.38 (83.11) [6.51]	16.05 (58.24) [25.71]	5.33 (79.51) [15.16]	12.9 (72.6) [14.5]
Consumer Prefer Local Rice Over Imported: Yes, (No)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)
Presence of the Trade Restrictive Policy Measures: Yes, (No)	0.00 (100.00)	0.00 (100.00)	0.00 (100.00)	0.00 (100.00)	0.00 (100.00)	0.00 (100.00)	0.00 (100.00)	0.00 (100.00)

Source: Author's survey (2020). Note: Figures in brackets are percentages showing the responses. NA: The data are not available; LQR: Low-Quality Rice; HQR: High-Quality Rice; IR: Imported Rice.
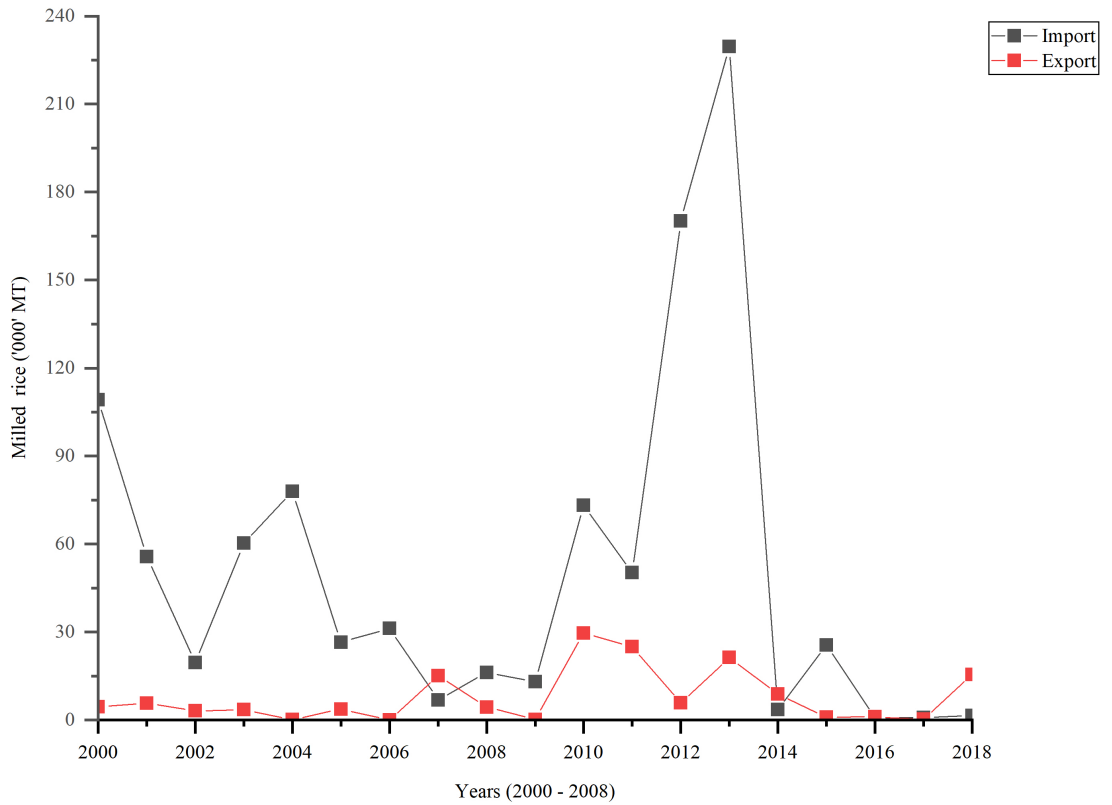
Figure 4. Tanzania milled rice import and export. Source: National Bureau of Statistics Tanzania (2019).
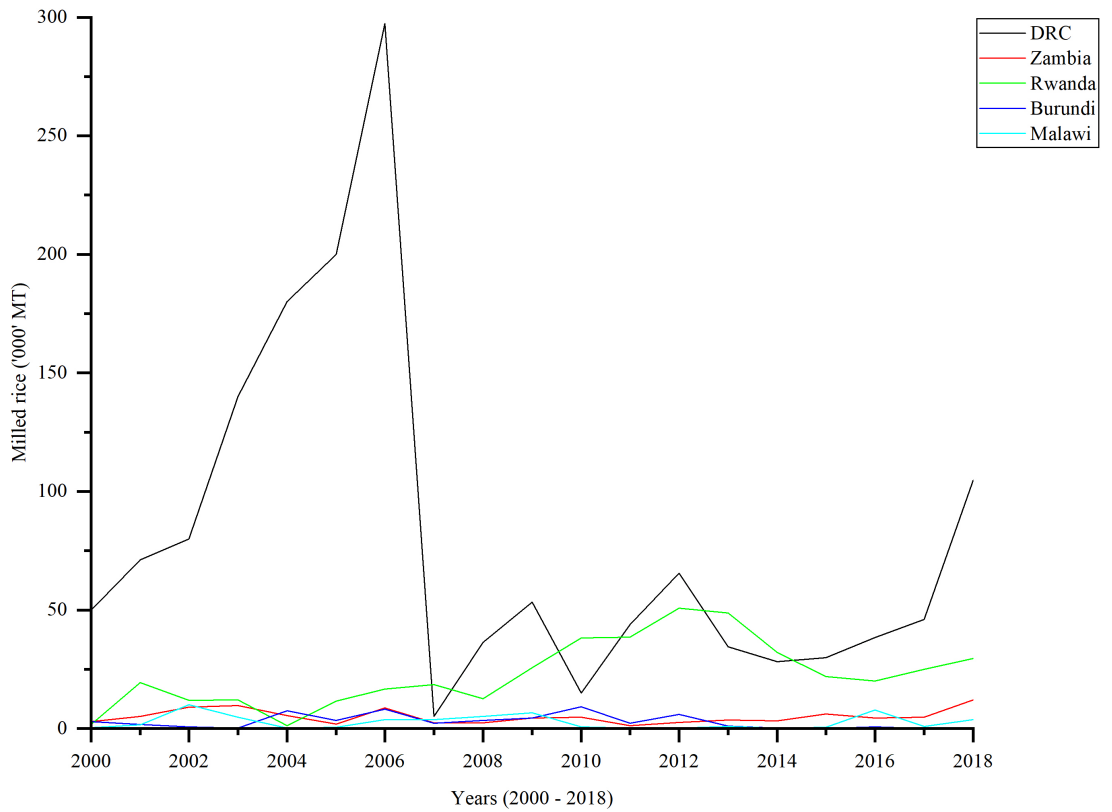

Figure 5. Import of milled rice by bordered countries ('000' MT). Source: FAOSTAT (2019).

Regarding the quality of the rice sold in the markets, the study noted that the differentiation of quality is mainly limited to the amount of broken rice present (level of completeness of the grain), aromatic or not, and local or imported. There are also regional preferences ("place of origin" or "geographic"), and rice is often labelled as coming from regions perceived by consumers to offer specific qualities. In all the markets studied, Kyela rice is considered the best, followed by Mbarali rice (both from the Mbeya region); Morogoro rice is considered to be of good quality but inferior to Mbeya rice; Shinyanga rice is considered to be of poor quality because it is not aromatic and historically contains a lot of foreign matter.

Regarding the purchase and sale of imported rice, only Dar es Salaam and Arusha traders reported buying and selling imported rice. Shinyanga, Mbeya, and Morogoro are the three markets surrounded by the main rice production areas. Traders specialising in the imported rice trade highlighted that sales are significantly high during the lean season and bad harvest years. Therefore, imported rice is mainly sold in deficit markets and during price peaks. Another reason for the low purchase of imported rice is the reliable supply of local rice (around 91% of traders said that there is sufficient local rice in the market throughout the year, especially in production areas). Overall, over the past five years (2015-2020), it's estimated that imported rice represents less than 5% of urban demand in the studied market.

Regarding rice demand, most traders (73.71%) in the markets surveyed indicated that the demand for rice has increased in recent years, attributed to urbanisation and an increase in disposable income. The increase in demand has prompted more people to engage in the rice business, especially in grading, branding, and packaging. The number of retailers selling rice packaged in small quantities of 1 kg, 2 kg, 5 kg, and 10 kg has increased as urban middle-class consumers are particularly willing to pay more for branded, clean, and well-packaged rice, unlike rural consumers. However, most of the traders (%) interviewed said they were constrained by the limited availability of packaging materials, which are also expensive. There are also very few brands in the rice markets, except for a few large private rice producers who are the largest individual rice suppliers to wholesalers in the main rice wholesale markets.

On the other hand, the study found that rice sellers are also heavily dependent on social events such as weddings and religious holidays such as Christmas, Easter, and Eid. In many areas visited, weddings take place between July and December, and this period is a time of high sales of rice and other products such as drinks and meat.

3.2.2. Characteristics and Conduct of Rice Wholesalers and Retailers

The characteristics of rice wholesalers and retailers are presented in Table 2. Overall, traders in the markets studied obtain their supplies from village collectors, millers, inter-regional travelling traders, and fellow traders. Sources of supply for traders vary mainly by season, but the main local rice collection period is

between June and September. The large share of village collectors and brokers as a source of supply at the time of the surveys is explained by the fact that the survey coincided with the harvest period. From January to April, which is the peak of the lean season, undoubtedly leaves the spotlight to the millers and large traders due to the depletion of stocks at the producers.

Table 2. Characteristics and conduct of rice traders surveyed.

	Variable	Wholesalers (n = 45)	Retailers (n = 70)
Sex	Male	28 (62.22)	13 (18.57)
	Female	17 (37.78)	57 (81.43)
Type of business	Sole proprietor	43 (95.56)	70 (100.00)
	Limited company	2 (4.44)	
Business Experience	<1 year	3 (6.67)	7 (10.00)
	1 - 3 years	7 (15.56)	18 (25.71)
	3 - 5 years	9 (20.00)	15 (21.43)
	>5 years	24 (53.33)	30 (42.86)
Mode of procurement	Procurement from the farm gate	5 (11.11)	4 (5.71)
	Supplier delivers to trader	15 (33.33)	39 (55.71)
	Middlemen delivers	25 (55.00)	27 (38.57)
Forms of products procured	Milled rice	27 (60.00)	70 (100.00)
	Paddy rice	18 (40.00)	
Barriers to entry	Official and unofficial regulations	15 (33.33)	32 (45.71)
	Funding	41 (91.11)	53 (75.71)
	Access to information	8 (17.78)	23 (32.86)
Sources of capital	Credit	35 (77.78)	47 (67.14)
	Friends/relatives (equity)	10 (22.22)	15 (21.43)
	Sell household assets		8 (11.43)
Challenges in accessing credit	Long-term procedures	27 (60.00)	46 (65.71)
	Lack of collaterals	37 (82.22)	62 (88.57)
	High-interest rates	34 (75.56)	58 (82.86)
	Lack of proper information	18 (40.00)	36 (51.43)
Stock	Available	45 (100.00)	22 (31.43)
	Not available		48 (68.57)
Means of access to information on rice prices in different markets	Print and electronic media	11 (24.44)	
	Wholesalers	-	62 (82.67)
	Mobile phone	42 (93.33)	43 (61.43)
	Fellow traders (colleagues)	34 (75.56)	60 (85.71)
	Others	7 (15.56)	17 (24.29)

Continued

	Supermarkets	3 (6.67)	
	Institutions	17 (37.78)	3 (4.29)
Categories of major buyer	Individual consumers	2 (4.00)	67 (95.71)
	Retailers	19 (42.22)	
	Fellow wholesalers	4 (8.00)	
	Millers	14 (31.11)	4 (5.71)
	Larger scale farmers	4 (8.89)	
Rice Suppliers for traders	Purchasing agents/ rural collectors	25 (55.56)	14 (20.00)
	Farmers' groups	2 (4.44)	
	Wholesalers		52 (74.29)
	Poor storage/Post Harvest management Practices	19 (42.22)	21 (30.00)
Reasons for unavailability of rice grades demanded by Wholesalers and Retailers	Inadequate information on market standards by suppliers	24 (53.33)	
	The unwillingness of consumers to pay	8 (17.78)	35 (31.43)
	Stiff competition for the right grades	5 (11.11)	
	Expensive, consumer unawareness	21 (46.67)	63 (52.86)
Perception of market fees and licenses on rice businesses by rice actors	Too high costs	17 (37.78)	32 (45.71)
	It takes a lot of time to comply	3 (6.67)	29 (41.43)
	The process of compliance is bureaucratic	13 (28.89)	47 (67.14)

Source: Author's survey (2020).

Wholesalers and retailers in the markets surveyed sell milled rice, so they mainly procure it, mostly from within the country. As the results of this study show, only a few wholesalers in Dar es Salaam and Arusha sell locally produced rice imported from Thailand, India, and Pakistan. Among the wholesalers surveyed, more than 50% have a network of local collectors, allowing them to buy large quantities during the harvest period, which they then store in anticipation of the lean season, thus generating significant profits. The analysis of procurement highlights two sources that are fueling the retail market. Most of the retailers in deficit markets source their supplies from wholesalers (74.3 per cent), millers (5.7 per cent), or purchasing agents/local collectors (20 per cent). In the latter case, 92.7 per cent of the retailers in surplus markets declared that the rice purchased came from nearby production areas.

In most cases, rural collectors transport the rice to the retail market, reducing transportation and handling costs for retailers. Likewise, those who buy from wholesalers do not spend much on transportation costs, as their small stocks are close to wholesalers. They only pay a sum of TZS 1000 to 2000 to transport a 100 kg bag of rice from the wholesaler to their stock. For wholesale, rice is sold in 100 kg bags, while for retail, rice is mainly sold by the kilogram, the lowest being a quarter of a kilogram. Supermarkets repackage the product in plastic bags containing just under 10 kg of rice; however, the scale of supermarket operations in the Tanzanian market is still small. At other stages of the marketing chain,

rice is sold by tin (especially in production areas).

Furthermore, among the wholesalers surveyed, the majority (62.2%) are men. Conversely, retailers are predominantly women (81.4%). This difference may reflect easier access to capital for men, but nothing in the study has been done to confirm this. Although wholesalers operate with business licenses, most of them (over 90 percent) operate as sole proprietors, indicating their small-scale operations. On the other hand, all retailers do business as sole proprietors, most of whom operate diverse retail businesses. The retail trade practised by these actors concerns almost all food products such as rice, beans, corn flour, potatoes, wheat flour, etc. The amount of rice sold varies from retailer to retailer, but it is between 5 and 50 kg per day. With these results, it seems obvious that retailers need to combine rice with other food products to derive profit margins from this activity and support their households. There is also a strong dichotomy between retailers with short supply chains and low financial capacity and wholesalers with the capacity to collect large quantities of local produce in anticipation of the lean season price increases. This type of actor can have real-time information on the availability and prices of rice in many markets, allowing them to maximise their profit according to the changes in the situation in other markets. They have the significant financial capacity to wait for the right time to sell, which retailers lack.

The study results show that all traders regard product quality as essential in determining the buying and selling prices. Indeed, more than 95% of all the traders interviewed say they are concerned about the quality of the rice to buy and that the negotiated price depends on it. They also said that the price given by consumers depends on the quality. Like wholesalers, all retailers agree that the high quality (aromatic) rice comes from the Mbeya region, especially Kyela and Mbarali districts. At the wholesale level, rice storage before the sale can take 2 to 6 weeks in most cases. The size of stocks is also a characteristic of the operating conditions of wholesalers. The results show that stocks vary from 10 to 150 tons—an average of 25 tons, confirming that some wholesalers are facing financial difficulties. On the other hand, nearly 70% of retailers do not have their stock, which slows down the expansion of their activity. In addition to keeping small quantities of rice, almost all retailers stock up when the available quantities tend to run out. In short, they source directly to sell, not to store for future sales.

In all the markets studied, there are both official and unofficial regulations, including registration in the trade register, taxes payable for the exercise of wholesale trade, and other guidelines put in place by the administrative bodies. All wholesalers who took part in this study were registered in the trade register and regularly paid a monthly market fee and an annual trade license fee set by the administration, which is different from retailers. The study reveals that these monthly taxes range from TZS 35,000 to 50,000 (monthly market fees) and TZS 100,000 to 150,000 (annual business license); all wholesalers consider them too high. On the other hand, most retailers only pay a daily license fee in the market,

except those who own stalls, which must pay an annual license. These different fees paid by traders vary from TZS 30,000 to 50,000 per month.

3.2.3. Purchasing Behaviour of Rice Consumers

A brief consumer study was undertaken to understand consumer preferences and purchasing behaviour to provide the basis for a more focused market development approach, including branding, segmentation, and other value-adding opportunities. The results in Figure 6 show that approximately 39.06 per cent of surveyed consumers consume "grade one" polished rice (aromatic with not more than 15 per cent broken), while grade 2 is consumed by 73.44 per cent of respondents. Grade three, which has between 30 and 50 per cent broken grains, is consumed by 42.71 per cent of those surveyed. The sum of the percentages exceeds 100 per cent because some consumers have reported consuming two or more rice types. By analysing consumer preferences in terms of quality and type of rice separately by income group (Figure 6), it can be seen that polished white rice with less than 30 per cent broken (grades one and two) is the most consumed regardless of household income. Grade three, which has between 30 and 50 per cent breakages, had a higher percentage of household consumption with family income below TZS 150,001. This was expected as it was the most accessible type for low-income families as it had the lowest price.

Regarding the rice package size preference, the results showed that 5 kg packages are preferred by 51.04 per cent of consumers in Dar es Salaam, while 14.06, 20.83, and 11.46 per cent of consumers prefer packages of 1 kg, 2 kg, and 10 kg, respectively (Figure 7). 5 kg packages are preferred in households with incomes between 300,001 and 500,000 TZS at minimum wage (Figure 6). The preference for 1 kg, 2 kg, and 10 kg packages is verified in two cases: first, when the household income is below TZS 150,000, consumers have to buy gradually and in smaller quantities; and second, as the range of average household income increases (an effect that can be attributed to the increase in consumption of rice relative to other grains), households have to buy more.

When asked about the criteria used to choose the product at the time of purchase, the product's price was highlighted by 77.08 per cent of consumers surveyed. In comparison, 53.13 per cent of consumers said they considered the geographic origins of rice (Figure 7). About 48.44 per cent of consumers mentioned the grain's appearance as an important criterion in the choice of the product. Other criteria were also mentioned less frequently, such for example the low amount of broken grains (25.52%), the uniformity of grain size (7.81%), and the packaging (2.08%). The product selection criteria varied considerably between different ranges of average family income. Although considered to be the main criterion used to buy rice, the price of rice is less important than grain appearance and low amount of broken rice in households with income above the minimum wage of TZS 1,200,001, as shown in Figure 6.

When asked which foods replaced rice in a meal, maize stiff porridge ("ugali") appeared more frequently. About 83.85 per cent of consumers surveyed reported

consuming *ugali*, while 15.1 per cent consume bananas (plantains) when the rice is not served in a meal at home. Almost 10 per cent of consumers said they consider rice an irreplaceable food. Other foods, including bread, sweet pastries ("mandazi"), and "chapati" (a kind of flatbread), were seen as substitutes for rice by 6.77 per cent of respondents, chips with eggs by 36.46 per cent, and potatoes for 8.85 per cent of the sample. A total of 15 foods were mentioned in this question, but those with the most frequency are listed in **Figure 7**. When asked which foods make up the meal with rice most often, different foods were mentioned (the most cited being shown in **Figure 6**). The meats group, consisting of beef, chicken, and fish, is almost unanimous among respondents as a complementary food to rice in meals, being cited by almost all consumers surveyed (98.44%). Beans and salad were also mentioned by 85.42 and 61.98 per cent of the consumers surveyed.
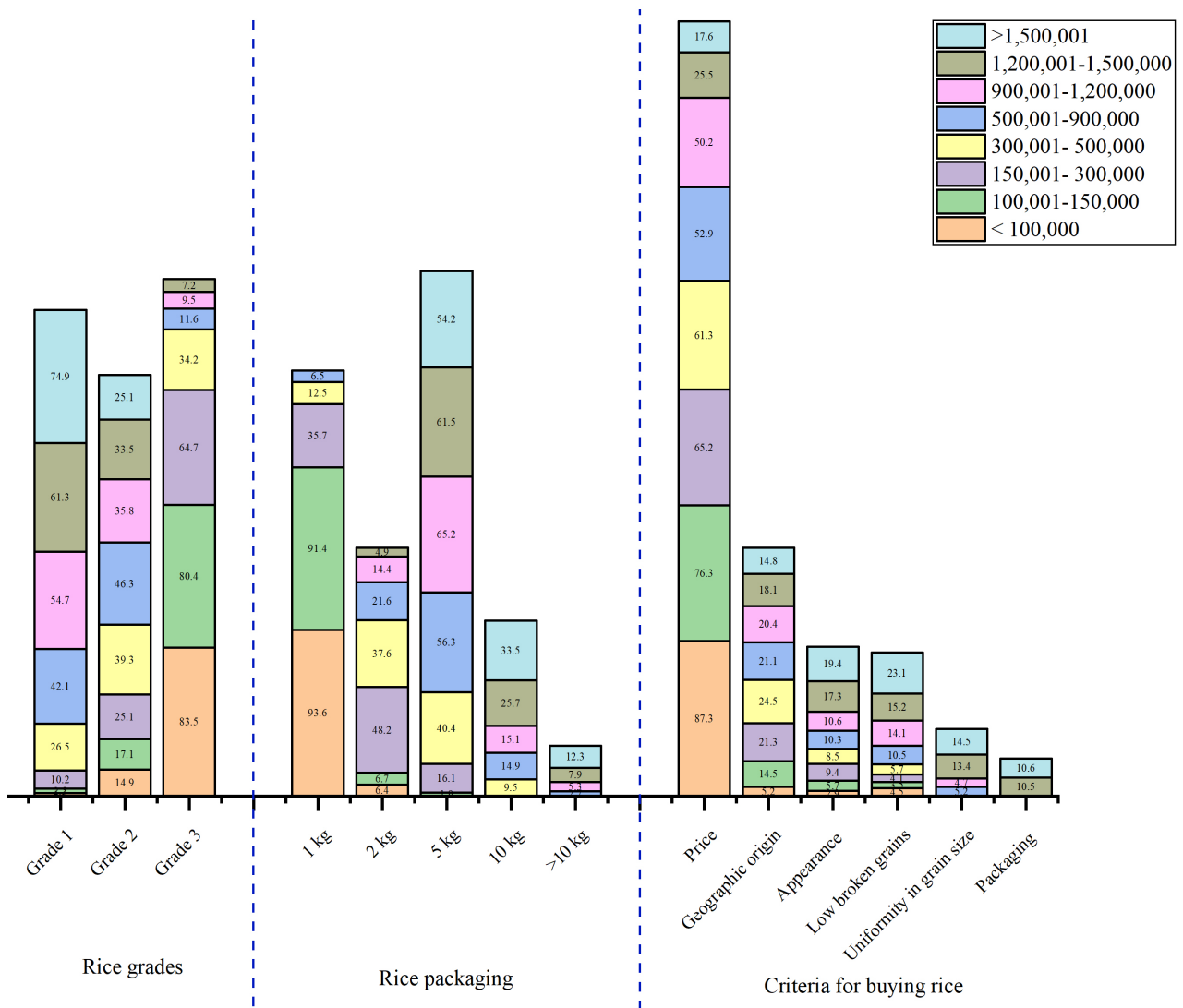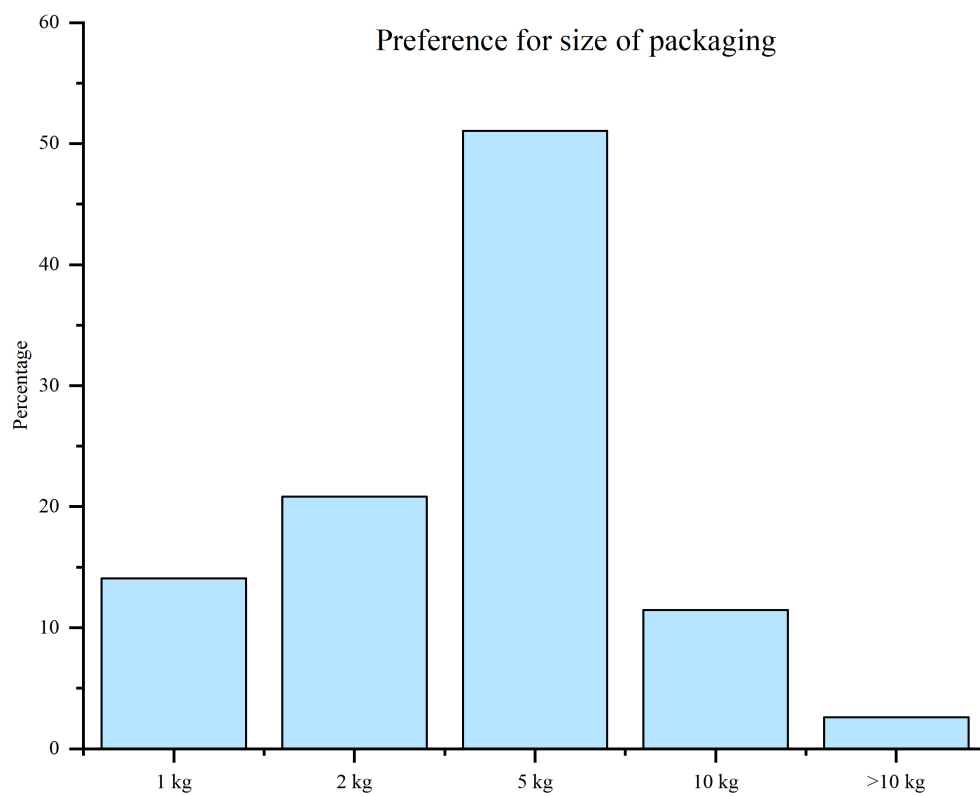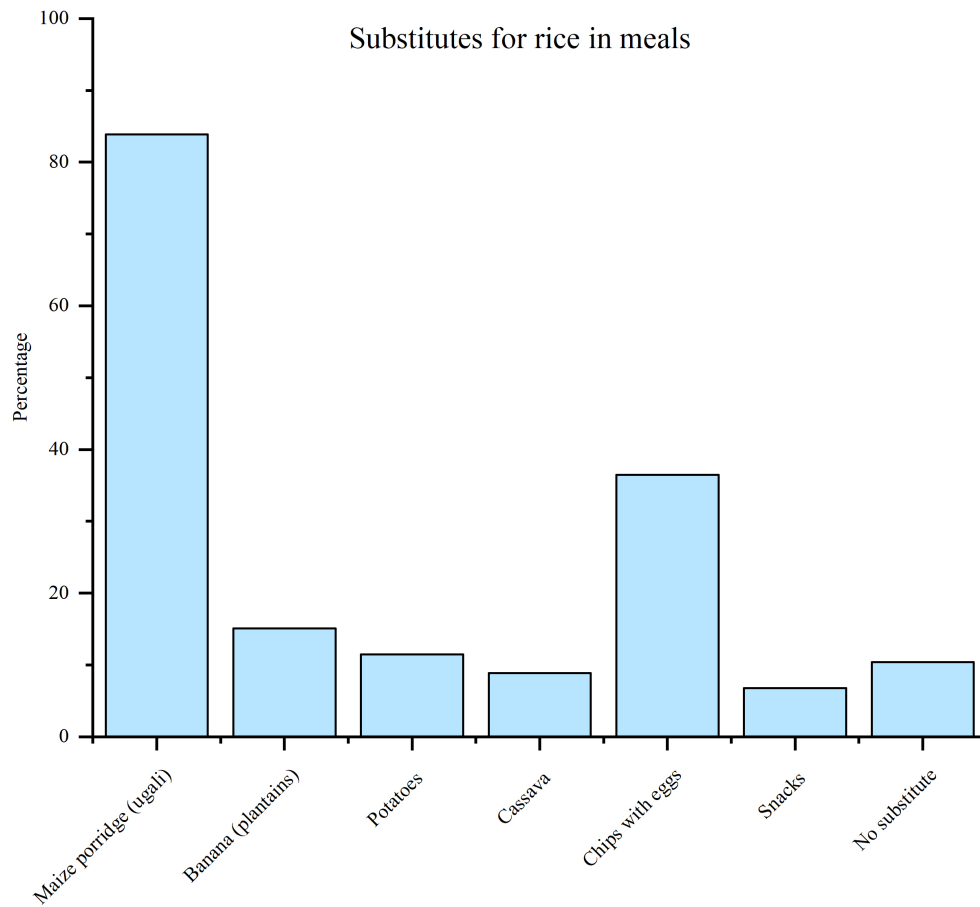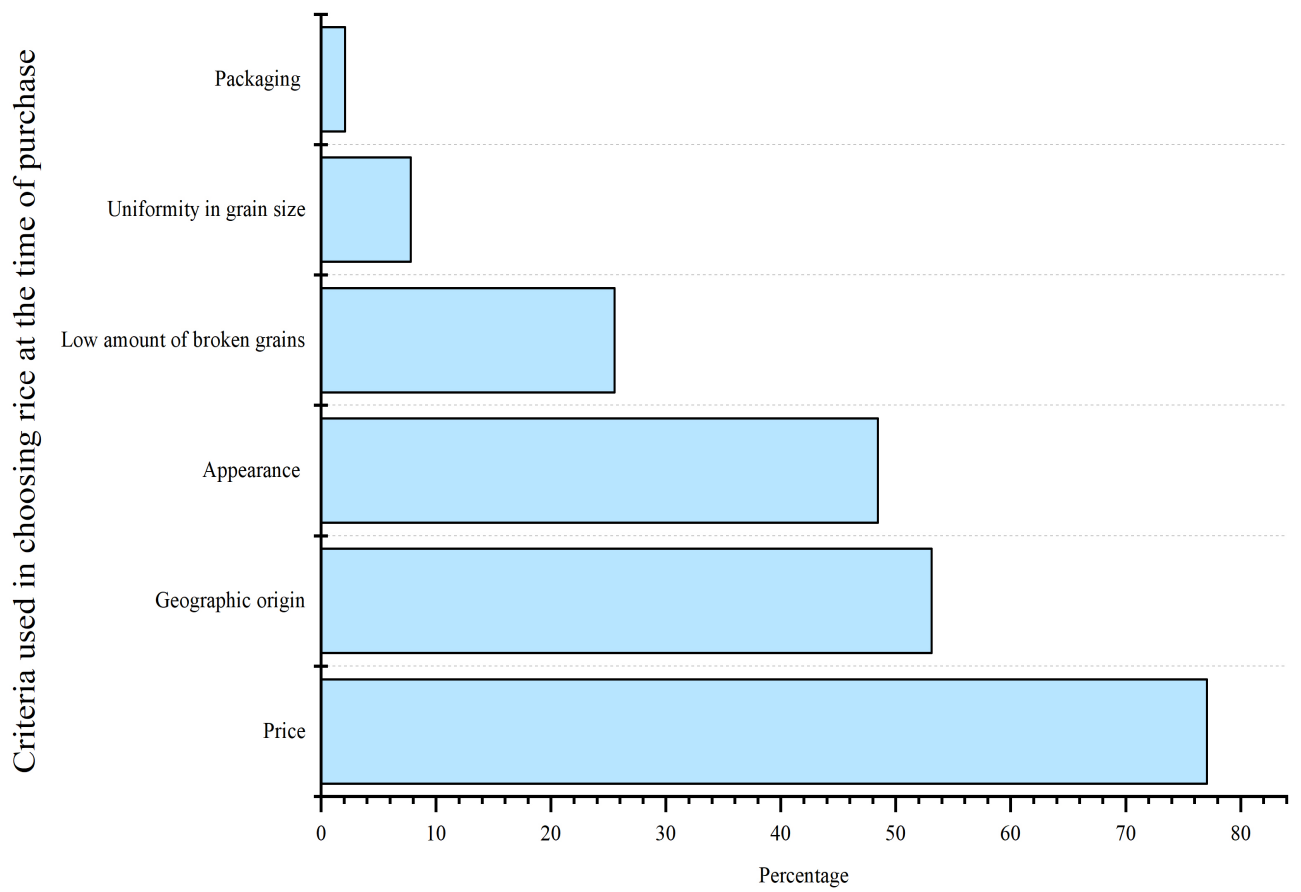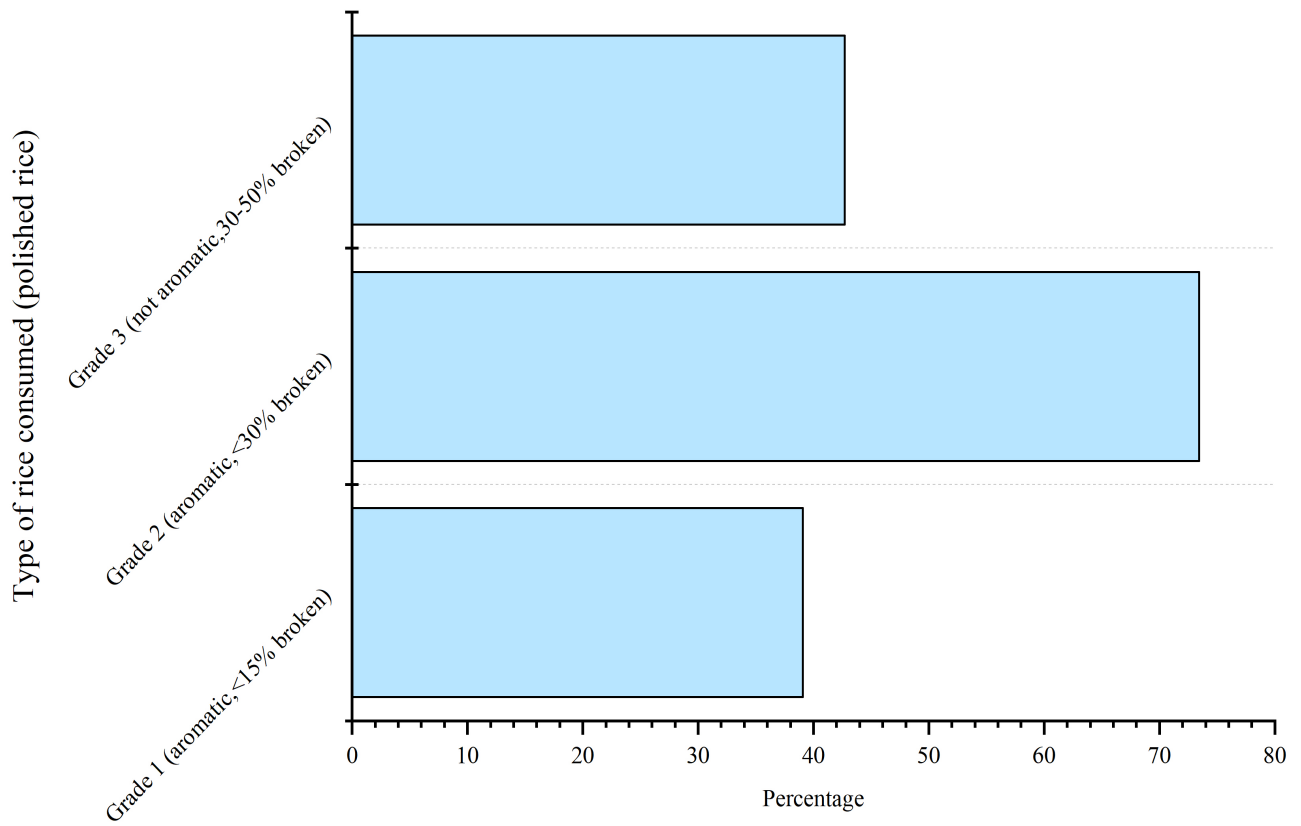

Figure 6. Distribution of criteria used in choosing rice at the time of purchase within each income group. Source: Author's survey (2020).

Substitutes for rice in meals
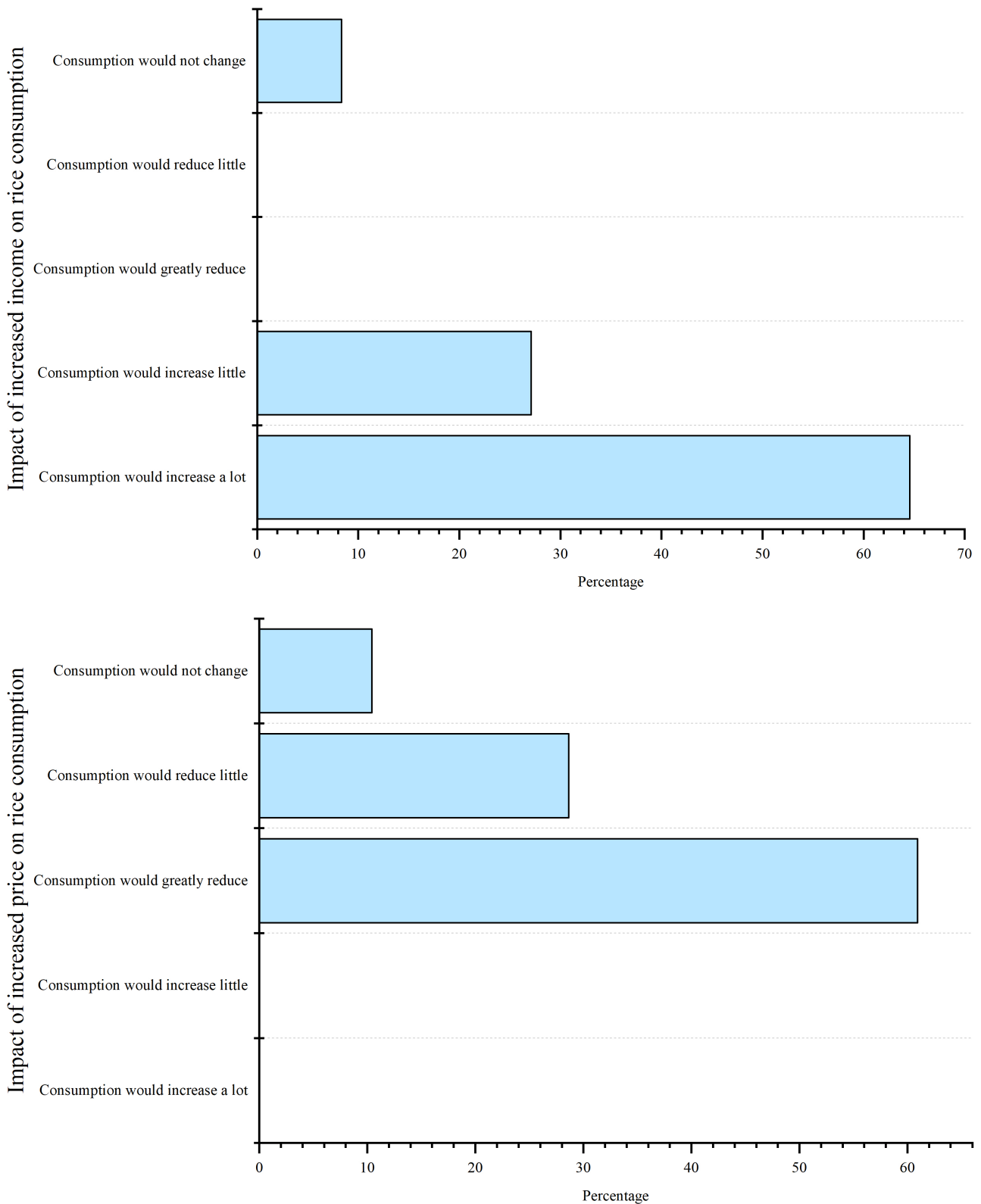

Preference for size of packaging

Figure 7. Distribution of rice consumers according to different characteristics. Source: Author's survey (2020).

Seeking to assess the impact of rising incomes and rice prices on their consumption, 91.85 per cent of consumers said they would change the volume of

rice consumed if there was an increase in income, and an increase in the price of rice would also influence the volume consumed (>80 per cent of respondents). In addition, consumers admitted that they would start consuming higher value rice if there was an increase in their income and would start consuming cheaper or even lower quality brands if there was a substantial increase in rice price. In short, there would be changes in the quality and quantity of the rice that would be consumed with changes in income and price.

3.3. Performance of Rice Markets

3.3.1. Price Formation

In general, the main determinant of prices is cost price, followed by alignment with market prices. Traders decide on a fixed or variable margin depending on the season, which they add to their purchase price. However, it should be noted that in all markets, at least 50 per cent of traders said that there are players who can set the prices. The level of competition in the markets is likely to vary seasonally; the harvest periods are periods of strong competition, while the lean season is conducive to large wholesalers' monopolies. Thus, while price inflation is normally observed during the lean season, it is difficult to know to what extent it is due to the relative scarcity of rice and to what extent it is due to market power. The smaller and more isolated a market, the higher the lean inflation will be due to weak competition. However, due to households' low purchasing power, wholesalers cannot charge high prices for a long time.

According to the survey results, the price of rice in domestic markets also depends on its origin (local or imported rice), location, quality, and the quantity purchased. The local "Kyela" rice is the most expensive variety in the country. Its price is almost double that of imported rice. Other types of local rice considered to be of a lower quality are sold at similar or slightly higher prices than imported rice. There are no quality standards in force in the domestic rice market. Quality is assessed based on the grain characteristics: variety, length, thickness, flavour, taste, degree of breakage, and impurities. From the consumer's point of view, perceived nutritional quality and cooking time are additional quality criteria.

Figure 8 and Figure 9 compare the prices of local and imported rice from Thailand. The results show that local rice is more expensive than imported rice due to the higher production costs attributed to the limited use of yield-increasing technologies, minimal use of fertilisers, high labour requirements associated with very little mechanisation, and limited adoption of improved cultivars, and high transport costs. There is also little confidence in business transactions, usually conducted informally without contractual obligations, which increases business costs. Rice production in Tanzania is 179.4 USD/MT, more expensive than in Thailand. When rice from Thailand arrives in Dar es Salaam (CIF), it costs 115 USD/MT (28.3%) less than rice from Mbeya. With the import tariff of 75 percent (342.4 USD/MT) and the customs clearance and shipping cost, it becomes 277.5 USD/MT more expensive than local Mbeya rice. Unexpectedly, rice im-

ported from Thailand is only retailed at 785.6 USD/MT in Dar es Salaam, meaning traders would experience a loss of 93.1 USD/MT (around 11.7%). However, it is known that imported rice is smuggled into Tanzania, making it cheaper. For example, in 2013, 40,000 tonnes of imported rice were reportedly smuggled into Tanzania, causing wholesale prices to drop by 54 per cent (Kilimo Trust, 2017).

3.3.2. Seasonality of Rice Prices

The findings in Table 3 show that local rice prices in Tanzania are affected by strong seasonality. Although the rice harvest times are different in Tanzania, rice is mainly harvested from May to July. The off-season harvest (November-December) weighs very little in the total harvest. Thus, prices reach their lowest point between May and July, depending on the markets considered. They then start to rise again before reaching their peak between October and April. The differences appear mainly in the price level and in the month of the year when the price is highest. The difference between maximum and minimum prices is interesting because it signifies the markets' supply capacity. Not surprisingly,
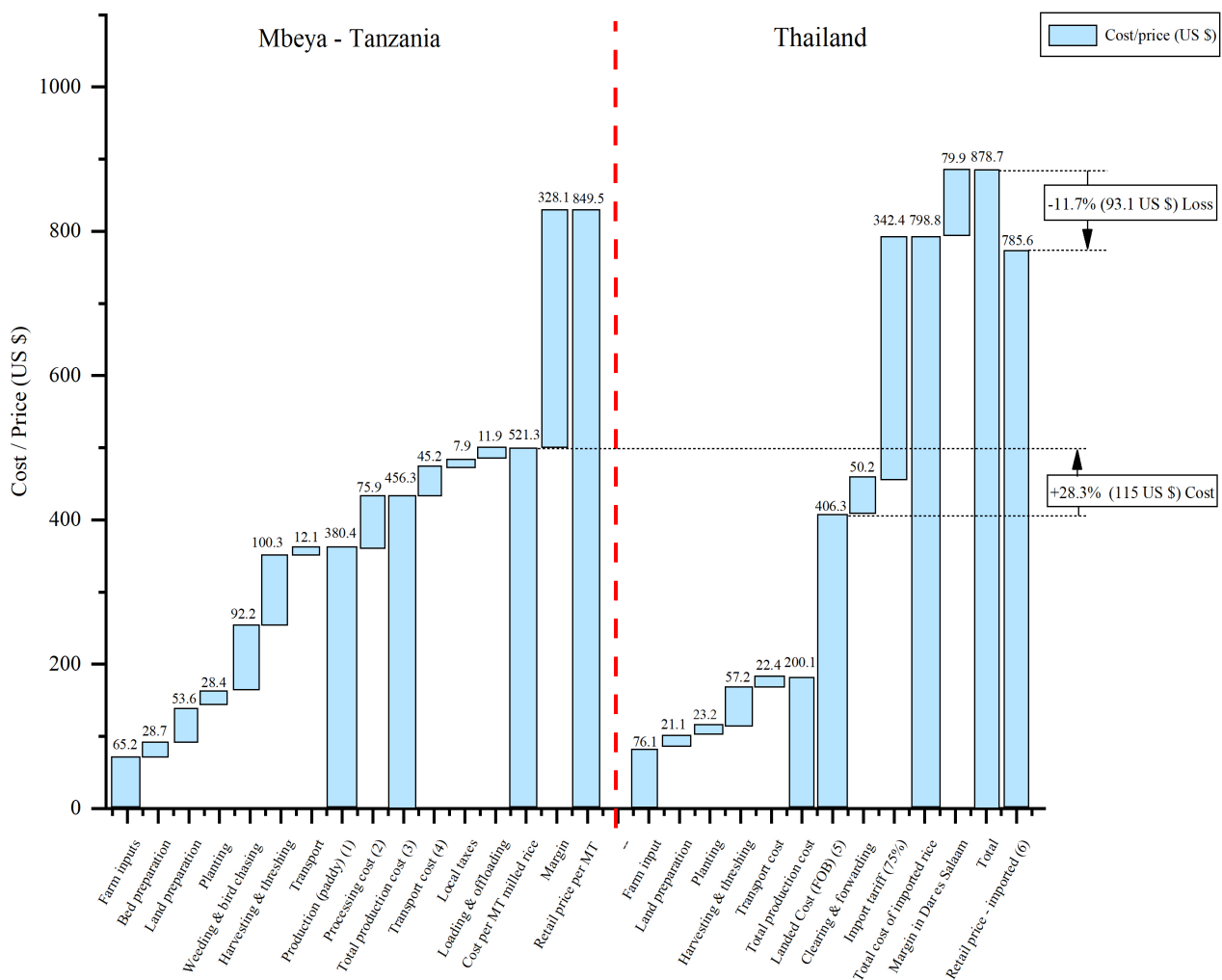

Figure 8. Competitiveness of rice produced in Tanzania against imported rice from Thailand. Source: RATIN, FAOSTAT (2019).
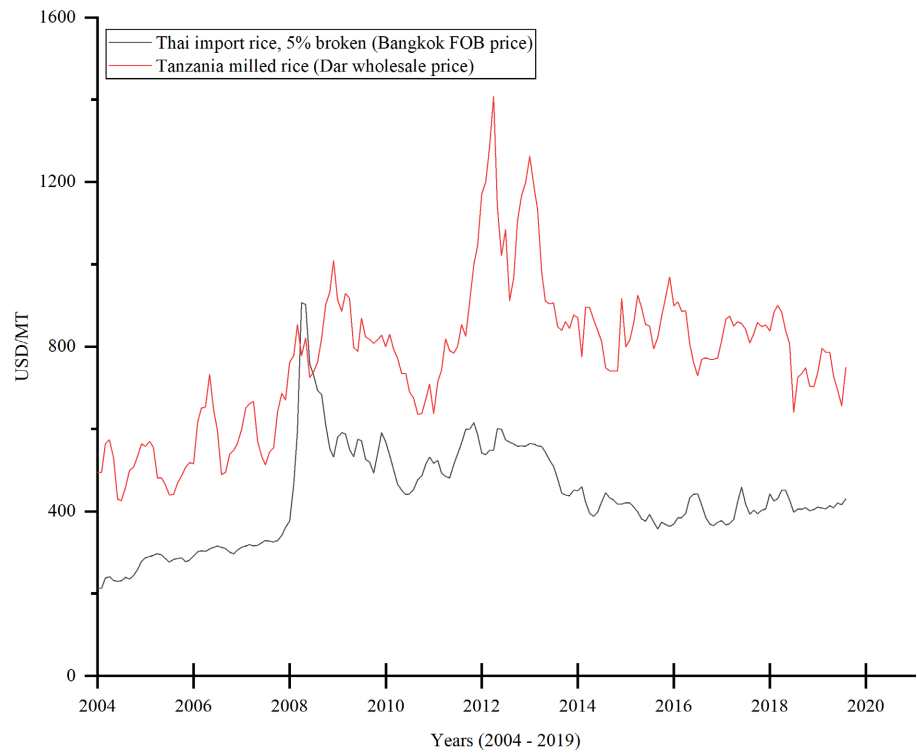
Figure 9. Price comparison of Tanzania and Thai milled rice [USD/MT]. Source: National Bureau of Statistics Tanzania, World Bank (2019).

Table 3. Monthly average local rice prices per 100 kg of rice[1].

	Dar es Salaam	Mbeya	Morogoro	Shinyanga	Dodoma	Arusha	Lindi
January	127.074	119.490	119.013	114.560	124.918	124.251	135.960
February	130.736	121.901	120.155	115.693	129.097	127.165	139.429
March	133.686	122.755	122.318	116.120	130.653	129.389	141.843
April	140.567	123.798	123.046	118.719	133.339	135.803	149.842
May	131.557	121.315	122.106	114.591	130.715	128.248	139.625
June	121.685	113.494	111.808	101.297	121.479	119.894	131.259
July	113.902	105.021	103.318	96.473	115.074	113.445	123.829
August	111.604	103.752	102.114	96.108	112.487	113.026	119.512
September	113.047	104.104	101.487	98.842	112.965	113.606	120.587
October	119.102	109.686	108.507	106.279	117.555	118.515	128.004
November	124.888	116.662	114.854	110.285	123.869	122.966	133.982
December	135.765	124.552	123.402	117.207	128.448	131.096	140.478
Difference (max − min)	28.963	22.229	21.346	22.611	20.852	22.778	30.330

Source: Author's computations from Tanzania Ministry of Industry and Trade database (2020). Note: [1]Price in thousands of Tanzanian shillings (2004:01-2018:12).

the difference between harvest and lean prices is the smallest in Shinyanga, Morogoro, and Mbeya. A very high spread in Dar es Salaam or Lindi shows that there is strong pressure on lean prices due to a lower supply.

From the results in Table 4, it is evident that the months with the highest Seasonal Variation Index (SVI), greater than 100 per cent, were from November to May, when the average price of rice was highest. From April, the trend was for rice prices to drop and reach below 100 per cent in June, continuing this behaviour until August, but with an increasing trend from September, reaching more than 100 per cent from November to May. The reason for this trend is that December to May is a period of rice cultivation; this implies that the supply of rice is low as only the rice that has been stored is supplied, resulting in higher prices during the period.

Figure 10 illustrates the behaviour of the seasonal variation indices (SVI's) of the price of a 100 kg bag of rice in the two wholesale markets (Dar es Salaam "deficit market" and Mbeya, "surplus market"). When the SVI is greater than 100 per cent, rice marketing is favourable to the producer and unfavourable to the buyer, and the reverse occurs when the SVI is below the 100 per cent level. Based on the results, it can be concluded that from November to May, the producer is likely to sell his product at a high price (SVI above 100%), but at the risk of selling it at a low price between April and September (LCL curve is far from the SVI curve). Note that December, January, March, April, and May are the months when the producer is most likely to make the greatest economic gains when the HCL curve is furthest from SVI. Coincidentally, producers are also at risk of selling rice below prices traditionally charged in February, April, May, and November, as the distances between SVI and LCL, are vast. From a buyer's perspective, the best time to buy rice is June to October, when the SVI curve is below the 100 per cent level. February is also a good month for the buyer to buy rice, although the risk of paying a very high price is low because historically, rice has not reached a very high price this month (the HCL curve is close to the SVI curve).

In the case of imported rice, the price of broken Thai Super A1 rice and its Indian and Pakistani equivalents, although in theory determined only by rice prices in the world market and changes in transport costs, follows a seasonal pattern similar to the price of local rice. Traders are forced to lower the price of imported rice at harvest to continue selling. However, imported rice does not fully align with local rice prices and remains cheaper than local rice. This indicates an increase in "preference" for local rice in different parts of the country. The explanation provided by the traders met is, in particular, that with the development of mini-rice mills and the improvement of small hullers, the quality of local rice has greatly improved, which has enabled it to gain market share in the consumption of rice by the middle and wealthy classes of Dar es Salaam and other major cities of the country.

Table 4. Seasonal variation index of rice price in the surplus and deficit markets[1].

Months	Seasonal variation index		Confidence limits (95%)			
	Dar es Salaam	Mbeya	Dar es Salaam		Mbeya	
			LCl	HCL	LCL	HCL
January	104.83	104.67	99.25	130.74	94.98	127.38
February	106.67	104.62	91.17	115.67	86.01	113.19
March	108.66	107.83	102.67	124.36	94.82	121.93
April	106.76	106.94	94.16	125.74	78.97	121.48
May	102.31	102.85	90.22	123.90	84.64	118.85
June	96.58	93.89	87.90	109.07	83.73	101.26
July	94.51	94.13	89.75	112.75	86.56	103.92
August	91.36	90.67	85.12	98.80	83.20	96.63
September	92.21	91.50	85.13	105.07	81.69	101.97
October	98.45	97.12	89.62	107.55	87.63	101.63
November	102.87	101.50	90.79	114.72	86.11	113.99
December	105.81	104.29	95.77	121.90	92.86	118.55

Source: Author's computations from Tanzania Ministry of Industry and Trade database (2020). Note: [1]Price in thousands of Tanzanian shillings, LCI—Lower Confidence Interval, HCI—Higher Confidence Interval.
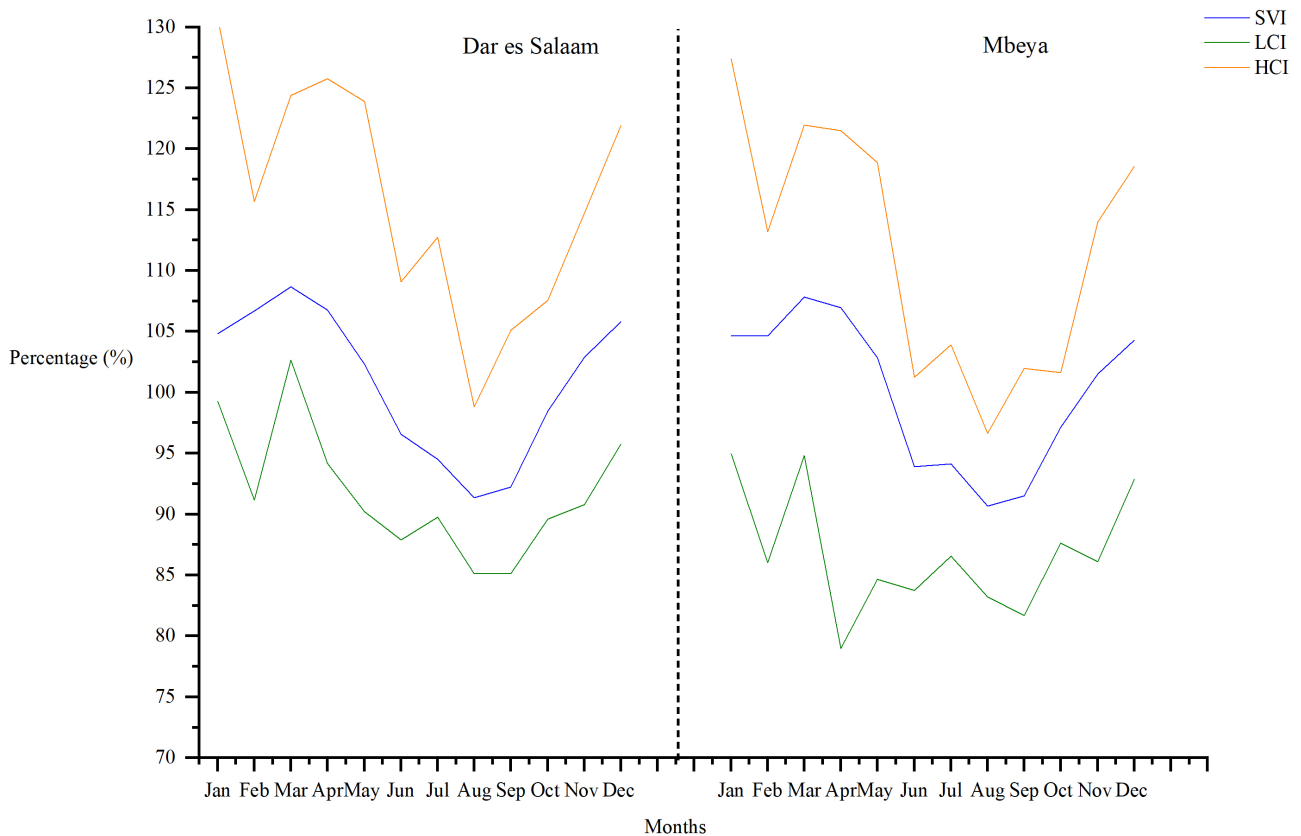

Figure 10. Seasonal variation Index (SVI), Lower and Higher Confidence Limit (LCL and HCL), of the price for a 100 kg bag of rice. Source: Author's computations from Tanzania Ministry of Industry and Trade database (2020).

3.3.3. The Degree of Concentration in Rice Markets

In this study, market concentration was used to measure the level of competitiveness in the rice markets. The volume of rice traded by retailers and wholesalers was used to analyse market concentration and reported in Table 5. The market concentration here means that a limited number of traders take a large share of total rice sales. According to the results, most rice markets had low trader concentration levels for retailers (Herfindahl-Hirschman Index below 0.15) and a moderate to higher concentration for wholesalers (Herfindahl-Hirschman Index between 0.15 and 0.25, or above 0.25). These results imply that the markets surveyed appear to be competitive/efficient with the possibility of some degree of market power. The risk of collusion between traders to fix the price level is almost non-existent during harvest. But still, it can exist during the lean period when the supply is concentrated in the hands of a few large traders.

Table 5. Market concentration in the major regional rice markets of Tanzania.

Markets	Trader category	HHI	The Pre-Defined Intervals for HHI	Interpretation
Dar es Salaam	Wholesaler	0.33	HHI> 0.25	Higher concentrated market
	Retailer	0.07	HHI<0.15	Low concentrated market
Morogoro	Wholesaler	0.22	0.15< HHI >0.25	Moderately concentrated market
	Retailer	0.09	HHI<0.15	Low concentrated market
Mbeya	Wholesaler	0.25	0.15< HHI >0.25	Moderately concentrated market
	Retailer	0.09	HHI<0.15	Low concentrated market
Shinyanga	Wholesaler	0.24	0.15< HHI >0.25	Moderate concentrated market
	Retailer	0.12	HHI<0.15	Low concentrated market
Dodoma	Wholesaler	0.21	0.15< HHI >0.25	Moderate concentrated market
	Retailer	0.10	HHI<0.15	Low concentrated market
Arusha	Wholesaler	0.27	HHI> 0.25	Higher concentrated market
	Retailer	0.11	HHI<0.15	Low concentrated market
Lindi	Wholesaler	0.23	0.15< HHI >0.25	Moderately concentrated market
	Retailer	0.10	HHI<0.15	Low concentrated market
All markets	Wholesaler	0.24	0.15< HHI >0.25	Moderate concentration market
	Retailer	0.09	HHI<0.15	Low concentrated market

Source: Author's computation, (2020). Note: HHI < 0.15 indicates unconcentrated markets, HHI between 0.15 and 0.25 indicates moderately concentrated markets, and HHI> 0.25 indicates highly concentrated markets.

A moderate level of competition in the wholesale trade means that there is some form of barrier to entry into the wholesale rice trade, such as the availability of capital and credit. Since the markets considered are main regional markets, the volumes traded may have attracted larger traders. It could also mean that the lack of capital and storage facilities has prevented many small traders from engaging in wholesale trade. This may have caused a few large wholesalers to gain market share in the surveyed markets. In contrast, low concentration in retail is because retail does not need higher capital.

3.3.4. Barriers to Entry into the Rice Trade

Although rice in Tanzania is traded under a liberalised market system with minimal government intervention, the results show that a number of barriers remain, including institutional, technical, financial, and risk factors that have led to a certain level of uncompetitive market behaviour. Institutional and legal entry barriers include formal and informal regulations set by the government and actors with which traders must comply. These include licensing requirements imposed by local authorities, taxes payable for wholesale or retail trade, and other guidelines put in place by established administrative bodies. Traders with stalls are required to pay annual licenses, while those who do not pay daily depend on the number of bags brought into the markets or a fixed amount. Other market costs are those related to hygiene, security, and parking in markets. Importers are required to pay certain regulatory duties and levies on rice imports. This can create a barrier to entry, especially for small traders with low capital who may intend to go into the business.

Technical barriers are linked to the flow of information and the constraints that can hinder access to information. Obtaining information on product sources and markets, cost structure, and prevailing market prices in each market channel is essential to making markets more efficient. Most rice traders obtain information from their colleagues, print and electronic media, and cell phones. Although over 75 per cent of traders consider market information to be available and accessible, heavy reliance on word of mouth from other traders poses reliability issues.

Financial barriers are related to the availability of capital and credit, especially initial capital investments. Lack of access to sufficient capital was one of the main obstacles to entering and expanding traders' activities. Most traders consider that the available credit is insufficient to meet their needs. If conditions allow, they prefer to increase their capital. Those who got loans complained that getting loans has to follow long-term procedures (over 60%), guarantees (over 80%), high-interest rates (over 75%), and other requirements (Table 2). These make commercial borrowing risky and become a barrier to entry into the rice trade, especially wholesale. In addition, the capital required for wholesale is higher than for retail. Off-season storage is also subject to financial constraints. Thus, obtaining credit and raising sufficient funds offer undue protection to traders established in the business.

4. Conclusion

The study used primary and secondary data to examine the characteristics and functioning of the domestic rice markets and trade in Tanzania based on the Structure, Conduct and Performance (SCP) model. The result reveals that rice distribution and sale in Tanzania is carried out through a network of brokers, wholesalers, and retailers who ensure that the product reaches the end consumer through local stores and retail markets. Of all major regional rice markets studied, the Dar es Salaam rice market, as the country's largest trading centre, dominates the remaining markets in the majority of the analyzed indicators. Rice prices vary a lot depending on the season, region, buyer's relationship with the seller, transportation/distance, and handling costs. While local rice is widely available and purchased by traders and consumers in domestic markets, imported rice is available in small quantities (mainly in supermarkets and big cities). In addition, compared to imported rice, local rice appears to be quality competitive but not price competitive. As the population increases and becomes more urbanised, the demand for rice is expected to dramatically increase the opportunities for niche markets such as food service markets, food processing companies, feed producers, and processors of speciality products, which could result in a rational consumer switch to imported rice due to its price competitiveness. These necessities improve rice production and reduce its production costs.

Furthermore, the results show that consumers' socio-economic characteristics and the characteristics of rice grains directly affect the purchasing behaviour of rice consumers. This suggests that policies that aim to increase the purchasing power of consumers; reduce production and transaction costs, such as cost reduction technologies, practices, and infrastructure; develop ready-to-use and quick-to-use rice products; promotion of grading, branding, and packaging of rice; and the promotion of more efficient processing technologies could promote rice trade in the country.

On the other hand, although the size and distribution of traders tend towards a competitive market structure, they still face many constraints such as insufficient capital and the high cost of doing business in some markets. There is also a moderate to high concentration in the wholesale rice markets. This finding implies that a favourable marketing environment for both parties involved in the rice supply chain can improve their ability to conduct the rice trade more efficiently. Policies aimed at building institutions to facilitate actors' access to low-cost credit and reliable market information will play an important role in improving the efficient functioning of rice markets in the country.

Data Availability Statement

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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