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Analysis of the Rice Value Chain in East Timor—The Consumers' Perspective

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Abstract

The consumer is an important factor to measure the performance of the rice agri-food value chain in East Timor. The purpose of this work is to identify the links in the rice chain, as well as to do the consumers' characterization, along with their segments. The methodologies used to represent the functioning of consumer preferences are cluster analysis, applied the K-Mean method, qualitative nature, exploratory factor analysis (EFA) and regression analysis. It was constituted a sample of 240 rice consumers in the county of Dili, capital of East Timor, and the questionnaire was conducted in the presence of the researcher. As consumers become more aware and experience higher purchasing standards, failure to consider their concerns will affect the profit of value chain participants, many of whom will need to update their practices. The result of KMO statistic, 0.781, shows that the quality of the analysis is good and the null hypothesis of Bartlett's test of sphericity was rejected. It was found the existence of two components, with the first having a greater weight of variables in relation to distance, transportation and availability, while the second component has a greater weight on variables related to quality, human benefit and healthy living. The first component was considered as Access and the second as Quality. Regarding the segmentation of consumers, we proceeded to create two distinct groups of rice consumers. Group I, composed of 171 individuals, and a Group II, with 69 individuals. Both groups considered rice to be the key food element, particularly important for the Timorese population.

Keywords

Rice, Value Chain, Consumers, East Timor

1. Introduction

Rice, one of the most produced and consumed cereals in the world, is the key

food element of more than half of the world's population, especially in Asia, where about 60% - 70% of the caloric intake, of more than 2 billion people, comes from this product and its by-products (Abdullah, Kobayashi, Matsumura, & Ito, 2008; Hossain, 1996; Zhao, Lin, & Chen, 2020).

Rice is considered by the Timorese population as the safest, sanitary food in the country. Rice consumption in East Timor is 135,000 tons per year, while farmers produce only 65 tons per year (Costa, Tjandrasa, & Djanali, 2018). Timorese rice consumption is approximately 112 kg, per capita, per year (Silva, Henriques, Jorge, & Narciso, 2012; Reis, 2020, In Nesbitt, Erskine, da Cruz & Moorhead, 2016). Asia consumption is more than 100 kg, per capita, per year (Seck, Diagne, Mohanty, & Wopereis, 2012; Ito, Peterson, & Grant, 1989, Mottaleb, Kruseman, & Erenstein, 2018) and Muthayya, Sugimoto, Montgomery, & Maberly (2014) while in the European Union there is a consumption of 5.3 kg, per capita, per year (Jifroudi, Teimoury, & Barzinpour, 2020). According to Gao, House, Gmitter, Filomena Valim, Plotto, & Baldwin, (2011) and Mora, Espinoza, Schnettler, Echeverría, Predieri, & Infante (2011), understanding, globally, consumer value preferences is considered essential to achieve the ideal performance of rice value chains. For Poole, Martínez, & Vidal Giménez (2007), it is now widely accepted that private sector's profitability and public policy effectiveness cannot be achieved without the knowledge of the consumer preferences and concerns related to the rice value chain. Consumer's awareness of food quality, safety and hygiene is also increasing due to changes in living standards caused by rising incomes, urbanization and globalization. Consumers in East Timor are also experiencing similar changes. However, little is known about what they value in terms of food products in general and rice. Therefore, this study was conducted to obtain insight about the value of rice, consumer's concerns, and the rice value chain in East Timor. Certainly, the large domestic demand for any agri-food product, such as rice in East Timor, should provide an incentive for producers and intermediaries to increase their market supplies Gunden and Thomas (2012), as long as they are able to align their supply with the consumer's needs (Collins, 2009). Some authors claim that agri-food products can only be adequately developed by embracing consumers' needs (Soosay, Fearne and Dent, 2012). Similarly, public sector's policies and business practices should also be consistent with the needs of different consumer segments in order to ensure healthy food choices (Honkanen and Frewer, 2009; Alamanos, Bourlakis and Tzimitra-Kalogianni, 2013). Companies often need to impose higher prices in order to minimise possible losses caused by the exchange rate variation, thus reducing their competitiveness when facing domestic competition and improving the rice value chain. The rice would necessarily have to be destined for low value markets, due to reduced quality, inadequate storage conditions, conservation, poor packaging, not corresponding to the international standards, and possible pesticide residues, among other factors, which lead, inevitably, to a low price. Consequently, many Timorese consumers do not get the value and quality they

are looking for in rice. Others have concerns about food safety, particularly the unregulated use of hazardous chemicals, and there is also a growing awareness about the impacts of food production and marketing systems on human health, economy and society (Prowse & Moyer-Lee, 2013).

All these challenges mean that the rice agri-food chain in East Timor does not contribute robustly to the sustainable development of the country. In consequence, changing consumer's needs, rapid urbanization, population growth, increasing environmental concerns and stringent international compliance requirements (quality certifications such as Eurep-Gap and Global-Gap (Malik et al., 2010)), are all aspects that need to be addressed while promoting sustainable rice production.

2. Literature Review

Porter was one of the first authors to propose a new paradigm in the mid-1980s, affirming that activities developed alongside the goods and financial flows, add value to the chain (Porter, 1985a). This added value, created by one or more of activities developed throughout the various stages, can be seen as the consumer's willingness to pay for a product or service, whose final cost is higher than the initial execution cost. Porter (1985a) also classifies as primary the activities that add value and create competitive advantage in a value chain, which range from product development and production to logistics, marketing and after-sales services, support activities, such as human resource management, purchasing of goods and services, technological development, and business infrastructure (finance, accounting, quality management, public relations, legal advice, among others).

The value chain includes the set, or the network, of organizations, or entities, and facilities involved in the functions of acquiring materials or raw materials, following their transformation into intermediate and finished products and their distribution to final customers (Hunkaa, Huckab, Kasikb, & Vymetalc, 2011; Lee & Billington, 1993; Frazelle, 2002; Busch, 2002). For Waters (2003), the existence of organizational barriers and restrictions in the information flows can lead to a complete centralized undesirable control of the material flows in a value chain.

Webber and Labaste (2010) focus, mainly, on the connections in a value chain, including the vertical links, the interdependent processes, that generate value for the consumer, and the horizontal links to other value chains that provide intermediate goods and services. The authors observe that a value chain implies value creation in both processes.

Planning, supply, use/transform and delivery are some of the processes integrated in the value chain, which also incorporates all interactions and transactions from the raw material supplier to the customer (Roussel, 2005). For Mentzer et al. (2001) there are three degrees of complexity in the value chain, depending on its size or depth, which are direct, extended and complete. The direct chain is composed by an organization, or supplier, and a client that is not in-

volved in the products, services, financial and/or information flows. The extended chain includes all these (suppliers and customers involved in the products, services, finance and/or information flows, from the origin to the consumption). In the complete chain, all participants interact directly, or indirectly, in the products, services, finance and information flows, from the initial supplier of raw materials to the final consumer.

To understand consumer's preferences, it is important, in rice agri-food development, to take into consideration both private and public sector's points of view (Hobbs, 1998, Cuevas, Pede, McKinley, Velarde, & Demont, 2016 & Suwannaporn, Linnemann, & Chaveesuk, 2008). According to Walters and Lancaster (2000) & Woodruff (1997), for the consumer, value is globally defined as the benefits that a consumer receives while consuming a product. According to Ares and Gámbaro (2008), and Kotler, Armstrong, Wong, & Saunders (2010) knowing, accurately, what consumers value in a product is a complex matter, given the heterogeneity of their behaviour, often influenced by socioeconomic contexts, attitudes and individual behaviours. Different consumer's segments have different value preferences regarding consumption, purchase and quality attributes of products (Myrland, Trondsen, Johnston, & Lund, 2000 & Verbeke, Vermeir and Brunsø, 2007). The identification of different consumer's segments is considered important in the sustainability of the rice agri-food chain (Gunden and Thomas 2012).

For Rutsaert, Demontn, & Verbeke (2013), strong urbanisation and urban bias have marked a trend in the urban markets in West Africa: a preference for imported rice consumption. Understanding consumer's preferences, in Africa, related to rice consumption is, however, necessary to reverse this trend, in order to embrace the growing demand for local rice, thereby reducing the import bill. The information given by this research can be used by policy makers and stakeholders, adapting the domestic rice value chains to the market patterns, in order to increase the competitiveness of the domestic rice sector in the domain of consumer's preference. The study by Wang, Gao, Heng, & Shi (2019) shows that consumer's confidence towards the food safety is low due to frequent scandals. Price also plays an important role: the lower the price the higher the tendency to consider that the product has a low quality. According to Abukari, Donkoh, & Ehiakpor (2019), the study in the Northern region of Ghana proved that consumer households' preference for quality rice were classified, with an agreement of about 71%, in a descending order of taste, colour, cleanliness, nutrient content, nutritional value, aroma, grain size and texture. The study by Bairagi, Demont, Custodio, & Ynion (2020) shows that in South and Southeast Asia, rice attributes preferences depend on the consumer's gender, education levels, family size and income, rice consumption, expenditure share and purchase frequency.

Hagan & Awunyo-Vitor (2020) offered to evaluate the consumer preference' determinants of imported rice in Ghana. The result revealed that 98% consumed imported rice. On the other hand, the consumers revealed that imported rice

had less nutritional value and, for health reasons, they would like to reduce their consumption of imported rice.

Food safety and health are the most important attributes of sustainability for Nigerian rice consumers. These results are strong across several aspects, including consumer's education, incomes and markets (Okpiaifo, Durand-Morat, West, Nalley, Nayga, & Wailes, 2020).

Cuevas, Pede, McKinley, Velarde, & Demont (2016) provide important information on upgrading the value chain, since the Philippines strives to reduce imports, increase rice self-sufficiency and increase the income of poor farmers. For high-income consumers, the biggest variability is present in the rice grain quality attributes and, among all consumers, they have the most pronounced preferences.

The results presented by Custodio, Cuevas, Ynion, Laborte, Velasco, & Demont (2019) revealed that the ones who act on the rice value chain can further strengthen the rice quality through labels, branding and packaging, especially in Thailand, Cambodia, South India and Bangladesh, where consumers usually buy packaged rice.

Widayanti, Amir, Indah, & Septya (2020) focused on analysing consumer's preference on rice attributes by describing the comparison between the performance of packaged rice and the performance of bulk rice, according to urban consumers in Indonesia. It was verified that branded packaged rice is overall better, in attributes, compared to bulk rice.

Bach, Pham and Hoang (2016) analysed the rice value chain and its effects, in order to find the elements that affected their export capacity, on Vietnam's rice export in Kien Giang province, from December 2012 to November 2015. The results were obtained through multiple regression and collection of information, by surveying 450 individuals, of which 412 exporters, that included farmers and processors, showed that there were seven important factors in the value chain that successfully affected their export capacity, specifically, development strategy, control policy, planning, support policy, rice seed quality, cultivation techniques and post-harvest processing.

How food is produced, processed, transported and consumed is critical to achieving sustainability across the agri-food chain—The complexity that persists in coordinating it has led to increased food waste over the years (Govindan, 2018).

3. Methodology

For Mooi & Sarstedt (2011), survey is the most popular technique to gather quantitative data because it allows the collection of answers from a sample of respondents. The main reasons for the popularity of the survey research are its versatility, efficiency and ability to be general (Check & Schutt, 2011). Surveys are particularly effective when the goal is to obtain specific numerical information about trends, opinions, attitudes, liking or clicking on something, from a

relatively large number of respondents, in a short period of time (Creswell, 2009). The research tool is a questionnaire that contains a set of questions, statements, scales and ratings relevant to the phenomenon under investigation (Stake, 2010). It can be presented to respondents in various ways, in person, by telephone, mail or online (Neuman, 2011). In this study it was conducted a research with consumers to collect specific information, through a questionnaire, about their rice preferences, in East Timor. The consumers' analysis is going to include the search for "market segments", therefore it is necessary to group individuals homogeneously. In this context, cluster analysis will be applied. In a first stage, given the totally exploratory nature of the analysis, the hierarchical method will be applied with different distance measures and agglomerative methods. In a second stage, the K-Means method will be applied to check results and thus consolidate its validation (Hair et al., 2014). It should also be noted that, as the primary variables used are of a qualitative nature (Likert scales, in particular), it will be necessary to reduce the size of the database and search for unobservable variables (dimensions). In this context, the exploratory factor analysis (EFA) will be used to obtain latent variables, without measurement units, which will be used in cluster analysis and regression analysis.

This study follows a survey research design, which is useful for solving problems when the process is guided by one or more specific research problems. The population of this study covers six hundred (600) rice consumers in Díli, East Timor. Based on the above population, the sample size of the study is therefore determined using the Yaro Yamane (1967) sample determination technique,
where; N = Population size; n = sample size; e = Error of margin (0.05)

$n = N/(1 + Ne^2)$

$n = 600/(1 + 600 \times 0.05^2) = 240$ consumers

This research adopted the mixed research method (qualitative and quantitative). Data was collected through a questionnaire survey for consumers. The questionnaires were tested, and the results of this pilot study were used to revise the initial questionnaires, which were subsequently applied to a sample of 240 rice consumers. The questionnaire was performed face-to-face, by the researcher. The data collected was analysed descriptively, using cluster analysis to obtain the consumer's segments and factor analysis to obtain the dimensions of value chain analysis. These analyses were performed using the *Statistical Package for the Social Sciences* (SPSS 24.0) software.

Cluster analysis is a multivariate statistics technique that intends to group homogeneous individuals (cases), thus defining the underlying structure of the data (Hair et al., 2014). There are different clustering algorithms that can result in different clustering patterns. The hierarchical algorithm is characterised by being fully exploratory, where successive groupings or successive divisions of the individuals under analysis are carried out. The non-hierarchical algorithm (K-Means) is performed when the number of groups (K) is known, being based on criteria for minimizing the variance within groups.

In this research work, the hierarchical algorithm and the Ward and Average

Linkage between Groups criteria were initially applied. These criteria were chosen due to the exploratory nature of the analysis. Normally, when you have quantitative variables (as the case here), the squared Euclidean distance is used as a distance measure. This measure can be found based on the following equation:

$$D_{i,j}^2 = \sum_{k=1}^{p} \left(x_{i,k} - x_{j,k} \right)^2 \quad (1)$$

where

$D_{i,j}^2$ = square of the distance between the pairs of variables "*i*" and "*j*";

$x_{i,k}$ = value of the *k*-th variable for the *i*-th pair of variables;

$x_{j,k}$ = value of the *k*-th variable for the *j*th pair of variables;

p = number of variables.

Since cluster analysis is a non-inference statistical technique, validation techniques were used while deciding the number of clusters. Initially, different criteria were used to verify if there are clustering differences. In this study, the results obtained with *Ward's* criterion are presented, since no significant differences were perceived, compared to other explored methods. The proportion resulting from the ratio between the dispersion among groups (Error Sum of Squares), the total dispersion (Total Sum of Squares) and the elbow graph, were evaluated and compared.

In an attempt to obtain the analysis' dimensions of the value chain's consumer link, exploratory factor analysis (EFA) is applied to matters where it is understood that the correlation levels are high and that, in this context, it makes sense to reduce the database. In this context, the principal components method was applied (Equation (2)), which is based on the assumption that the total variance of the data can be explained by the dimensions obtained (Hair et al., 2014).

$$\begin{aligned} CP_1 &= a_{11}X_1 + a_{21}X_2 + \cdots + a_{p1}X_p \\ CP_2 &= a_{12}X_1 + a_{22}X_2 + \cdots + a_{p2}X_p \\ &\vdots \\ CP_m &= a_{1m}X_1 + a_{2m}X_2 + \cdots + a_{pm}X_p \end{aligned} \quad (2)$$

where CP_i is the principal component i and a_{ij} the coefficients of X_i variables. Based on the KMO index and Bartlett's test, the quality of the dimensions obtained is evaluated and, with a simpler interpretation of the results perspective, Varimax rotation is applied. Thus, it becomes possible to interpret and name the new dimensions obtained.

4. Results and Discussion

4.1. Characterisation of the Rice Consumer's Sample

The data described in Table 1 presents the consumers' socioeconomic characteristics. The male gender represents the majority, with 166 individuals (69.2%)

Table 1. Consumers' dominant socio-economic characteristics.

Items	
Age	31 - 40 Years Old
Sex	Male
Education Level	Bachelor's Degree
Family members	6
Children	2
Marital Status	Married
Occupation/profession	Civil Servant
Level of Monthly Income	115 US Dollars

and 74 females (30.8% of the surveyed sample). The highest percentage is between 31 and 40 years old, with around 72 individuals (30.0%), followed by 21 to 30 years old, around 66 (27.5%) and 41 to 50 years old, around 59 (24.6%) of responses.

Regarding the academic degree, most of them have a bachelor's degree. Most of them live in a household with six individuals; regarding the number of children of the respondents, most of the sample has two children. The consumers, who answered the questionnaire regarding the marital status, revealed that the majority is married, 178 (74.2% of the answers). Regarding the occupation or profession of the consumers in the sample, the most frequent one is civil servant, counting 117 individuals (48.8%). Most consumers earn an income of less than 115 American dollars, with 50 consumers (20.8%) stating that their income is not sufficient for their daily needs.

4.2. Factor Analysis

In order to understand better the consumers' behaviour regarding rice consumption, the principal components analysis was applied. The KMO statistic of 0.781 shows that the quality of the analysis is good, and the null hypothesis of Bartlett's sphericity test was rejected (see Table 2). In this context, two principal components were extracted based on the eigenvalue criterion.

Table 3 presents the coefficients referring to the matrix rotated by the Varimax method.

The results point to the existence of two components, whereby the first component has a greater weight of variables related to distance, transportation and availability. The second component has a higher weight in variables related to quality, human benefit and healthy life. In this context, it was considered to name the first component as Access and the second as Quality. These components will be analysed in the classification of groups (or segments) in the following section.

Table 2. KMO statistics and bartlett's test (KMO Statistics—Bartlett's specificity test).

Estatística KMO	0.781
Teste de esfericidade de Bartlett	Aprox. Chi-Square 316.439
	Df 28
	Sig 0.000

Table 3. Matrix of the main components.

	Components	
	1	2
Good quality rice	0.237	0.607
The price of rice is affordable	0.516	0.496
Human benefit and healthy life	−0.085	0.617
Easy access to the market	0.506	0.389
Availability	0.730	0.289
Distance and transport	0.769	−0.004
Income	0.589	0.204
Substitution with other food	0.637	−0.355

4.3. Consumer's Segmentation

The cluster analysis applied to the sample of consumers, created two distinct groups of rice consumers, in East Timor. We obtained a Group I with 171 individuals and a Group II with 69 individuals. In order to characterize these groups, an analysis is made based on the psych-demographic variables obtained, as well as on the questions related to taste and preference for rice consumption. Table 4 summarizes the main psych-demographic characteristics of each group. Group I tends to be younger, with a higher frequency in the ages between 21 and 50 years old. Group II, on the other hand, presents a larger frequency in the ages between 31 and 50 years old. Globally, both groups are composed by male individuals. In terms of level of education, the majority holds a bachelor's degree in Group I, while in Group II there are also PhD students. Regarding the size of the family unit, Group I presents a higher frequency of households with approximately five members and Group II with approximately seven members. A large part of the individuals of Group I belong to a family with two children, as for Group II, the individuals have between one and five children. The marital status of most of the respondents is married. Concerning the occupation/profession of the consumers, Group I consumers are mostly civil servants and students, while Group II consumers are mostly civil servants, employees of private companies and students. The income level of consumers in both groups is low, mostly up to 324 US dollars.

Table 5 shows the importance given to rice consumption by consumers. Respondents from Group I consider as very important all the items under evaluation:

Table 4. Higher frequencies of the psych-demographic variables of groups I and II of rice consumers.

Items	Group I	Group II
Age	21 - 50 years old	31 - 50 years old
Sex	Male	Male
Level of Education	Bachelor's Degree	Bachelor's Degree and PhD
Family Members	±5 people	±7 people
Children	2 children	1, 2 and 5 children
Marital Status	Married	Married
Occupation/ Profession	Civil servants and students	Civil servants, employees of private companies and students
Monthly income level	Up to 324 US dollars	Up to 324 US dollars

Table 5. Higher frequencies in the importance given to rice consumption by consumers.

Items	Group I	Group II
Rice taste	Very Important	Important
Rice as a basic need	Very Important	Important
Dependence on rice	Very Important and Important	Unimportant and important
Rice consumption as an energy booster	Important and Very Important	Important and Unimportant
Habitual rice consumption	Very Important	Important

rice taste, base food element, habitual consumption and dependence on this product in the diet. Group II, on the other hand, also attributed importance to these items, but not as strongly as Group I. Group II considered the dependence on rice in the diet as "important" and not as "very important".

Table 6 presents the highest frequencies for items related to the importance attributed to improvements in the sale of rice. Most consumers in both groups admit that it is "very Important" to have clear information for consumers, an affordable price, the creation of laws regulating the sale of this product, intervention in the market and the creation of subsidies for farmers. As it shows, these variables do not allow us to distinguish between the groups under analysis, since they have similar perceptions.

Table 7 shows the characterisation of the groups, based on items related to the importance given to safe and sustainable food. Group I consumers consider all items of high importance, with "Very important" and "Important" being the most frequent answers. Group II considers issues related to economic viability, the development of rural areas and the promotion of research to be "Important", while the others are considered "Very important".

It is also important to understand the importance given by each group to the components obtained in the factor analysis. Table 8 shows the descriptive results per group.

Table 6. Highest frequencies of the importance attributed to suggested changes for rice sales improvement.

Items	Group I	Group II
Clear information for consumers	Very important	Very important
Affordable rice price	Very important	Very important
Creating laws to regulate sales	Very important	Very important
Market intervention	Very important	Very important
Subsidies for farmers	Very important	Important and Very important

Table 7. Majority frequencies about the importance given to safe and sustainable food.

Items	Group 1	Group 2
Improvement of life's quality	Important and Very important	Important and Very important
Ensuring economic viability	Important and Very important	Important
Development of rural areas	Very important	Important
Guaranteeing access to land	Very important and important	Very important and important
Defending sustainable agriculture	Very important	Very important and important
Promoting research	Important	Important
Human survival	Very important and important	Important

Table 8. Descriptive measures of the components per group.

		N	Average	Standard deviation	Minimum	Maximum
Access	Group I	171	0.131	0.930	−2.924	1.597
	Group II	69	−0.325	1.097	−3.935	1.400
Quality	Group I	171	−0.027	0.777	−2.729	2.475
	Group II	69	0.068	1.414	−2.986	8.835

It should be noted that the component values are standardised, so it is perfectly natural for negative values to exist. It should be referred that Group I places more emphasis on Access and Group II on *Quality*. This result seems to be aligned with the results obtained previously in the groups' classification. These new variables (*Access and Quality*), being continuous, allow a comparison of averages. In this context, averages' comparison tests were done, and it was presented the respective analysis of variance. The *Access* component has different averages between the groups, but the *Quality* component does not show statistical significance, therefore the null hypothesis of average's equality can be rejected (**Table 9**).

To sum it up the results obtained throughout this work show that most consumers revealed that rice is a very important basic food element for the population of East Timor. Since always, rice food security has been a major concern in East Timor, given the rural nature and the dependence on this product's high

Table 9. Test for averages comparison of the components between the two groups. (Squares' sum /gl/Square/F/p-value); (Access between groups/Inside each group); (Quality Between Groups/Inside each group).

		Square sum	gl	Square	F	*p*-value
Access	Between groups	10.239	1	10.239	10.653	0.001261
	Inside groups	228.761	238	0.961		
Quality	Between groups	0.444	1	0.444	0.443	0.506248
	Inside groups	238.556	238	1.002		

nutrition. This happens when everyone always has physical, social and economic access to adequate, safe and nutritious food, fulfilling their dietary needs and preferences and supporting an active and healthy life (Aliaga & Chaves-Dos-Santos, 2014). Food security of rice means that this food is available, being the distance and transport accessible and usable. Most consumers usually buy rice in the shop and, overall, consumer satisfaction is high, and it is considered a safe and sustainable food.

Consumer's demand is undergoing rapid changes as buyers become more aware of the issues related to food quality and safety, both on a national and international level. It is therefore necessary to optimize the economic, social and environmental performance of value chains in order to provide sustainable development of the rice agri-food chain in East Timor. However, it is essential better value chain linkages, information flows and coordination. Whole value chains, perceived as integrated systems, must be developed and strengthened if there is going to be any hope of delivering the values desired by consumers. The individuals who act on the value chain cannot achieve this by doing it alone; therefore, they need to play an active role, improving their practices and developing collaborations along the chain. Stakeholders, associated with the public sector, have a duty to support these practices, through relevant regulations. The demand for rice in the domestic market is high. We can even say that the domestic rice agri-food chain is essential in this demand, since we are facing a population that is growing very fast and whose needs need to be fulfilled.

The study identified four consumer segments and surveyed them considering rice taste, food security, sustainability and access. These segments can be used by public and private sector organizations as well as individuals to promote the sustainability of the rice value chain in East Timor.

5. Contributions and Limitations

Consumers are an important part of society and the effectiveness of policies depends on compatibility with the needs expressed by this group. They can learn from the different requirements of the rice consumer segments and are concerned with safety and quality of their products. It is interesting to note that most consumers are more concerned with the value of rice and are willing to pay more if the rice has high quality.

The actors in the value chain develop and strengthen their chains, improving practices that focus on product quality and safety. This study highlighted concerns about food security for consumers, which require an update of practices, particularly those that are still closely linked to the value chains of rice consumers.

With respect to the limitations, we highlight the problems with data collection and the empirical implementation of the results. In addition to the lack of information and studies on the subject of the rice value chain in East Timor from the consumer's perspective, the main problem was that there are often inconsistencies in the data collected from consumers. The collection of primary data started with the construction of the questionnaire.

It was not possible to obtain reliable responses from consumers in the communities of East Timor. The K-Means models, exploratory factor analysis (AFE) and Likert scales had to be adapted to the rice value chains, with the need to establish the parameters that compose them. In the construction of these models for consumers in the selected district Dili, questionnaire questions were used for the main variables that characterized the consumption of rice. However, not all information was available in the responses to the questionnaires, which hindered the empirical implementation of the model. In addition, the logistical and financial difficulties in the rice agri-food value chains were also dealt with.

6. Conclusion

This study examined the consumer's segments with value preferences as well as the individuals who act on the value chain. Different requirements of rice consumer segments, concerned with safety and quality of their products, were established. Curiously, most consumers are looking for value. Consumers are willing to pay more for the value added to the food.

Value chain participants were offered the opportunity to develop and strengthen their chains, by improving practices that provide adequate levels of quality and safety, as well as develop collaborative relationships along the chain. A significant portion of shoppers seek value/quality in both traditional and more modern shops, which may suggest an opportunity for value chain participants to redirect their efforts in order to achieve modern retail standards.

This study highlighted consumer's concerns regarding food safety that clearly demand an upgrade on the practices of the value chain's participants, particularly those linked to traditional value chains (Verbeke, Frewer, Scholderer, & De Brabander, 2007). As the market participants of modern value chains grows, those who operate traditional value chains cannot remain economically viable if they continue to ignore quality characteristics related to food safety and marketing, particularly, of rice. This changing scenario makes it imperative that traditional wholesalers understand consumer's value preferences and provide good quality, safe and affordable rice. Once initiating this process, it should be established hygienic conditions, both inside and around retail premises.

7. Practical Implications

This study examined the consumer's segments with value preferences as well as the individuals who act on the value chain. Different requirements of rice consumer segments, concerned with safety and quality of their products, were established. Curiously, most consumers are looking for value. Consumers are willing to pay more for the value added to the food.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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