

DO WE KNOW WHAT WE SHOULD BE EATING?

Consumption patterns of fruit and vegetables



HART

**HECTOR KOBBEKADUWA AGRARIAN
RESEARCH AND TRAINING INSTITUTE**

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Research Report No: 246



October 2021

Hector Kobbekaduwa Agrarian Research and Training Institute
114, Wijerama Mawatha
Colombo 07
Sri Lanka

2021, Hector Kobbekaduwa Agrarian Research and Training Institute

First Published: 2021

ISBN: 978-624-5973-09-5

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FOREWORD

The importance of fruit and vegetable consumption for human health is so widely accepted that ironically it often goes under the radar so to speak in policy formulation processes. The disjuncture between agriculture and nutrition, for example, is evident, considerable and demands redress.

The United Nations, by declaring 2021 as the International Year of Fruits and Vegetables, was in fact emphasizing the need to raise awareness about the nutritional and health benefits of consuming more fruits and vegetables as part of a diversified, balanced and healthy diet. In other words, one could argue, societies seem to have forgotten the importance of fruits and vegetables.

Indeed, when one considers that Sri Lanka's per capita fruits and vegetable consumption remains far below the minimum level recommended by nutritionists and medical practitioners, it is clear that something has gone dreadfully wrong somewhere in the evolution of the country's food culture. There's diversity all around us, there are so many varieties of fruits, vegetables and leafy greens, but we've lost the eyesight necessary to notice them. There are literally hundreds of food plants in the country whose nutritional as well as medicinal value have been recognized for centuries and yet typically the consumer is aware of only a fraction and consumes even less.

The flip side of this situation is that there's great potential for better utilization of the natural diversity of the land and ample opportunity for increased consumption of fruits and vegetables. Put another way it is eminently possible to make them more accessible to consumers while generating other economic, social and environmental benefits.

To proceed in such directions, however, it is necessary to obtain the full dimensions of the issue, and this is what has been attempted here. This study explores the fruit and vegetable consumption patterns, contributory factors on intake and potentials and barriers to increase consumption at the household level. This has been complemented by an attempt to focus attention on actions that could ensure safety and delivery of healthy diets for all.

I believe that the findings and recommendations of this study would be immensely beneficial for strategic policy actions and programmes related to keeping the nation healthy and ensuring both food security and food sovereignty, especially given the fact that these two food categories have often been neglected in terms of nutritional worth and related policy imperatives.

Malinda Seneviratne
Director/ Chief Executive Officer

ACKNOWLEDGEMENT

We extend our gratitude to the former Directors of HARTI: Mr. Keerthi Kotagama and Prof. Ranjith Premalal de Silva for providing the required assistance to make this study a success. We are also grateful to Mr. Malinda Seneviratne, the present Director of HARTI, for his constant support in publishing this report. The research team also expresses sincere thanks to Mrs. Susila Lurdu, Head of the Agriculture Policy and Project Evaluation Division of HARTI, for her comments on the first draft.

We appreciate the valuable comments provided on the final draft by Prof. L.M. Abeywickrama, Professor of Agriculture Economics at the University of Ruhuna, and Dr. L.P. Rupasena, Senior Lecturer at the Rajarata University of Sri Lanka.

We also wish to express our sincere gratitude to Dr. Amanthi Bandusena, Consultant Community Physician of the State and Urban Health Division at the Ministry of Health, for providing valuable insights to improve this study. The research team highly appreciates the households who participated in the questionnaire survey. Further, we extend our appreciation to all the administrative and field level officers who helped in gathering data and provided relevant information for this study.

We would like to thank Mr. J.K. Indraprabath, Statistical Assistant at HARTI, for his dedication and hard work in data collection, data tabulation and data analysis. Our special thank goes to Ms. M.D.T. Fernando and Ms. D.T.S.N. Karunathilake, the Investigators of this study, for their excellent support during the data collection and data processing.

We wish to convey our sincere thanks to Mrs. L.A.K.C. Dahanayaka, Assistant Registrar (Programme) of HARTI, for providing administrative facilitation throughout the study. We also thank to Mr. S.A.C.U. Senanayake for proof reading the report, and the staff of the Publication and Printing Unit of HARTI for publishing it.

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EXECUTIVE SUMMARY

Fruits and vegetables (henceforth referred to as F&V) are very good sources of vitamins, minerals, antioxidants and dietary fibre. Adequate consumption of F&V is one of the most cost-effective measures to alleviate micronutrient deficiencies and could help to reduce a wide range of diseases. Therefore, the consumption of F&V is encouraged as part of a healthy diet which will lead to lower personal and social health costs. According to medical recommendations, an adult needs a minimum of 400 grams of varying F&V each day to lead a healthy life. However, Sri Lanka's per capita consumption of F&V remains far below the required average daily intake. Due to the diverse nature of socio-economic status, the patterns and decisions in F&V intake may vary from household to household (henceforth referred to as HH). Understanding this behavior is important in decision making along the F&V supply chain as well as in implementing nutrition policies. Hence, the focus of this study is identifying F&V consumption patterns, contributory factors for consumption, and barriers and potential to increase F&V intake at HH level in Sri Lanka with special attention to the urban, rural, and estate sectors.

Multistage Random Sampling Method was employed and 443 HHs representing the urban, rural, and estate sectors were surveyed using a structured questionnaire. Descriptive analysis was conducted to examine F&V purchasing behaviour of HHs. The F&V intake was measured according to the National Food Guidelines presented by the Ministry of Health of Sri Lanka, and Food and Agriculture Organization guidelines. The Simpson Index Analysis was used to calculate F&V consumption diversity across HHs. The factors which influence HH F&V consumption were examined using a Regression Analysis. An Exploratory Factor Analysis was used to identify factors that influence the potentials and barriers to F&V consumption.

Urban HHs spend more than twice the amount that rural and estate HHs spend on F&V. The budget share of F&V varies across the three sectors showing values of 0.42, 0.32, and 0.29 among urban, rural, and estate dwellers respectively. The vegetable budget share is higher than the fruit budget share in all three sectors indicating a higher spending for vegetables in comparison to fruits. In the time period from 2002 to 2016, there is an increasing trend in fruit budget shares in urban HHs over time, and a declining trend in the rural sector. There is no significant change in fruit budget shares in the estate sector during this time period. Urban HHs show a declining trend in the vegetable budget share over time in same time period, while the rural and estate sectors showed an upward trend. However, the percentage of the food budget spent on F&V is generally small in all three sectors, ranging from 1.9 percent to 10 percent.

A majority of the urban (69%), estate (69%), and rural (56%) HHs totally depend on outsources for obtaining F&V, while only four percent of the rural sector and one percent of estate HHs fully depend on home gardens to obtain F&V. Most of the HHs in the urban sector are inclined to use supermarkets to obtain F&V while the rural sector HHs prefer home gardens and the local market (*pol*a). Estate HHs mostly

prefer the local market and roadside vendors. A majority of the respondents (99%) did not have problems with availability of F&V at markets. However, there was a keen interest in buying fresh F&V rather than packed or processed ones. Quality and freshness were the most important attributes that come under F&V purchasing, followed by price, safety and seasonality which were ranked under important attributes.

The per capita fruit consumption was estimated and it varied across urban (187.78 g/day/person), rural (151.51 g/day/person) and estate (43.34g/day/person) HHs. The per capita vegetable consumption was reported as 180.55 g/day/person in the urban sector, 165.89 g/day/person in the rural sector, and 108.38 g/day/person in the estates. The Simpson Index Analysis revealed that diversity of F&V intake varies among HHs and highest diversity is in urban (0.65) HHs, followed by rural (0.58), and estate (0.32). In addition, the consumption of vegetables (urban- 0.63, rural- 0.56, estate- 0.28) is more diversified than the consumption of fruits (urban-0.31, rural-0.19, estate-0.025). However, quantity as well as diversity of F&V intake is very low in estate HHs in comparison to the urban and rural sectors. According to the Multiple Linear Regression Analysis, HH size, gender, education level of the HH head, number of children, food habits, dwelling in an urban area, and access to F&V market have a significant effect on HH expenditure on F&V over other expenditures. The results of the Exploratory Factor Analysis revealed eight factors that impact potentials and constraints in F&V consumption. They are, “the willingness to change”, “choice of F&V”, “awareness of recommendations”, “liking”, “health consciousness”, “difficulties,” “ease” and “perceived quality of F&V”. All together, these factors explained 70 percent of the total variation.

Most of the respondents were aware of the nutritional benefits of F&V. However, the majority of respondents (75%) in the survey were not aware of the National Food Guidelines, quantity, variety of intake, and terms like serving and serving sizes. Perception of chemical usage in fruit ripening, poor taste, and high prices were the most important factors which hindered HH fruit consumption. Awareness about the nutritional benefits of F&V, quality of the products, availability at home gardens, reasonable price and seasonal availability were reported as motives for F&V intake. Majority of the respondents (97%) highly perceived that the F&V they purchased are not very safe and believe that they are contaminated with pesticide residues. This belief negatively affected the F&V consumption and purchasing decisions of a majority of HHs (74%). Most of the respondents (60%) were aware of organic F&V. However, non-availability, doubt about the product guarantee, lack of promotion, and unclear declarations of the organic status were the major barriers for reducing purchase of organic F&V.

According to the sector of residence, socio-economic status and the F&V consumption patterns of HHs varied, which suggests that actors in the supply chain of F&V should find most suitable markets for their produce across three sectors. The nutrition policies should place more emphasis on promoting F&V consumption, making people aware of the importance of a diversified F&V intake, and promoting

better attitudes towards healthy diets. Estate sector HHs in particular should be specifically targeted in such strategies as they have the least F&V intakes in accordance with dietary recommendations. Assurance of quality and safety of F&V available at the market is essential and market inspections and legislation procedures should be strengthened and regulated. It is recommended that scientific research is done to assess the residual effects of pesticide use, and that people are made aware of this information to prevent misconceptions. There is a potentially viable market for safe F&V and national legislation for reputable organic certification will lead to greater trust in organic F&V. Moreover, investments in F&V research aimed at reducing production costs and enhancing food safety could greatly benefit population health by helping to lower the price of F&V making them more accessible to the populations that need them.

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ABBREVIATIONS

DS	-	Divisional Secretariat
FAO	-	Food and Agriculture Organization
F&V	-	Fruits and Vegetables
GND	-	Grama Niladari Divisions
HH	-	Household
HIES	-	Household Income and Expenditure Survey
MC	-	Municipal Council
NCDs	-	Non-Communicable Diseases
UC	-	Urban Council
WHO	-	World Health Organization

CHAPTER ONE

Introduction

1.1 Fruits and Vegetables in Sri Lanka

Fruits and vegetables (F&V) are the famous horticultural crops in Sri Lanka. They are the highest contributors to the horticultural sector. Sri Lanka is blessed with ideal conditions for cultivating a wide range of tropical and temperate F&V crops due to its topography and climate. Tropical F&V are important to developing countries from both a nutritional and commercial perspective. However, the F&V market has many particularities due to the fact that the products are perishable and they represent an important nutritional component for the consumers.

The vegetables grown in Sri Lanka can be divided into two categories- Namely, up-country vegetables and low-country vegetables. As a whole, the cultivation extents of these two types of vegetables are more or less stable. However, there are gluts in certain seasons due to the changes in the weather and the relative prices of the vegetables concerned. Regardless, the country is virtually self-sufficient in vegetables (Senanayake and Wimalaratana, 2014). Moreover, there are many fruit species and consequently, a great diversity of fruits exists in Sri Lanka (Anonymous, 2007). In addition to the major fruit species, Sri Lanka has over 60 varieties of underutilized fruit species.

1.2 Importance of Fruit and Vegetables as a Nutrient Supplement

Fruits and vegetables are widely accepted as important components of a healthy diet and the adequate consumption of these could help to reduce a wide range of diseases. They are very good sources of vitamins, minerals, antioxidants and dietary fibre. Hence, consumption of a wide variety of F&V regularly reduces the risk of obesity, diabetes, coronary heart diseases, and cancers. It also protects against the effect of ageing (Ministry of Health, 2011).

Fruits and vegetables play a unique role in a healthy diet and variety is as important as quantity. Each colour of F&V lends itself to unique nutrients (Ariel, 2009; USDA, 2015) and helps to fulfill most of the micronutrient requirements which are needed for metabolism and immunity (Ministry of Health, 2011). Considering the nutritive value and the health benefits of F&V, the Food and Agriculture Organization (FAO) and World Health Organization (WHO) recommended that an adult needs a minimum 400 grams of F&V each day (146 kg per person per year) consisting of at least five varieties of F&V for a healthy life.

1.3 Fruit and Vegetable Consumption towards Healthy Diets

Fruit and vegetables in the diet are considered as one of the most cost-effective measures to alleviate micronutrient deficiencies. Overweight and obese people should be encouraged to replace some of the food categories which are intense in fat, with F&V. In spite of the growing body of evidence highlighting the protective effect of F&V, their intakes are still grossly inadequate both in developed and developing countries (IARC, 2003).

Sri Lanka is a low-middle income country undergoing rapid epidemiological and nutritional transition (Shekar *et al.*, 2007). Traditional food components are increasingly replaced by processed foods and convenience products that tend to be nutritionally less desirable. Poor dietary intakes have been associated with higher risk of Non-Communicable Diseases (NCDs) (Popkin, 2017) and low F&V intake is among the top 10 selected risk factors for global mortality. Up to 2.7 million lives could be saved annually with sufficient F&V consumption (WHO, 2003) and in 2017, 3.9 million deaths worldwide could be attributed to not eating enough F&V (WHO, 2019). Therefore, improving population diet with sufficient F&V is a key public health target.

1.4 Problem Statement

Under-nutrition, low dietary diversity and micronutrient deficiencies remain big problems in many developing countries (Qaim and Sibhatu, 2018). Immediate attention to diet related interventions is required in order to create behavioural change towards healthy and balanced diets (Weerahewa *et al.*, 2018). Hence, promoting a healthy diet, such as increasing F&V consumption, has been a global priority because of the scientific linkage between food intake and human health (Browe *et al.*, 1966; Aldana *et al.*, 2005; Bertias *et al.*, 2005; Allen, 2006; Park *et al.*, 2009).

The important role of F&V consumption has been affirmed on several occasions. 2021 has even been declared as the International Year of F&V by the United Nations with the aim of raising awareness about the nutritional and health benefits of consuming more F&V as part of a diversified, balanced, and healthy diet. However, Sri Lanka's per capita consumption of fruits (88.2g) and vegetables (124.3 g) remains far below the required average daily intake (Food Balance Sheet, 2014). Hence, action at a national level is necessary in order to increase F&V consumption and make them more economically accessible to consumers, while generating economic, social, and environmental benefits. However, availability of recent country estimates of dietary intake is limited and Household Income and Expenditure Surveys (HIES) have limitations, as they are designed to measure expenditure rather than consumption at the HHs. Therefore, to develop effective policies and implement comprehensive programmes, the government requires country level baseline information on the prevalence of low F&V consumption.

In addition, many developing countries lack data on the F&V consumption patterns in their populations. Moreover, due to the diverse nature of socio-economic conditions, it is possible that different sub-populations in a single country also show different dietary patterns on some occasions (Popkin, 1999). This poses a challenge to policy makers in coming up with a set of food and nutrition policies to address diet related issues in a country. To reduce morbidity and mortality from chronic disease caused by low F&V consumption, these gaps in knowledge, including the identification of specific populations and subgroups at risk, need to be filled (Justin, 2009).

The act of consumption influences consumers' purchasing decisions (Bagozzi and Dholakia, 1999). The lifestyle changes in recent times have made an impact on the purchasing behaviour of HHs due to rise in spendable income, rise in dual income groups, less time to spend in local markets, and accessibility to online purchase platforms (Akpinar *et al.*, 2009). Further, consumption of F&V is determined to a large extent by the supply. However, this impacts not only the quantity, but also the quality, diversity, and safety of F&V (Nijhuis and Brouwer, 2020). Hence, promotion of F&V consumption requires a better understanding of how the food environment, availability, safety, and affordability (Wang *et al.*, 2016) affect HHs purchasing and consumption decisions. Therefore, understanding the needs, preferences and consumer behaviours towards F&V purchasing have many positive impacts on developing strategies on F&V intake.

Ensuring that all people consume healthy foods is morally and economically imperative. Therefore, effective programmes and policies are urgently needed to influence consumption behaviour and foster F&V intake. Key questions that emerge in regards to this, are why these consumption levels are so far from the ideal and what can be done to improve this situation. Questions such as what are the factors that shape consumption behaviour related to F&V and what is their relative importance in different sub population groups are also important. Therefore, the knowledge of the actual intake, consumption patterns, potentials and barriers to upgrade consumption levels are needed for the strategies to be set up properly and to assess what changes need to be made if the recommendations are to be met. Therefore, more research with comprehensive data which focus on physiological and psychological determinants as well as the broader environmental determinants on F&V consumption is needed (Popkin *et al.*, 2001; WHO, 2003; Lucenteforte *et al.*, 2008).

Hence, this study focuses on identifying F&V consumption patterns, contributory factors for consumption, and constraints and potentials to increase F&V intake at HH level in Sri Lanka with special attention to the urban, rural, and estate sectors. Findings will guide future policy initiatives to promote and facilitate greater consumption of F&V. It will direct policy makers, academia, and researchers to design more effective interventions to promote healthy diets and improve the nutrition status of the country.

1.5 Objectives

The overall objective of the study is to identify F&V consumption patterns and contributory factors to F&V intake, for formulating strategies to attain the recommended level of per capita intake.

Specific Objectives:

1. To describe trends, patterns, and buying behaviour of F&V
2. To estimate per capita F&V consumption and its diversity across HHs
3. To identify factors which influence HH F&V consumption
4. To identify potentials and barriers to increase F&V consumption at HH level

1.6 Limitations of the Study

Fruit and vegetable consumption was based on reported intake of one week of time which may not have represented habitual intakes.

1.7 Organization of the Report

This report consists of eight chapters. The introductory chapter gives the background and objectives of the study. The Second Chapter reviews the literature of past studies on F&V consumption patterns, factors influencing F&V consumption, and potentials and barriers on F&V intake. The Third Chapter is dedicated to the concepts and reviewing factors which influence HH F&V consumption. The Fourth chapter provides the research methodology and study locations. Chapter Five presents the F&V consumption patterns of HHs in Sri Lanka and Chapter Six brings out the determinants, per capita F&V consumption, and the diversity of F&V consumption. The Seventh Chapter presents the constraints and potentials of F&V consumption. The Final chapter contains the conclusion and recommendations of the study.

CHAPTER TWO

Review of Literature

2.1 Trends and Patterns of Fruit and Vegetable Consumption

In 2050, the global average F&V availability is predicted to vary between 608 to 862 grams per person per day, depending on different socio-economic scenarios. Nevertheless, numerous low-income countries in Asia, the Pacific and sub-Saharan Africa are expected to fail to supply at least 400 gram per capita per day in 2050 (Mason-D’Croz *et al.*, 2019). The study of Vereecken *et al.*, (2015) analyzed F&V consumption trends among adolescents from 2002 to 2010 in 33 countries using standardized methodology. This study found that there was a positive trend overall in daily F&V consumption among adolescents across most countries between 2002 and 2010. However, a review of F&V policies and initiatives across countries could help to explain the changes and guide future strategies to increase F&V intake among adolescents. According to the studies of Casagrande *et al.*, (2007) and Larson *et al.*, (2007) the United States population is not meeting the recommended levels of F&V consumption. There is no statistically significant increase in F&V intake among adults between the years 1988–1994 and 1999–2002.

The study of Asfaw (2008) examined the patterns and determinants of F&V availability for human consumption in Latin American and Caribbean countries between 1991 and 2002. The results showed that there were considerable disparities between and within countries. Only one-third of the sampled countries (if only 20% wastage is assumed) could achieve the World Health Organization’s recommendation of 146 kg of F&V intake/person/year. The elasticities estimated from a fixed effect regression also showed that income, urbanization, price and poverty were some of the important factors that affect the long-term availability of F&V.

According to the study of Uraiwan *et al.*, (2009) a large proportion of adults in Asia consume an inadequate amount of F&V despite the abundant availability. Education and behavioural change programmes are needed to promote F&V consumption. The study of Weerahewa *et al.*, (2013), shows that banana, papaw, mangoes, and pineapple are the major fruits consumed and the consumption levels of such fruits have been rising over the years. The urban HHs and the HHs in high-income deciles are found to be allocating a relatively higher proportion of their food expenditure on fruits. The results of econometric estimations reveal large income effects and relatively small price effects. The necessity for a larger role for income based interventions as opposed to price based interventions to improve fruit consumption in Sri Lanka is evident from the results.

Perera and Madhujith (2012) explored the patterns of F&V consumption of undergraduate students. They found that the mean F&V consumption per day was 267 gram which is far less than the recommended quantity for the particular age group. However, gender, income, taboos and knowledge scores have shown significant effect on F&V consumption among undergraduate students tested. Further, it was revealed that a large percentage of the students were unaware of the health benefits of consumption of F&V.

2.2 Buying Behaviour of Fruit and Vegetables

Consumer's buying behaviour is made up of activities that involve buying and using a product or service for personal and HH use (Mazziotta, 2001). Both external and internal attributes are used by consumers to perceive a product quality. A study by Obuobie *et al.*, (2006) in Ghana revealed that, during the buying of vegetables, consumers look for certain characteristics such as freshness, colour and spotless leaves. In Vietnam, supermarket expansion had an impact on consumers' demand for F&V. The demand for products from modern supply chains, especially modern retailers and non-traditional imports is highly income elastic (Bhattacharya *et al.*, 2007).

The Study of Manjunath *et al.*, (2012) analyzed the factors affecting consumer purchase behaviour for major vegetables in Delhi. The results showed that the proportion of income spent on vegetables decreases as level of income increases. The proportion of consumers preferring to purchase off-seasonal, processed, pesticide free and organically produced vegetables was high in the high income group. The majority of low and middle income group consumers purchase vegetables from local markets or vendors whereas high income group consumers purchase at supermarkets. The monthly income of the family, credit facility/credit card facility, price, education, condition of store, appearance of produce, organic produce, service facility offered by shop and type of market were the factors that significantly affect purchase behaviour of vegetable consumers.

Studies have concluded that credence attributes have a positive impact on consumer's attitude towards a product, and consequently influence consumers' buying intentions (Dentoni *et al.*, 2009; Wirth, *et al.*, 2011). Most of the consumers make their buying decisions regarding F&V based on an analysis of cognitive and emotional elements and are not very much influenced by advertising or other campaigns (Nicolae and Corina, 2011). Consumers valued freshness, appearance and price more than other characteristics (Mahaliyanaarachchi, 2007). Most of the consumers considered safety, a credence attribute which cannot be checked by consumers, the most important quality aspect in F&V (Dimech *et al.*, 2011).

It is evident that the perceptions or attitudes towards food attributes such as taste, nutritional qualities, and convenience are the key determinants of food choices and these attitudes and perceptions are in turn influenced by a number of personal variables such as education, socio economic status, age, and gender (Fearne and

Lavelle, 1996). Results showed that consumers perceive organic F&V as very healthy, tasty, and of good quality. Among the purchase motives, quality, freshness, nutritional value, being organically grown, and safety were indicated as the most important reasons for purchasing organic F&V in EU member states (Tina, 2015).

2.3 Factors Affecting Fruit and Vegetable Consumption

Various economic and non-economic factors can affect the availability or consumption of F&V at national, HH, and individual levels. Factors such as natural resource endowment, price, income, poverty, and infrastructure can affect the supply and demand for F&V. At the same time, social and demographic factors such as urbanization, prevalence of chronic diseases, knowledge on nutrition, culture and religion can influence the behaviour and attitudes of consumers towards F&V (Asfaw, 2008).

Whichelow *et al.*, (1996) found that the size of a HH, the age, the socio-economic group and the geographic location affect the consumption of fruits in the United Kingdom. Frequent consumption of fruits is associated with small HHs, living in the south of the country, middle age and non-manual socio-economic groups. Similarly, Johnson *et al.*, (1998) found that elderly people tend to consume less than the recommended levels of fruits compared to younger people. Education and occupation appear to be critical determinants of fruit consumption. Irala-Estevez *et al.*, (2000) proved that there is a positive association between high level of education and a greater consumption of fruits. Marital status also seems to play a significant role in the consumption of fruits (Billson, 1999). There are fewer studies in the literature that link food variety with demographics. Moon *et al.*, (2002) suggested that highly educated consumers have been exposed to information about benefits of eating various types of foods and have consumed many different products.

A study carried out by Neumark-Sztainer *et al.*, (2006) investigated F&V consumption among American adolescents. The authors identified that the strongest correlates of F&V intake was home availability of vegetables and taste preferences. Correlates of home availability included social support for healthy eating, family meal patterns, family food security, and socio-economic status. Schroeter *et al.*, (2007) investigated the F&V consumption among college students in Arkansas and determined that demographics, lifestyle, knowledge on health and food culture were significantly related to the consumption behaviour.

A research carried out by Unusan (2004) investigated the F&V consumption among university students in Turkey discussing the significant gender differences related to the consumption of F&V. The determinants most consistently supported by evidence are gender, age, socio-economic position, preferences, parental intake, and home availability/accessibility. Further, a need for internationally comparative, longitudinal, theory-based, and multi-level studies taking both personal and environmental factors into account was emphasized.

2.4 Potentials and Barriers of Fruit and Vegetable Consumption

The findings of Wang *et al.*, (2016) suggested that there is an urgent need to increase the general population's awareness about F&V recommendations and their current intake, particularly among young and middle-aged people. The findings also highlighted the need to initiate joint efforts by dietitians, the food service industry, communities, policy makers and the mass media to improve the lack of availability, awareness and convenience of fruit/vegetable intake in addition to facilitating positive attitudes, self-efficacy, and social support of individuals.

According to the study of MacLellan *et al.*, (2004), the main barriers of F&V consumption in Prince Edward Island were effort, lack of knowledge, socio-physiological and socio-environmental factors, and availability. Internal influences, life events and food rules were identified as encouraging factors for women to include F&V in their diets. Given the challenges in effecting meaningful dietary change, dietitians must look for broader dietary behavioural interventions that are sensitive to women's perceptions of benefits and barriers to F&V intake. The study conducted among Austrian adults, found that both intake frequency and the number of F&V servings were largely independent of seasonal fluctuations. The primary reason for the consumption of both F&V was taste. As the health aspect plays a much smaller role in comparison, efforts to increase intake should increasingly consider the aspect of taste in addition to the health advantages. The greatest barrier to higher intake was the perception that current individual consumption was already sufficient. In contrast to other studies, price was found to be only a minor barrier to consumption of F&V in Austria (Manuel *et al.*, 2009).

The importance of availability is affirmed by the fact that people often forget to eat F&V, as well as naming preparation effort and inconvenience if not at home as barriers to consumption (Manuel *et al.*, 2009). Availability is regarded as a major reason for, as well as an important barrier to, consumption. Especially availability of F&V at the place of work plays an important role (Anderson *et al.*, 1998; Oppen, 2002). According to Johnson and Anderson (1998) in countries where rural households produce and consume varieties of F&V, urbanization may reduce the overall availability of F&V for consumption especially if there is high urban poverty and income inequality.

According to Affret *et al.*, (2017), an increase in F&V consumption was mostly observed in women with high socio-economic position. The socio-economic environment of individuals must be taken into account in order to develop effective nutritional interventions and policies. Ugur (2014) found that the increase in purchasing power is positively associated with the increase in the monthly budget of vegetables and the variety of places vegetables are bought. He suggested that future studies which include larger samples and different populations and regions may bring a different perspective to the issue in terms of both the production chain of vegetables and the consumption habits, taking consumer opinion into account.

The increase of F&V intake has become a public health priority in many countries. Although cost constraints may explain the lower F&V intake in lower socio-economic groups, the relative influence of budgetary resources, nutrition knowledge, and social and environmental barriers in socio-economic disparities need further investigation (Carla *et al.*, 2008). Future nutrition interventions that promote F&V intake should address the specified socio-demographic determinants and should be tailored to the needs of the specific groups of consumers. Multi-sectoral partnerships are also important and necessary to create supportive environments for the effective implementation of F&V promotion initiatives across different levels, including school, community, and national levels (Chong *et al.*, 2017).

CHAPTER THREE

Conceptual Framework

The consumption of F&V, which has been widely accepted to be related to a healthy life and lower diseases, is influenced by different factors. Fruit and vegetable consumption is governed by a complicated decision-making process that is influenced by individual, HH and environmental factors (Zhang, 2011). The theoretical framework to be used in this study is drawn from existing studies which focus on factors which influence F&V consumption.

3.1 Barriers and Motives that Affect Household Fruit and Vegetable Consumption

3.1.1 Factors of Intra- Household Decision Making for Fruit and Vegetable Consumption

Previous studies suggested that age, gender, ethnicity, residency (urban/rural), and socio-economic status are important demographic factors affecting F&V consumption (Whichelow *et al.*, 1996; Johansson and Anderson, 1998; McClelland *et al.*, 1998; Pollack, 2001).

Education: Education and occupation appear to be critical determinants of fruit consumption (Irala-Estevez *et al.*, 2000). Higher levels of education were associated with greater consumption of F&V (Galobardes *et al.*, 2001; Ball *et al.*, 2006).

Health status: Healthy people try to eat more nutritious foods, which encourages F&V consumption (Lennernas *et al.*, 1997). Obese people tend to underestimate their food intake, including F&V consumption (Heitmann and Lissner, 1995). However, optimistic bias may occur as people believe they are at less of a risk than others for overeating. It may result in overestimation of F&V consumption (Cox *et al.*, 1998).

Household size: Limited studies have investigated the impact of family structure on F&V consumption. Generally, married individuals with more family members, especially children, consumed significantly more F&V (Devine *et al.*, 1999; Pollack, 2001). Family influence is a key factor in children's F&V consumption (Gross *et al.*, 2010).

Household income: Households with higher income are more likely to meet the recommended amount of servings of F&V compared to lower income families (Pollack, 2001). According to Asfaw (2008) income and prices of F&V are the key determinants of consumption of F&V in Latin American and Caribbean countries.

Indeed, fruit consumption is positively related to income (Giskes *et al.*, 2002; Blisard *et al.*, 2006).

Household decision-maker: A study of HH budget data from Rwanda found that female headed HHs allocate a larger share of their budget on F&V than male-headed HHs (Ministere du Plan, 1988). However, a study in Vietnam found that no statistically significant difference between the F&V consumption patterns among male and female headed HHs (Minot, 1992). Thus, the effect of female status or female control on F&V consumption patterns remains a hypothesis for further research.

Number of children: Household factors mainly contribute to children's F&V intake. Income elasticity was the strongest in infants compared to older children and adult females. Elderly people tend to consume less than the recommended levels of fruits compared to younger people (Nicklas *et al.*, 1998).

Dietary habits: Food/dietary habits are complex constructs reflecting numerous cultural, traditional and psychosocial factors which affect food choices (Rozin, 1986). Eating fast food is associated with low or less frequent consumption of F&V. Parental F&V intakes, knowledge of intake recommendations, and food preparation skills had a positive association with children's intakes (Blanchette and Brug, 2005).

3.1.2 Factors of Household Preference for Fruit and Vegetable Consumption

Fruit and vegetable consumption habits and traditions may differ between and within countries. Ethnicity can also affect dietary behaviour because of cultural differences, group norms, and psychological factors (Kiviniemi *et al.*, 2011). Social norms are considered to be significant factors in F&V consumption (Sorensen *et al.*, 2007). Food preference, knowledge, attitudes, and self-efficacy have been associated with F&V consumption (Klepp, 2005). Positive attitudes towards F&V is associated with consumption according to several studies (Cullen, 2003; Resnicow *et al.*, 1997; Domel *et al.*, 1996).

Sensory appeal: Properties of F&V, such as taste, smell, and appearance, are important elements in satisfying consumers (Clark, 1998; Glanz and Basil, 1998; French, 2003). While the taste of fruits is generally perceived as pleasurable, the taste of certain vegetables is considered to be a barrier to their consumption (Drewnowski, 1997). These appeal related factors are especially important for young children (Brug *et al.*, 2008) who are more likely to be affected by the appearance and taste of food and are less aware of their nutritional value. Coulthard and Blissett (2009) found that children who are more sensitive to food taste and smell rely more on their own preferences rather than parents' eating arrangements for them.

Perception of health: Smoking, Body Mass Index (BMI), and self-rated health status are related to the food choices people make. An individual's health status can be a consequence of his/her lifestyle, which also influences his/her food preferences.

3.2 Supportive and Restrictive Tools of Fruit and Vegetable Consumption

3.2.1 Product Characteristics which Determine Fruit and Vegetable Consumption

The primary lifestyle factors which affect food choices in the west are time constraints on food shopping and preparation, given the perishable nature of F&V. Individuals believed that more visits to grocery stores were necessary to increase F&V consumption (Anderson and Cox, 2000). Although fruit was viewed as convenient to consume, vegetable preparation time was seen as a barrier. Availability of preferred F&V, having more choices (variety), and the preparation methods of F&V were all important determinants of produce intake of adolescents. People have preference for fruits instead of vegetables (Krolner *et al.*, 2011).

Food price: Food cost is a major factor, second only to taste, in determining food choices, especially for income constrained groups. Price is an important motive relating to food choices for people in general, and vegetables and fruits in specific. Price was a main driver of choice for F&V in a choice experiment in all countries and for all products included (Glanz *et al.*, 1998; French, 2003; Powel *et al.*, 2009). Because of the strong relationship between food price and F&V consumption, consumers are quite responsive to changes in F&V prices (French, 2003) and price sensitivity also varies by socio-economic status (Powell *et al.*, 2009).

Season: The seasonal factor in F&V consumption is especially influential in agricultural communities (Locke *et al.*, 2009). The amount of F&V supply, the quality of produce available, and prices vary in different seasons, therefore F&V consumption also changes seasonally. Most customers consumed comparatively greater amounts of F&V during the summer, while consuming less in the winter (Utrecht *et al.*, 1999). Several studies have assessed seasonal consumption of F&V. One cohort study of white men in New Jersey (Ziegler *et al.*, 1987) found that consumers could be categorized into two groups: year-round versus seasonal consumers.

Processed/ value added F&V products: Production of F&V with improved quality, avoiding nutrient loss and safety is more convenient with regard to portion size or storability. Also, for those consumers not fond of vegetables at all this could be a way to increase intake. The portion size of F&V in ready-to-eat meals could be higher and more in line with recommendations (Sijtsema *et al.*, 2018).

3.2.2 Factors of Availability and Accessibility to Fruit and Vegetable Consumption

Availability and accessibility at home: More than half of the variations in F&V consumption among children could be attributed to the family and home environment. There is a stronger positive association between parental intake and children's F&V intake within families with a high availability of F&V at home. Fruit

and vegetable availability had the greatest influence on the F&V consumption by children (Katarzyna *et al.*, 2015).

Accessibility and availability at market: Location, access, and food availability in grocery stores are all related to F&V consumption. Low-income populations that lack adequate transportation are more likely to utilize high-cost convenience stores instead of accessing supermarkets that are further away but offer more choices and lower-priced F&V (Leather, 1995). Women shopping at supermarkets consumed more F&V than the ones choosing other types of grocery stores. However, the supermarket effect may not be found in all metropolitan areas (Zenk *et al.*, 2005).

New efforts have been proposed to increase F&V availability and accessibility in workplaces, especially for low-income populations. When employers provided an available fruit supply at workplaces, the F&V intake increased for the low-income employees (Backman *et al.*, 2011). Availability and accessibility of F&V were closely linked to determining F&V intake in children (Kratt *et al.*, 2000; Cullen *et al.*, 2001; Skinner *et al.*, 2002; Cullen *et al.*, 2003). Availability and accessibility accounted for more than 10 percent of the variability in F&V consumption (Cullen *et al.*, 2003).

An individual's F&V consumption is positively affected by positive social capital in high-socio-economic status neighbourhoods. Residents in disadvantaged neighbourhoods consumed fewer F&V (Kamphuis *et al.*, 2006). There was a significant relationship between social factors and F&V consumption if there was a community garden for F&V instead of home gardens (Litt *et al.*, 2011).

Information and promotion: In general, students who participate in school meal programmes are more likely to intake healthy foods which include F&V than those who don't (Condon *et al.*, 2009). Furthermore, in a school community environment, girls are more likely to be influenced by their friends in terms of dietary habits and fitness, which will potentially affect their F&V intake (Eisenberg *et al.*, 2005). More specifically, another barrier to F&V consumption is the lack of high branding of F&V in media and advertisements, leading some consumers to perceive F&V as "boring" or "old fashioned" (Anderson *et al.*, 1994). Consumers exposed to media and different messages concerning healthy eating may demand more F&V (Nicklas *et al.*, 1998). However, exposure to commercial food advertisements and video viewing may promote the consumption of unhealthy fast foods and can lead to a decline in F&V consumption (Boynton-Jarret *et al.*, 2003; Taveras *et al.*, 2006, Wiecha *et al.*, 2006).

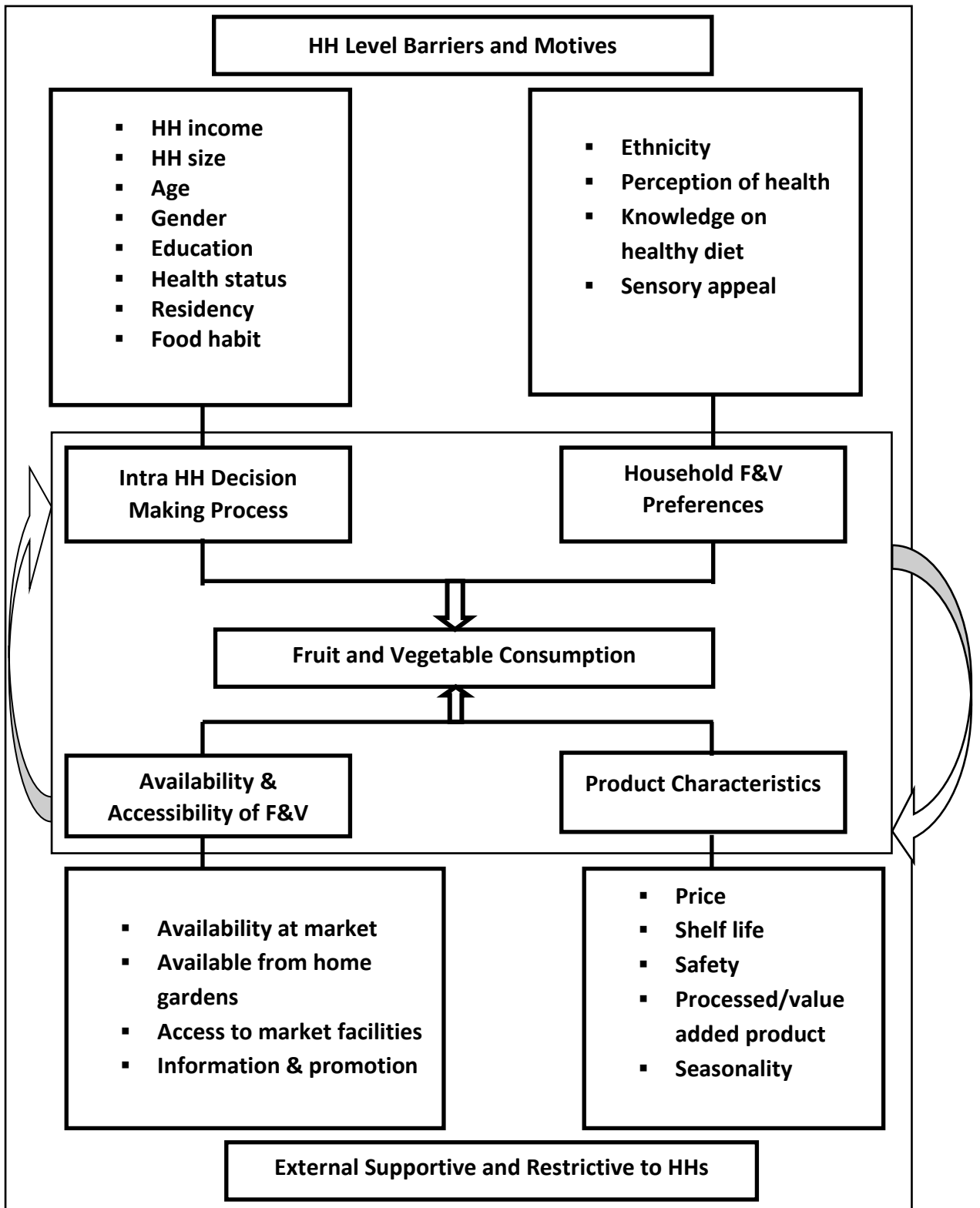


Figure 3.1: Conceptual Framework of Determinants of F&V Consumption

CHAPTER FOUR

Methodology

4.1 Data Collection Methods

4.1.1 Primary Data Collection

The primary data required for performing the qualitative and quantitative analysis of the study was gathered through structured questionnaires.

Data on F&V purchase was collected from HHs based on a recall period of one month. Fruit and vegetable consumption through home gardens and any kind of transfers were considered as monetary purchases. Data on individual dietary intakes was collected using a questionnaire and a 24 hour dietary recall method was used. It consisted of reporting all F&V consumed within the 24 hours prior to interview. Consumption on weekdays and weekends were investigated separately as diets can vary between weekend and weekdays (Bingham, 1987; Appleton *et al.*, 2009). Therefore, individual dietary intakes of F&V in weekends were also taken. Subsequently the data was combined ($[\text{weekday} * 5 + \text{weekend day} * 2] / 7$) to provide an average consumption of F&V per day per individual.

The definitions of “fruit” and “vegetable” vary from country to country. While fruit definitions are more homogeneous, vegetable definitions vary considerably and raise particular issues in terms of the inclusion/exclusion of starchy roots and tubers and legumes (WHO, 2003). In this study, the main focus of interest is the micronutrient content of F&V. Hence, in this study, the below classifications of F&V were used.

Fruits: The fruit group consisted of fresh or preserved fruits except those classified as vegetables. Fruit drinks were not included in this group as most of them contain only a small amount of the original fruit juice, fiber is lost, and in some cases sugars are added (WHO, 2003).

Vegetables: Vegetables are broadly defined as the edible portions of a plant excluding fruit and seeds. Nuts, pulses, sugar crops, and starchy crops are excluded from this group. Further, legumes were added to the vegetable group.

If respondents had strong perceptions of an item as a fruit or a vegetable other than the above classification, they were grouped in line with public perceptions for the sake of clarity.

4.1.2 Secondary Data Collection

The study used national HIES data. Therefore, the secondary data was mostly collected from secondary data sources of Department of Census and Statistics and Central Bank reports of Sri Lanka. In addition, secondary data was gathered through research reports, journals and newspaper articles.

4.2 Operational Definitions

Household

A household may be a one-person household or a multi person household. A one-person household is a unit where a person lives by himself and makes separate for his food, either by cooking for himself or purchasing. A multi person household is a group of two or more individuals who live together and have a common arrangement for cooking and sharing food (HIES, 2016).

Residential sector: The residential sector was either urban sector, rural sector or estate sector.

Urban sector: Households in areas governed by either Municipal Council (MC) or Urban Council (UC) were considered.

Estate sector: Households in plantation areas, which are more than 20 acres of extent and having not less than 10 residential labourers, were considered.

Rural sector: Households, which do not belong to the urban sector or estate sector described above were considered.

4.3 Study Location

The study focused on identifying patterns and determinants of F&V consumption across various HHs in Sri Lanka. Therefore, study locations were selected based on urban, rural and estate sectors. A Multistage Random Sampling method was employed.

Districts with the highest number of HHs in each sector were selected for the first stage. In the second stage Divisional Secretariats (DSs) with the highest number of HHs were selected. Grama Niladari Divisions (GNDs) were selected as third stage based on the number of resident HHs. Randomly selected HHs from each GNDs were the final stage.

4.4 Sample Selection

The individual household was selected as the sampling unit. The sample was selected from HHs in Sri Lanka representing the urban, rural, and estate sectors. According to the report of Census of Population and Housing of Sri Lanka (2012) the total number of HHs reported was 5.2 million, and sample size of 384 HHs for the survey was decided considering the margin of error (5%) and confidence interval

(95%). Households representing urban and rural sectors are proportionately very high in comparison to the estate sector. Therefore, the total sample was taken representing urban and rural sectors only. Sixty HHs in the Nuwara-Eliya district were surveyed to represent the estate sector. The data of a total of 443 HHs was used in the analysis after removing outliers.

Table 4.1: Study Locations

Sector	Selected Districts	Selected Divisional Secretariats	Total Number of HHs to Survey
Rural (309)	Kurunegala	Pannala	65
		Rideegama	
		Ibbagamuwa	
	Kandy	Polpithigama	51
		Gangawata Korale	
		Kundasale	
	Kalutara	Yatinuwara	47
		Bandaragama	
		Mathugama	
	Galle	Bulathsinhala	43
		Baddegama	
		Karandeniya	
Anuradhapura	Elpitiya	36	
	N.N.P.*		
Jaffna	Thalawa	34	
	Nallur		
	Kopay		
Kegalle	Chavakachcheri	33	
	Rambukkana		
	Mawanella		
Urban (74)	Colombo	Galigamuwa	33
		Colombo	
		Kaduwela	
	Gampaha	Kasbewa	37
Gampaha			
Estate (60)	Nuwara-Eliya	Minuwangoda	64
		Nuwara-Eliya	
		Ambagamuwa Korale	
Total			443

* Nagenahira Nuwara Palatha

Source: Authors' own compilation

4.5 Data Analysis and Analytical Techniques

Objective 1: To describe trends, patterns and buying behaviour of fruit and vegetables

Secondary data was used to identify F&V consumption patterns of HHs across different sectors during the time period from 1992–2016. Per Capita F&V consumption, expenditure incurred on F&V purchase, HH food budget share, budget share of fruits, and budget share of vegetables were used to describe the HH F&V consumption patterns by generated data from HIES and Food Balance Sheets of the Census and Statistic Department.

The cross sectional data and descriptive analysis was conducted to examine F&V purchasing behaviour of HHs. The data was analyzed using descriptive methods which included tables, graphs, and charts.

Objective 2: To estimate per capita fruit and vegetable consumption and its diversity

I. Per Capita F&V Consumption

A single self-administered 24 hour recall survey data was used to obtain quantitative information for fruits (g/day) and vegetables (tablespoons/day) on F&V intake. The intake was measured in accordance with the National Food Guidelines of the Ministry of Health, Sri Lanka (Ministry of Health, 2011) as well as with FAO and WHO guidelines (FAO/WHO, 2004).

II. Diversity of F&V Consumption

The literature provides two approaches to calculate diversity in HH purchases (McDonald *et al.*, 2003; Stewart *et al.*, 2004). Both approaches were used and presented in this analysis.

The simpler approach is the Count Approach. The different fruit and/or vegetable categories purchased by the household were counted. The count can theoretically have values from 1 to n , which is the maximum number of fruit or vegetable categories available.

The second approach to measure variety is the Simpson Index. The Simpson Index describes the distribution of quantity shares over the n fruit and/or vegetable categories. If we denote the share of fruit j of the household i as W_{ij} , then,

$$W_{ij} = \frac{q_{ij}}{\sum_{j=1}^n q_{ij}}$$

Where q_{ij} is the quantity of j fruit or vegetable category purchased by household i , then, the Simpson index S_i is defined as,

$$S_i = 1 - \sum_{j=1}^n W_{2ij}$$

It is obvious that if a HH concentrates all of its purchases in only one fruit/vegetable category, then $S_i=0$. The more a HH diversifies the quantities of fruit/vegetable purchases, the closer S_j is to 1.

Objective 3: To identify contributory factors for fruit and vegetable consumption in households

Measures

In this study a Regression Analysis was used to examine the factors that influence F&V intake.

Regression Model

$$Y_i = \beta_0 + \sum_{i=1}^{n=13} \beta_i X_i + \epsilon$$

Where:

Y_i = HH expenditure on F&V as a ratio of total food expenditure

X_i = Vector of all the explanatory variables

β_0 = Intercept of the equation

β_i = Coefficients of the explanatory variables

ϵ = Error term

Dependent variable

The total HH expenditure on F&V as a ratio of total food expenditure was considered as the dependent variable. Household monthly expenditure for F&V was calculated for both commodities together and as separate commodities.

Table 4.2: Description of the Independent Variables Used in the Regression Model

Variable	Type	Type of Measurement
Contributory Factors of Intra HH Decision Making Process		
Household income	Continues	Monetary value (LKR)
Household size	Continues	Number
Age	Continues	Number of years
Gender	Dummy	=1 if Male, 0=Female
Education	Continues	Number of years
Number of children	Continues	Number
Food habit	Likert Scale	Level of agreement to the statements (annex I) by taking mean score
Residency	Dummy	= 0 if rural, 1= urban, 2= estate
Status of health	Continues	Number of persons having NCDs per HH
Contributory Factors for HH F&V Preferences		
Ethnicity	Dummy	= 0 if Sinhala, 1= Tamil, 2=Muslim
Knowledge on healthy diets	Likert Scale	Level of agreement to the statements (annex II) by taking mean score
Factors of Availability and Accessibility to F&V		
Availability at market	Dummy	=1 if Yes, 0=No
Availability at home gardens	Dummy	=1 if Yes, 0=No
Access to market	Continues	Distance to nearest market (Km) to purchase F&V
Characteristics of F&V Which Influence Intake		
Shelf life	Likert Scale	1= Not Important, 2=Slightly Important 3=Important, 4=Most Important
Safety	Likert Scale	1= Not Important, 2=Slightly Important 3=Important, 4=Most Important

Source: Authors' own compilation

Objective 4: To identify potentials and barriers to increase fruit and vegetable consumption

Potentials and barriers to increase F&V intake were identified by open ended questions. The data relevant to this objective was analyzed using a descriptive method and Exploratory Factor Analysis.

CHAPTER FIVE

Trends, Patterns and Buying Behaviour of Fruits and Vegetables

5.1 Socio-economic Characteristics of the Sample

The variations in socio-economic characteristics influence F&V consumption and purchasing patterns of HHs. Data from a total of 443 HHs representing three different sectors which completed the survey was used. Average HH size of the sample was recorded as four in urban and rural HHs. While in the estate sector it was five, with a minimum of two members and a maximum of thirteen members. According to Table 5.1 the majority of the HHs in urban and rural sectors were female while in the estate sector the majority was male. A majority of the respondents who participated for the survey were females in urban, rural, and estate HHs as they are the key decision makers with regard to F&V consumption in HHs.

5.1.1 Gender Distribution

Table 5.1: Distribution of Surveyed HHs based on Gender

Variable	Urban (%)	Rural (%)	Estate (%)
Household			
Male	47.2	49.1	51.6
Female	52.8	50.9	48.4
Total	100.0	100.0	100.0
Respondent			
Male	48.0	46.9	49.4
Female	52.0	53.1	50.6
Total	100.0	100.0	100.0

Source: Authors' own calculation based on field survey (2019)

5.1.2 Distribution of Age

Table 5.2: Distribution of Surveyed HHs based on Age

Variable	Urban (%)	Rural (%)	Estate (%)
Household			
0-14	17.4	21.0	23.6
15-64	67.4	67.4	66.4
>=65	15.2	11.6	10.0
Total	100.0	100.0	100.0
Respondent			
15-30	10.0	8.1	18.8
31-45	32.9	31.1	34.4
46-60	32.9	37.5	25.0
>=61	24.3	23.3	21.9
Total	100.0	100.0	100.0

Source: Authors' own calculation based on field survey (2019)

According to Table 5.2, most of the respondents were in the age bracket of 31-60 years in all three sectors. Hence, a majority of the respondents were in the age category where they can make decisions regarding their HH F&V consumption and purchasing. In addition, 17.4 percent, 21 percent, and 23.6 percent of HHs had children below 14 years of age.

5.1.3 Level of Formal Education

Table 5.3: Distribution of Respondents based on Formal Education

Variable	Urban (%)	Rural (%)	Estate (%)
Formal Education			
No Formal Education	3.5	9.7	15.3
1-5 Years	8.2	12.9	23.0
6-11 Years	29.1	43.5	44.8
Passed G.C.E A/L	34.8	26.9	14.7
Tertiary Education	24.5	7.0	2.1
Total	100.0	100.0	100.0

Source: Authors' own calculation based on field survey (2019)

According to the results in Table 5.3, the highest percentage of the respondents (34.8%) have passed the G.C.E. Advanced Level (A/L), followed by 29 percent of the respondents having had 6-11 years of formal education in the urban sector. In the rural sector, the highest percentage of respondents (43.5%) had 6-11 years of formal education and 27 percent had passed the G.C.E. A/L examination. However, in the estate sector, 45 percent of the respondents had 6-11 years of formal education. The highest percentage (15.3%) of HHs which had no formal education was found in the estate sector. The estate sector has the smallest percentage (2%) of respondents who had received a tertiary education.

5.1.4 Status of Occupation

Table 5.4: Occupation Status of Respondents

Variable	Urban (%)	Rural (%)	Estate (%)
Public	13.8	8.8	3.2
Private	26.0	20.4	31.0
Other	60.2	70.8	65.8
Total	100.0	100.0	100.0

Source: Authors' own calculation based on field survey (2019)

Results from Table 5.4 shows the occupation status of respondents out of which a majority were women. The highest number of employees in the public sector (13.8%) was recorded in the urban sector, followed by the rural sector. Most of the respondents are in the category of 'other' which included the respondent status of retired, housewives, farming activities, entrepreneurs, and business owners etc.

5.1.5 Average Monthly Income

Table 5.5: Average Monthly Income of Households

Variable	Urban (%)	Rural (%)	Estate (%)
Income category (LKR)			
0-50,000	18.6	61.2	89.1
51,000- 100,000	36.4	34	10.9
>100,000	45	4.8	0
Average Monthly Income (LKR)	119,992	57,368	36,062

Source: Authors' own calculation based on field survey (2019)

The average monthly HH income of the urban sector is 119, 992 LKR, ranging from 51,000 to >100,000 in most of the respondents surveyed. The majority of the respondents in the urban sector earn more than 100,000 per month (45 percent), with fewer HHs earning less than 50,000 LKR (18.6 percent). The average monthly income of rural sector HHs is 57,368 LKR and a majority of the respondents are in the income category of 0-50,000 LKR. The mean monthly income of the estate sector HHs is recorded as 36, 062 LKR with 89 percent of the HHs falling under the income category of 0-50,000 LKR. The mean income in the urban sector is more than three times higher than in the estate sector.

5.1.6 Status of Ethnicity and Religion

Table 5.6: Status of Ethnicity and Religion of Households

Variable	Urban (%)	Rural (%)	Estate (%)	Total Sample
Ethnicity				
Sinhala	98.6	78.6	0	70.4
Tamil	0	15.9	100	25.5
Muslim	1.4	5.5	0	4.1
Total	100	100	100	100
Religion				
Buddhist	91.4	78.6	0	69.3
Hindu	0	15.5	81.3	22.6
Islam	1.4	5.2	0	3.8
Catholic	7.2	0.7	17.2	4.1
Other	0	0	1.5	0.2
Total	100	100	100	100

Source: Authors' own calculation based on field survey (2019)

According to Table: 5.6, the majority of the respondents in urban and rural sectors were Sinhala Buddhists. However, in the estate sector the majority were Tamils who follow Hinduism. The overall profile suggests that there are sector variations with respect to socio-economic characteristics. Most of the respondents who participated in this survey were middle aged with average education and belonged to different income groups with respect to income categories.

5.2 Household Budget for Fruit and Vegetable Consumption

5.2.1 Average Monthly Household Food Expenditure across Sectors

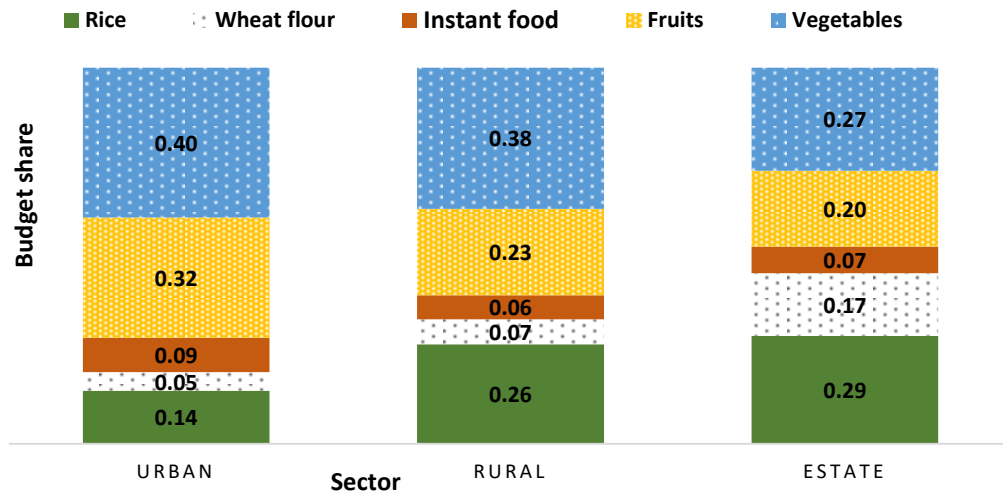
Table 5.7: Average Monthly Food Expenditure of Households

Description	Urban	Rural	Estate
Average monthly HH food expenditure (LKR)	30,857	19,949	18,171

Source: Authors' own calculation based on field survey (2019)

According to the survey results, the average food expenditure for urban HHs was recorded as 30,857 LKR. It was 19,949 LKR and 18,171 LKR for the rural and estate sectors respectively. However, in estate sector HHs, 50 percent of the monthly average income was allocated as food expenditure, while in the rural sector it was 34.7 percent. Though the urban sector had a higher average monthly income, their share for total food expenditure is around 25.7 percent of the average monthly income which depicts the highest amount of non-food expenditure. Similarly, the study of Nord *et al.*, (2006), and Jetter and Cassady (2006) found that the proportion of HH income spent on food is higher for low-income HHs than for high-income HHs.

5.2.2 Food Budget Share across Sectors

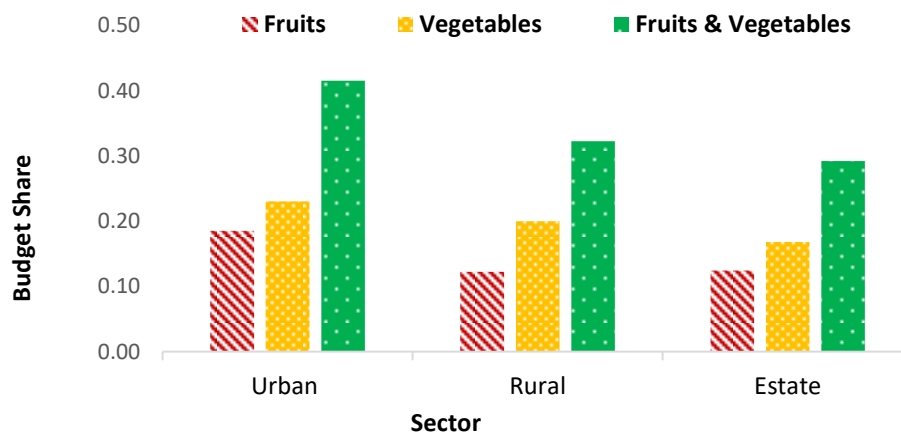


Source: Authors' own calculation based on field survey (2019)

Figure 5.1: Average Monthly Expenditure on Rice, Wheat flour, Instant Food, F&V

The food budget share was calculated as a percentage of expenditure on a particular food item in relation to the total cost. Vegetables show the highest budget share in comparison to other food categories considered. The highest budget share for rice was reported in the rural sector and followed by the estate sector. With respect to the consumption of wheat flour, the estate sector shows the highest budget share. The urban sector shows the highest budget share for instant foods as well as F&V, while the estate sector shows the least budget share for that. Urban HHs spent more on instant food than the HHs in the rural and estate sectors. However, the estate sector shows a high budget share for rice which shows that currently most of the HHs in the estate sector are moving towards a rice based diet instead of wheat flour.

5.2.3 Budget Share of Fruits and Vegetables



Source: Authors' own calculation based on field survey (2019)

Figure 5.2: Budget Share of Fruits and Vegetables in the Food Basket

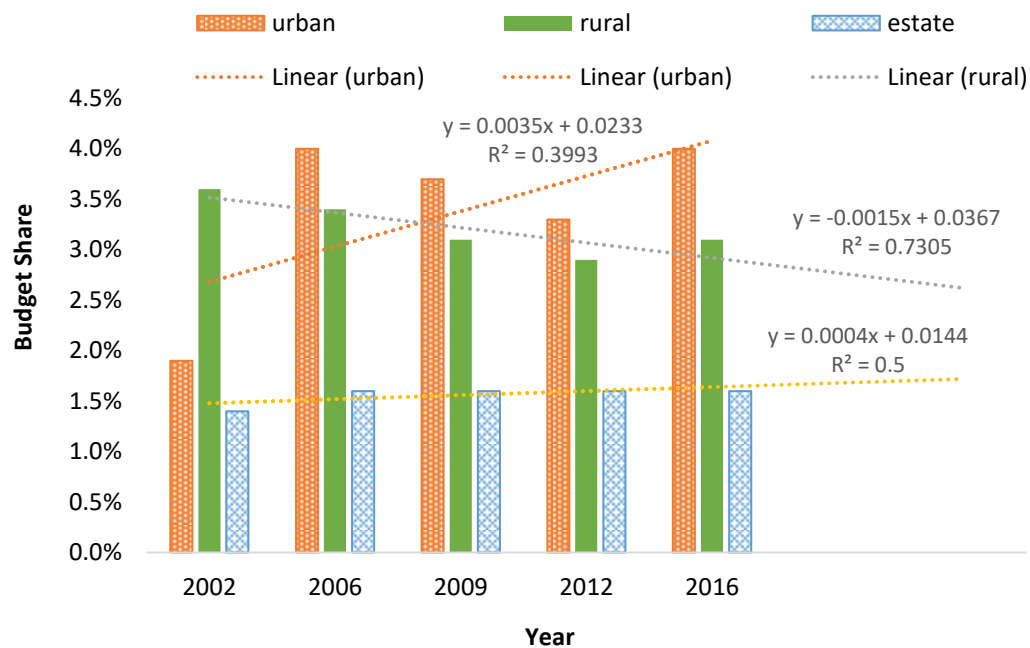
Fruit and vegetable consumption was measured by quantities of fruits and/or vegetables consumed, expenditure incurred on fruit and/or vegetable purchases, and the percentage of expenditure on fruits and/or vegetables as a proportion of food consumption expenditure (budget share) at the HH level. According to Figure 5.2, the highest budget share for F&V was reported in urban sector HHs. Followed by the rural sector, with the least budget share for F&V being reported in the estate sector. Urban sector HHs spent more on F&V in comparison to the other two sectors. This suggests that urban areas place a higher importance on intake of F&V. This may be due to reasons such as HHs in the urban sector earning relatively higher income levels, being relatively more educated, and the majority being employed. Further, vegetable budget share is higher than fruit budget share in all three sectors showing higher spending for vegetables than fruits.

Results show that an average urban HH spent 30,857 LKR per month on food of which 5708 LKR was spent on fruits. In the same time, the estate sector HHs spent an average of 18,171 LKR for food out of which 2256 LKR was spent on fruits. In the rural sector, HHs spent 2444 LKR per month on fruits on average from their average monthly food cost of 19,949 LKR. On average 7112, 3992 and 3056 LKR is spent on vegetables by urban, rural, and estate HHs respectively. According to the results, HHs spent more on vegetables than fruits suggesting relatively high consumption of vegetables in comparison to fruits. However, urban HHs spend more than two fold for F&V than rural and estate sector HHs do. The budget share of both F&V was also varies across the three sectors showing values of 0.42, 0.32, and 0.29 in the urban, rural, and estate sectors respectively.

5.3 Trends and Patterns of Fruit and Vegetable Consumption in Sri Lanka

5.3.1 Trends in the Fruit Budget Share across Sectors

The summary results of HIES from 2002-2016 were used to calculate fruit budget shares across different sectors. The percentage of expenditure on fruits as a proportion of the total food expenditure at the HH level was considered as the fruit budget share.



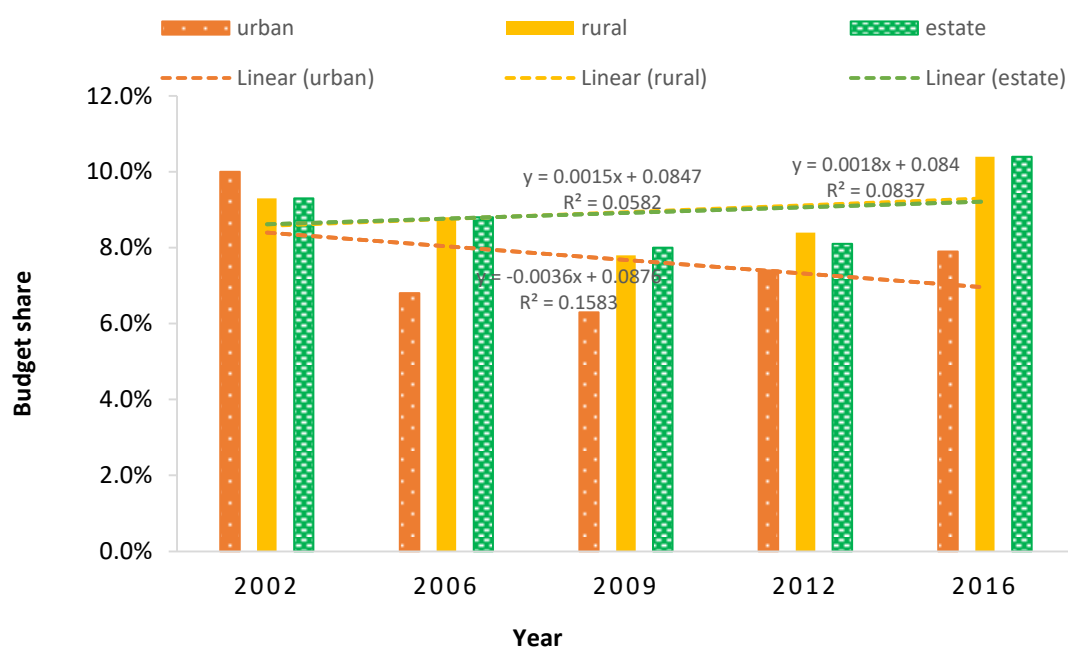
Source: HIES, Department of Census and Statistics (2002-2016)

Figure 5.3: Budget Share on Fruits

According to the results, the fruit budget share of urban HHs indicates a positive trend, suggesting that urban HHs have started placing a higher importance on fruits over time. According to Figure 5.3, the fruit budget share of rural sector HHs shows a declining trend during the time period from 2002 to 2016. This indicates that the share allocated for fruits in the total budget has been slightly declining over the previous years. In the estate sector, fruit budget shares are seen to be almost stable or consistent over the time and need more attention with regard to increasing fruit consumption. The differences in budget shares across sectors could be attributed to availability, access and education level.

5.3.2 Trends in the Vegetable Budget Share across Sectors

The percentage of expenditure on vegetables as a proportion of the total food expenditure at the HH level was considered as the vegetable budget share. According to Figure 5.4, there is a declining trend in the vegetable budget share in urban HHs over time. The allocations for cereals and animal proteins had taken place over the period and this may be the reason for slight reduction in the vegetable budget share in urban HHs. Rural and estate sector HHs show a positive trend in the vegetable budget share over the time. However, the percentage of the food budget spent on F&Vs is generally small, ranging from 1.9 percent to 10.4 percent.



Source: HIES, Department of Census and Statistics, (2002-2016)

Figure 5.4: Vegetable Budget Share across Sectors

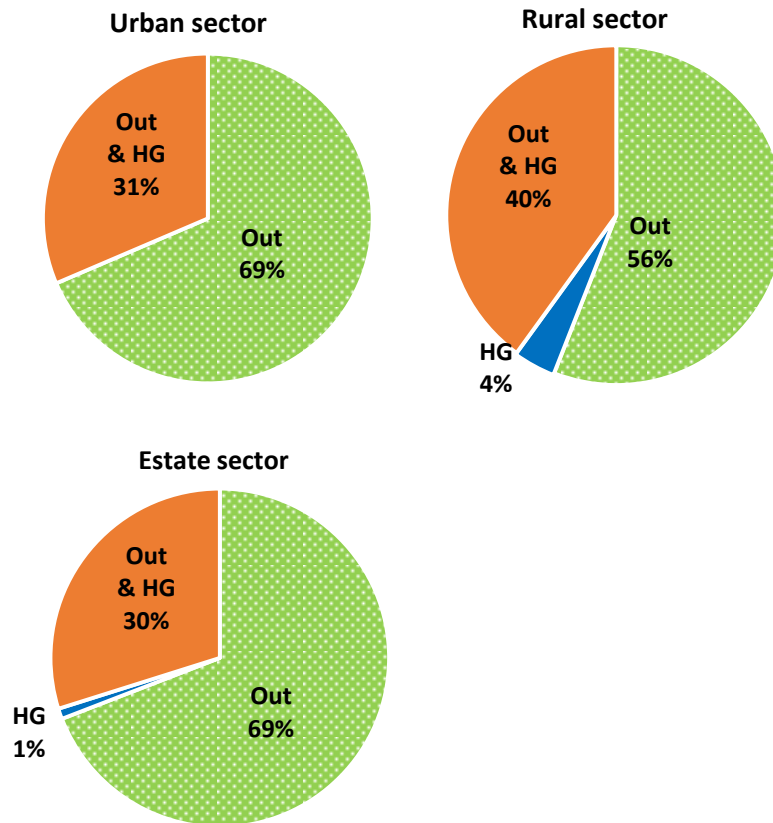
5.4 Household Preference for Fruit and Vegetables

5.4.1 Major Fruits and Vegetables Consumed in Sri Lanka

Major F&V consumed by the HHs were selected by considering the frequency of consumption in a one week period. The results of the survey indicate that banana and papaw were the most frequently consumed fruits among HHs followed by mangoes, apples, and oranges.

The most-consumed vegetables included beans, carrots, and leeks as upcountry vegetables and brinjal, okra, and long bean as low country vegetables. Gotukola and Mukunuwenna were recorded as the most preferred leafy vegetables. However, vegetables such as cucumber, snake gourd, and radish are also consumed occasionally at most of the HHs.

5.4.2 Source of Obtaining Fruits and Vegetables across Sectors



Source: Authors' own calculation based on field survey (2019)

Figure 5.5: Source of Obtaining Fruits and Vegetables

Respondents were asked to indicate their sources for obtaining F&V for HH consumption. Figure 5.5, reveals that the majority of (69%) urban HHs obtain F&V totally from outside sources such as supermarkets, vendors, the local markets (*po/a*), roadside markets etc. The rest of the respondents obtain F&V from both home gardens and outside sources. According to the results, 56 percent of the respondents in the rural sector completely depend on outside sources for obtaining F&V. However, four percent of rural HHs completely depend on home gardens for obtaining F&V. They thoroughly believe that home grown F&Vs are fresh and safe. In the estate sector only one percent of the respondents totally depended on home gardens and the majority (69%) was dependent on outside sources mainly due to limited land for cultivation.

5.5 Purchasing Patterns of Fruit and Vegetables

Respondents were asked to indicate their most preferred outlets for buying F&V and multiple responses were also allowed. According to Table 5.8, the majority of the urban HHs prefer buying F&V from supermarkets, followed by roadside vendors, and home gardens.

5.5.1 Place of Purchase/ Obtain

Table 5.8: Preferred Place for Purchase/Obtain of Fruits and Vegetables

Source	Urban (%)		Rural (%)		Estate (%)	
	Fruits	Vegetables	Fruits	Vegetables	Fruits	Vegetables
Home Garden	51	36	51	38	45	27
Super-Market	60	61	14	14	34	22
Local Market (<i>Pola</i>)	27	30	45	61	58	66
Road side Vendors	49	53	49	47	52	59
Neighbours	11	13	17	15	19	19
Other	1	3	3	3	2	2

Note: Total percentage of categories used for purchasing fruits and vegetables, exceed 100, because HHs have multiple responses.

Source: Authors' own calculation based on field survey (2019)

Most of the respondents in urban HHs had limited access to local markets and limited space for home gardens. It turned out that most of the HHs in the urban sector have to depend on supermarkets. However, in the rural sector home gardens and local markets (*pola*) are most commonly used for obtaining F&V. They believe that vegetables sold in local markets are fresh and cheap. Moreover, the availability of diverse products in the local markets and being close to their home or workplace were other reasons.. Other than that, they also choose roadside vendors to buy F&V. Estate sector HHs mostly prefer local markets (*pola*) and roadside vendors for obtaining F&V. It is suggested that actors in the supply chain of F&V should find the most suitable markets for selling their produce across the three sectors.

5.5.2 Frequency of Purchase

Table 5.9: Frequency of Fruit and Vegetable Purchase

Source	Urban (%)		Rural (%)		Estate (%)	
	Fruits	Vegetables	Fruits	Vegetables	Fruits	Vegetables
Daily	13	13	9	11	5	6
Once in two days	26	21	11	10	10	13
Once in three days	27	21	21	12	3	13
Once a week	26	40	39	55	56	67
Once a two week	4	3	7	8	6	1
Irregular	4	2	13	4	20	0

Source: Authors' own calculation based on field survey (2019)

The purchasing behaviour of consumers in buying F&V has been presented in Table 5.9. The results indicate that most of the respondents prefer buying vegetables once a week followed by those that prefer to buy vegetables once every two or three days. With respect to fruits, responses of urban HHs vary among all categories.

However, the highest number of respondents procured fruits once a week in the rural and estate sectors. Due to their perishability and short shelf life people buy F&V frequently.

5.5.3 Time of Purchase

Table 5.10: Purchasing Time of Fruits and Vegetables

Source	Urban (%)		Rural (%)		Estate (%)	
	Fruits	Vegetables	Fruits	Vegetables	Fruits	Vegetables
Morning time	30	30	42	48	27	30
Evening time	36	36	24	27	44	53
Night time	6	4	2	2	3	3
Irregular	27	29	23	22	23	14
Do not buy	1	1	9	1	3	0

Source: Authors' own calculation based on field survey (2019)

Most of the respondents in the urban and estate sectors purchase F&V during the evening time and rural HHs strongly prefer to do their purchasing at morning times. However, most of the respondents in the sample purchase F&V normally in the morning or evening times.

5.5.4 Availability and Accessibility

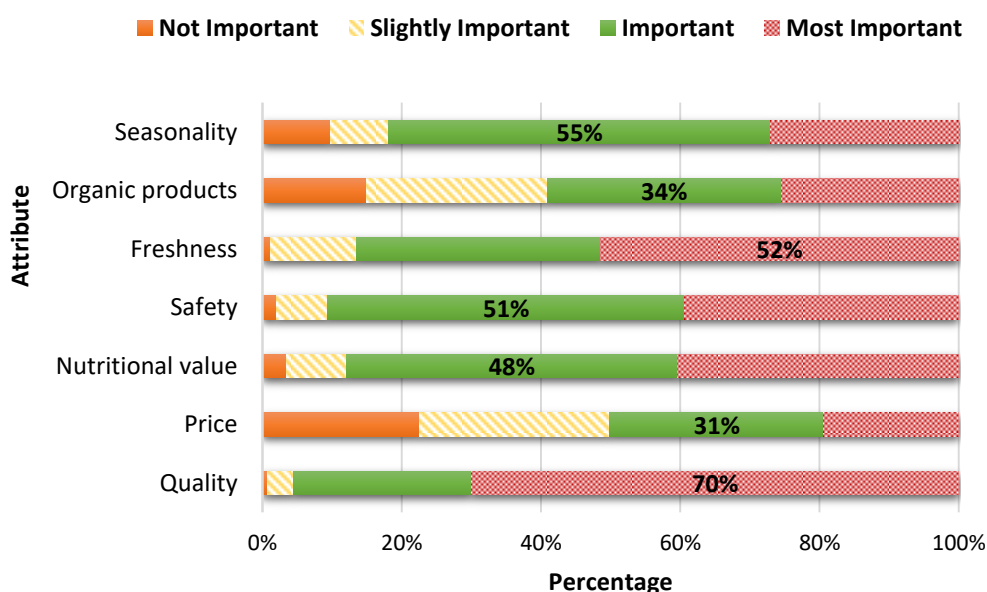
Table 5.11: Availability and Accessibility to Fruits and Vegetables

Source	Urban		Rural		Estate	
	Min	Max	Min	Max	Min	Max
Accessibility (km)	0.1	5	0.05	30	0.1	35
Availability (%)	Yes	No	Yes	No	Yes	No
	99	1.4	99.7	0.3	100	0.0

Source: Authors' own calculation based on field survey (2019)

The majority of respondents (99%) do not have problems with the availability of F&V at markets. However, during the personal interviews, they emphasized that there are limited opportunities or the facilities to access F&V at working places or schools. Average distance to access F&V markets were recorded as 1.5km, and 5.6km, and 8.7km in the urban, rural, and estate sectors respectively.

5.5.5 Product Attributes which Affect Fruit and Vegetable Purchasing



Source: Authors' own calculation based on field survey (2019)

Figure 5.6: Product Attributes which Affect Fruit and Vegetable Purchasing

According to the results of Figure 5.6, quality and freshness are the two most important attributes which affect the purchase of fresh F&V. These are followed by price, safety, and seasonality which are ranked as important attributes. Similar results were reported in the studies of Mahaliyanaarachchi (2007) and Dimech *et al.*, (2011). More than 70 percent of the sample respondents confirmed that they are more concerned about product quality before purchasing with the mean score of 3.15. Price is also important and very important to 31 percent and 19 percent of the respondents respectively. Seasonality is another attribute which affects the purchasing and consumption of F&V. During the season, availability of a particular fruit or vegetable is high and the price is comparatively low in comparison to the off-season. Safety is another attribute which is important to more than 51 percent of the sample respondents as they are more distressed about pesticide residues in F&V and artificially ripened immature fruits.

5.5.6 Information Sources Used before Purchasing Food Products

Table 5.12: Information Sources Used in Food Product Purchase

Source	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
Product labels	7.45	3.84	9.03	79.68
Medical	27.31	15.58	41.31	15.80
Media	49.44	24.15	20.99	5.42
Friends and family	26.19	14.22	48.08	11.29
Own decision	1.35	0.90	14.45	82.84

Source: Authors' own calculation based on field survey (2019)

Table 5.12 shows the information sources used by respondents to purchase food related products. Approximately 80 percent of the respondents read the product label before purchasing a product giving more attention to expiry and production dates. Sometimes they base their purchasing decisions on medical recommendations (41%) and the likes and dislikes of family members (48%). However, the majority of respondents do not make decisions regarding food purchase based on advertisements in the media. The majority (83%) of respondents make their own decisions at the moment of purchasing food items based on their own preferences.

5.5.7 Households Having Facilities for Storing Fruit and Vegetables

Table 5.13: Availability of Refrigerator Facilities in HHs

Availability of Refrigerator	Sector		
	Urban (%)	Rural (%)	Estate (%)
Yes	94.3	75.4	40.1
No	5.7	24.6	59.9

Source: Authors' own calculation based on field survey (2019)

The majority of urban and rural HHs have refrigerators for storing F&V (94 percent and 75 percent respectively). However, the majority (59%) of the estate HHs do not have such facilities to store F&V. This is also one of the limiting factors which affect F&V consumption and purchasing as they have limited access to storing facilities.

5.5.8 Fruit and Vegetable Purchase Preference in Terms of Fresh or Processed

Table 5.14: Use of Processed Fruit and Vegetable Products

Item	Yes (%)	No (%)
Processed fruits	28	72
Processed vegetables	18	82

Source: Authors' own calculation based on field survey (2019)

The results indicate that respondents prefer to buy fresh vegetables rather than packaged or processed vegetables (Table 5.14). Similarly, with respect to fruits as well, HHs prefer to buy fresh fruits rather than processed products such as jam, chutney, cordial etc. The main reason for this is that respondents believe that the chemical ingredients used in those products for preservation are harmful to their health.

CHAPTER SIX

Determinants and Diversity of Fruit and Vegetable Consumption

6.1 Household Fruit and Vegetable Consumption

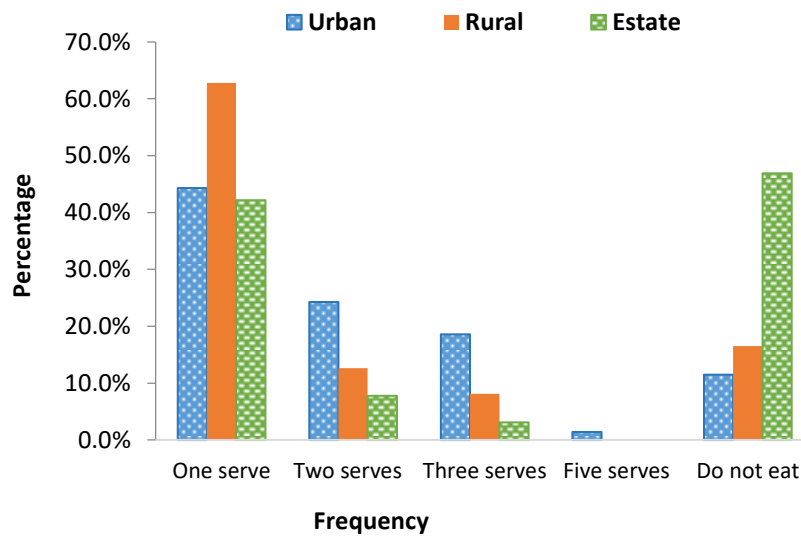
Eating a variety of F&V helps to fulfill most of the micronutrient requirements. At least five varieties of F&V should be consumed each day. An adult needs a minimum of 400 g of F&V per day (Food Based Dietary Guidelines for Sri Lankans, 2011).

6.1.1 Awareness on Servings and Serving Sizes of Fruits and Vegetables

Both the definition of F&V and portion size vary considerably between countries. However it is important to determine whether HHs are aware of the terms of servings and size of servings to assess the per capita consumption of F&V. The Food Based Dietary Guidelines for Sri Lankans : 2011 recommends 2-3 servings of fruits and 3-5 servings of vegetables. Three tablespoons of cooked vegetables or one cup of raw vegetable salads is considered as one serving for vegetables. One to two medium size fruits (banana, orange, mango) or 1 - 1 ½ cups of cut fruit/ fruit salad or 1-1 ½ cup of pure fruit juice or 4 - 6 tablespoons of dried fruit a day is considered the recommended serving size for fruits.

However, the majority of the HHs (75%) in the survey was not aware of the term or the definition of 'serving' and 'serving sizes'. In the group that was aware, the majority represented the urban HHs. Therefore, it is logical that awareness of the number of servings one should consume would aid people in goal setting of increasing F&V intake. Previous studies in this area also highlighted the ignorance of such terms, specifically regarding portion size (Dixon *et al.*, 2004; Didsdall *et al.*, 2002), what is counted as F&V (John and Ziebland, 2004; Sayhoun *et al.*, 2005), and the need for variety (Clark *et al.*, 2002).

6.1.2 Frequency of Fruit Consumption

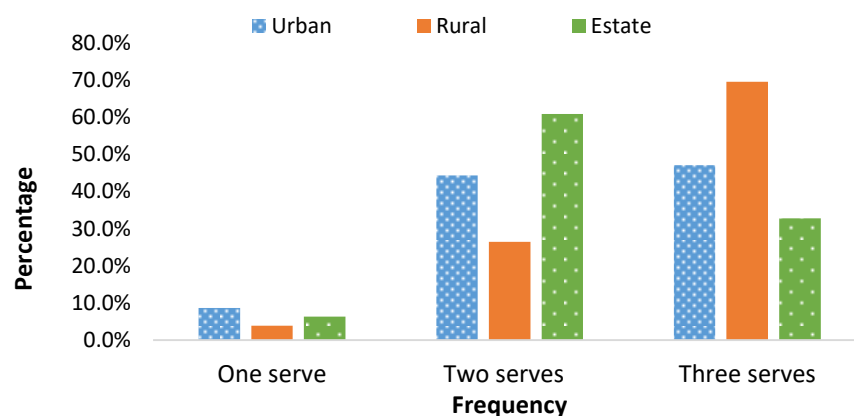


Source: Authors' own calculation based on field survey (2019)

Figure 6.1: Frequency of Fruit Consumption per Day

The frequency of consumption refers to the number of times that a particular food or food group is consumed over a given period of time. According to the results, the majority of the respondents in the urban (44.3%), rural (62.8%), and estate (42.2%) sectors consumed fruits at least once a day while 47 percent of estate HHs do not take fruits during their normal diets. Further, 12 percent and 17 percent of urban and rural HHs respectively do not eat fruits daily, illustrating the limited awareness regarding the importance of fruit consumption.

6.1.3 Frequency of Vegetable Consumption



Source: Authors' own calculation based on field survey (2019)

Figure 6.2: Frequency of Vegetable Consumption per Day

According to Figure 6.2, the highest percentage of respondents in urban (47%) and rural (70%) HHs include vegetables in their diet at least three times per day.

However, in the estate sector, the majority (61%) of the respondents include one vegetable in their diet twice a day; usually in their breakfast and dinner.

6.1.4 Estimation of Per-capita Fruit and Vegetable Consumption across Sectors

The per capita F&V consumption was estimated across the HHs. The highest value was recorded in urban HHs. Per Capita F&V consumption in urban HHs is at a satisfactory level as it is about to reach the recommended level. This was further confirmed, as urban HHs show the highest budget share for F&V. The study results of Weerahewa, *et al.*, (2013) also demonstrates similar results, showing that fruit consumption in urban areas is relatively higher regardless of the income level.

Table 6.1: Per capita Fruit and Vegetable Consumption across Sectors

Sector	Fruit Consumption (g/day/person)	Vegetable Consumption (g/day/person)
Urban	187.78	180.55
Rural	151.51	165.89
Estate	43.34	108.38

Source: Authors' own calculation based on field survey (2019)

6.2 Diversity of Fruit and Vegetable Consumption

6.2.1 Estimation of F&V Consumption Diversity across Sectors

The literature provides two approaches to calculate variety in a household's purchases (Stewart *et al.*, 2004; McDonald *et al.*, 2003). Both approaches were used and presented in this analysis.

Count Approach

The simplest is the Count Approach. The different fruit categories purchased by the HHs are counted. The count can theoretically have values from 1 to n, n being the maximum number of fruit or vegetable varieties available. In cases where two HHs have purchased the same number of different fruits and/or vegetables during the time period of the research, even in different quantities, they had an equivalent diversity of fruit and/or vegetable diet, according to Count Approach.

The Count definition varies from 0-8, 0-6, and 0-2 for fruits in urban, rural, and estate HHs respectively, out of the 30 fruit categories used in the analysis. It varies from 0-9, 0-8, and 0-3 in urban, rural and estate HHs for vegetables, out of 48 vegetable varieties used in the analysis. The highest diversity of both F&V recorded using the count approach was in urban sector HHs and the least was recorded in estate HHs.

Table 6.2: Diversity of Fruit and Vegetable Consumption based on Count Approach

Category	Sector	Mean	Min	Max	STD
Fruits	Urban	2.13	0	8	1.50
	Rural	1.46	0	6	1.10
	Estate	0.48	0	2	1.10
Vegetables	Urban	3.97	1	9	1.85
	Rural	3.22	1	8	1.57
	Estate	1.36	0	3	0.91

Source: Authors' own calculation based on field survey (2019)

6.2.2 Simpson Index Analysis

The Simpson Index has been widely used as a measure of diversity in economic and ecological studies and adopted in recent studies for evaluating dietary diversity (Katanoda *et al.*, 2006; Drescher *et al.*, 2007; de Oliveira *et al.*, 2015).

6.2.2.1 Diversity of Household Fruit Consumption

According to the equation, It is obvious that if a HH concentrates all of its purchases in only one fruit category, then $si=0$. The more a HH diversifies the quantities of fruit purchases, the closer si is to 1. According to the results, the highest diversity of fruit consumption was recorded in urban sector HHs with respect to weekly consumption data. However, 20 percent of the urban HHs were recorded as 'non-taken' or as not having consumed any fruit during that surveyed week. The least diversity was recorded in the estate sector and majority of the estate HHs (54%) had not taken any fruit category in the considered period. However, as a whole, HHs should be conscious about taking a variety of fruits as all the three values representing the three sectors are far from the value of 1 which indicates great diversity.

Table 6.3: Diversity of Fruit Consumption based on Simpson Index

Sector	Mean	Min	Max	STD
Urban	0.3101	0	0.8554	0.2441
Rural	0.1957	0	0.7993	0.2318
Estate	0.0259	0	0.3756	0.0968

Source: Authors' own calculation based on field survey (2019)

6.2.2.2 Diversity of Household Vegetable Consumption

Table 6.4: Diversity of Vegetable Consumption based on Simpson Index

Sector	Mean	Min	Max	STD
Urban	0.6258	0	0.84	0.2041
Rural	0.5564	0	0.83	0.2365
Estate	0.28	0	0.67	0.2692

Source: Authors' own calculation based on field survey (2019)

According to the results, the highest diversity of vegetable consumption was also recorded in urban HHs. Like with the fruits, diversity of vegetable consumption was also lower in the estate sector. Further, results show that 19 percent of the estate HHs did not consume even one vegetable for the considered one week period of time. With respect to values taken, urban and rural sector HHs have slightly high diversity of vegetable consumption with values closer to one.

6.2.2.3 Diversity of Fruit and Vegetable Consumption by Households

According to the results, there is an average diversity of F&V consumption in urban and rural HHs. However, there is not a satisfactory level of diversity in F&V consumption among estate HHs.

Table 6.5: Diversity of F&V Consumption by Households based on Simpson Index

Sector	Mean	Min	Max	STD
Urban	0.6452	0.13	0.89	0.16
Rural	0.5795	0	0.88	0.2066
Estate	0.3186	0	0.72	0.2687

Source: Authors' own calculation based on field survey (2019)

The intake of F&V in urban dwellers is generally more diverse than those in the rural and estate sectors. This may be due to a combination of factors including the availability of a wider variety of foods in urban markets, the availability of storage facilities, differences in lifestyle, and cultural patterns. The studies of Regmi and Dyck (2001), Ruel and Garret (2004)) also reported similar results showing that the diets of urban dwellers are generally more diverse than those of their rural counterparts. Further, Ruel *et al.*, (2004) confirms that F&V consumption is generally higher in urban areas compared to rural areas based on the study done involving 10 countries of Sub Saharan Africa.

6.3 Determinants of Fruit and Vegetable Consumption

The study employed Multiple Regression Analysis in order to identify the determinants of F&V consumption.

According to Table 6.6, the average HH income was reported as 79,987.58 LKR per month. The HH size is in accordance with the national average HH size (Four members per family). The average age of the HH head in the surveyed sample is forty-nine years. Further, at least one member of the family has NCDs in the majority of the HHs. The majority of the respondents have education up to the ordinary level which indicates that the HHs are educated enough for rational decision making on HH nutrition as the knowledge about healthy diets leads to the intake of more F&V. The average distance to the market is 2.7 km and the majority of the population has access to purchase their F&V requirements.

Table 6.6: The Summary Statistics of the Variables Used

Variable	Mean	Std. Deviation
Fruit Ratio	0.354	0.029
HH income (LKR/month)	79,987.58	243,263.47
HH size (number of family members)	4	1.48
Age (years)	49	14.23
Gender (Male=1, Female=0)	0.32	0.46
Education level (years)	3.23	0.70
Number of Children (number)	1	1.09
Food habit (mean score)	3.54	0.52
Area of dwelling (urban=1, estate=2, rural=0)	1.99	0.55
Status of health (mean score)	0.76	0.85
Knowledge on healthy diets (mean score)	3.59	0.63
Market availability (Yes=1, No=0)	1	0.06
Distance (Km)	2.7	3.91

Source: Authors' own calculation based on field survey (2019)

According to the Regression Analysis, HH size, gender, education level of the household head, number of children, food habits, dwelling in an urban area, and access to the F&V market have a significant effect on HH expenditure on F&V over other expenditures. It is interesting to note that when the HH size increases, the F&V consumption reduces. As the Regression analysis shows a negative significant relationship between the F&V expenditure ratio and the HH size. However, there is a statistically significant positive relationship between the number of children in the HH and the budget share of F&V. The higher number of family members in a family require a comparatively large share of expenditure on non-food items causing food expenditure to shrink. This may be the reason for the statistically significant negative relationship between the F&V expenditure ratio and the HH size. Further, the study of Whichelow *et al.*, (1997) also found similar results; the size of a HH, the age, the socio-economic group, and the geographic location affect the consumption of fruits in the United Kingdom.

Female headed HHs have a higher tendency to spend a larger share of their budget on F&V when compared to the male headed HHs which shows a statistically significant negative relationship in the Regression Analysis. This supports the idea that men and women may have different spending priorities, with women giving higher priority to diet quality. These results are consistent with the argument that diet quality is improved when women have more control over HH decisions (Smith, *et al.*, 2003).

However, the education level of the HH head has a negative relationship with the F&V expenditure. This may be due to the reason that higher education levels may result in more non-food expenditure than food expenditure. This result is consistent with the results of Ruel *et al.*, (2004). They explain that an educated HH member may indicate an educated mother who is more likely to work outside the home. As a result, the HH may move away from fresh fruits, and especially vegetables towards food that require less preparation time.

Table 6.7: Estimates of Determinants of Fruit and Vegetable Consumption

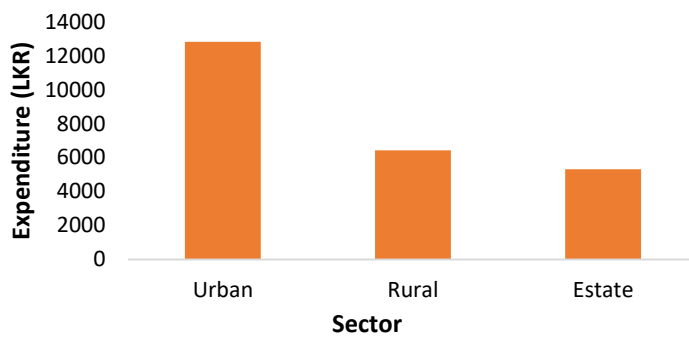
Variable	B	S.E	Sig.
Constant	0*	0.044	0.048
HH income	0.067	0.000	0.152
HH Size	-0.225**	0.002	0.000
Age	-0.06	0.000	0.261
Gender	-0.154*	0.005	0.002
Education level	-0.127**	0.004	0.010
Number of children	0.129**	0.003	0.043
Food habit	0.098**	0.007	0.001
Area of dwelling			
Urban	-0.101*	0.007	0.041
Estate	-0.040	0.003	0.397
Status of health	-0.040	0.003	0.397
Knowledge on healthy Diet	0.010	0.004	0.838
Distance	-0.146*	0.001	0.002
Available at market	0.044	0.036	0.339

Adjusted R² 0.112, N=443

Note: *** significant at 1.00 significant level, ** significant at 0.05 significant level, *significant at 0.100 significant level.

Source: Authors' own calculation based on field survey (2019)

The area of residence significantly affected the HH F&V consumption. In comparison to the rural sector, the urban dwellers' F&V expenditure share over the total expenditure is 0.101 lower. This indicates that rural dwellers spend more of their income share on F&V consumption than urban dwellers do. However, the urban dwellers spend more than the rural dwellers if expenditure is taken on gross terms.



Source: Authors' own calculation based on field survey (2019)

Figure 6.3: Household Expenditure for Fruits and Vegetables

The food habits of the HHs also significantly affect the level of expenditure by the individual HHs. The HH food habits are decided based on the HH dwellers' food preferences (being a vegetarian), taste, and motivation by the close relatives and friends to consume F&V. Childhood habits also influence on F&V consumption. The study of Gross *et al.*, (2010) also shows that family influence is a key factor in children's F&V consumption.

Location, access, and food availability of grocery stores are all related to F&V consumption. Accessibility or the distance to reach the market significantly affects the F&V consumption. This is consistent with the research done by Leather (1995), which indicates that low income populations that lack adequate transportation are more likely to utilize high cost convenience stores instead of accessing supermarkets that are further away but offer more choices and lower priced F&Vs. Backman *et al.*, (2011) reported similar results showing that F&V intake increased for low income employees when F&V availability and accessibility in workplaces was increased. Therefore, a possible explanation for this result is that F&V availability in neighbourhood food stores or at convenience places for HHs has a positive effect on F&V intake.

CHAPTER SEVEN

Potentials and Barriers for Fruit and Vegetable Consumption

7.1 Potentials and Barriers for Fruit and Vegetable Consumption in Households

7.1.1 Factors Regarding Fruit and Vegetable Consumption in Households

An Exploratory Factor Analysis was used to reduce the variables for identifying the effective factors on potentials and barriers of F&V consumption in Sri Lankan HHs. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy in this research is 0.582 (0.5 is considered as the acceptable value) showing that the data is adequate for factor analysis. On the other hand, the value of Bartlett's test of sphericity was significant at the 95% confidence level ($X^2_2 = 2950.624, p = 0.000$). Further, the variable reliability gained by Cronbach Alpha was 0.7.

Table 7.1: The Extracted Factors with Eigenvalues, Percentage of Variance and Cumulative Percent Variance

Factor Name	Eigenvalue	Percent of Variance of Eigenvalue	Cumulative Percent Variance
1. Willingness to Change	2.692	13.459	13.459
2. Choice of F&V in the Shop	2.421	12.105	25.564
3. Awareness	2.191	10.956	36.520
4. Liking	1.757	8.787	45.307
5. Health Conscious	1.485	7.426	52.733
6. Difficulties	1.261	6.306	59.039
7. Easiness	1.138	5.689	64.729
8. Perception of Quality	1.020	5.100	69.829

Source: Authors' own calculation based on field survey (2019)

The results of factor loadings, eigenvalues, and percentages of variance are summarized in Table 7.1. Eight components with eigenvalues greater than 1 were extracted, which collectively all together accounted for 69.83 percent of the total explained variation.

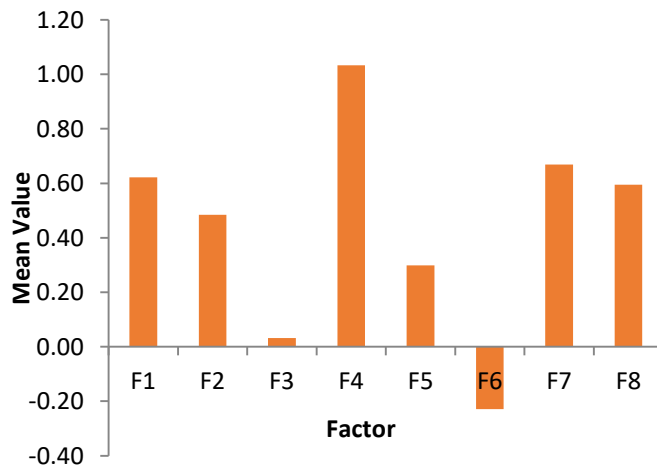
Further, factor 1 consisted of three items of the variable list and explained 11.45 percent of the total variance, with an eigenvalue 2.692. Based on the sub-items of the criteria list, factor 1 was termed 'Willingness to Change'.

Factor 2 consisted three items which highlighted respondents' perception on the choice of F&V available in the shop. Therefore, factor 2 was labelled "Choice of F&V in the Shop". This accounted for 12.10 percent of the total variance, with an eigenvalue of 2.421. Further, factor 3 consisted of two variables and it was labelled 'Awareness' as it related to the respondent's awareness of current food guidelines

and recommendations. Factor 3 accounted for 10.96 percent of the total variance, with an eigenvalue of 2.191.

The factor 4 consisted of two items and indicate motivators for F&V intake. Therefore, factor 4 was termed as “Liking” and accounted for 8.79 percent of the total variance, with an eigenvalue of 1.757. Further, factor 5 included two sub items and related to conscious on healthy diets. Then factor 5 termed as “Health Conscious” and it accounted for 7.43 percent of the total variance, with an eigenvalue 1.485.

The factor 6 consisted of four variables relating to barriers and difficulties regarding F&V purchasing and consumption. Hence, it was labelled as “Difficulties”. The factor 6 accounted for 6.31 percent of the total variance, with an eigenvalue 1.261. The factor 7 included two sub items and related to easiness of storage and preparation of F&V. Therefore, factor 7 was termed as “Easiness” and accounted for 5.69 percent of the total variance, with an eigenvalue 1.138. Furthermore, the factor 8 consisted of two variables attached to respondent’s perception of quality and hygiene of the F&V available. Hence, it was labelled as “Perception on Quality of F&V” and accounted for 5.10 percent of the total variance, with an eigenvalue 1.020.



Source: Authors’ own calculation based on field survey (2019)

Figure: 7.1: Mean Values of Factors

Table 7.2: Factor Analysis for Grouping Potentials and Barriers for Fruit and Vegetable Consumption in Households

Factor	Variable Description	Factor Loading
1. Willingness to Change	I would consider cutting out foods I normally eat in order to eat more fruit and/or vegetables	0.582
	I would eat more F&V in order to improve my health	0.932
	I would eat more F&V in order to increase the number of nutrients I eat	0.919
2. Choice of F&V in the Shop	The shop where I usually buy food has a wide choice of F&V	0.861
	Buying more F&V than I already do would be difficult for me due to the limited choice in the shop	-0.641
	I am satisfied with the choice of fruit and /or vegetables at the shop where I usually buy my food	0.848
3. Awareness	I am aware of current food guideline recommendation of eat 3-5 portions of F&V per day	0.909
	I am aware to eat 5 varieties or five colour of F&V each day	0.918
4. Liking	I like eating F&V	0.924
	I like the taste of F&V	0.935
5. Health Conscious	I eat enough F&V for my health	0.839
	I eat the recommended amount of F&V for my health	0.876
6. Difficulties	Buying more F&V than I already do would be difficult for me due to the total food cost	0.629
	Buying more F& V than I already do would be difficult for me due to the effort in getting them home	0.727
	Buying more F& V than I already do would be difficult for me due to the effort in preparing them	0.597
	I find F&V tasteless and dull to eat	0.450
7. Easiness	I find F&V easy to store so that they keep well at home	0.786
	I find F&V easy to prepare and cook for eating	0.797
8. Perception on Quality of F&V	I do not prefer to buy more F &V as perceived that contamination of pesticides residues	0.621
	I do not prefer to buy more F&V as they have short shelf life	0.832

Source: Authors' own calculation based on field survey (2019)

According to Figure 7.1, out of the eight factors only the sixth shows a negative mean value. F1 (Willingness to Change), F2 (Choice of F&V in the shop), F3 (Awareness), F4 (Liking), F5 (Health Conscious), F7 (Easiness), and F8 (Perception on quality of F&V) show a positive perception towards F&V consumption while F6 (Difficulties) shows a negative perception of respondents. Consequently, factors of F1, F2, F3, F4, F5, F7 and F8 can be grouped as potentials and factor F6 named as a barrier in F&V consumption in HHS.

7.2 Factors which Hindered Household Fruit and Vegetable Consumption

Table 7.3: Factors which Hindered Household Fruit and Vegetable Consumption

Statement	Frequency	Percentage (%)
Perception of chemical usage in fruit ripening	335	63.7
Poor taste	327	62.2
High price	202	45.8
Low quality	116	22.1
Dislike of family members	103	19.6
Non availability	68	15.3
Time for preparation	78	14.8
Due to health conditions	54	10.3
Low income	46	8.7

Note: Total percentage of categories used for purchasing fruits and vegetables, exceed 100, because HHs have multiple responses.

Source: Authors' own calculation based on field survey (2019)

More than half of the respondents perceived chemical use in fruit ripening and poor taste as the most important barriers that hindered HH fruit consumption. About 45.8 percent of the surveyed respondents stated that the high price was another most important factor which hindered F&V consumption in Sri Lankan HHs. In addition, low quality (22.1%), dislike of family members (19.6%), non-availability (15.3%), time taken for preparation (14.8%), health conditions (10.3%), and income (8.7%) were mentioned as other factors which hindered the F&V consumption in HHs.

7.3 Status of Non- communicable Diseases of Surveyed Households

Table 7.4: Status of Non - Communicable Diseases among Respondents

Disease	Frequency	Percentage (%)
Diabetes	54	12
Blood Pressure	73	16
Heart Diseases	25	6
Other	29	7

Source: Authors' own calculation based on field survey (2019)

Table 7.5: Status of Non – Communicable Diseases among Different Age Groups

Age	Diabetes (%)	High Blood Pressure (%)	Heart Diseases (%)	Other (%)
< =15	0	0	0	0.5
16-64	3.5	4.0	1.3	1.4
>=65	13.2	17.9	6.0	7.7

Source: Authors' own calculation based on field survey (2019)

Each year nearly 38 million people die from NCDs in the world. The majority of these deaths are due to four common non-communicable diseases: cardiovascular diseases (heart attack and stroke), diabetes, cancer, and chronic respiratory

diseases. Around 70 percent of the disease burden in Sri Lanka is due to NCDs (Demographic and Health Survey - 2016, Sri Lanka).

Table 7.5 shows the percentage distribution of HH members suffering from NCDs by age group. The findings revealed that there are three most common NCDs. These are diabetes, high blood pressure, and heart diseases. The results further depict that the above mentioned diseases increase with age in all sectors. Overall, diabetes, high blood pressure, and heart disease are mostly prevalent among the older population (> 64). Therefore, they are the most concerned about healthy diets and tend to purchase F&V in accordance with medical recommendations.

7.4 Potentials to Increase Fruit and Vegetable Consumption

Table 7.6: Factors to Motivate Fruit and Vegetable Consumption

Statement	Frequency	Percentage (%)
Awareness on nutritional value	284	64
Quality of products	203	46
Available at home gardens	205	46
Reasonable price	159	36
Seasonality	158	36
Preference of children and adults	139	31
Taste	107	24
Availability of processed products	34	8
Shop promotions for F&V	9	2
Other	10	2

Source: Authors' own calculation based on field survey (2019)

The results in Table 7.6, show that most of the respondents (64 %) take the nutritional value of F&V in their consumption into consideration. This result further confirms that the health aspect is the most important factor in increasing F&V consumption in Sri Lankan HHs. Additionally, the quality of final products (46 %) and availability of both F&V (46%) at home gardens become more important motives to increase F&V consumption in HHs. Seasonal fluctuations also play a significant role in F&V consumption as most of the respondents tend to consume more or less F&V depending on the seasonal availability. The quantity of F&V supply, the quality of the produce available, and the prices vary in different seasons. Therefore, F&V consumption also changes seasonally. Several studies showed that seasonal variations in F&V intake could greatly affect reported F&V consumption, if such information is collected at different times of the year (Willett, 1990; Gloria *et al.*, 2009; Loock *et al.*, 2009).

Further, reasonable price (24%) and preference of children and adults in the HH (31%) are other more important factors in increasing both F&V consumption in Sri Lanka. However, price sensitivity also varies with socio-economic status and consumers are quite responsive to changes in F&V prices. In addition to the above

mentioned factors, the availability of processed products (8%) and shop promotions for F&V (2%) are reported as motives to increase HH F&V consumption. Although fruit was viewed as convenient to consume, vegetable preparation time was seen as a barrier- especially in urban HHs. Therefore, the increasing supply of processed vegetables may meet the increasing demand for convenient F&V.

7.5 Perception of Chemical / Pesticide Residues in Fruit and Vegetables

Table 7.7: Perception of Pesticide Residues in Fruit and Vegetables

Response	Frequency	Percentage (%)
Yes	430	97
No	13	3

Source: Authors' own calculation based on field survey (2019)

Table 7.7 indicates that the majority of the respondents (97%) believe that the F&V available in the market are contaminated with pesticide residue. This belief negatively affected the HHs F&V purchasing and consumption decisions (Table 7.8). A recent study in Vietnam shows food safety to be the most important factor in food choice (Meldrum *et al.*, 2019). Similar results were found in the study of Schreinemachers *et al.*, (2018), if vegetables regularly contain pathogens or exceed maximum pesticide residue limits, consumers begin to associate fresh vegetables with health risks rather than health benefits and reduce consumption.

Table 7.8: Purchasing and Consumption Decision of Fruits and Vegetables due to Pesticide Residues

Statement: The perception of pesticide residues in F&V, negatively affect my F&V consumption and purchasing decision

Response	Frequency	Percentage (%)
Yes	330	74
No	133	26

Source: Authors' own calculation based on field survey (2019)

7.6 Awareness and Perception of Organic Fruit and Vegetables

Table 7.9: Awareness of Organic Fruits and Vegetables

Response	Frequency	Percentage (%)
Yes	265	60
No	178	40

Source: Source: Authors' own calculation based on field survey (2019)

Table 7.9 indicates that the majority of the respondents (60%) are aware of organic F&V. While 'organic' may be a familiar term for some, very few understand the actual meaning. Several supermarkets and fresh food markets are now selling

organically produced food items and consequently provide consumers with an alternative to conventionally grown food.

7.6.1 Source of Information on Organic Fruit and Vegetables

Table 7.10: Source of Information on Organic Fruits and Vegetables

Source	Percentage (%)
Television	41
Organizations in the village	20
Government institute/ officers	16
News Paper	9
Medical Institutes	6
Own experience	4
Friends, Family members, neighbours	3
Internet	1

Source: Authors' own calculation based on field survey (2019)

The majority of respondents (41%) obtained information and awareness about organic F&V by watching television programmes. Forty two percent of the respondents received information, through formal ways such as from medical institutes, organizations in the villages, and government institutes/officers. The rest of the respondents gained awareness through newspapers and the internet. Only four percent of the respondents were aware due to their own experiences, while three percent of the respondents received information through their friends, family members and neighbours.

7.6.2 Perception of Organic Fruit and Vegetables

The respondents' perception towards organic F&V is presented by Table 7.11, 7.12, and 7.13 respectively. This section analyses the scoring patterns of the respondents per variable per section. Levels of disagreement (negative statements) were collapsed to show a single category of "D/SD". A similar procedure was followed for the levels of agreement (positive statements).

7.6.2.1 Availability and Accessibility of Organic Fruits and Vegetables

Table 7.11: Availability and Accessibility to Purchase

Statement	Percentage		
	D/SD	NAD	A/SA
I would purchase more organic F&V if it available at my regular store	25.28	2.93	71.78
It is relatively easy to find safe/quality F&V in my area	49.21	5.64	40.14

Note: SA- Strongly Agreed, A- Agreed, NAD- Neither Agreed nor disagreed, D-Disagreed, SD- Strongly Disagreed

Source: Authors' own calculation based on field survey (2019)

The results of Table 7.11 shows that most respondents (71.78 %) were willing to purchase organic F&V if they were available at their regular stores. However, 49.21 percent of the respondents experienced a relative amount of difficulty in finding safe and good quality F&V in their residential areas.

7.6.2.2 Awareness regarding Organic Fruit and Vegetables

Table 7.12: Knowledge and Attitude towards Organic Fruit and Vegetable Purchasing

Statement	Percentage		
	D/SD	NAD	A/SA
There is adequate information regarding F&V for me to make an informed purchase	27.99	13.32	58.69
I choose certain food items because I am concerned with chemical residues in my food	18.73	8.35	72.91
I buy certain F&V from certain places as I am concerned about the environment	15.81	8.13	76.07
Organic F&V are more tastier and healthier than conventional F&V	7.68	9.26	83.07
Organic F&V do not contain any pesticides	53.72	11.51	34.76

Note: SA- Strongly Agreed, A- Agreed, NAD- Neither Agreed nor disagreed, D-Disagreed, SD- Strongly Disagreed
 Source: Authors' own calculation based on field survey (2019)

According to the results shown in Table 7.12 the average level of agreement with the statements is 65.1 percent. It is observed that all of the statements are close to this average except the first (58.69%) and the last (34.76%). Consequently, the high levels of agreement imply that the respondents are fairly knowledgeable on the concept of organic F&V and the total organic food concept. However, the last statement implies that a little more than half of the respondents (53.72%) have doubts about the organic status of the product.

7.6.2.3 Purchasing of Organic Fruit and Vegetables

It is noted that all statements of this section are negatively directed. A majority of the respondents (56.43%) said that non-availability is the major barrier which reduces the purchase of organic F&V. Consequently, they emphasized that even though they have a sufficient budget to purchase organic F&V they could not find quality organic products in their residential areas. Almost 43.34 percent of the respondents do not buy organic F&V due to unclear declarations of the organic status. Moreover, 45.6 percent of the respondents do not believe that organic F&V are without chemicals. Similarly Worner and Meier-Ploeger, (1999) also reported

that doubt the product guarantee, lack of promotion, and unclear declarations of the organic status will reduce the purchasing of organic products. Hence, the presence of an organic label or the certification is important in relation to buying intensity.

Table 7.13: Reasons for Lack of Purchases on Organic Fruit and Vegetables

Statement	Percentage		
	D/SD	NAD	A/SA
I do not buy organic F&V because it is not readily available	33.19	10.38	56.43
I do not buy organic F&V because it is not within my budget	56.43	16.25	27.32
I do not buy organic F&V due to lack of information	43.34	14.22	42.44
I do not buy organic F&V as I am not believing that they are without chemicals	37.24	17.16	45.60

Note: SA- Strongly Agreed, A- Agreed, NAD- Neither Agreed nor disagreed, D-Disagreed, SD- Strongly Disagreed
Source: Authors' own calculation based on field survey (2019)

CHAPTER EIGHT

Conclusion and Recommendations

8.1 Conclusion

- Urban HHs spend more than twice the amount on F&V than the rural and estate sector HHs do. The vegetable budget share is higher than fruit budget share in all three sectors showing higher spending of HHs for vegetables when compared to fruits.
- There is an increasing trend in the fruit budget share of urban HHs while rural sector HHs show a declining trend which indicates that the share of fruits in the total budget has been slightly declining over the years. With respect to the estate sector, there is no significant change in the fruit budget share over the time.
- There is a declining trend in the vegetable budget shares of urban HHs. However, rural and estate sector HHs show an upward trend in vegetable budget shares during the time period between 2002 and 2016. However, the percentage of the food budget spent on F&V is generally small ranging from 1.9 percent to 10 percent across the three sectors.
- A majority of the urban (69%), estate (69%), and rural (56%) HHs totally depend on outsourcing to obtain F&V. However, only four percent of the rural sector HHs and one percent of the estate sector HHs fully depend on home gardens to obtain F&V. They strongly believe that home-grown F&V are fresher and safer than F&V obtained from outsources.
- Most of the urban HHs picked buying F&V at supermarkets as their preferred choice, while the rural and estate HHs preferred the local market (*pola*). Their second preference was roadside vendors. Therefore, actors in the F&V supply chain should find the most suitable markets for selling their produce across the three sectors.
- Majority of the respondents (99%) do not have problems of availability of F&V. Most of the HHs prefer to buy F&V once in a week during the evening and morning times. However, there was keen concern of buying fresh F&V rather than packed or processed ones.
- Quality and freshness were the two most important attributes which affected the purchasing of fresh F&V. Followed by price, safety, and seasonality which were ranked under important attributes.
- The per capita F&V consumption was estimated among the respondents and it is lower than the medical recommendation. The per capita fruit consumption varies across urban (187.78 g/day/person), rural (151.51 g/day/person), and estate (43.34g/day/person) HHs. The per capita vegetable consumption was reported as

180.55 g/day/person in urban HHs, 165.89 g/day/person in rural HHs, and 108.38 g/day/person in estate HHs.

- The Simpson Index Analysis revealed that the diversity of F&V consumption varies among HHs. The highest diversity is found in urban HHs (0.65), followed by rural HHs (0.58) and estate HHs (0.32). The consumption of vegetables (urban-0.63, rural- 0.56, estate- 0.28) is more diversified than the consumption of fruits (urban-0.31, rural-0.19, estate-0.025).
- According to the Linear Regression Analysis, HH size, gender, education level of the HH head, number of children, food habits, dwelling in an urban area, and access to F&V market has a significant effect on HH expenditure on F&V over other food expenditure.
- An Exploratory Factor Analysis was used to identify factors related to potentials and barriers in F&V consumption in HHs. Eight factors were identified; namely, “willingness to change”, “choice of F&V at the shop”, “awareness about recommendations”, “liking”, “health consciousness”, difficulties,” “ease”, and “perceived quality of F&V” which all together accounted for 70 percent of the total explained variation.
- Most of the respondents are aware of nutritional benefits of F&V. However, the majority of the HHs (75%) in the survey was not aware of the National Food Guidelines, quantity and variety of intake, and terms like serving and serving sizes. Hence, most of the respondents perceive their current diet as being healthy and sufficient, despite being less consistent with recommendations like dietary guidelines.
- Perception of chemical usage in fruit ripening, poor taste, and high prices were the most important factors which hindered HH fruit consumption. Awareness about the nutritional value of F&V, quality of the products, availability at home gardens, reasonable price, and seasonal availability are the motives for F&V intake.
- Majority of the respondents (97%) strongly believe that the F&V available at the market are not very safe and believe that they are contaminated with pesticide residues. This belief negatively affects the majority of HHs (74%) F&V consumption and purchasing decisions.
- A majority of the respondents (60%) were aware of organic F&V and were willing to purchase if they are available at their regular stores. However, non-availability, doubt about the product guarantee, lack of promotion, and unclear declarations of the organic status were the major barriers which reduce the purchase of organic F&V.

8.2 Recommendations

- Programmes and policies on public health and nutrition interventions should promote F&V consumption, making people aware of diversified F&V intake and attitudes towards healthy diets. Furthermore, estate sector HHs should be specifically targeted in such strategies as they have comparatively low F&V intakes and diversity in relation to the dietary recommendations.
- There is a potentially viable market for safer F&V if production is scaled up. All hands must be on deck to promote the production, certification, and sales of safe F&V. It is important to establish national legislation for reputable organic certification that could lead to greater trust in the organic F&V available in the local market.
- The aim of F&V production is to deliver a safe and wholesome final product to the consumer. Hence, it is recommended that market inspections and legislation procedures are strengthened to assure quality and safety of the F&V available at the market. Further, scientific research must be carried out to assess residual effects from pesticide use on F&V and people must be made more aware to prevent misbeliefs from forming and spreading.
- Home gardens are one potential way to increase the production and consumption of F&V. Therefore, home gardening programmes should be promoted in order to produce fresh F&V by addressing its limitations.
- Investment in F&V research aimed at reducing production costs and enhancing food safety could greatly benefit population health by helping to lower the price of F&V making them more accessible to the populations that need them.

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ANNEXES

Annex I: Statements used in measuring food habits and knowledge on healthy diets

1.1 Statements Related to Food Habit

Indicate your level of agreement regarding the following Statements.

Code: (1) SD: Strongly disagree (2) D: Disagree (3) A/D: neither agree nor disagree (4) A: Agree (5) SA: Strongly Agree

Statement	SD	D	A/D	A	SA
I prefer to consume more F&V because I am a vegetarian					
I like the taste of fruits					
I like the taste of vegetables					
Believe friends and family members encourage me to eat F&V					
I have made a habit to eat lots of F&V since childhood					

1.2 Statements Related to Knowledge on F&Vs in Healthy Diet

Indicate your level of agreement regarding the following Statements.

Code: (1) SD: Strongly disagree (2) D: Disagree (3) A/D: neither agree nor disagree (4) A: Agree (5) SA: Strongly Agree

Statement	SD	D	A/D	A	SA
Knowledge on healthy diets leads to eat more fruit and vegetables					
I prefer to eat more F&V that I think it has good health benefits					
I am aware of current food guideline recommendation of eat 3-5 portions of F&V per day					
I am aware to eat 5 varieties or five colours of F&V per day					