

Factors Affecting on Shifting from Current Cultivation to Hot Pepper Cultivation along with Contract Farming Practices: A Case Study in Minuwangoda, Sri Lanka

HSW Gunasekara^{1#}, GC Samaraweera¹ and G Jayasundara²

¹*Department of Agricultural Economics, Faculty of Agriculture, University of Ruhuna, Sri Lanka*

²*Ceylon Agro Industries (Prima Group), Seeduwa, Sri Lanka*

#sapuniwathsala38@gmail.com

Abstract— Even though Capsicum Chinese (Hot Pepper) has been recognized as a profitable crop for contract farming in all over the world, Sri Lanka has not yet recognized its economic value and this sector remains unexplored yet. Therefore, this study was conducted to identify the factors affecting the shifting from current cultivation to Hot Pepper cultivation. This research survey study was carried out using a pre-tested questionnaire for 70 vegetable farmers in Minuwangoda. The sample was selected using simple random sampling method. Collected data were analysed using descriptive and inferential statistics. The findings of this study revealed that market potential and agro climatic compatibility are the main factors that impact on farmers' preference on Hot Pepper cultivation on contract basis. Furthermore, the present study revealed that price, quality, timeliness, quantity, proximity and credibility of seed source and crop performance affect while purchasing the seeds from the company in contract farming. Moreover, a fixed price, market assurance, profit, quality standards, transportation and legal framework are requirements demanded by the farmers. According to the findings, the study provides significant insights to plan a sustainable contract farming system for Hot Pepper cultivation with suitable policy initiatives. Key recommendations of this research study include, providing extension services, remedies for diseases, free trials, proper responses to farmer inquiries and flexible agreements, which are required to enhance and sustain Hot Pepper cultivation along with contract farming system.

Keywords— *contract farming, hot pepper, shifting cultivation*

I. INTRODUCTION

Chilli (*Capsicum* spp.) is one of the major spice crops all over the world. It is daily consumed by one quarter of the world's population, and the rate of consumption is ever growing. Hot Pepper (*Capsicum chinense*) belongs to family Solonacea, genus *Capsicum* and Originally found in Amazon basin. Even though Hot Pepper has been identified as a profitable crop in all over the world, Sri Lanka has not yet recognized its economic value. Hence, a leading conglomerate in Sri Lanka expects to shift farmers from current cultivation to Hot Pepper cultivation along with contract farming practices in Minuwangoda.

Fruits of this species show an enormous variability in size and shape, and in the different intensities of yellow, orange or red when ripe. Since Hot Pepper shows a wide range of colors and shapes in fruits, it is used as an ornamental plant among gardeners. Especially it uses to add significant heat to traditional foods like stews, sauce, and marinades the meat since the high content of carotenoids in ripe pepper fruits make them important sources of these essential nutrients in the human diet. Moreover, it is used to produce hot sauces, paste, sausage, and extra spicy salsas in western foods. Additionally, Hot Pepper shows medicinal uses like Stimulate circulatory and digestive system, varicose veins, Asthma, Digestive problems etc.

This plant has natural capsaicinoids such as capsaicin, dihydrocapsaicin, norhydrocapsaicin, homocapsaicin, and homodihydrocapsaicin, (Sarwa et, al, 2012). Hot Pepper's unique fruity aroma and Intense spiciness of the crop due to the presence of these chemicals naturally has made increasing demand and an economical price in both global and local market. Sri Lanka also has a higher

climatic potential to cultivate this as it represents the tropical climate. Even though, this is an unidentified profitable crop seeds of that variety are very expensive (1kg of seeds are more than Rs.1.8 Million) and Hot Pepper has thriving demand, excellent properties, and economic profitability with a high price, the cultivation of Hot Pepper can't be observed in Sri Lanka context in large scale. Only very few farmers cultivate this crop on a contract basis for research purposes.

Sri Lanka has to face number of challenges under an open economy such as production at competitive prices and meeting global standards regarding quality while providing foods for the rising population. Wide fluctuations in food commodity prices due to the seasonality of crop production are a common phenomenon experienced in the farming sector. In general, agricultural commodity prices have been more volatile than those of manufactured goods over the last three decades all over the world, mainly due to the impacts of changing climate or weather-related risks and price-related risks which is inherent to the agriculture sector (Champika, 2014).

Contract farming involves agricultural production being carried out on the basis of an agreement between the company and farmers. This is a production and marketing/procurement system wherein producers agree to grow a crop at a pre-agreed market price for procurement by another party, usually a public or private company/corporation. Both the company and the farmer are bound by a written and signed contract agreement that specifies the terms and conditions of the relationship between the two parties, including the buyback prices. In this system, the farmer undertakes to supply agreed quantity of the harvest based on the quality standards and delivery requirements of the buyer. In return, the company purchases the products often at a price that established in advance. As well as, the company agrees to support the farmer through supplying inputs, assisting with land preparation, providing production advice and transporting produce to its premises.

Contract farming has been used for agricultural production for decades but its popularity appears to have been increasing in recent years. The use of contracts has become attractive to many farmers because the arrangement can offer both an assured

market and access to production support. Contracts with farmers can also reduce risk from disease, weather, price fluctuations, market uncertainty and facilitate certification, which is being increasingly demanded by advanced markets. Therefore, Contract farming is considered as a risk transferring mechanism, which enables small scale farmers to transfer market risks to global agribusiness firms (Woodend, 2003). Furthermore, Colier and Dercon, 2014 stated that, there are also potential benefits for national economies as contract farming leads to economies of scale. As well as, contract farming has to be commercially viable and companies need to choose the best available farmers to maximize the profitability. Once suitable farmers have been identified it is then necessary to develop trust, as contracts will only work when both parties believe they are better off by engaging in them.

According to Champika and Abeywickrama, 2014, Contract farming facilitates the linkage between smallholder farmers and agribusiness firms who have built strong marketing channels. Furthermore, Contract farming has tremendous potential to boost the agricultural sector to be on par with other sectors that exist in an economy. It is evident that the development of contract farming relies very much on our youths since they are the pillar of the future. (D'Silva et al., 2009). All in all, it's clear that contract farming has tremendous potential to boost the agricultural sector to be on par with other sectors that exist in an economy.

II. METHODOLOGY

A. Problem Statement

Even though Hot Pepper (*Capsicum chinense*) has been identified as a profitable crop (Sanusi et al, 2013) and it has a very good market potential locally and globally, Sri Lanka has not yet recognized the economic value of it and cultivation of Hot Pepper cannot be seen in Sri Lanka for commercial purposes. Even though, some areas are very suitable for this crop, farmers are growing other crops in vain, while missing the opportunity of gaining profits. As a new direction, a leading conglomerate in Sri Lanka expects to go for some innovations in their product portfolio using a unique variety of Hot pepper. The global market place also has expanded for hot sauces due to its evolving popularity and enhanced consumer inclination towards innovative and bold flavors.

Therefore, the company needs to shift farmers from current cultivation to Hot Pepper cultivation along with contract farming practices in Minuwangoda area. But shifting from current cultivation to Hot Pepper cultivation seems a judicious decision if it is financially profitable, since need to explore, as the existing literature didn't document much on this. For that, factors affecting on shifting vegetable farming towards Hot pepper should be analyzed.

B. Research Objective

The primary objective of this research is to identify factors affecting on shifting farmers from current cultivation to Hot Pepper cultivation along with contract farming practices.

C. Literature Review

Chilli belongs to family Solanaceae and consists of 27 species (Onus and Pickersgill, 2004) including five domesticated *Capsicum* species: *Capsicum annuum* L., *C. chinense* Jacq. *C. frutescens* L., *C. baccatum* L., and *C. pubescens* Ruiz & Pav. Among the five domesticated *Capsicum* species, *Capsicum annuum* (Common chilli), *C. chinense* (Nai miris) and *C. frutescens* (Kochchi) are commonly cultivated in Sri Lanka. *C. chinense* and *C. frutescens* species have special characteristics such as resistant to pest and disease incidences, high pungency and resistant to drought conditions (Kannangara, 2013). *C. chinense*, known as hot chili or hot pepper is the hottest species among the *Capsicum* species. Moreover, having the uppermost extent of phenolic compounds (Zhang and Hamazu, 2003). It reveals that *C. chinense* has the highest antioxidant activity and it is known to be an excellent source of phytochemicals, including Vitamins A and C, phenolic compounds, flavonoids and carotenoids (Zhang and Hamazu, 2003). In addition, *C. chinense* has a wide diversity in traits such as pod color, pod length, pod size, pod shape, pod weight, plant height, capsaicin content and pungency level (Finger *et al.*, 2010). Due to the unique aromatic flavor, *C. chinense* has a high demand as an appetizer, success in breeding (can artificially cross with *C. annuum*) less germination problems compared to *C. frutescens* and can get a good yield for a long period due to its perennial nature (Kannangara, 2013).

Sri Lanka has a diverse collection of *C. chinense* at Plant Genetic Resources Center (PGRC),

Gannoruwa and Nanayakkara *et al.* (2018) revealed that there is a high genetic diversity among selected *Capsicum* species and within the tested *C. chinense* germplasm and the genetic diversity identified in this study will be useful in *C. chinense* breeding programs and for conservation activities. Temperature is one of the main environmental factors involved in plant growth and development. Garruña-Hernández *et al.*, (2014) stated that the thermal optimum range in a tropical crop such as Habanero pepper is between 30 and 35°C (leaf temperature, not air temperature). In this range, gas exchange through stomata is probably optimal. *Capsicum chinense* cultivars with different pungency levels: Bhut Jolokia, Akaneer Pirote, Orange Habanero, and BGH1719 have different capsaicinoid production levels depending on the shade level. Approximately, 70% of shade is needed for Bhut Jolokia, 50% for Akaneer Pirote and BGH17 needs lower shade. Therefore, to increase capsaicinoid yield, it is recommended to use appropriate level of shading to manage the light intensity. (Tanaka *et al.*, 2017) The level of soil organic content, and microbial activity have significant influence on capsaicin, pungency and other important metabolites in Hot Pepper plants. Moreover, fruit yield, protein, fibre and sugar-acid contents in plants increased with organic inputs. In addition, inorganic fertilizers can be useful in enhancing capsaicin accumulation in *C. chinense* fruits. (Saban *et al.*, 2015).

Capsicum spp. is a tropical and sub-tropical plant requiring a combination of warm, humid yet dry weather. During the growth stage it needs a warm and humid weather. However, a dry weather is suitable for fruit maturity. Range between 20^o-25^oC is ideal temperature range for chilli growth. At 37^oC or higher the crop development is affected. Similarly in case of heavy rain the plant starts rotting. In case of low moisture conditions during fruiting time period the bud does not develop properly. It has been found that black soil which retains moisture is ideal in case they are grown as rainfed crops. Under irrigated conditions, the crop needs well-drained sandy loam with rich organic content. (Gurung *et al.*, 2011).

Minuwangoda belongs to the wet zone of the country and it has a mild temperature. The mean annual temperature varies from 26.5 C to 28.5C. The most part of the Gampaha district receive high

precipitation annually which is about 2000 to 3500 mm from both monsoons as well as from inter monsoon. Soil type of Minuwangoda area is Red Yellow Podzolic Soils with soft and hard laterite.(Fernando,2018)

Contract farming can be defined as a firm lending “inputs” — such as seed, fertilizer, credit or extension to a farmer in exchange for exclusive purchasing rights over the specified crop. It is a form of vertical integration within agricultural commodity chains so that the firm has greater control over the production process and final product, as well as the quantity, quality, characteristics and the timing of what is produced (Prowse, M., 2012). However, the existing local and international literature suggest that long term viability and better execution of FSC is practiced only under contract farming system. (Champika and Abeywickrama, 2014).

Under contract farming, landowners or tenants have contracts with agribusiness marketing and/or processing firms, who specify prices, timing, quality and quantity/ of the produce to be delivered. The agreement could involve the agribusiness firm supplying inputs and, in some cases, controlling and supervising farm operations. Contract farming has been practiced in various countries for a long time, and it has had a significant effect on contracting households' incomes (Bellemare, M.F. and Bloem, J.R., 2018).

According to Champika and Abeywickrama, 2014, contract farming makes it easier for smallholder farmers to connect with agribusiness firms that have developed strong marketing networks. It was revealed that full-time farmers who have higher proportion of agricultural income, higher agricultural land ownership as well as agricultural experience and family labour participation were more likely to adopt contract farming system. Further, adopters earned about two times higher agricultural income than nonadopters. It revealed that mutual trust between farmers and buyers and existence of an assured market for buyers were the key factors for the success of the system. In addition, Inability to sell the whole harvest through contract farming system is the biggest challenge faced by the contract farmers. It appeared that absence of a crop insurance scheme and unavailability of an authorized institution to govern the contract farming process have hindered

the diffusion of contract farming system throughout the country.

Producers, processors, wholesalers, retailers, and other supply chain actors face threats and opportunities as a result of agricultural transitions toward contract farming and government responses. Small farmers in developing countries, in particular, are perceived to be especially vulnerable to changes. As Chen et al. (2005) indicate, modern organizational arrangements in agro-food systems might promote the emergence of power imbalances and unfavorable terms of trade in the transactions between smaller-scale chain actors and the larger players which typically exercise the leading coordination role in a managed supply chain. Despite these stereotypes, governments and development agencies are promoting contract farming as a mode of cooperation that can help small farmers integrate into supply chains. (Da Silva, 2005).

D. Research Methodology

The survey of this research was conducted for vegetable farmers in Minuwangoda D.S division. There are 121 G.N. divisions under Minuwangoda D.S. Division. Among that 25 G.N. divisions having higher number of vegetable farmers are selected purposively. Thereafter, among these 25 G.N. divisions, 70 farmers were selected using simple random sampling method. This study was based on both primary and secondary data on the information sources. Primary data were collected from survey questionnaire, interviews and discussions. Pre structured questionnaire was tested on each objective in the research based on variables and measurements. Secondary data were collected using journal articles, reviews, books and websites. As well as details of vegetable farmers in Minuwangoda D.S. division were obtained from the Govijana Sewa Centre, Minuwangoda.

In data analysis procedure, first of all the collected data were tabulated in a way that is convenient to use them for analysis in order to achieve the intended research objectives. All the collected data were tabulated in IBM SPSS statistics 25 software for non-parametric analysis using descriptive and inferential statistics such as bar charts, pie charts, Wilcoxon sign rank test.

III. DISCUSSION AND ANALYSIS

A. Farmers Willingness to Shift Towards Hot Pepper Cultivation

Table 1. Farmers’ willingness to shift from current cultivation to Hot Pepper cultivation

| Factor | P | Decision |
|---|--------|-------------|
| Preference to grow Hot Pepper | 0.000* | Significant |
| Willingness to shift from current cultivation to Hot Pepper cultivation | 0.000* | Significant |
| Profitability of Hot Pepper cultivation | 0.000* | Significant |

Wilcoxon signed rank test

The significance level is 0.05 (P< 0.05) *Significance

Wilcoxon Signed Ranked Test was used to analyze farmers’ preference to grow hot pepper as a commercial crop, farmers’ willingness to shift from current cultivation to Hot pepper cultivation and profitability of cultivating hot pepper in the study area. According to the obtained results of this test, the significance of all three factors is less than 0.05 which means these three factors are significantly affecting on shifting farmers towards hot pepper cultivation. Therefore, when farmers prefer to grow Hot Pepper as commercial crop, they tend to shift from current cultivation to Hot Pepper cultivation. As well as, if the farmers perceive that cultivation of Hot Pepper is profitable than their current cultivation, they are more likely to shift towards Hot Pepper cultivation.

Preference to grow Hot Pepper as a commercial crop

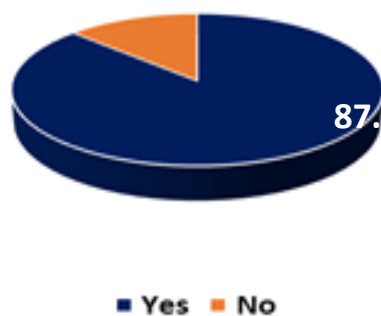


Figure 1. Preference to grow Hot Pepper as a commercial crop

Willingness to shift from current cultivation to Hot Pepper cultivation

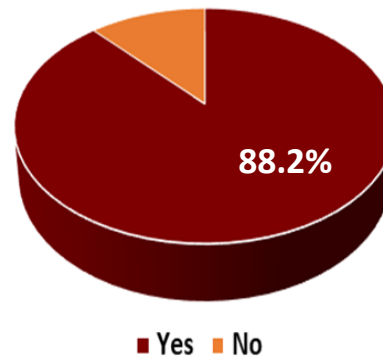


Figure 2. Willingness to shift from current

Figure 1 and figure 2 represent that 87.1% of farmers in Minuwangoda prefer to grow Hot Pepper as a commercial crop while 88.2 % of farmers are willing to shift from current cultivation to Hot Pepper cultivation. Therefore, majority of farmers in Minuwangoda prefer to cultivate Hot Pepper in commercial level while gaining the maximum benefits.

B. Factors Affecting On Shifting Towards Hot Pepper Cultivation With Contract Basis

Table 2. Factors affecting on shifting from current cultivation to Hot Pepper cultivation along with contract farming practices

| Factor | P | Decision |
|---------------------------------|--------|--------------------|
| Market potential | 0.006* | Considering factor |
| Agro climatic compatibility | 0.006* | Considering factor |
| Credit facilities | 0.791 | Not consider |
| Extension services | 0.726 | Not consider |
| Crop insurance | 0.267 | Not consider |
| Incentives | 0.579 | Not consider |
| Required technology & equipment | 0.087 | Not consider |

Kruskal Wallis Test

The significance level is 0.05 (P<0.05) *Significance

Kruskal Wallis test was used to analyze the significance of factors affecting on shifting towards Hot Pepper cultivation along with Contract Farming practices. According to that only market potential and agro climatic compatibility similarly and significantly affected on shifting towards Hot Pepper cultivation. It means if there is a good market potential and Hot Pepper is compatible with the agro climatic condition in Minuwangoda, there is a more tendency to shift towards Hot Pepper cultivation.

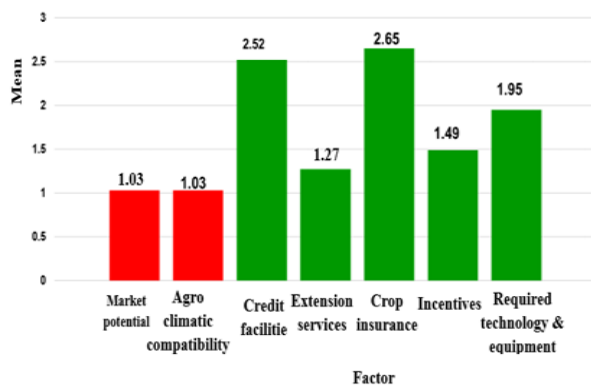


Figure 3. Factors affecting on shifting from current cultivation to Hot Pepper cultivation along with contract farming system

Figure 3 shows the mean value of above factors. Here also it's very clear that only market potential and agro climatic compatibility significantly affected when shifting towards Hot Pepper cultivation. Therefore, if there is a good market in the industry for Hot Pepper and if the variety well suited for the agro climatic condition in the area current vegetable farmers in Minuwangoda will shift towards Hot Pepper cultivation.

C. Types of inputs provided by the company

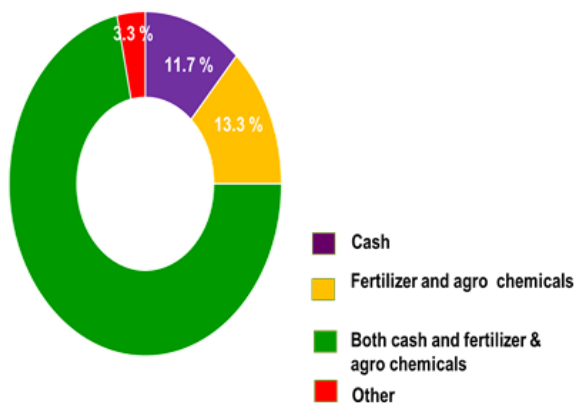


Figure 4. The type of inputs provided by the company

This diagram shows the farmers' preference on the type of inputs provided by the company. Normally inputs are provided by the company for the farmers at the earliest of the cultivation and its cost will be deducted from the harvest to be sold to the company. According to that most of the farmers in Minuwangoda expected both cash and fertilizer & agro chemicals as inputs. Only 3.3 % of farmers require other inputs such as land for rent, tools and equipment etc.

D. Preference To Engage With Contract Farming Practices

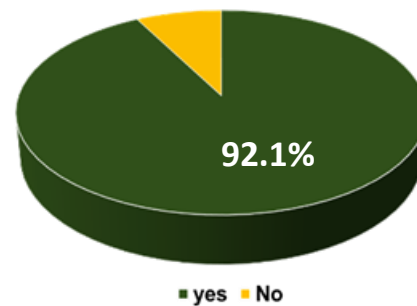


Figure 5. Preference to engage with CF practices

E. Easiness of Contract Farming System

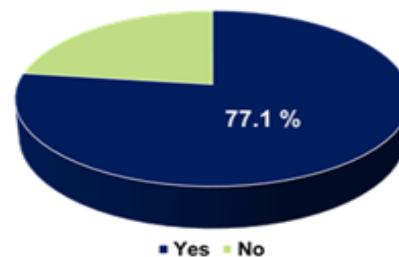


Figure 6. Easiness of contract farming

Figure 5 and 6 represent farmers' preference on Contract Farming system. According to that 92.1 % of farmers prefer to engage with contract farming practices while 77.1 % of farmers think it is easy for them to engage with contract farming system rather than cultivating at their own risk.

F. Factors Affecting While Purchasing Hot Pepper Seeds From The Company

Table 3. Factors affecting while purchasing Hot Pepper seeds from the company

| Factors | Mean | P | Decision |
|--------------------|-------|-------|--------------------|
| Price of the seeds | 1.98* | 0.000 | Considering factor |

| | | | |
|--|-------|-------|--------------------|
| Quality of the seeds | 1.98* | 0.000 | Considering factor |
| Timeliness of availability of seeds | 0.86* | 0.000 | Considering factor |
| Availability of seeds in adequate quantities | 0.88* | 0.000 | Considering factor |
| Proximity to seed source | 1.17* | 0.000 | Considering factor |
| Credibility of seed source | 1.90* | 0.000 | Considering factor |
| Crop performance | 1.92* | 0.000 | Considering factor |

Wilcoxon signed rank test

The significance level 0.05 ($p < 0.05$)
*Significance

Wilcoxon signed rank test was used to check the significance of factors affecting while purchasing Hot Pepper seeds. According to that P values of price of the seeds, quality of the seeds, Timeliness of availability of seeds, Availability of seeds in adequate quantities, Proximity to seed source, Credibility of seed source and crop performance are less than 0.05. Therefore, all these factors significantly affected while purchasing Hot Pepper seeds from the company. When price of the seeds decreases and quality of the seeds increases farmers are willing to purchase seeds from the company. As well as when seeds are available in adequate quantities within the required time period like rainy season farmers are more likely to purchase the seeds. Further, seed source should not be far from the field and farmers expect higher crop performance and trustworthiness with the company to purchase the seeds for long time.

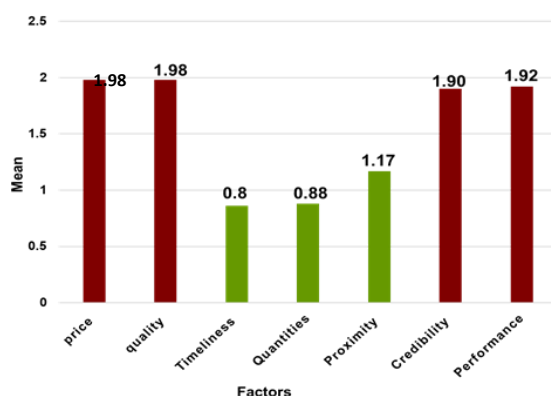


Figure 7. Factors affecting while purchasing Hot Pepper seeds from the company

According to figure 7 most prominent factors considered by farmers while purchasing the seeds

from the company are price of the seeds, quality of the seeds, credibility of seed source and crop performance. When price of the seeds is low and seeds are in good quality, farmers are willing to purchase seeds from the company. As well as, to purchase seeds from the company, there should be good credibility with the seed source. Furthermore, farmers preferred to purchase seeds if the crops are highly performed.

In addition to that, seeds should be available in required time in adequate quantities. If there is a less proximity to seed source farmers are willing to purchase seeds from the company due to less transport cost.

G. The Method of Purchasing Hot Pepper Seeds

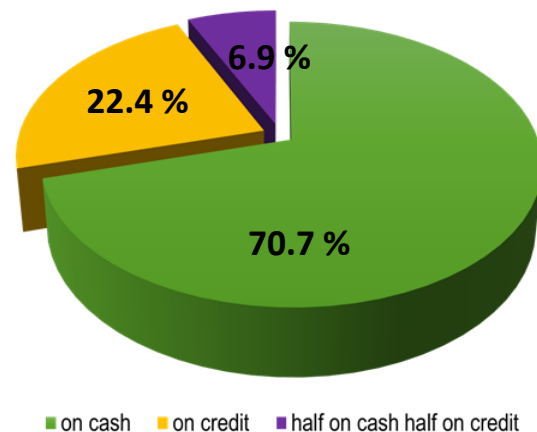


Figure 8. Methods of purchasing Hot Pepper seeds

This diagram shows different seed purchasing methods of farmers in Minuwangoda. According to that majority of farmers willing to purchase seeds on cash while 22.4 % farmers prefer to purchase seeds on credit. Only 6.9% farmers prefer to purchase the seeds half on cash & half on credit.

H. Factors Affecting While Selling the Harvest to the Company

Table 4. Factors affecting while selling the harvest to the company

| Factor | Mean | P | Decision |
|---------------------------------------|------|--------|--------------------|
| Guaranteed & fixed pricing strategies | 1.85 | 0.000* | Considering factor |
| Assured market | 1.97 | 0.000* | Considering factor |
| Profit margin | 1.98 | 0.000* | Considering factor |
| Quality standards | 1.56 | 0.000* | Considering factor |

| | | | |
|----------------------------|------|--------|---------------------|
| Easiness of transportation | 1.03 | 0.000* | Considering factor |
| Agreed quantity | 0.03 | 0.684 | Not consider |
| Legal framework | 1.71 | 0.000* | Considering factor |

Wilcoxon signed rank test

The significance level 0.05 (p < 0.05) * Significance

Wilcoxon signed rank test was used to check the significance of factors affecting while selling the Hot Pepper harvest to the company. According to that, guaranteed & fixed pricing strategies, assured market, profit margin, quality standards, easiness of transportation and legal framework significantly affected while selling the harvest to the company. Therefore, these factors are considered by farmers while selling the harvest to the company. But agreed quantity was not significantly affected while selling the Hot Pepper harvest to the company. It means agreed quantity was not considered by farmers while selling the harvest to the company. Farmers are willing to sell their whole harvest, even at lower prices than the market price, if the company continuously purchase the harvest from those farmers.

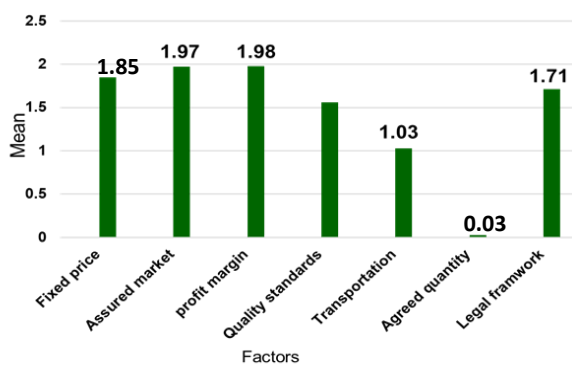


Figure 9: Factors affecting while selling the harvest to the company

Figure 9 shows the mean values of above factors. According to this graph most prominent factors considered by farmers while selling the harvest are profit margin, assured market, guaranteed & fixed pricing strategies and legal framework. The least considering factor is agreed quantity. Therefore, if there is a good profit margin for the harvest farmers prefer to sell their whole harvest to the company. As well as farmers expect assured market, guaranteed and fixed prices and legal protection when dealing with a company. Further,

if their harvest is in good quality, they tend to grade it sell at higher prices to the company. Moreover, majority of farmers in Minuwangoda preferred the company come to their field and collect the harvest. Then they can sell their harvest at lower prices due to reduced transport cost and convenience. However, if the farmer has to transport the harvest to the company, they preferred to sell their harvest somewhat higher prices due to the transport cost.

IV. CONCLUSION

According to the research findings, when shifting from current cultivation to Hot Pepper cultivation 87.1 % of farmers prefer to grow Hot Pepper as a commercial crop while 88.2 % of farmers are willing to shift towards Hot Pepper cultivation. As well as, both market potential and agro climatic compatibility similarly and significantly affect when shifting from current cultivation to Hot Pepper cultivation along with contract farming practices.

Furthermore, factors such as price of the seeds, quality of the seeds, crop performance, credibility of the seed source, proximity to seed source, availability of seeds in adequate quantities and timeliness and availability of seeds are considered by farmers while purchasing the seeds from the company. As well as, factors such as profit margin, assured market, guaranteed & fixed pricing strategies, legal framework, quality standards, easiness of transportation are considered by farmers while selling the Hot Pepper harvest to the company. But agreed quantity is not considered by farmers while selling the harvest to the company and farmers are willing to selling their whole harvest to the company even at lower price than market price if the company continuously purchase the harvest from those farmers.

Finally, to enhance and sustain Hot Pepper cultivation along with this type of contract farming system different suggestions made by farmers in the study area. They are, providing extension services, providing suitable lands, remedies for diseases, free trial, proper responds for farmer inquiries, flexible agreement, collaborative farming, pot cultivation, providing water facilities, providing nursery plants instead of seeds.

REFERENCES

- Bellemare, M.F. and Bloem, J.R., 2018. Does contract farming improve welfare? A review. *World Development*, 112, pp.259-271.
- Champika, P.J. and Abeywickrama, L.M., 2014. An evaluation of maize contract farming system in Sri Lanka: adoption, problems and future prospects. *Tropical Agricultural Research*, 26(1), pp.62-73.
- Chen, K., Shepherd, A. and Da Silva, C. 2005. "Changes in Food Retailing in Asia: Implications of Supermarket Procurement Practices for Farmers and Traditional Marketing Systems", FAO AGSF Occasional Paper No. 8.
- Collier Paul ; Stefan Dercon. "African Agriculture in 50 Years: Smallholders in a Rapidly Changing World" (PDF). Archived from the original (PDF) on 8 April 2014. Retrieved 7 April 2014
- Da Silva, C., 2005. "The Growing Role of Contract Farming in Agrifood Systems Development; Drivers, Theory and Practice, Working Document, Agricultural Management, Marketing and Finance Service", Available: <http://www.fao.org/ag/ags/subjects/en/agmarket/contractfarming.html>
- D'Silva, J.L., Shaffril, H.A.M., Uli, J. and Samah, B., 2009. A review of contract farming and factors that impinge youths acceptance to contract farming. *European Journal of Social Sciences*, 11(2), pp.328-338.
- Eaton, C. and Shepherd, A., 2001. *Contract farming: partnerships for growth* (No. 145). Food & Agriculture Org.
- Finger, F.L., Lannes, S.D., Schuelter, A.R., Doege, J., Comerlato, A.P., Gonçalves, L.S. and Scapim, C.A. (2010). Genetic diversity of Capsicum chinensis (Solanaceae) accessions based on molecular markers and morphological and agronomic traits. *Genet. Mol. Res.* 9(3), 1852-1864.
- Gurung, T., Techawongstien, S., Suriharn, B. and Techawongstien, S., 2011. Impact of Environments on the Accumulation of Capsaicinoids in Capsicum spp. *HortScience*, 46(12), pp.1576-1581.
- Hernández, R. et al. (2014) 'Understanding the physiological responses of a tropical crop (Capsicum chinense Jacq.) at high temperature', *PLoS ONE*, 9(11), pp. 1-9. doi: 10.1371/journal.pone.0111402.
- Kannangara, K.N. (2013). Serai Rasai Nai miris, Govikam Sangarawa (Sinhala). Department of Agriculture, Sri Lanka. 44, 22-24
- Mansur, K., Tola, M. and Ationg, R. 2009. "Contract Farming System: A Tool to Transforming Rural Society in Sabah", Available: <http://mpr.aub.uni-muenchen.de/13271/>
- Minot, N. 1986. "Contract Farming and its Effect on Small Farmers in Less Developed Countries", Working Paper No. 31 Department of Agricultural Economics, Michigan State University.
- Moreira, A.F.P., Ruas, P.M., de Fátima Ruas, C., Baba, V.Y., Giordani, W., Arruda, I.M., Rodrigues, R. and Gonçalves, L.S.A., 2018. Genetic diversity, population structure and genetic parameters of fruit traits in Capsicum chinense. *Scientia Horticulturae*, 236, pp.1-9.
- Nanayakkara JOUR, Dhanesha Wasala, Samantha Ubeysekara, N. Jayarathne, K.Wickremasinghe, I. 2018/05/29 218 Molecular diversity analysis of conserved Capsicum chinense Jacq. germplasm in Sri Lanka 29 10.4038/tar.v29i2.8291Tropical Agricultural Research
- Olsen, J., 1993. Investigation of the effects of planting density and nutrition on marketable yield of capsicums.
- Onus, A.N. and Pickersgill, B. (2004). Unilateral incompatibility in Capsicum (Solanaceae): occurrence and taxonomic distribution. *Ann. Bot.* 94, 289-295.
- Prowse, M., 2012. *Contract farming in developing countries: a review* (Vol. 12). AFD, Agence française de développement
- Rabha, D.K., Muthukumar, P. and Somayaji, C., 2017. Experimental investigation of thin layer drying kinetics of ghost chilli pepper (Capsicum Chinense Jacq.) dried in a forced convection solar tunnel dryer. *Renewable energy*, 105, pp.583-589.
- Saleh, B.K., Omer, A. and Teweldemedhin, B., 2018. Medicinal uses and health benefits of chili pepper (Capsicum spp.): a review. *MOJ Food Process Technol*, 6(4), pp.325-328.
- Sanusi, M.M. and Ayinde, I.A., 2013. Profitability of pepper production in derived savannah zone of Ogun State, Nigeria. *IJAFA*, 4(2), pp.401-410.
- Sarwa, K. K., Kiran J., Sahu J., Rudrapal M., and Debnath M., (2012) 'A short review on Capsicum chinense Jacq', *Journal of Herbal Medicine and Toxicology*, 6(September 2020), pp. 7-10.
- Schweiggert, U., Schieber, A. and Carle, R., 2006. Effects of blanching and storage on capsaicinoid stability and peroxidase activity of hot chili peppers (Capsicum frutescens L.). *Innovative food science & emerging technologies*, 7(3), pp.217-224.
- Shaban, A.A., 2015. Factors influencing farmers' decision to shift to organic farming: The case of Gaza Strip. *Journal of Economics, Management and Trade*, pp.78-87.

Starin Fernando, 2018, Island wide Construction Raw Material Survey Report on Gampaha, district, <http://www.gsmb.gov.lk/web/images/pdf/gampaha%20report.pdf> (accessed: 20/11/2020)

Tanaka, Y., Nakashima, F., Kirii, E., Goto, T., Yoshida, Y. and Yasuba, K.I., 2017. Difference in capsaicinoid biosynthesis gene expression in the pericarp reveals elevation of capsaicinoid contents in chili peppers (*Capsicum chinense*). *Plant cell reports*, 36(2), pp.267-279.

Woodend, J.J. (2003). Potential of contract farming as a mechanism for the commercialisation of smallholder agriculture: The Zimbabwe case study [on line]. [Accessed on 08.10.2013]. Available at <ftp://193.43.36.93/docrep/fao/010/ah925e/ah925e00.pdf>.

Zhang, D. and Hamauzu, Y. (2003). Phenolic compounds, ascorbic acid, carotenoids and antioxidant properties of green, red and yellow bell peppers. *J. Food Agric. Environ.* 1, 22-27.

ACKNOWLEDGMENT

We should offer our sincere thanks to Ms. Kaumadie Rathnayake and all other staff members in Ceylon Agro Industries (Prima Group) for the guidance and assistance. Further, we would like to express our gratitude to any individual who supported even with a mere word for the success of the research project.

AUTHOR BIOGRAPHIES



Sapuni Gunasekara: is an undergraduate of faculty of Agriculture University of Ruhuna, Sri

Lanka. Currently final year student, specialized in Agricultural Economics attached B.Sc. Agri Business management degree programme. Her research and publication interests include Agricultural marketing management.



Ganganee Samaraweera: B.Sc. Agriculture (UOR); MSc.IGAU (India); PhD.HZAU(China). She is currently Professor and Head of the Department of Agricultural Economics, Faculty of Agriculture, University of Ruhuna, Sri Lanka.



Gamunu Jayasundara: Senior Business Manager of Ceylon Agro Industries (Prima group of Companies), Sri Lanka. He received his Bachelor Degree B. Sc, Agric. Hons from University of Peradeniya, Bachelor of Laws (LLB) Degree from Open University of Sri Lanka, Master of Business Administration (MBA) from university of Colombo, Sri Lanka; Further, he was an Assistant Lecturer at University of Peradeniya. Also he is an Attorney at Law of the Supreme Court of Sri Lanka.