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## ANALYSIS OF PERCEIVED COMPETITIVE FORCES INFLUENCING TREE TOMATO VALUE CHAINS IN RWANDA

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## ABSTRACT

The globalization of economies has added many new challenges to global agriculture. Agriculture not only needs to compete in foreign markets but also in domestic markets. The production and export of tree tomatoes remain extremely weak in Rwanda despite horticulture sector-specific economic policies in favour of the production and export of horticultural crops by the government of Rwanda. The goal of this study was to analyse the competitive performance of Rwanda's tree tomato value chain to shape the tree tomato industry in Rwanda for the benefit of smallholder farmers and the Rwandan Economy. One hundred twenty (120) respondents were surveyed for this study using a semi-structured questionnaire and focus group discussions. Participants were stratified into groups as traders (80), institutional consumers (12), and household consumers (28) all from Bugesera, Nyabihu, Rubavu districts and Kigali markets (Nyabugogo, Nyarugenge and Kimironko). Key enablers (International Centre for Research in Agroforestry, Rwanda Agricultural Board, National Agricultural Export Board, and Ministry of Commerce and Financial institutions) provided useful information related to the tree tomato value chain in Rwanda. The findings of this study show that factors that hamper the tree tomato value chain competitiveness in Rwanda are related to bargaining power. Overall 63% of respondents who were tree tomato suppliers and 58.43% of respondents who were tree tomato buyers agreed that the bargaining power of suppliers and buyers hamper the competitiveness of the value chain. The study found that 70% of traders and 57% of consumers and institutional consumers preferred the tree tomato. Therefore, tree tomato is highly linked to consumers, traders, and institutions than banana which is the 38<sup>th</sup> fruit highly scored. The severity of the threat to the tree tomato industry is new entrants into the tree tomato industry, the intensity of rivalry in existing key competitors, and the severity of the threat of substitutes. The strategies proposed to improve on the competitiveness of the tree tomato industry comprise of improving collaboration of tree tomato chain actors. This study found that 75.69% of the sampled key actors agree that the highest criteria to be considered are the product quality, and 64.74% of the sampled key actors settled on product quality as the least criteria.

**Key words:** tree tomato, smallholder farmers, consumers, traders, competitiveness, value chain, Rwanda



## INTRODUCTION

The processes of globalization and integration in world economics make the concept of competitiveness relevant and provoke a debate over key factors influencing this category [1]. The dynamic changes generate discussion of how to allocate resources and ensure food security and social welfare [2]. The determinants contributing to competitiveness and productivity growth are subject of interest worldwide [3]. Competitiveness in the agricultural sector has specific features and characteristics, which require change and adaptation of research approaches. Due to the complexity of the concept in theory and practice, no consensus has been reached on competitiveness definition and measurement [4]. The literature notes that the precise definition of competitiveness is subject to vagueness and that it has been explained and interpreted in different ways [5]. The difficulty in defining competitiveness has been attributed to its multidimensional applications and interpretations. Some authors define competitiveness based on its sources, such as productivity, whilst others place more emphasis on the indicators of competitiveness, such as profits [6].

Competitiveness in the context of agriculture could be seen on a national and international level. The competitive success of the agricultural holdings is determined by the competitive abilities they possess. They depend on factors such as resources, production structure, national markets, and related supporting productions [7]. The globalization of the economies has added many new challenges to agriculture around the world. Agriculture not only needs to compete in foreign markets but also in domestic markets and induce new customers in new markets to buy its products and attract investors [8]. It is for this reason that the issue of competitiveness has become important for the agricultural industry. As the industry cannot sustain its financial broader relevance and growth without producing and marketing competitive products and services [8].

In a study conducted on production constraints and measures to enhance the competitiveness of the tree tomato industry in the Wenchi municipal district of Ghana, Anang [9] found that the main constraints to tree tomato performance and its exportation are not limited to the lack of capital, but also to the high cost of production (high cost of fertilizer, pesticide, seed and tractor services), low price and exploitation by market queens. The fruit industry is indeed highly influenced by several factors, including increased globalization of markets, trade liberalization, advances in information technology, and consumer preferences [10]. These factors are changing rapidly and have a continuous effect on the competitiveness of the tree tomato industry, thus forcing producers, traders, and processors to remain unstable and not competitive when compared with other fruit producing farmers [10].



The government of Rwanda has developed horticulture sector-specific economic policies in favour of the production and export of horticultural crops [11]. However, despite all these opportunities, the production and export of tree tomatoes remains extremely weak. The reasons for this weakness are thought to be either production, marketing, or export problems in addition to policy-related problems [12]. To shape the tree tomato industry in Rwanda for the benefit of smallholder farmers and the broader Rwandan economy, it is critical to understand the industry's competitive forces and their underlying causes. The goal of this study was to analyse the perceived competitive forces influencing tree tomato value chains in Rwanda.

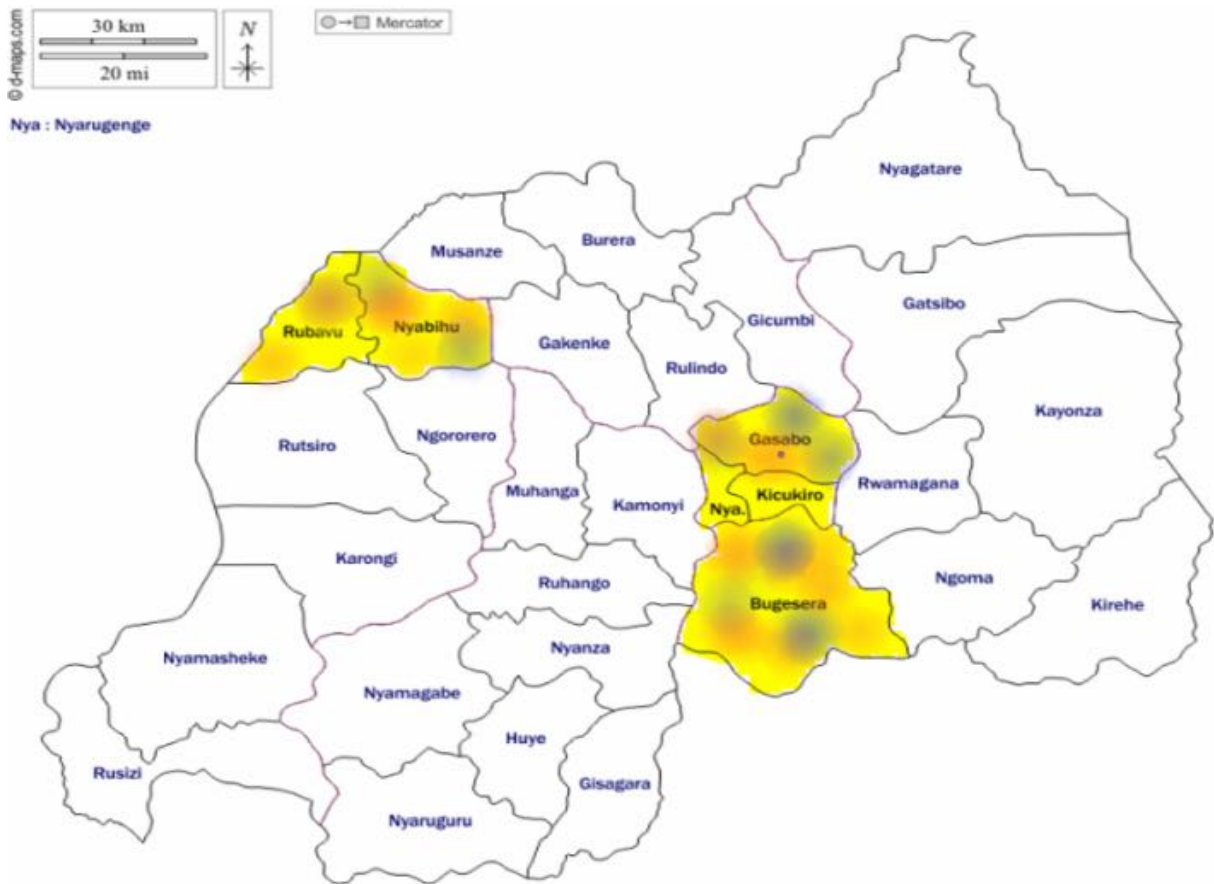
## **MATERIALS AND METHODS**

### **Description of the study area**

This study was carried out in Nyabihu and Rubavu districts of the western province, Gasabo, Kicukiro and Nyarugenge districts of Kigali city, and Bugesera district in the eastern province of Rwanda. Topography of the Bugesera area is characterized by a mixture of plateaux with an altitude ranging between 1,100 m and 1,780 m. Rolling hills are dominated by varying heights. The climate of Bugesera is dry with a temperature range between 20°C and 30°C with an average ranging between 26°C and 29°C. The rainfall of Rubavu district varies from 1200 mm to 1500 mm per year. The impact of climate change in the district is evidenced through the floods and droughts. Environmental degradation caused the deforestation of the Gishwati forest. The Nyabihu district is geographically characterized by 90% rugged mountains of relief with a slope of more than 55% creating a high risk of erosion [13]. The soil is sandy and clay, laterite and volcanic, and very fertile. Precipitation is almost uniform over every month and close to 1400 mm per year. The climate is temperate with an average temperature of 15°C which is favorable for the growth of the agro-pastoral products throughout the year.







**Figure 1: Map of Rwanda indicating the three research districts**

### Sampling technique

Determination of sample sizes was done by estimating proportions of the key tree tomato actors from the selected district according to Malterud *et al.* [14]. The study used primary data collected from 120 tree tomato value chain actors all from six research districts which are Bugesera, Gasabo, Kicukiro, Nyabihu, Nyarugenge and Rubavu districts of Rwanda. Markets of Kicukiro, Nyabugogo, Nyarugenge and Kimironko in the city of Kigali, Musanze and Rubavu markets in the northern and western provinces, and the Nyamata market in the eastern province were utilized to meet respondents. Respondents included institutional consumers (12), household consumers (28) and 80 traders.

### Data collection and analysis

Three different questionnaires, one for institutional consumers` respondents, one for household consumer` respondents and one for trader` respondents. Questionnaires defined the following attributes (factor, demand, related and supporting industries, and the firm's strategy and rivalry), which were pre-tested among smallholder farmers in the same study, assessed for survey's ethics and used. The questionnaires were checked afterwards to determine if all questions

had responses, thus, ensuring unanswered questions were addressed to eliminate any data entry gaps to improve the quality of data analysis.

Data were collected by three trained enumerators. In addition to the questionnaire, focus group discussions with structured interviews were used to collect the quantitative and qualitative data with tree tomato producers, traders and distribution based on their capacity. Porter's five forces model of competitive analysis was used in data analysis. Porter's five forces model of competitive analysis is an illustration of how the five competitive forces can be used to explain low profitability and viable entries to an industry [15]. These five forces are the threat of new entrants, buyer power, supplier power, threat of substitutes, and rivalry among the already established firms. The intensity of these forces highly determines the average expected level of profitability in an industry and their thorough understanding, both individually and in combination, which is beneficial in deciding what industries to enter, and in assessing how a firm can improve its competitive position [16].

Quantitative data were analysed using Excel and Stata SE 13 software packages. Frequency distribution, descriptive statistics, measures of central tendencies were utilized for data interpretation and summarization. Tables and charts were used to assess the level of competitiveness of the tree tomato value chain in Rwanda.

### **Ethical consideration**

The consent for the survey was obtained from the postgraduate students' affairs from the University of Rwanda, College of Agriculture, Animal Sciences and Veterinary Medicine, School of Agriculture, and Food Sciences, before it began. The rights of respondents were explained to them prior to their participation or not in the survey. Therefore, respondents' participation was voluntary. Privacy and confidentiality of respondents were assured. Respondents were requested to select from a list of questions and respond according to their choice, understanding and opinion.

## **RESULTS AND DISCUSSION**

### **Descriptive statistics of socio-economic characteristics of sampled respondents**

Consumers surveyed from Rubavu, Nyabihu, and Bugesera districts were 65 % females. The traders surveyed were 81 % females. These findings are consistent with the work of Bucyana *et al.* [17] and Brenton *et al.* [18] who found that the tree tomato value chain is dominated by women rather than men mainly in the trading sector. The study found that only 24 % of consumers had more than six years of basic education while 5 % of consumers had less than six years of basic education. About 25 % of tree tomato traders had more than six years of basic



education while only 6 % had less than six years of basic education. It is an implication in contrast from the report of National Institute of Statistics of Rwanda (NISR), 2016 adapted by Chantal [19] where in a 2016 Seasonal Agricultural Survey (SAS) analysis about 66.6 % of agricultural operators had primary level education. Tree tomato value chain actors, especially traders and consumers had less education level (25 %), which calls for an intervention aimed at improving the education level. Such an intervention would allow those actors to make relevant communication and decisions for business purposes. Age is the other demographic factor aspect analysed for the respondents. The age of the respondents ranged from 19 years to 67 years with an average mean age of 34 years for consumers and institutional consumers. To tree tomato traders' age category ranged from 19 years to 55 years with the mean age of 31 years. There was no significant difference in the ages of the sampled respondents for consumers and traders of tree tomatoes. This indicates that these two potential actors are still younger, productive and are risk-takers compared to the old actors. The findings are supported by the work of Desire [20], who found that the young generation is actively participating in the agriculture sector.

### **Bargaining power of suppliers**

The heaviness exerted by suppliers becomes contingent upon the prominence of their input product as a percentage of the total firm costs. High dependency signifies the bargaining power the suppliers will have upon the tree tomato industry. The bargaining power of suppliers ranges from low to high as indicated by tree tomato value chain key actors switching costs of input suppliers (71.26%) and reliance of producers on sales from input suppliers (68.95%), switching costs of buyers (producers) (67.73%), dependence of input suppliers on sales from producers (62.80%) are the main factors. Other factors that affect the bargaining power of suppliers are the availability of substitutes, the number of input suppliers relative to producers and the threats of forwarding integration.

### **Bargaining power of buyers**

Likert scale measure was used from low-weak to high/ strong association of different factors that may affect the tree tomato competitiveness. The bargaining power of buyers is very influential. The buyers of the organizations' outputs have the bargaining power that has the potential to lower prices and increase quality, this in turn, restricts the pressure on earning. The power and price sensitivity of the buyers are influenced by low switching costs and the importance of the product to the buyer. Table 2 shows that the factors that strongly affect the bargaining power of buyers were switching the costs of buyers (70.73%), number of producers relative to buyers (70.17%), and product differentiation (36.78%). Substitute's availability (47.46%) show a lesser effect on the bargaining power of buyers. Other





important factors that affect the bargaining power of buyers include, the volume of purchases made by the buyer (68.95%), threats of backward integration (62.08%) and reliance of producers on sales from buyers (52.85%). These findings are coherent with the results of the study conducted by Ndou [10]. who confirmed that the quantity of the total costs and product purchased in high volume is very high when switching off the cost of buyers.

### **Threat of new entrants in tree tomato value chain**

Profitable markets that yield high returns will attract new entrants who become competitors, sometimes of the existing chain actors. This results in many new entrants, which eventually will decrease profitability for all firms in the industry. Tree tomato key actors mainly consumers, traders, and institutions indicated variations of responses on threats of new entrants. Results in Table 3 show that the factors that pose a severe threat to new entrants in the tree tomato value chain are the capital investment required/ cost advantage (28.61%), access to suppliers and distribution channels (27.18%) and proprietary/special technology required (23.66%). The retaliation/collusion (12.38%) factor, is the last threat of new entrants in the tree tomato value chain. Brand loyalty and government regulations as well as the proprietary/special technology requirements are also associated with some severe threat of the new entrants in the tree tomato value chain. The threats of new entrants have a constraining impact on the competitiveness of the tree tomato value chain. These findings are consistent with the research results of Edwin [21], who confirmed that the threat of substitutes and of new entrants, respectively constrain the industry's competitiveness. It is important to indicate that new entrants do not have many new fruits introduced on the market, which can positively change the competitiveness of tree tomatoes. New entrants lead to increased competition and ultimately lower profits. The threat of entry can be lowered by barriers to enter. Some of the most common barriers are capital requirements, access to distribution channels, legal barriers, economies of scale and absolute cost advantage, product differentiation and the threat of retaliation.

### **Rivalry among existing competitors of tree tomato value chain**

The market rivalry enhances the competitiveness of the industry. Table 4 shows the results on the intensity of rivalry in the competition in the tree tomato value chain. There is an intense rivalry among the tree tomato value chain. The brand royalty (72.93%) is associated with high rivalry among the chain actors while the least rivalry is caused by fixed cost (59.49%). Between these two elements, there are production capacity, number of competitors, level of strategic diversity, exit barriers, size market share controlled by competitors, industry growth and differentiated products that are also the source of rivalry among actors in the tree tomato value chain.

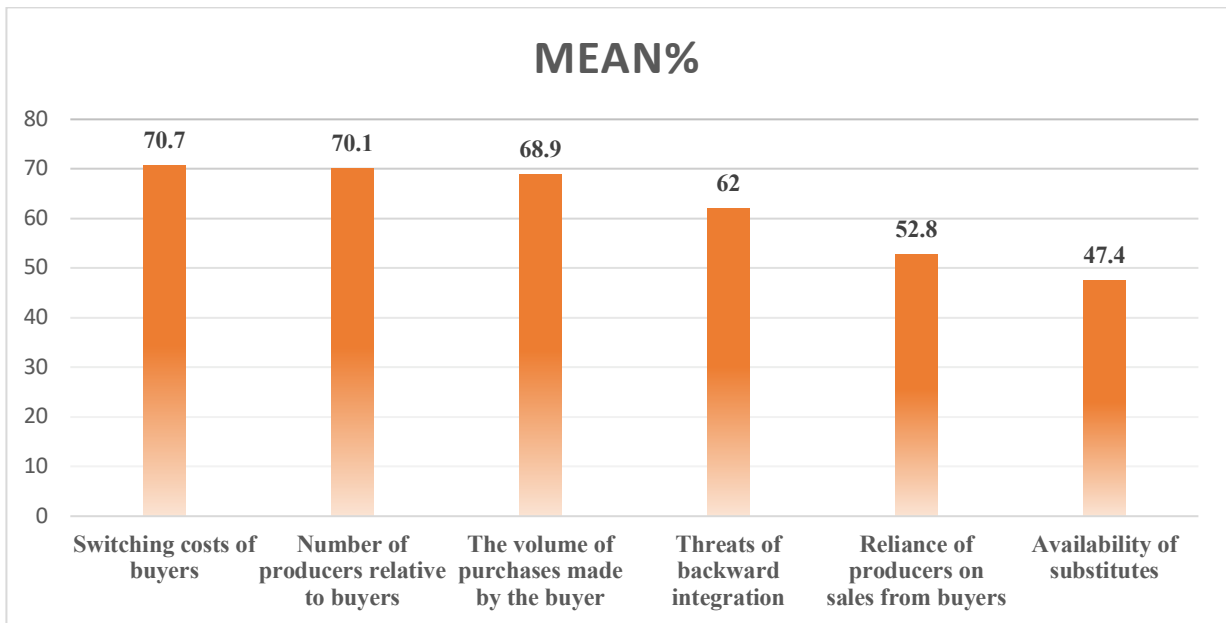


The market rivalry in the fruit value chain analysis is very intense. Results (about 64.93% of respondents) showed that the size of the market share controlled by competitors enhances the competitive advantage of the value chain, since intense market rivalry creates pressure on them to improve and innovate as reported by Shariar [22]. This pushes the chain actors to improve quality and services and to create new products and processes, which are required for competitiveness. Furthermore, 67.69 % of the respondents showed that the level of strategic diversity may affect the rivalry of existing key competitors of the tree tomato value chain. The findings confirm the theory on the strong correlation between vigorous domestic rivalry and the creation and persistence of competitive advantage in any industry. Inadequate competition in the domestic market gives rise to the inflexible value chain that is insensitive to market requirements, making them less competitive. The works of Edwin [21] and Rabah [23] showed also that strong local competition is important for the domestic market to become globally competitive. According to findings, it is rare for an industry to be competitive at global level while it is not competitive in its domestic market.

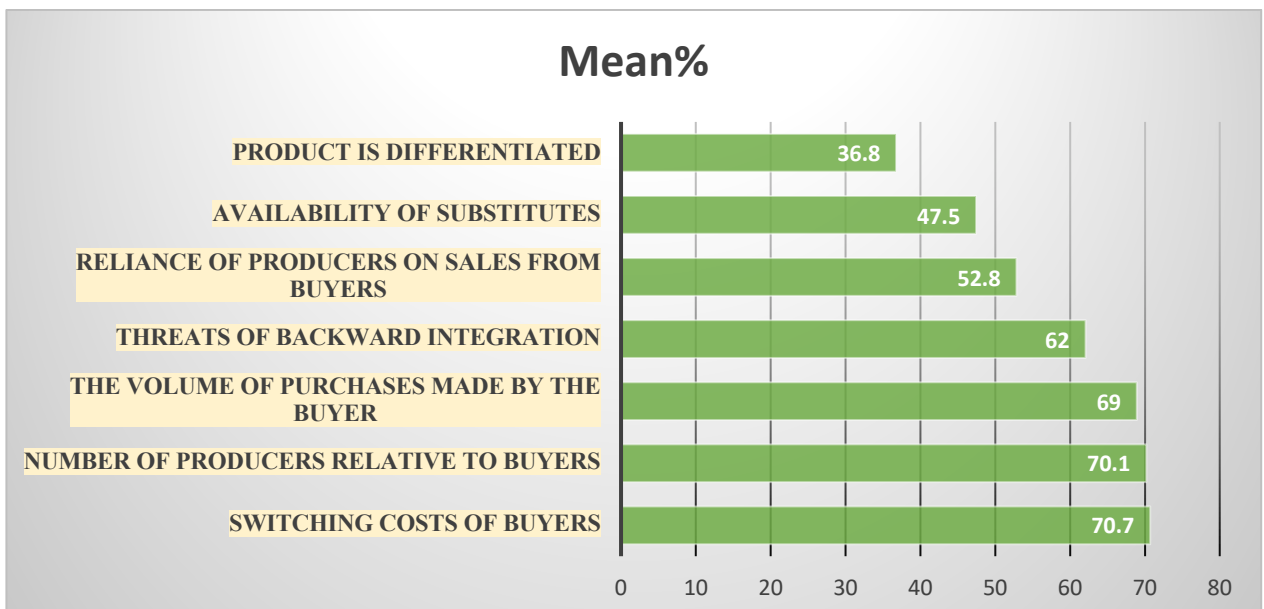
### **Threat of substitute products of free tomato value chain**

Table 5 presents the results on the severity of the threat of substitutes to tree tomatoes. Product (substitute) quality (75.69%) and product (substitute) performance (64.74%) are associated with the highest and least severe threat to tree tomatoes. Between these two elements, there is the availability of substitutes, the price of substitutes and the consumer switching costs that also threaten the competitiveness of the tree tomato industry. These results show that avocados, mangoes, and passion fruits are threat substitutes that do affect the pricing tree tomato value chain. Tree tomato value chain actors may be forced to reduce prices such that they match the market prices to avoid high differential gaps that may result in decreased sales hence fewer profit margins.





**Figure 2: Assessment of the bargaining power of suppliers**



**Figure 3: Assessment of the bargaining power of buyers**

## CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

Tree tomato value chain was dominated by females. In consumers surveyed, females were 65 % and in traders surveyed females were 81 %. The study found that only 24 % of consumers had more than six years of basic education while 5 % of consumers had less than six years of basic education. Tree tomato value chain actors, especially traders and consumers had less education level (25 %), which calls for an intervention aimed at improving the education level. The age of the

respondents ranged from 19 years to 67 years with an average mean age of 34 years for consumers and institutional consumers. The tree tomato traders' age category ranged from 19 years to 55 years with the mean age of 31 years. There was no significant difference in the ages of the sampled respondents for consumers and traders of tree tomatoes. This indicates that these two potential actors are still younger, productive and are risk-takers compared to the old actors. The findings are supported by the work of Desire [20], who found that the young generation is actively participating in the agriculture sector.

The bargaining power of suppliers ranges from low to high as indicated by tree tomato value chain actors switching costs of input suppliers (71.26%) and reliance of producers on sales from input suppliers (68.95%), switching costs of buyers (producers) (67.73%), dependence of input suppliers on sales from producers (62.80%) are the main factors.

The factors that strongly affected the bargaining power of buyers were switching the costs of buyers (70.73%) and number of producers relative to buyers (70.17%) while product differentiation (36.78) and substitute's availability (47.46%) show lesser effect on the bargaining power of buyers.

The study concluded that there is a need to switch off all channels of fruits from suppliers in the vicinity of Rubavu, Nyabihu, and Bugesera districts. Once these channels are switched off, there will be comparative advantages to the three selected tomato industries in the indicated districts of Rwanda. Therefore, the need for the tree tomato chain actors and farmers to be directly linked to ensuring that transaction costs are lowered for both actors (suppliers and buyers).

It was observed that substitute products of tree tomatoes may hamper the tree tomato competition and there is a need to bring down substitutes at a low price. It would require the tree tomato industry to reduce prices to match market prices in order to avoid high differential gaps that may result in decreased sales with fewer profit margins. The inclusion of women, the sense of associativity of processors and distributors, and the training of producers in topics related to post-harvest, and good agricultural practices, would significantly improve the economic performance of the network, and encourage greater participation of the agents involved. The network requires increasing the area allocated to tree tomato cultivation, and the application of greenhouse production systems that increase yields. Furthermore, the potential buyer of restaurant/hotels/ other institution consumers can spell out certain product criteria and assist farmers in their production activities to ensure a regular supply of tree tomatoes to the buyers. The tree tomato value chain in Rwanda has a strong rivalry from imports from Tanzania. This competition can provide an opportunity for the spread of innovation along the tree tomato value



chain, which in the long run will make the tree tomato industry in the Rwandan sector more competitive either locally, regionally, and on the international markets.

### **CONFLICT OF INTEREST**

The authors declare no conflict of interest.

### **ACKNOWLEDGEMENTS**

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**Table 1: Assessment of the bargaining power of suppliers**

Variables	Frequency (%) of bargaining power of suppliers n=80						
	Low	High	Slow	Fast	Large	Small	Mean
Switching costs of input suppliers	85.95	90.24	55.12	60.84	70.14	65.24	<b>71.26</b>
Reliance of producers on sales from input suppliers	75.34	82.27	65.47	55.34	66.56	68.74	<b>68.95</b>
Switching costs of buyers (producers)	55.32	75.2	48.31	78.23	70.94	78.35	<b>67.73</b>
Dependence of input suppliers on sales from producers	71.32	73.03	59.31	51.21	55.87	66.07	<b>62.80</b>
Availability of substitutes	60.12	30.12	68.17	55.37	73.12	68.58	<b>59.25</b>
Number of input suppliers relative to producers	82.21	75.23	50.12	52.38	50.12	40.18	<b>58.37</b>
Threats of forwarding integration	77.23	85.12	68.64	5.12	4.35	75.32	<b>52.63</b>

Source: Author's data, 2020

**Table 2: Assessing the bargaining power of buyers (Household (HH) and Institutional consumers)**

Variables	Frequency (%) of bargaining power of buyers n=40						
	Low	High	Slow	Fast	Large	Small	Mean
Switching costs of buyers	70.21	75.2	48.31	78.23	72.24	80.17	<b>70.73</b>
Number of producers relative to buyers	82.21	75.23	67.35	70.11	60.25	65.84	<b>70.17</b>
The volume of purchases made by the buyer	75.34	82.27	65.47	55.34	66.56	68.74	<b>68.95</b>
Threats of backward integration	53.17	65.3	68.64	35.84	74.18	75.32	<b>62.08</b>
Reliance of producers on sales from buyers	60.12	30.12	68.17	55.37	73.12	30.21	<b>52.85</b>
Availability of substitutes	23.12	35.24	30.2	60.84	70.14	65.24	<b>47.46</b>
Product is differentiated	28.12	30.18	27.67	40.03	30.45	64.25	<b>36.78</b>

Source: Author's data, 2020



**Table 3: Assessing the severity of the threat of new entrants**

Variables	Frequency (%) of severity of the threat of new entrants n=80						
	Low	High	Slow	Fast	Large	Small	Mean
Capital investment required/ cost advantage	75.2	28.1	6.12	11.4	3.21	47.7	<b>28.61</b>
Access to suppliers and distribution channels	55.1	22.4	3.45	35.1	32.2	14.9	<b>27.18</b>
Proprietary/special technology required	3.84	9.23	74.1	4.85	36.2	13.7	<b>23.66</b>
Brand loyalty	3.25	36.2	12.1	18.5	1.36	54.3	<b>20.96</b>
Government regulations	42.2	18.3	7.37	6.21	9.18	42	<b>20.88</b>
The threat of retaliation/collusion	11.9	7.12	21.4	5.12	19.8	8.93	<b>12.38</b>

Source: Author's data, 2020

**Table 4: Assessment of the intensity of rivalry in the competition of tree tomato value chain**

Variables	Frequency (%) of intensity of rivalry in the competition of tree tomato VC n=80						
	Low	High	Slow	Fast	Large	Small	Mean
Brand loyalty	80.3	68.2	73.1	65.1	83	67.8	<b>72.93</b>
Production capacity	75.4	80.1	85.1	75.4	22.3	86.1	<b>70.74</b>
Number of competitors	55.3	47.3	85.4	77.2	68.4	78.4	<b>68.65</b>
Level of strategic diversity	73.1	59.2	74.1	64.4	66.6	68.7	<b>67.69</b>
Exit barriers	38.3	57.6	87.4	54.3	71.2	82.2	<b>65.16</b>
Size market share controlled by competitors	69.2	61.7	64.8	65.2	67.6	61.1	<b>64.93</b>
Industry growth	65.4	56.2	58.1	74.1	56	55.3	<b>60.87</b>
Differentiated products	58.6	71.4	49.9	58.2	64.3	57.4	<b>59.96</b>
Fixed costs	82.2	68.1	48.3	52.4	67.1	38.9	<b>59.49</b>

Source: Author's data, 2020



**Table 5: Assessment of the severity of the threat of substitutes among key chain actors**

Variable	Frequency (%) of the severity of the threat of substitutes among key chain actors n=40				
	Low	High	Better	None	Mean
Product quality	80.9	58.5	88.2	75.2	<b>75.7</b>
Availability of substitutes	78	70.2	73.2	71.2	<b>73.2</b>
Price of substitutes	72.1	82.2	64.2	70.8	<b>72.4</b>
Consumer switching costs	65.1	66.3	75.4	74.2	<b>70.3</b>
Product performance	55.9	75.4	67.4	60.3	<b>64.7</b>

Source: Author's data, 2020

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