

RESEARCH ARTICLE

Challenges in tomato cultivation and marketing: a thematic analysis

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ABSTRACT

This paper aims to identify the challenges in the cultivation and marketing of tomatoes and the marketing mechanisms for the surplus production of tomatoes. This paper uses in-depth interviews with twenty-eight farmers and nine agricultural officials in different parts of Jaffna district. Focus group discussion was conducted to explore themes; six sub-themes were identified under two broad themes. Climatic changes, Modern technology adaptation, price fluctuation, and institutionalized policy, product diversification, and systematic marketing mechanisms were the identified sub-themes in this research study. Different strategies to overcome the climatic changes should be developed. As observed, local level adaptation and farm management system should be adapted in tomato farming system. Creation of an economic center in the region is very useful in order to avoid price fluctuations and losses faced by the farmers. Government should make policies to put up a processing center which in turn will give many employment opportunities for the youths and tomato farmers in the region.

Keywords: Challenges, marketing mechanisms, themes, tomato cultivation

INTRODUCTION

Economy of the Northern Province of Sri Lanka is in a crisis situation. It has been a decade since the end of the war but still the war affected Jaffna Rural livelihoods are struggling. The economy of the North mostly depends on agriculture and the obstacles facing its revitalization after the war recounts to agriculture. Vegetables are cultivated in Jaffna as a commercial subsistence crop as well as for domestic consumption (Dharmaratne, 2014). Untimely rains, floods and crop diseases have also ruined the northern agriculturalists during the past years to a great extent (Kadirgamar, 2017).

Jaffna Peninsula is a part of the dry zone of Sri Lanka which receives a total annual rainfall of about 635-1,400 mm (Mikunthan, 2010). The Peninsula however is well known for its cultivation of small onions, tomatoes and chilies which contribute significantly to the Gross Domestic Production (GDP) of the country. New crops such as potatoes and other horticultural crops have been introduced into the cropping system. Indeed, due to three decades war, not only the Jaffna district but also the whole parts are continuously suffering from enormous and long-lasting human, social and economic problems. It took a long time to move from this stage but still the region is not economically recovered from the cost of civil war (Sirinivasam, 2020).

After the civil war, agriculture marketing pattern has also changed (Perera, 2015). Marketing is the biggest issue that Sri Lankan agricultural producers face (Weerahewa, 2017). Vegetables, rice, and other agricultural products are imported from other parts of the island and the world. Even though certain agricultural products are produced in Jaffna the same products are coming from other parts into the Jaffna peninsula. Given the verge economic development, especially Jaffna peninsula wants to form a favorable cost-effective atmosphere and confirms that the benefits of development are largely distributed. Many researchers (Jayawardana *et al.*, 2019) indicated that Northern Province has plenty of resources to cultivate but in the case of agriculture development, policymakers should pay attention not only in designing agriculture and agriculture marketing policy but also in implementing and achieving the targets within a given time frame. Majority of the Sri Lankans believe that government authorities should actively engage in providing marketing services to smallholders (Weerahewa, 2017). This is because it does not have an ideal sustainable agriculture policy. At present, many farmers concentrate on

various crop cultivations including tomato and red onions in this district. However, they are facing many challenges while sustaining in the field.

Recently Jaffna district secretariat office launched a five-year district development plan: 2018 – 2022. It disclosed following issues related to the agriculture industry: low adoption of new technology, lack of institutional capacity, ineffective post-harvest handling and lack of marketing capacity and value addition mechanism (District Secretariat-Jaffna, 2018). Within literature, many researchers observed that throughout the world the agriculture marketing has become a big challenge due to globalization and economic liberalization (Magar and Gauchan, 2016). According to Cairns (2019) food marketing is any form of commercial advertising or other for-profit persuasive activity used to promote the purchase and/or consumption of a food or non-alcoholic beverage-for example price discounts, sponsorship, and point of sale incentives. Kohls and Uhl (1985) described food marketing as the performance of all commercial activities involving the movement of products and services from the idea of initial agricultural production until they are in the final consumers' hands. This explains that the marketing is not limited to non-farm operations. There is no interdependence between the producer and the intermediaries who complete the process of producing by adding values to the agricultural products. Agricultural marketing theory is the underpinning theory for this study. Kotler (2003) defined agricultural marketing as the performance of all business activities involved in the flow of food products and services from the point of initial agricultural production until they are in the hands of consumers.

In emerging nations, as per the Food and Agriculture Organization (FAO) of the United Nations emphasized, traditional marketing of agricultural products involves many problems such as restricted access to market information, illiteracy among majority farmers and multiple channels of distribution involving several middlemen (United Nations, 2019). Neither producer nor consumer is benefitted by the time the product reaches the final consumer from the farmers. The middlemen earn higher profits as compared to the farmers. According to Rööös *et al.* (2017), size of the human population, per capita consumption of food (eaten and wasted), and impact per kg of food produced, transport, distributed and ultimately disposed of will affect the total environmental impact of food consumption. The global population is expected to reach 9-11 billion by 2050 (United Nations, 2012). In addition to that as viewed by United Nations in 2019, this improved demand for foodstuff will be determined by the population growth; by 2050, it is expected that the earth will have 9.7 billion people, representing 26% increase compared to population of 7.7 billion (United Nations, 2019).

Researchers believe that in developing countries, agriculture sectors play a major role on development of rural economy (World Bank, 2020). However, in Sri Lanka, contribution of agricultural products to Gross Domestic Product is continuously decreasing (Jayasinghe-Mudalige, 2010). As mentioned earlier, farmers in Jaffna district are paying more attention to cultivate various varieties of crops like onion, tomato and other vegetables. Tomato cultivation was selected for the study due to its importance in production and consumption patterns. It plays an important role in human nutrition because of its low fat and carbohydrate but high content of vitamins, minerals and dietary fibers (Chagomoka *et al.*, 2014). This research study tries to find out the challenges faced by tomato farmers in their production, marketing and the marketing mechanisms to protect the farmers from surplus production. Tomato is the largest vegetable crop produced in the world, and is known as protective food due to its unique nutritional value and wide distribution (Ramappa and Manjunatha, 2017). Tomatoes and tomato-based foods are said to be safe because they are significantly low in calories but hold a remarkable micronutrient combination of antioxidants. Tomato is a significant and seasonal cash crop for Sri Lankan farmers. Due to seasonality, there is a substantial surplus of production over customer demand during the period. At the same time, a wide variety of processed foods is also derived from tomatoes.

There are several tomato products in the Sri Lankan Market such as tomato sauce, paste, puree, chutney etc. These items are commonly used in households, hotels, restaurants and institutions. In Jaffna, tomatoes are generally used garden-fresh but to a limited degree as processed paste, puree, and to an even limited degree, as juice. The absence of a heat tolerant assortment for the dry season and the low level of technological know-how knowledge for farming are the key flaws in the existing production system (Dharmaratne, 2014). Tomato cultivation in terms of the area is 200 ha and the production is 1957 MT in 2018 in Jaffna Peninsula. Farmers get surplus production in tomatoes in the Jaffna district. The main reason for the surplus is lack of vision and understanding of the farmers. Cultivation of different types of vegetables by the farmers is mostly decided based on the prices of the previous season. Due to lack of dissemination of market information and high supply, farmers are not being protected during the crisis of over production. Farmers do not have enough knowledge about processing tomatoes into various other products or a value addition. One of the main obstacles that needs to be counted in terms of farming improvement in the Jaffna Peninsula is the rebuilding of appropriate agronomic marketing structures for tomatoes in the area. A baseline study on agricultural marketing structures will be supportive in recognizing the contemporary condition of agricultural marketing structures and flaws of the prevailing marketplace arrangements for tomato production in Jaffna.

LITERATURE REVIEW

One of the elementary characteristics of entire markets, including agrarian markets, all the direct and indirect contributors like producers, suppliers, customers etc. will have a great attachment within themselves. According to Renko *et al.* (2002), when considering the function of the market, normally the members of the dealings are counted on, whereas the importance of the associated institutional and infrastructural backing which affects the market activities, is neglected. The national and its administrative organizations have an essential part which generate the elementary conditions for the working of the market and encouraging market growths that the regime considers to be progressive. There is no appropriate and up-to-date information received to the state organizations and members in exchange, and thus there is a lack in fundamental circumstances with regard to cost-effective usage of constantly rare means. Government experts in Croatia - a country in transition - has identified abundant flaws in running the market of agrarian goods. One of the most vital failures was the inadequate and delayed diffusion of facts that would be beneficial for the ordinary operation of the market, particularly the data that was linked with marketplace disorders.

Pacific and Asian region are largely agricultural yet there takes place a transformation from traditional farming into money-making initiative which produces mostly for marketing. In transitional nations where the marketplace instruments still are immature, due to the inbred weaknesses initiated by their former operation in non-market economies (former communist states), where the government plays a major role, because the public government should become involved in process aimed at refining the agricultural structure, increasing the effectiveness of local manufacturers and recognizing, presenting and implementing new expertise.

Quick globalization of national and international agriculture systems present numerous contests for researchers and policy makers in emerging nations (Birner *et al.*, 2009; Labarthe *et al.*, 2013). In last few years, China and India have executed several reforms to enhance their agricultural expansion and economic progress (Babu *et al.*, 2019; Gulati and Fan, 2007). Both countries employed diverse tactics to tackle the agrarian development concerns. China handled bottom-up style beginning with reforms within the agrarian sector on the other hand India adopted top-down restructurings. Thus far, the agriculture-driven economic development in China had a larger influence on poverty alleviation, mainly in rural zones (Huang and Rozelle, 2009).

Researchers say that the prevailing agricultural technology and understanding are insufficient to achieve the development in food creation needed to meet the set growth aims (Bishwajit, 2014; Rosegrant *et al.*, 2007). Modern technologies, policies and practices should be designed and disseminated to the farmers in order to enhance the agricultural production and efficiency. The

advancement and dispersion of a novel technology is finally reliant on the competency and efficacy of the agricultural research and extension. Agricultural transformation makes smallholders to travel away from conventional manufacturing procedures, thus growing the need for a more differentiated extension system (Birner *et al.*, 2009; United Nations, 2019). However, the smallholder farmers in developing countries face difficulties in finding enough information on how to manufacture, process, and market commodities (Magar and Gauchan, 2016).

In China new agricultural market modifications have been announced such as augmented commercialization which has caused in many smallholders unable to get services (Hu *et al.*, 2012). In India, through the reforms, the farm income has been increased but efforts to scale-up these inventions have been severely controlled by a lack of regime means, inadequate backing for native extension platforms, and a lack of collaborations with NGOs to form farmers' clusters.

Terpstra (1972) proposed a very interesting marketing approach which can be applied to food with some credentials. It has defined four tasks that have to be performed successfully if a business is to market its goods properly. Firstly, the company should do a study about their potential customers and factors which affect their purchasing behavior, to create goods and services which meet the needs and expectations of customers. In this regard, the company must set rates and conditions that appear acceptable to consumers while achieving what the company considers to be fair profit at the same time. Thirdly, the company has to ensure the distribution channel that goods are available when and where the consumers can get them easily. The fourth and final task of the company is to educate the customer about its product and this will possibly include some ways to convince them to purchase.

Sri Lanka is a tropical agricultural paradise blessed with an agro-climate appropriate for an extensive range of tropical, subtropical and some temperate fruits and vegetables. Vegetables and fruits from the Northern region are greatly favored by customers due to their sole essence and the savour. This environment is a strength to crop growth in the area and the agricultural segment in the region seems to bid the best promise for growth of the horticultural segment in the forthcoming as this sector gets importance in vegetable and fruit industry (Dharmaratne, 2014).

Jaffna peninsula is reflected as the agronomic heaven of the nation and agriculture is the main commercial activity of the natives in the area. Since the ancient times, paddy/rice, red onion, green chili, potatoes, tobacco, fish, dairy products, palmyra products and eggs are the major agricultural products of Jaffna. Recently, banana, grapes, mangoes and vegetables such as tomato, beetroot, carrot, cabbages and brinjal have developed into more famous and money-making crops. It is distinguished that the crop assortment is the prominent attractiveness in Jaffna peninsula (Dharmaratne, 2014).

Marketing structure of the Jaffna district is mainly disorganized and less creative. After three decades of war in the country, little efforts have been made to form and progress the marketing structure in the region recently. Government took some efforts to shape several marketing operations but nothing considerable has really been accomplished, because there are numerous kinds of difficulties and restrictions in agricultural marketing (Dharmaratne, 2014).

Tomato plant is one of the most broadly cultivated plant crops in the world. It is a significant source of vitamin and an essential cash crop for average scale money-making agriculturalists. Tomato has been originated in the Andes Mountains in South America and contributes to a healthy well-balanced diet. They are rich in minerals, vitamins, amino acid, sugars and dietary fibers. Tomato contains vitamin B and C, iron and phosphorus although a ripe tomato comprises 93 to 94 percent water. In Nepal, tomato is the third most important vegetable after cauliflower and cabbage in terms of area and production (Magar and Gauchan, 2016) whereas India positions second in the area as well as in production of tomato according to the Indian Horticulture Database in 2013 (Ramappa and Manjunatha, 2017). Wilt is one of the main illnesses causing commercial damages in many harvests. It is initiated by infections of many bacterial (*Ralstonia solanacearum*), fungal (*Fusarium* spp., *Verticillium* spp., *Rhizoctonia* spp.,

Sclerotium spp.), oomycete (*Pythium* spp., *Phytophthora* spp.) and viral (Tomato Spotted Wilt Virus) pathogens (Sandani and Weerahewa, 2018). The climate variability would further aggravate the production of tomatoes.

The practice of agrarian marketing in Jaffna is widely enhanced, well-structured and urbanized after the civil war. Jaffna district consists of many practices of markets. These are spread throughout the area mainly in places such as Chunnakam, Thriunelveli, Maruthanarmadam, Changanai, Kodikamam, Chavakacheri, Nellyyadi, Pointpedro, Kalviyangkadu and the city of Jaffna. Before 1950, Chunnakam and Kodikamam markets had functioned two days a week. Chankanai and Chavakachcheri markets also had been functioning their business activities only three days a week. The agricultural market activities have been happening at minor level a century ago in Jaffna. These markets include daily market system, small wayside shops and super markets which are an emerging trend nowadays. However, it is essential to note that there are no every day Economic Centers in Jaffna (Dharmaratne, 2014). Many vegetable markets are nearby to the grower's field area. Due to these agriculturalists are aided in terms of transportation, packing, retailing and finding out the market situation. Therefore, the transportation time and cost, wastages remain very less in many agrarian goods. Thirunelveli, Maruthanarmadam and Chunnakam are wholesale and retail markets. Most of the other markets are only retail markets.

The prolonged civil war and calamity in the area and plan modifications had spoiled the marketing schemes, market places, infrastructure and its safety link. Therefore, most small-scale agriculturalists do not hold appropriate marketing means, and this is the main hindrance for a bigger production. Many of the growers feel that they face a high hazard of not being able to sell their production at reasonable values in the markets. As mentioned by Dharmaratne (2014) is it much crucial to secure a reliable market, an affordable price for the production, a smooth system by way of which a farmer can market his production and at the same time he should be able to obtain the maximum possible portion of the amount paid by the customer for that production.

MATERIALS AND METHODS

Research design

This study adopted exploratory research design. It focused on the qualitative research methodology. The power of qualitative research is its skill to deliver complex textual explanations of how individuals experience a given research problem. It delivers information about the "human" side of a problem – that is, the often contradictory conducts, principles, views, feelings, and interactions of individuals (Bricki and Green, 2007). Content from thirty-seven personal interviews (twenty-eight farmers and nine agricultural professionals) and focus group interviews have been interpreted using thematic analysis. Thematic analysis is the search for emerging themes that best describe the phenomenon (Daly, 1997). Braun and Clarke (2006) claim that thematic analysis is a flexible and useful research tool, provides a rich and very detailed, but complex, account of the data. As suggested by Fereday and Muir-Cochrane (2006) thematic analysis is a method consists of identifying themes via reading the data thoroughly and many times. This analysis method is very useful in drawing the insights from the real happenings and understandings and expands on the social context which is linked with the interpretation of these experiences (Braun and Clarke, 2006). The six steps recommended by Braun and Clarke (2006) to do a thematic analysis. They are familiarizing yourself with your data, producing initial code, searching for themes, revising themes, outlining and naming themes and finally generating the reports.

Data Collection

The researcher collected the data from the farmers and agricultural department officials. Snowball sampling technique was adopted in this study. Twenty-eight farmers who do tomato cultivation and nine agricultural department officials were selected through this technique. Respondents were denoted in sequential order as R1, R2, to R37. The data collection included both semi-structured interviews and focus group discussion. Snowball sampling consists of a group of interested people to recognize other members. At the initial stage, one farmer and one agricultural officer were selected for the interview. Then, the farmer introduced several other farmers around his area and the agricultural officer introduced other officials and one farmer from other areas. Using snowball/referral sampling approach, the researcher was able to get in contact with other farmers. Thus, the focus group discussion was held from December 2019 to August 2020.

Data Analysis

Research questions of this study would be illustrated as followings: Research Question 1 (RQ1): What are the challenges faced by tomato farmers in their Cultivation and marketing? Research Question 2 (RQ2): What are the marketing mechanisms to protect the farmers from surplus production? All interviews were audio recorded in their entirety and transcribed. Four interview questions were asked to get the perspectives of the farmers regarding the two research questions. Interview questions were the challenges faced by the farmers in their production and marketing their production, the support given by the agricultural/governmental authorities, what they expect as their solution from their perspective. Thematic analysis was selected because this technique is especially beneficial “for the purpose of drawing insights from real events and experiences and further elaborates on the social context which is associated with the interpretation of these experiences” (Rishi and Gaur, 2012). Based on Braun and Clarke (2006) and Creswell and Tashakkori (2007) for the current study, a theme is well-defined as a collective bunch of ideas, “issues” (Stake, 2005) and “fragments of experiences” (Aronson, 1994). A wide theme in this research, hence, signifies patterned sense within the data set. Sub-themes reveal a “hierarchy of meaning within the data” (Braun and Clarke, 2006). Sub-themes in the current research are used to give shape to a large, broad theme and help in accepting the difficulty and all-inclusiveness of the broad theme. Collected data were thematically analyzed and came up with two broad themes and six sub-themes.

RESULTS AND DISCUSSION

In this research, RQ1 tries to find out the answer to the challenges faced by tomato farmers in their production and marketing. RQ2 emphasizes on what are the marketing mechanisms to protect the farmers from surplus production. The researcher identifies two broad themes as “challenges in tomato production and marketing” and “marketing mechanisms for surplus production” and sub-themes too. Climatic changes, modern technology adaptation, price fluctuation and institutionalized policy are the identified themes for the RQ1. Product diversification and systematic marketing mechanisms for surplus tomato production are the sub-themes for the RQ2.

Many evidences prove that universal climate change is increasing. It is being experienced in numerous forms as temperature rise, sea level rise, droughts, floods, storms and landslides. Although, at present, the complete influence of weather conversion on the universal scale agrarian yield is not reliably projected (Gornall *et al.*, 2010), numerous studies display severe repercussions for agrarian yield. For example, in South Asia by 2050 the production of rice, wheat and maize will reduce by 14, 44 to 49, 9 to 19%, respectively, in relation to a no weather change condition (Nelson *et al.*, 2009). The historical temperature-yield relationship shows that, at the universal scale, heating from 1981-2002 possibly offset some of the yield gains from technology improvements, increasing CO₂ and other non-climatic aspects (Lobell and Field, 2007). The most severe effects of worldwide climate change will be felt on smallholder growers in the developing states (Esham and Garforth, 2013). Panabokke and Punyawardena (2009)

stated that the precipitation variability accompanied by weather extremes has developed a norm rather than an exception in the dry zone in recent years. High shower variability tempts great precipitation occasions such as floods and droughts which are the most eminent climate-based natural calamities inflicting harms to agriculture in Sri Lanka (Esham and Garforth, 2013). This was evident through the interviews. Respondents said that they are suffering from climatic changes and could not predict it too. For example, they said that “Climate changes cause many problems in our tomato cultivation. Rainfalls patterns have changed nowadays. Department of Agriculture does not support us much. We, on our own bear all the expenses and losses. That’s why we are still poor. Our livelihoods are not stable (R1, R7, R19, R17, R30)”.

As pointed out earlier, climate change in Sri Lanka has become a major challenge to the agriculture industry. This has limited the ability of farmers in the context of livelihoods. Many farmers are struggling to meet their day-to-day expenditures. Livelihood is defined as sufficient stocks and movements of food and cash to meet fundamental requirements, security states to secure ownership of, or access to, assets and revenue – earning deeds, counting capitals and assets to offset risk, case shocks, and meet contingencies (Ashley and Carney, 1999). Sustainable denotes to preservation or improvement of resource productivity on an extended period basis. A household may be allowed to gain sustainable livelihood safety in many ways – through ownership of land, livestock to trees; rights to grazing, fishing, hunting or gathering; through constant employment with sufficient wage; or varied repertoires of activities (World Commission On Environment And Development, 1987) In this sense, sustainable livelihood helps reduce poverty and is a precondition to secure life of the population. Further, one of the respondents mentioned that “Tomato crops are affected by many kinds of diseases. It’s really hard for us to maintain. We are not sure whether these happen due to climatic changes or not. Department of Agriculture should come forward to prevent it by doing some research in collaboration with some other institutions (R3, R4, R14, R27).

Climate change has become a major cause of the spread of infection, destruction of crops, particularly tomato crops and farmers apprehension. It creates a complex and complicated situation in the agriculture sector. Youths’ attentiveness in the agricultural sector is declining over years. Youths are part of farming household, but many rural parents in evolving nations do not want their kids to do farming. Without parental backing, it is not easy for young people to get involved in family farming (Paisley, 2014). Labour cost is another major problem. The young generation does not come forward to work in the field. They prefer white-collar jobs now. Labour cost is high and the working hours are very limited due to high demand for the labourers (R2, R15, R21, R31).

Adoption of a novel technology frequently requires extra investment. Producers are capable and eager to make this investment under two conditions: (1) when they have adequate properties or access to adequate principal to finance the first investment and costly experimentation during the initial learning stage, and (2) when the future does not look too unclear. At the same time, there is also the concern of irreversible fixed costs, which discourages the investment in the face of price variability (Chavas, 1994; Dixit and Pindyck, 1994).

Modern technology is adapted by a very few numbers of farmers in the Jaffna district. There is an evidence that one farmer is doing chilly production in hybrid technology under World Bank project.

This particular farmer comes under our agrarian office zone. I have seen him adapting different modern technologies. His Chili plants are specially covered with nets to avoid the insects coming inside and the proper net was set to get enough sunlight. CIC has made a contract with him for daily supply (R11, R12).

Throughout the interview, many respondents expressed their worries about the investment for modern technology. Despite that many of them do not like to shift to modern technology as they have trained in the traditional way from their childhood. Making an attitudinal change in farmers' minds is very difficult. For example, one farmer indicated that "We still follow the traditional way of farming. We do not know any technologies like other countries. We always suffer. No one helps us to learn or invest in this (R23)".

Famers seek productive seeds. Hybrid seeds are also in fewer amounts and less encouragement in doing among the farmers. It is also one of the main factors to lower productivity of agriculture products in Jaffna.

Agricultural organizations matter for agrarian growth (Fan and Zhang, 2008; Kijima *et al.*, 2011; Laiglesia, 2006). In particular, informal and formal agrarian organizations lower the cost of participating in the agricultural enterprise, encourage faith, and lessen price volatility. For example, in China, the institutional novelties make known to the world in 1978 led to a 60 percent rise in agricultural output growth and a 20% point reduction in rural dearth during 1978 and 1984 (Fan and Zhang, 2008). Absence or deprived functioning of agricultural organizations can impact the performance of the agricultural sector (Bategeka *et al.*, 2013). Many participants emphasized the requirement and importance of institutional arrangement with the collaboration and coordination of the host community participants.

Most of them stressed that earlier there were onion cooperation. Due to the civil war, it has broken down. Now also we do not have separate cooperation for tomatoes. Government authorities should take initiatives to start such cooperation for tomatoes. Presently, we are getting tomatoes from other districts like Nuwara-Eliya. The government authorities should restrict that. They should have regional based policies. Political parties in Jaffna should think about policies too. If we have a policy of not sending our vegetables to other districts during some the season and not get any from other districts during some seasons it will help the farmers to do more cultivation. This is given by the fact that our people consume tomatoes which come from other parts of the country (R5, R18).

Today, economic deregulation, advancement in population, urbanization, and extremely changing rates (both upwards and downwards) are significant elements to consider because they materially change the conditions of access to markets and marketing. Many farmers pointed out the problems they meet when trying to sell their products and the low levels of revenue that they are able to earn. Market access is a primary struggle, but it is only one feature of the problem: once at the market, they must sell for a price that produces adequate income for them.

Almost all the family members take part in vegetable farming including preparing the site, making vegetable beds, fertilizing, weeding, watering, protecting, harvesting, taking the produce to the roadsides, and waiting for the lorries that are coming to collect them (R9, R17).

The prices are very low in most of the time; farmers get less than the cost of production. We usually just level off the cost of the labour. The traders make a huge profit while we continually suffer. Sometimes, the farmers do not bother to harvest tomatoes and just left them to decay on the farm because of very low prices (R29, R22).

Tomato is a widely grown crop around the globe because of its savour, color, aroma, and nutrient contents. It can be eaten fresh or processed forms. Tomato may contribute to a healthy, well-balanced diet as it is low in calories and is a source of vitamin A, C, and minerals. It provides small amounts of the vitamin B complex, such as thiamin, riboflavin, and niacin (Sainju and Dris, 2005). Tomato consists full of iron.

Organizations may follow diverse progress tactics to strive and to face economic vagueness. Such tactics can be molded by a concurrent pursuit of marketplace saturation, marketplace growth and product expansion. Among development stratagems, diversification is well notable (Jarrar and

Smith, 2011). Tomato in India occupies second place amongst the vegetable crops in terms of production. Another positive trend has been that India's making level of processed tomatoes has risen by 50 percent. The focal objective of processing is to supply wholesome, safe, healthy and satisfactory food to buyers throughout the year. Tomato has excess production. But, there are no facilities for product diversification in Jaffna for example, tomato sauce, paste, puree, chutney. Those tomato processing facilities should come to Jaffna. During the excess production, farmers are struggling to store their excess products.

Price variation is a multifaceted problem credited to several factors which, when combined, culminate in hazardous consequences for the most vulnerable. Although high prices can technically be good news for agrarians, price fluctuation is extremely hazardous, as farmers and other mediators in the food chain risk losing their investments if prices plummet. One commonly quoted cause for augmented prices is 'market fundamentals' (Huka *et al.*, 2014). Intermediaries play a major role in the prices changes. They are facing higher transportation charges which they are in turn passing on to agriculturalists (Baffes, 2011). Many agriculture productions have been sending to out – district. Farmers expressed reasons: there are two purposes for sending their productions to out-district, one; they are getting more profits and the other one is they are able to sell more products at a time. Most of the farmers prefer to get profit immediately to manage their day-to-day expenses. Even the slightly damaged products are accepted by the regular customers if they send to the economic center. In Jaffna, the influence of intermediaries is high. Farmers are working hard and customers need products at a certain price but the intermediaries are getting more profit in a short period. When farmers sell in the local market, there is a reduction in their return and even the farmers are struggling a lot, they are unable to get the desired profit.

CONCLUSIONS

Tomato production in Jaffna is giving high yield due to the weather conditions and the soil type. Farmers put more effort to protect plants from diverse diseases and insects and finally they managed to get a good yield. During the research study, the researcher was able to find out many issues faced by the tomato cultivators.

The Sri Lankan government understands the prominence of temperature change adaptation has taken numerous initiatives at the strategy level to address the fears of temperature change. Yet, it is important to note that neither the national development strategy nor the national agricultural policy had spoken the problem of temperature change explicitly. This suggests that little effort has been made to mainstream climate change adaptation into national development policies until the National Climate Change Adaptation Strategy (NCCAS) was formulated in 2010. Ministry of Agriculture (2021) in its National Agriculture Policy proposed to promote adoption of appropriate adaptation and mitigation measures to increase climate-resilience of the agriculture system under the thematic area of climate resilience and other risk management.

Further, in order to fight against this challenge, research studies have emphasized on different strategies to overcome the climatic change. On technology growth front, the most shared tactic is to develop crop varieties to increase tolerance to moisture pressure, salinity, high temperature and elevated CO₂ levels (Harris and Shatheeswaran, 2005), local-level adaptations (Esham and Garforth, 2013) the village tank-based farming societies in the dry zone adapted by aligning agricultural deeds with the recognized seasonal pattern of rainfall and managing rainwater harvest in the generally maintained village tanks (Senaratne and Wickramasinghe, 2010), farm management methods in order to overcome climatic change issues.

Modern technology has been adopted by only one farmer in Jaffna. Others are reluctant to adapt to the changes. Lack of knowledge, lack of awareness of the modern technology benefits and fear to invest on this technology are the major barriers to the farmers in Jaffna. Technology in agriculture can be used in different aspects of agriculture such as the application of herbicide, pesticide, fertilizer, and improved seed. Ministry of Agriculture has already introduced some e-agriculture packages that include interactive ICT and mobile platforms, software applications, etc. to spread agriculture facts. But, there are lacks in modern technology knowledge

dissemination among the tomato cultivators in Jaffna district. Integrated natural resource management information system, e-market place for agriculture, agriculture early warning system, online compensation for crop and livestock affected are a few solutions that should be highly implemented by the authorities. Relevant agricultural system should take imitative steps to spread the knowledge about the modern technology usage.

Market price fluctuation for tomatoes is another biggest challenge faced by the farmers. Institutionalized policies should come up to protect the farmers in specific regions. Economic center establishment will create a good opportunity for the farmers to sell their products for a good price which gives a good profit to the farmers where there is no intermediary business.

Agricultural authorities should take steps to build up a tomato processing center in the region. Surplus productions are being thrown away due to less storage and processing facility. Transporting tomatoes from the farm to the marketing center's is a risky task because of the short shelf life and the absence of proper refrigeration facilities along the market chain. Tomato processing facilities would offer producers the necessary buffer against seasonal glut that reduces prices of the production.

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