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ATTITUDE OF VEGETABLE FARMERS IN GALLE DISTRICT IN SRI LANKA TOWARDS GOOD AGRICULTURAL PRACTICES (GAP)

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SUMMARY

Vegetable farmers are facing a number of challenges including price fluctuations, production and marketing problems, low level of income etc. One strategy to overcome these problems is adoption of Good Agricultural Practices (GAP) in vegetable production. However, there is limited information regarding farmers' awareness of GAP and its applications under the circumstances of farming in the country. Therefore, assessing farmers' attitude is a timely requirement for directing farmers towards good agricultural practices. Thus, the objectives of the research were to assess the level of awareness of GAP program, relationship between socio-economic factors and awareness of GAP, farmers' attitudes towards GAP program, factors affecting the willingness to adopt GAP program and the potentials and constraints in implementing GAP program in Galle District. A sample of 100 vegetable farmers in the district was selected through a multi-stage simple random sampling technique. Data were collected from March to July 2018, through a self-administered questionnaire survey and analyzed using descriptive statistics and chi-square test. The results revealed that the majority of vegetable farmers in the district were middle-aged males who had studied up to GCE ordinary level and they received a monthly income of 24000 LKR. Their age, gender, educational level and experience were significantly associated with the level of awareness of GAP program. However, despite their positive attitude towards GAP, most farmers were unwilling to take a risk to adopt GAP due to many issues such as lack of required inputs, capital, required field conditions, information and technical know-how. There are several potentials and also many constraints for implementing GAP in the district. Therefore, providing firstly better theoretical knowledge and then providing the main requirements will motivate more farmers to adopt GAP in their vegetable production procedures. Research studies related to application of GAP by Sri Lankan farmers are still at a lower level. This research thus will be useful for different stakeholders related to adoption of GAP in Sri Lanka.

Key words: adoption, Good agricultural practices (GAP), Galle district, vegetable farmers, Sri Lanka

Abbreviations: GAP - Good Agricultural Practices; FAO - Food and Agriculture Organization; GMO - Genetically Modified Organisms; SLEDB - Sri Lanka Export Development Board; SLSI - Sri Lanka Standards Institution; DOA - Department of Agriculture; DS - Divisional Secretariat; GN - Grama Niladhari.

INTRODUCTION

The importance of food safety has grown over the last several years, due to its impact on consumers' health and growth in domestic and international trade in food products (Oo, 2016). In the case of fresh fruits and vegetables, it is essential to make sure that there is no adverse health effect or harm, including physical injury of consuming these foods in their fresh form as they are often eaten in a raw state. Generally, the major food safety concerns are related to residues and contaminants, pests and diseases of plants and animals, pathogens and micro-organisms, physical contaminants and technological issues such as irradiation or GMOs, food allergens, persistent organic pollutants, claims and labeling

related issues such as an incorrect “best before” date and fraud (FAO, 2013, 2016).

Food safety hazards may occur at different stages of the food chain, starting from primary production and extending to secondary and tertiary processing, storage, distribution and packaging. Therefore, it is imperative to address food safety procedures initiating from the farm level to the consumption level. Hence, implementing good agricultural practices during on-farm production and post-production processes is of great importance for ensuring safe food supply. Here the application of Good Agricultural Practices (GAP) is an excellent alternative. There are fears that stringent new GAPs could marginalize small producers, cutting off access to export markets and imposing disproportionately higher production costs on smaller producers, given the investments that may be needed to adopt good practices. On the other hand, GAPs may provide a catalyst for enhancing the production techniques and supplying chain infrastructure (e.g. processing, storage, transportation) in developing countries (Hobbs, 2003).

What is GAP?

GAP is one of the most important contributors for the preventative practices proposed earlier and it ensures that on-farm practices result in products reaching the farm gate. The GAP frame proposed by the Food and Agriculture Organization Committee on Agriculture (FAO, 2003) provides an insight into the scope and wide-ranging objectives of GAPs. Basically, there are ten generic components of GAPs identified by this framework including: water management, soil management, crop protection, crop and fodder production, animal health and welfare, human welfare of farms, health and safety, harvest and animal production, on-farm processing practices such as harvesting and storage of foods, energy and waste management and wildlife and landscape conservation practices. It is practice that needs to be applied from the farm to ensure food safety during the pre-production, production, harvesting and post-harvesting operations. In many cases, such practices help in protecting the environment as well as safety of the workers engaged in the food production activities.

The GAP concept addresses two different issues: improving environmental sustainability for permanently productive farm operations and ensuring the safety of food and other agricultural products during on-farm practices and post-production processes. It also contributes to social and economic sustainability. Thus, the adoption of GAP has become increasingly important in light of increasing domestic and international trade in food and other agricultural products. The consumer's perception of GAP certified products as well as the growing consumers' awareness of these products lead farmers towards the good agricultural practices (Manual on Good Agricultural Practices, 2016).

Application of GAP is widespread in most countries in the world. In Europe, GAP (EUREP GAP) fruit and vegetables started as a private-sector standard developed in 1997 by European supermarket chains and their major suppliers, representing all stages of the supply chain in the fruit and vegetable sector in Europe. It has developed into a privately managed on-farm accreditation scheme that seeks to provide a worldwide verification framework for fruit and vegetables based on application of good agricultural practices. The name of EUREP GAP was altered to GLOBAL GAP in September 2007 to reflect its increasingly global scope.

GLOBAL GAP is a private sector body that extends voluntary services of certification standards and procedures for good agricultural practices. It aims to enhance consumers' confidence in food safety by developing GAP to be adopted by producers. Although GLOBAL GAP is focusing on food safety and traceability, it also comprises certain requirements for health, safety and welfare of the workers and conservation of the environment. GLOBAL GAP is a pre-farm gate standard, which means that the certificate covers the process of the certified product from sowing of the seeds until the product leaves the farm. GLOBAL GAP has developed GAP standards for fruit and vegetables, and other products such as combinable crops, flowers, ornamental plants, tea, green coffee and animal products such as pigs, poultry, cattle and sheep, dairy and aquaculture (Vermeulen et al., 2010). Currently, there are more than 150 000 farms in 123 countries implementing GLOBAL GAP standard, while more than 140 approved certification bodies around the world are managing these certifications.

The ASEAN Secretariat developed ASEAN GAP in 2006 as a standard for GAP for the member countries to improve the harmonization of national GAP programs within the ASEAN region, to enhance the safety of fruit and vegetables, and also to ensure sustainability of natural resources while facilitating the trade of fruit and vegetables regionally and internationally (FAO, 2016). The ASEAN GAP is expected to enhance the harmonization of product standards and facilitate trade since there are great opportunities for certified producers to increase their exports of fresh fruit and vegetables to other ASEAN countries. There is an opportunity for the less developed countries of the region to use ASEAN GAP as a benchmark to develop national GAP as ASEAN GAP includes implementation of guidelines and training materials and codes of recommended practices. However, ASEAN GAP is a voluntary standard, which regulates the procedures of planting, crop caring practices, harvesting and post-harvesting operations, but it does not regulate fresh-cut produce and sprouts. Also, the standard is not used to certify organic products or products free from genetically modified organisms (GMOs) and it applies only to food production processes. There are four

segments in the standard: food safety, workers' health, safety, and welfare, environmental management and produce quality (FAO, 2016).

Sri Lanka is a potential country for diversified agricultural production. There is an export market for Sri Lankan fresh produce of tea, rubber and rubber-based products, coconut and coconut-based products, and also spices (SLEDB, 2013; Ayoni, 2017). The favorable climate and other factors make Sri Lankan tropical agricultural products unique. However, it is difficult to maintain the quality of products due to various restrictions as well as lack of infrastructure facilities in the agricultural sector in Sri Lanka. The factors of poor product quality such as exceeding the maximum residue levels, pest and disease attacks and improper storage conditions are the main problems in the export market (Padmajani et al., 2014).

The Standard for Good Agricultural Practices (GAP) Part 3: Fresh Fruit and Vegetables is published by the Sri Lanka Standards Institution (SLSI, 2016) to facilitate fruit and vegetable sector as initial steps (SLSI, 2016). The Department of Agriculture (DOA) implemented a GAP certification scheme and started a farmer registration program to identify suitable farms. GAP standard preparation for rice, spices, and other field crops was also initiated and expect to export GAP certified products in future to the global market. Very few Sri Lankan companies have obtained GLOBAL GAP certification and government-initiated GAP promotional program for commercial-level farmers. There are certain restrictions to popularize GAP certification among farmers, but the government started several projects to improve the quality of products, and introducing GAP is one of the leading programs. GAP provides guidelines for correct cultural practices at the farm level (SLSI, 2016).

Background and Justification

Agriculture is the most common livelihood of the Sri Lankans, and almost eighty (80) different varieties of fruit and vegetables are grown in Sri Lanka's varied agro-climatic areas. Sri Lanka produces around 710,000 metric tons of vegetables annually (SLEDB, 2013). Vegetable sector is an important sector in Sri Lanka as it accounts for around 11% of the total agriculture production, i.e. around 16.8% of the GDP in Sri Lanka (Karunaratne & Wickramasinghe, 2008). Nowadays, the majority of farmers are mainly engaged in increasing their production without considering food safety. Farmers use more fertilizers and agrochemicals during cultivation to obtain higher yields. However, they cannot make the expected quantity of good quality crops as they do not use the recommended amount of agrochemicals, which in turn may adversely affect food safety. Food safety hazards can be raised at different stages of the food chain, starting right from the primary production and extending to secondary and tertiary processing, packaging, storage and distribution, and packaging (Chakrabarty et al., 2014). In addition to the soil erosion caused by deforestation and logging, reservoirs and streams are polluted with chemical fertilizers, particularly phosphate, as well as other agrochemicals (Mateo-Sagasta et al., 2017), heavy metals and pollutants leaking into streams from the surface runoff from urban areas and from the upcountry wet zone. Excessive use of agrochemicals and irresponsible and harmful agricultural habits cause soil and water pollution and secondary contamination of human food chain (Wimalawansa & Wimalawansa, 2014).

More attention has been placed on food quality and safety in developing countries driven by economic development, urbanization, increased out-of-home food options and changes in consumption patterns for cereals, vegetables etc (Satterthwaite et al., 2010). Furthermore, there is an increasing interest in environmentally friendly production in developing and emerging countries (My et al., 2010). These trends have been strengthened by various factors, including incidences of food safety crises, potential food risks from chemical use in food production (Lehtinen, 2017).

Accordingly, food quality is an essential factor for consumers. Therefore, food quality should be improved from the farmers' level. Food quality can be enhanced through practice of GAP in the fields. Thus the main objective of this research was to study the current situation of GAP program among vegetable farmers in the district. Assessing the level of awareness of GAP program among the farmers and the relationship between socio-economic factors and awareness of GAP, identification of the farmers' attitudes towards GAP, factors affecting their willingness to adopt GAP and detecting the potentials and constraints of implementing GAP program were carried out as specific objectives.

MATERIAL AND METHODS

Galle district was selected as the study area of the research (Fig. 1). Even though there are a large number of vegetable farmers in Galle district, very few farmers have been recently certified as GAP followers. A multi-stage simple random sampling technique was used to select appropriate sample to achieve the objectives of this study. The sample frame of this study included all registered vegetable farmers under the Agrarian Service Center in Galle

district. Galle district consists of 19 Divisional Secretariats (DS) and 896 Grama Niladhari (GN) divisions. At first, three DS divisions were randomly selected out of 19 DS Divisions. It was followed by randomly selecting ten Grama Niladhari divisions from those three DS divisions. Finally, 100 farmers were selected as 10 farmers per GN Division as it is a suitable sample size which can produce 95% confidence level.

Figure 1. Map of Galle District

This study was descriptive and explanatory in nature. The level of awareness was measured with responses on a three-point continuum as: “not aware at all”, “somewhat aware” and “fully aware”. The farmers’ attitude towards adoption of GAP in vegetable cultivation was assessed using a five-point Likert scale as follows: “Strongly disagree”, “Disagree”, “Neutral”, “Agree” and “Strongly agree” allocating weightage 1, 2, 3, 4 and 5, respectively. Finally, based on the mean value, they were converted into three categories as “Negative attitude” (1.00 - 2.60), “Neutral Attitude” (2.61 - 3.40) and “Positive Attitude” (3.41– 5.00). The potentials and constraints were classified under the following six categories: infrastructure facilities, access to information and extension services for GAP, economic aspects, marketing aspects and social aspects. The respondents were asked to report whether they have the mentioned potentials or constraints. If there are any other potentials or constraints, the respondents were asked to mention those potentials and constraints as well. Moreover, the farmers’ willingness towards adoption of GAP and the factors affecting their willingness to adopt GAP program were also analyzed.

Primary data were collected through a self-administered questionnaire survey. The questionnaire included closed-ended, open-ended and Likert scale type questions. Secondary information was collected through internet, journals and books and leaflets published by the Department of Agriculture. Apart from the survey, group discussions and observations were also conducted. Data collection was performed from March to July 2018. In data analysis, descriptive statistics were used to assess the socio-economic conditions of the farmers, the farmers’ attitudes as well as to assess the potentials and the constraints, while chi-square test was used to analyze the relationship between the socio-economic factors and awareness of GAP. Data analysis was done by using SPSS software.

RESULTS AND DISCUSSION

Socio-economic factors of the farmers

The studied socio-economic factors included the farmers’ gender, age, educational level, family size and monthly total income. The results are presented in Table 1.

The results in Table 1 show that 73 % of the respondents were males and 27 % were females. The majority of the farmers (47%) belonged to 45-54 age group while the smallest percentage of the respondents (2%) was in 18-24 age group. The majority of farmers (70%) were educated up to GCE Ordinary Level, and only 2% studied above GCE Advanced Level. In addition, 5% of the farmers had educational below GCE Ordinary Level and 23% of the farmers were educated up to GCE Advanced Level. With regard to the family size, most of the farmers (61%) had 3 to 5 family members while 3% had less than 3 family members. Regarding the monthly income, the majority of the farmers (65%) had LKR 15,001-30,000 of monthly income, while only 2% of the respondent had above LKR 45,000 of monthly income.

Table 1. Socio-economic factors of the farmers (n=100)

Factor	Category	Percentage (%)
Gender	Male	73
	Female	27
Age	18-24	02
	25-34	04
	35-44	29
	45-54	47
	More than 54	18
Educational level	Below GCE Ordinary Level	05
	GCE Ordinary level	70
	GCE Advanced level	23
	Above GCE Advanced level	02
Family size	Less than 3 members	03
	3-5 members	61
	More than 5 members	36
Monthly total income (LKR)	Less than 15,000	07
	15,001- 30,000	65
	30,001- 45,000	26
	More than 45,000	02

Source: Field survey, March to July 2018

The study also included some other important factors such as farming experience, size of the cultivated land area and ownership of the land by the farmers. Relevant results are presented in the Table 2.

Table 2. Other important factors of the farmers (n=100)

Factor	Category	Percentage (%)
Farming experience	Less than 5 years	05
	6-10 years	09
	11-15 years	19
	16-20 years	30
	More than 20 years	37
Cultivating land area (acres)	0.25- 0.5	29
	0.51-1.0	26
	1.01-1.5	12
	1.51-2.0	13
	More than 2.0	20
Land ownership	Own	81
	Rent or other	19

Source: Field survey, March to July 2018

As per Table 2, the majority of the farmers (37%) had more than 20 years of farming experience and the smallest percentage of them (5%) had less than 5 years of farming experience. From the total number of the farmers, the majority (29%) had 0.25-0.50 acres of cultivating land area while the smallest percentage of the farmers (12%) had 1.01-1.50 acres of cultivating land. In addition, 13% of the respondents had 1.51- 2.00 acres, 26% of them had 0.51-1.00 and the rest of 20% had above 2.00 acres of cultivating land. The majority of the farmers (81%) had their own land for cultivation of vegetables while other 19% of the farmers did not have their own land for cultivation. Thus, although the farmers have a significant level of farming experience, they have small areas of cultivating land. This is the main barrier for these farmers to engage in systematic farming. However, most of them have ownership of the land.

The farmers' level of knowledge of GAP related activities

The farmers' level of knowledge of GAP related activities was studied using four relevant statements. These statements and the respective results are presented in Table 3.

Table 3. The farmers' level of knowledge of GAP (n=100)

Knowledge of GAP	Not aware at all (%)	Somewhat aware (%)	Fully aware (%)
Knowledge of the concept of GAP	24	55	21
Knowledge of the importance of GAP	26	56	18
Knowledge of the criteria of GAP to follow	42	42	16
Knowledge of the process of obtaining GAP certification	49	44	07

Source: Field survey, March to July 2018

According to Table 3, 55% of the farmers were aware of the concept of GAP to a certain level, while 21% of them were fully aware of this concept. Whereas 56% of the farmers knew about the importance of GAP up to a certain level, 18% had better knowledge. Regarding the knowledge to follow GAP, 42% of the respondents had general knowledge, 16% had very good knowledge. While 44% of the respondents had knowledge about the process of getting GAP certification, 7% had very good knowledge of the process. Therefore, the farmers had a certain level of knowledge of GAP. According to the findings of Singh & Yadav (2014), the majority of the respondents (45%) had medium level of knowledge of GAP, followed by 33.33% who had high level of knowledge and it was reported that 21.67% had low level of knowledge. The results of this study indicate that the percentage of the respondents having medium level of knowledge was significantly high. It may be due to the level of awareness and lack of proper information availability about GAP for the farmers.

Relationship between the socio-economic factors and the level of knowledge of GAP

As it is important to study the relationship between the socio-economic factors and the level of knowledge of GAP, the analysis was performed using the chi-square test. The results are presented in Table 4.

Table 4. Relationship between the socio-economic factors and the knowledge level of GAP

Factor	Knowledge level of GAP			Asymp. sig	H ₀
	Not aware at all	Aware	Fully aware		
	Frequency	Frequency	Frequency		
Age				0.000	Rejected
18-24	00	02	00		
25-34	00	02	02		
35-44	00	12	17		
45-54	12	23	12		
>54	20	16	00		
Gender				0.730	Not rejected
Male	09	41	23		
Female	05	14	08		
Educational level				0.000	Rejected
Below O/L	05	00	00		
O/L	09	43	18		
A/L	00	10	13		
Graduated or Above	00	02	00		
Monthly income				0.008	Rejected
0-15000	02	05	00		
15001-30000	12	37	16		
30001-45000	00	11	15		
>45000	00	02	00		
Experience				0.025	Rejected
<5	00	03	00		
6-10	00	07	02		
11-15	00	08	11		
16-20	04	18	09		
>20	10	19	09		

The information in Table 4 reveals that the socio-economic factors, including age, educational level, monthly income and farming experience, had significant associations with the level of knowledge of GAP. However, the probability value of the gender factor was greater than 0.05. Therefore, it is not significantly associated with the knowledge level of GAP. The farmers' age was significantly associated with the knowledge level of GAP. This means the farmers

who are in 35-44 and 45-54 age groups were more aware than other younger age groups. The farmers with monthly income level LKR.15001-30000 and LKR.30001-45000 were more aware than other low income categories. Furthermore, the farmers who had more than 5 year experience in farming were fully aware of GAP. Singh & Yadav (2014) also reported that the educational level and monthly income were significantly associated with the farmers' level of knowledge of GAP related to rice production technology.

Farmers' attitude towards GAP

It is highly useful to study the farmers' attitudes towards GAP activities. Therefore, 12 vital attitudinal statements were prepared by reviewing literature and also getting instructions from the experts on GAP concept. These statements were then tested using a five-point Likert scale. The statements and the respective results are presented in Table 5.

Table 5. Farmers' attitude towards GAP (n=100)

Attitudinal statement	Disagree	Neutral	Agree	Strongly agree	Mean value	Nature of attitude
I would like to practice GAP on my farm	08	56	31	05	3.33	Neutral
I believe that having GAP certification will increase my income/profit	02	30	35	33	3.99	Positive
I believe that it is beneficial to practice GAP for both farmers and marketers	08	38	31	23	3.69	Positive
I recommend GAP to my peers	08	54	28	10	3.40	Neutral
I believe that there will be good demand in the export market for GAP certified products	01	33	44	22	3.87	Positive
I believe that there is adequate information and extension services for GAP to start GAP on farms	08	54	31	07	3.37	Neutral
I believe that I can successfully practice GAP on my farm	07	58	27	08	3.36	Neutral
I believe that there are adequate subsidiaries and compensations for farmers to start GAP on their farms	09	61	25	05	3.26	Neutral
I believe that there is a trend of local consumers to consume GAP certified products	08	37	36	19	3.66	Positive
I believe that practicing GAP is environmentally friendly method of farming	00	22	59	19	3.97	Positive
According to my farming experience, GAP will be a successful method of farming to earn more profit	07	61	25	07	3.32	Neutral
GAP will be a method of producing nutritious, healthy and quality products	04	32	51	13	3.73	Positive
Grand mean					3.58	Positive
Legend: 1.00-1.80 = Strongly disagree; 1.81-2.60 = Disagree; 2.61-3.40 = Neutral; 3.41-4.20 = Agree; 4.21-5.00 = Strongly agree; 1.00-2.60 = Negative attitude; 2.61-3.40 = Neutral attitude; 3.41-5.00 = Positive attitude						
Source: Field survey, March to July 2018						

Based on the results in Table 5, although the farmers agreed with six altitudinal statements, they were neutral about six statements. However, the overall attitude towards the application of GAP in farming was barely positive. Although the farmers believed that GAP is an environmentally friendly method of farming and that it is a method of producing nutritious, healthy and quality products, they still do not practice GAP on their farms. With respect to other studies, Akkaya et al. (2006) reported that despite all efforts to encourage farmers to get the certification, the use of GAP among Malaysian farmers is still low. Thus this study helps to uncover the underlying factors that could influence the vegetable farmers' assigned values and consequently their attitudes towards good agricultural practices. Furthermore, Han et al. (2016) revealed that most litchi farmers have a positive attitude towards different aspects of GAP and also Ghosh & Hasan (2013) showed a medium level positive attitude (65.6%) towards sustainable agricultural practices.

Potentials and constraints of GAP application

Important requirements for GAP application were identified and they were categorized within the following five aspects: infrastructure facilities, availability of information and extension services for GAP, economic aspects of GAP activities, marketing aspects of GAP products and social aspects of GAP activities. Afterwards, they were checked one by one to identify whether they are acting as potentials or constraints for the farmers. Firstly, important factors related to the necessary infrastructure of the farms were checked and the findings are presented in Table 6.

Table 6a. Necessary infrastructure facilities

Factor	Potential (%)	Constrain (%)
Building a fence and required establishments	72	28
Availability of facilities for soil and water testing and early detection of diseases	58	42
Availability of non-contaminated water for farming	57	43
Availability of storage facilities for production, fertilizers and agrochemicals	58	42
Availability of sanitary facilities and hygienic conditions for farmers	45	55
Availability of labor for extra farming practices	42	58

Source: Field survey, March to July 2018

Based on the results in Table 6a, the potentials of the farmers related to the necessary infrastructure facilities of the farms applying GAP include: building a fence and required establishments, availability of facilities for soil and water testing and early detection of diseases, availability of non-contaminated water for farming, availability of storage facilities for production, fertilizers and agrochemicals. However, the main constraints faced by the farmers are lack of sanitary facilities and hygienic conditions for the farmers and labor for extra farming practices. Hobbs (2003) mentioned that lack of adequate infrastructure to support GAPs can be a constraint in adoption of all types of GAP programs. They also reported that farmers are required to access the necessary institutional infrastructure to verify the input quality, output quality and source of the agricultural commodities. However, some farmers in poor developing countries may not have the access to these types of services.

Availability of information and extension services for GAP were assessed using six factors. The findings are shown in Table 6b.

Table 6b. Availability of information and extension services for GAP (n=100)

Factor	Potential (%)	Constrain (%)
Availability of general information about GAP	58	42
Availability of extension and awareness programs	56	44
Availability of awareness programs on keeping records	55	45
Availability of knowledge and awareness of techniques on safety of food production	46	54
Availability of good knowledge of hygienic and health problems	46	54
Availability of advisory service programs and requirements of the internal audit guidelines	45	55

Source: Field survey, March to July 2018

Table 6b shows that the major potentials related to availability of information and extension services for GAP include availability of general information about GAP, availability of extension and awareness programs and availability of awareness programs on keeping records. However, the main constraints were availability of knowledge and awareness of techniques on safety of food production, availability of good knowledge of hygienic and health problem and availability of advisory service programs and requirements of the internal audit guidelines. Parikhani et al. (2015) reported that groups of farmers (fruit, vegetables, grain, beef and dairy) have specific needs and extra effort is required to help them to adopt good agricultural practices. These findings show that extension services are the major constraint for adopting GAP by the farmers.

Important factors related to economic, marketing and social aspects of GAP application by the farmers were also studied in order to understand the potentials and constraints related to application of GAP on their farm lands. Firstly, important factors were identified and they were checked with the farmers. The results are shown in Table 6c.

Table 6c. Economic, marketing and social aspects related to application of GAP by farmers

Aspect	Potential (%)	Constrain (%)
Economic factors		
Affordability of some chemicals and fertilizers	34	66
Willingness to pay extra cost	43	57
Having access to subsidies	42	58
Marketing factors		
Ability to get a guaranteed price for GAP certified products	48	52
Availability of stable market for selling the production	43	57
Effect of availability of organic products on the demand of GAP certified products	44	56
Social factors		
Level of peers' pressure	52	48
Social acceptance of being a GAP farmer	56	44

Source: Field survey, March to July 2018

Table 6c shows that all the economic factors, including affordability of some chemicals and fertilizers, willingness to pay extra cost and access to subsidies, were the constraints. Moreover, all the marketing factors, including ability to get a guaranteed price for GAP certified products, availability of stable market for selling the production, effect of availability of organic products on the demand of GAP certified products, were also constraints. Hobbs (2003) mentioned that affordability of some chemicals and fertilizers and willingness to pay extra cost, such as variable and fixed costs, were constraints for implementing GAP.

Farmers' willingness to adopt GAP

Farmers' willingness to adopt GAP was studied using four relevant statements. These statements and the results are illustrated in Table 7.

Table 7. Farmers' willingness to adopt GAP on their farms

Factor	Yes (%)	No (%)
Willingness to adopt GAP program	24	76
Willingness to apply for GAP certifications	22	78
Willingness to adopt GAP in future	42	58

Source: Field survey, March to July 2018

As shown in Table 7, most of the farmers were not willing to adopt GAP on their farms. In group discussions, they mentioned that it is an extra burden for them in many aspects. However, a significant percentage of the farmers are willing to adopt GAP in future as it will be more useful than today. Pandit (2017) found that the awareness level of the farmers about GAP in basmati rice was 58.33%, whereas adoption was only 27.41%, which was even less than half of the determined level of awareness.

Factors affecting willingness to adopt GAP program

The main socio-economic factors affecting willingness to adopt GAP programs were analyzed using the Chi-square tests. The results are shown in Table 8.

Table 8. Factors affecting willingness to adopt GAP program

Socio-economic factors	Willingness to adopt GAP program		
	S.E	df	Sig.
Age	0.261	1	0.030
Gender	0.602	1	0.008
Educational level	0.937	1	0.001
Monthly income	0.554	1	0.044
Experience	0.277	1	0.511

The results in Table 8 revealed that age, gender, educational level and monthly income significantly affected willingness to adopt GAP program. They have probability values less than 0.05. Thus, the null hypotheses were rejected. Accordingly, age, gender, educational level and monthly income affected the farmers' willingness to adopt

GAP program. On the other hand, the farmers' experience did not affect the willingness to adopt GAP program. The probability value of it was higher than 0.05. Also, Singh & Yadav (2014) reported that educational level and monthly income significantly affected adoption of GAP by the farmers for recommended rice production technology.

Apart from the above mentioned potentials and constraints, a few extra potentials and constraints were also identified. One potential was availability of three GAP societies in Galle district with the farmers who already have GAP certificates and are also willing to practice GAP. Therefore, the farmers can get considerable knowledge and guidance to practice GAP from these farms by being members of these societies. The second one is that there is a GAP farm on Labuduwa government farm which can be used as a demonstration farm. Another major potential is availability of several collection centers in supermarkets such as Keels and Cargills which have established to buy GAP products with 25% premium. In addition, Ruhunu Rasara market, which is established under Labuduwa farm, is also acting as a collecting center. The main constraints include flooding of some farm lands in rainy seasons, difficulties in constructing required establishment in farm lands, lack of time to engage in all the steps (such as harvesting, cleaning and packaging) to produce GAP certified products.

CONCLUSION

According to the findings, male farmers are still engaged in farming highly more than female farmers in this area. However, compared to old farmers, the number of young farmers is lower. Most of the farmers have received a significant level of education. The farmers have more than 20 years of farming experience. However, the sizes of the farm lands are small. Although the majority of the farmers have ownership, a significant number of the farmers do not have the ownership of their farm lands. Although most of the farmers have knowledge and understanding of the concept of GAP and the importance of GAP application, they do not have in-depth knowledge of different criteria related to GAP and the processes of obtaining GAP certification. While most of the socio-economic factors of the farmers, including age, educational level, monthly income and experience, have shown positive relationships with the level of knowledge of GAP, gender has not shown a positive relationship with it. The farmers who are in 35-44 and 45- 54 age groups have more knowledge of GAP than young age groups. Also, farmers having monthly income level LKR.15001-30000 and LKR.30001-45000 have more awareness of GAP and farmers who have more than 5 year experience are fully aware of GAP program. The farmers have a barely positive attitude towards adoption of GAP as a whole. Although they believe that GAP is an environmentally friendly method of farming and that it is a method of producing nutritious, healthy and quality products, they still do not practice GAP on their farms. With regard to infrastructure facilities, the potentials of the farmers include basic activities such as building a fence and required establishments, availability of facilities for soil and water testing and early detection of diseases, availability of non-contaminated water for farming, availability of storage facilities for production, fertilizers and agrochemicals. On the other hand, some advanced requirements such as sanitary facilities and hygienic conditions for farmers as well as finding labor for extra farming practices are the main constraints faced by the farmers when implementing GAP. Regarding availability of information and extension services for GAP, availability of general information about GAP, availability of extension and awareness programs and availability of awareness programs on keeping records are the potentials. The constraints include unavailability of knowledge and awareness of techniques on safety of food production, absence of good knowledge of hygienic and health problem and unavailability of advisory service programs and requirements of the internal audit guidelines. The results for economic, marketing and social factors of GAP adoption indicate that while all the economic-related factors and all the marketing factors are acting as constraints for GAP application, social factors are acting as potentials for applying GAP by the farmers. With regard to willingness to adopt GAP, most of the farmers are not willing to adopt them on their farms. Age, gender, educational level and monthly income of the farmers have affected the farmers' willingness to adopt GAP program. On the other hand, the farmers' experience has not affected their willingness to adopt GAP program. Apart from these factors, there are a few specific potential factors for vegetable farmers related to good agricultural practices such as availability of three GAP societies in the district, a GAP farm in Labuduwa which can be used for demonstration and also availability of a few collection centers of supermarkets such as Keels and Cargills which have established to buy GAP products with 25% premium. There are also a few constraints for GAP application by the farmers. The most apparent among them include flooding of many farm lands during rainy seasons, difficulties in constructing required establishment in farm lands, lack of time to engage in producing GAP certified products. Based on the findings, it can be concluded that even though the farmers do not adopt GAP at present, they have a positive attitude towards it.

Recommendations

Farmer registration in agrarian service centers in order to do official announcements and to make them aware of GAP concept and the process of GAP certification. More farmers should be included in GAP awareness programs and training programs. Demonstrations of GAP in farmers' field schools can be organized for good establishment of GAP concept in the farmers mind. Since farm lands are very small, it is better to distribute some government lands among the vegetable farmers in order to maintain the economies of scale. Farmer organizations can be encouraged and well structured. Providing subsidies and grants to encourage farmers and introduce special loan schemes for farmers who are willing to practice GAP. Arrangement of better marketing facilities for GAP products can encourage farmers to adopt GAP.

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Appendix 1. Farmers' attitude towards GAP

Disagree	Neutral	Agree	Strongly agree	2 x disagree	3 x neutral	4 x agree	5 x strongly agree	Total	Mean value	Nature of attitude
8	56	31	05	16	168	124	25	333	3.33	Neutral
2	30	35	33	04	90	140	165	399	3.99	Positive
8	38	31	23	16	114	124	115	369	3.69	Positive
8	54	28	10	16	162	112	50	340	3.40	Neutral
1	33	44	22	02	99	176	110	387	3.87	Positive
8	54	31	07	16	162	124	35	337	3.37	Neutral
7	58	27	08	14	174	108	40	336	3.36	Neutral
9	61	25	05	18	183	100	25	326	3.26	Neutral
8	37	36	19	16	111	144	95	366	3.66	Positive
0	22	59	19	00	66	236	95	397	3.97	Positive
7	61	25	07	14	183	100	35	332	3.32	Neutral
4	32	51	13	08	96	204	65	373	3.73	Positive
Grand mean									3.58	Positive
Legend: 1.00-1.80 = Strongly disagree; 1.81-2.60 = Disagree; 2.61-3.40 = Neutral; 3.41-4.20 = Agree; 4.21-5.00 = Strongly agree										