

**UNIVERSITY OF EDUCATION, WINNEBA**  
**COLLEGE OF TECHNOLOGY EDUCATION – KUMASI**

**FRUITS AND VEGETABLE CONSUMPTION TRENDS AMONG BASIC SCHOOL  
STUDENTS IN THE KWADASO MUNICIPALITY ASHANTI REGION OF  
GHANA.**



**FEBRUARY, 2022**

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GHANA.**

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**A project report in the Department of Hospitality and Tourism, Faculty of Vocational  
Education, submitted to the School of Graduate Studies, University of Education  
Winneba, in partial fulfilment of the requirements for award of the Master of  
Technology (Catering and Hospitality) degree.**

**FEBRUARY, 2022**

## DECLARATION

### STUDENT'S DECLARATION

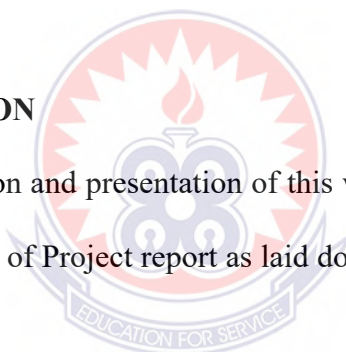
I, Hilda Osei declare that this project report, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

**SIGNATURE:**.....

**DATE:**.....

### SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Project report as laid down by the University of Education, Winneba.



**NAME OF SUPERVISOR: GILBERT OWIAH SAMPSON (Ph.D)**

**SIGNATURE:**.....

**DATE:**.....

## ACKNOWLEDGEMENT

This study owes its success to several people who assisted me in various ways and thus they need acknowledgement. First of all, I wish to thank Almighty God for His abundant grace and favour bestowed on me throughout my education. Praise be unto His name forever.

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Again, I would like to express my profound gratitude and appreciation to my children, Kahlan – Mary Nana Konadu Halm and Mildred Nana Konadu Kontor for their encouragement and support.

I also owe a debt of gratitude to all friends and colleagues for being there for me through hard times in my quest for knowledge. God bless you all.



## **DEDICATION**

I dedicate this project to my children Kahlan – Mary Nana Konadu Halm and Mildred Nana

Konadu Kontor with love.



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## ABSTRACT

In Ghana and more specifically, in the Ashanti Region, regardless of the abundance of fresh fruits and vegetables and numerous efforts by government and other stakeholders to encourage the consumption levels among school-aged children and adults, very little has been achieved. Generally, several factors such as socio-economic and socio-cultural factors, food costs, taste, convenience, and availability are known to influence the consumption of fruits and vegetables. The specific objectives sought to, assess the influence of knowledge of fruits and vegetables consumption on the consumer, evaluate the postharvest handling methods used by students in the postharvest management of fruits and vegetables; and their challenges. The study utilised the quantitative and descriptive research approach. The researcher used simple random sampling to select 120 participants for this study from the various schools in the community. The researcher used observation and questionnaire to collect data from respondents. Descriptive statistics such as frequencies, percentages and means were used to analyse the data collected. The population for this study covers the entire adult population residing in the Kwadaso Township who are aged 12 years and above. The population is estimated to be about 2000 according to the Ghana Statistical Service. This includes both males and females, educated and uneducated. The study also revealed that students conveyed their fruits and vegetables usually in polythene bags and jute sacs. It was also noticed that, the method of conveying was dependent on how longer or shorter the distances under consideration. Most of the losses that were recorded in fruits and vegetables consumption were mainly during the storage stage and in the course of transit. Most of the labour or workforce for the production of fruits and vegetables were aged people. The study recommends that partly prepared fruits and vegetables could be prepared for students who are unable to consume due to their busy schedules so that they could carry them along in order to increase their consumption.

## CHAPTER ONE

### INTRODUCTION

#### 1.0 Background to the study

It is widely accepted that fruits and vegetables are components of a healthy diet and the World Health Organization (WHO) aims at promoting an increase in their consumption.

Experts have recommended that fruits be made an essential component of every meal (Agudo, 2015). The term fruits and vegetables have different meanings depending on the context in which they are used. Vegetables could be defined as the plant part used as food typically as accompaniment to meat or fish, such as cabbage, potato, carrot or bean (O'Hare *et al.*, 2019).

Fruits are however, known to be the sweet and fleshy product of a tree or plant that contains a seed and can be eaten as food. For the purpose of this study, vegetables shall be defined as the edible part of a plant, commonly cultivated or collected for their nutritional values for humans (Agudo, 2015). By the foregoing definition of vegetables, a fruit is then a subset of the vegetable. In the same way, processed fruits and vegetables such as jams and jellies that may not retain the nutritive value of the original food, are usually classified under „sweets“ or „sugars“ (Agudo, 2020).

Fruits are important sources of potassium, magnesium and fibre “all of which are necessary nutrients for a healthy individual (Dinkgrave, 2020). For nearly a century, fruits and vegetables have been recognised as a good source of vitamins and minerals. Their consumption has been valuable for their ability to prevent vitamins C and A deficiencies (Pomerleu *et al.*, 2013). It is widely known that eating plenty of fruits and vegetables can help consumers to ward-off heart diseases and stroke, control blood pressure and cholesterol levels (Mintah, 2012). Fruits and vegetables consumption are also known to be a guard against eye related problems such as cataract and macular degeneration which are the two common causes of vision impairments (Dinkgrave,

2015). Diets that are high in fibre from fruits and vegetables help in the management of diabetes. They also serve as a risk factor to coronary diseases. Diets containing substantial and varied amounts of vegetables and fruits may prevent certain types of cancers and are also associated with healthy weight and decreased risk of obesity (Kratt, Shewchuk and Reynolds, 2015). Poor diets (diets without fruits and vegetables) in combination with lack of exercises had been ranked as second only to tobacco as cause of morbidity and mortality (McGinnis and Foege, 2017). In spite of the ever-growing evidence highlighting the protective effects of fruits and vegetables, their intake is still grossly inadequate, both in developing and developed countries. At present, only a small negligible minority of the world's population consume the recommended five servings of fruits and vegetables daily (consisting of 80g per meal) (WHO, 2013) of which students in basic schools are no exception.

Notwithstanding the enormous benefits derived from the consumption of fruits and vegetables, little work has been done to study the consumption of fruits and vegetables and its associated challenges among basic education students in Ghana. Challenges to the consumption of fruits and vegetables among students may be influenced by the level of knowledge of the consumer on fruits and vegetables which may influence their preferences and how vegetables and fruits are handled, stored and used. These challenges may also affect the level of losses thereby reducing the benefits obtained from their consumption. Evidence suggests that, postharvest losses tend to be highest in countries where the need for food is greatest (FAO, 1989; Babalola *et al.*, 2018). Lack of fruits or vegetables has also been identified as a possible factor affecting outcomes in interventions to improve fruits and vegetables intake (Kratt *et al.*, 2019). This study was therefore aimed at unearthing the level of use and the postharvest management of fruits and vegetables among university students.

## 1.1 Statement of the Problem

In Ghana and more specifically, in the Ashanti Region, regardless of the abundance of fresh fruits and vegetables and numerous efforts by government and other stakeholders to encourage the consumption levels among school-aged children and adults, very little has been achieved (Kpodo, Mensah and Dzah, 2015). Generally, several factors such as socio-economic and socio-cultural factors, food costs, taste, convenience, and availability are known to influence the consumption of fruits and vegetables. However, most studies on fruits and vegetable consumption in Ghana have concentrated on adults and students in basic schools (Richards and Kattelmann, 2016; Nti, Hagan, Bagina, and Seglah, 2011; Kpodo, Mensah and Dzah, 2015) with less attention on the subject relating to consumption among children in basic schools. Consequently, there seems to be very little or no empirical evidence about the factors to which Ghanaian basic students consume fruits and vegetables and the relationship between gender and fruits and vegetable consumption among students in basic schools in Ghana.

## 1.2 Objectives of the Study

The specific objectives sought to:

- Assess the influence of knowledge of fruits and vegetables consumption on the consumer;
- Evaluate the postharvest handling methods used by students in the postharvest management of fruits and vegetables; and their challenges;
- Assess the losses that occur in students' postharvest management of fruits and vegetables; and
- Identify the sensory attributes that influenced student's preference for some selected fruits and vegetables.

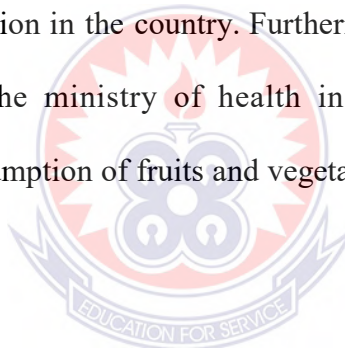
### **1.3 Research Questions**

The study will be guided by the following questions:

- i. What is the pattern of fruit and vegetable consumption among basic school students in the Kwadaso Municipality in the Ashanti Region?
- ii. What preferences and health knowledge do students have to fruit and vegetable?
- iii. What is the relationship between fruit and vegetable consumption patterns and gender among basic school students in the Kwadaso Municipality in the Ashanti Region?

### **1.4 Significance of the Study**

The study is very important because it will make useful empirical contributions to the literature of fruits and vegetable consumption in the country. Furthermore, findings from the study will help the government through the ministry of health in the formulation of policies and programs that will boost the consumption of fruits and vegetables among pupils in basic schools in the country.



## CHAPTER TWO

### LITERATURE REVIEW

#### **2.1 Nutrition in Fruits and Vegetables.**

The fruits and vegetables per capita consumption in sub-Saharan Africa revealed that Ghana in totality is ranked second to Kenya in fruits and vegetables consumption. However, globally fruits and vegetables consumption are considered minimal among countries such as Ethiopia, Burundi, Malawi, Mozambique, Tanzania, Rwanda, Kenya, Uganda, Ghana and many more. These countries record a fruit and vegetable consumption level below the recommended consumption level of (400g) per day (Reul, Minot and Smith, 2010). In other countries, per capita income is considered to be a determinant factor in fruit and vegetables consumption. This is evident in the consumption levels of some countries since some do not reach even half of the expected level of consumption set by the Food and Agriculture Organization (FAO) in spite of the ever-growing evidence highlighting the protective effects of fruits and vegetables consumption.

#### **2.2 Fruits and Vegetables Defined**

Vegetables in general have certain characteristics. The edible portion of vegetables has high water content. Vegetables are mostly consumed in their fresh state (Norman, 2017). Due to their perishable nature, they are stored for a short period of time. Vegetables, unlike fruits are mostly cooked before they can be eaten. However, some can be eaten in their fresh states, just like fruits. Fruit can be defined as the womb that holds, protects feeds, matures and eventually delivers the seed responsible for the survival of a species and its propagation (McKee, 2016). The fruit is a distinct organ that develops from the flower's female tissue, the ovary and encloses the female tissue. The word vegetable comes from the Latin verb "vegere" meaning to enjoy, delight in (McKee, 2015). By definition, vegetables then are inscribed in English as a useful fuel for humans

while fruits are perceived to be in a closer dimension to luxury and sensual pleasure (Mckee, 2015). In order to quantify fruits and vegetables consumption, it is important that both uses in the culinary state and fresh state are considered in defining fruits and vegetables. Certain groups of plants-based foods are not usually regarded as vegetables during classification. Examples are (a) herbs (b) spices and plant products used to make coffee and tea.

### **2.3 Importance of fruits and vegetables.**

The importance of fruits and vegetables is related to their nutritional value. Fruits and vegetables serve as a major source of vitamins and minerals which are necessary in ensuring balanced diet. They may also serve as supplementary foods. Some vegetables are used as richer sources of cheap proteins. They are also sources of roughages which by providing an indigestible matrix stimulates intestinal muscles and apart from keeping them in working order, prevents constipation due to their laxative effects (Norman, 2012). Fruits and vegetables are also important components of healthy diets and have been associated with the reduction of some cancers and cardiovascular diseases (Bazzano *et al.*, 2014; WHO, 2015).

Fruits have been identified to have a protective effect against the risk of cancers of the lungs, the bladder, mouth, pharynx and larynx. They are relatively cheap sources of essential micronutrients. They are also cost-effective means of preventing micronutrient deficiencies and also serve as protectant against chronic diseases which are the main killers in the world today (Ruel and Minot, 2015). Research has shown that, fruits and vegetables are major sources of Vitamins A. and C. An inadequate or lack of the supply of Vitamin A causes infantile mortality with early symptoms such as night blindness (Monterell, 2016); whilst inadequate supply of Vitamin C causes curved bones and many more. Disasters are also significant determinants of fruits and vegetables that contain Vitamin A. and C. Women who consume more fruits and vegetables tend to live longer when they



exercise more since they usually have a lower body mass index than those with lower fruits and vegetables intake rate (Lui *et al.*, 2014).

### **2.3.1 Fruits and Vegetables Consumption**

Low fruits and vegetables intake are a main contributor to micronutrient deficiency in the developing world, especially in populations with low intake of nutrient dense animal source of food. The World Health Organisation (WHO) estimates that, low fruits and vegetables intake contributes to about 2.7 million deaths a year from chronic diseases and causes about 31% of ischemic diseases and 11% of strokes worldwide (WHO, 2015). Fruits and vegetables consumption can be influenced by variable factors such as: household income, prices and availability of fruits and vegetables, consumer food preferences, home feasibility and home production of fruits and vegetables, household decision-making process, gender, age, proximity (closeness of production site to consumers), and the income levels of consumers. Research has shown that there is a relationship between the consumption of fruits and vegetables and disease prevention.

Women who consume five or more servings of fruits and vegetables a day stand a lower risk of attracting diabetes. It is recommended that on the average, each individual must consume 100g of fruits and vegetables per day (Grubben, 2018).

The portion size is an important issue in the loathing of reliable estimates about the actual quantity of fruits and vegetables that are consumed. It is known that the largest segment in processed fruit products is ready to serve beverages, followed by fruit pulp, pickles, preserves, chutneys, frozen fruits and vegetables, Tans and squashes and syrups (Grubben, 2018). Major exporters of fruits and vegetables include USA, Spain, Italy, Chile, France, Turkey, Netherlands, Ecuador and India.

Major importers of fruits and vegetables also include the following countries: Germany, France, USA, France, UK, Japan, Italy, Netherlands and Canada.

### **2.3.2 Benefits of Fruits and Vegetables Consumption**

Regular consumption of fruits is associated with reduced risks of cancer, cardiovascular diseases, stroke, alzheimer disease, cataracts and some functional diseases associated with stroke and ageing (Liu, 2003). It is more important to include a wide variety of fibre rich foods in daily diet(s) than it is to use the highest total fibre amount since different fruits and vegetables have different mixtures of the types of fibres. Eating 3-5 servings of colourful fruits and vegetables a day is important because deeply hued fruits and vegetables provide a wide range of vitamins, minerals, fibre and photochemical which the body needs to maintain good health (Rasmussen *et al.*, 2016). Reduction in the consumption of refined foods and the promotion of fruits and vegetables can reduce the risk of obesity which includes the deviation or reduction in cholesterol levels, reduction in the accumulation of adipose tissues amidst the drying of one's life style (Tasheu, 2018).

### **2.3.3 Sources of vitamins C and E**

The water soluble anti-oxidant (Vitamin C) is present in many fruits and vegetables, especially citrus and peppers. It is noted for the prevention of carcinogenic nitrosamines formation and also secondary amines in the stomach (Beaumont-Smith *et al.*, 2015).

### **2.3.4 Roles of Guardians in Fruits and Vegetables Consumption**

Parents are arguably the most influential environmental factors in children's development of food preferences (Kratt *et al.*, 2015). Availability has also proven to be a determinant factor for fruits and vegetables consumption (Kratt *et al.*, 2015).

### 2.3.5 Proteins minerals and vitamins

Various species of leafy vegetables have markedly varying water contents. These differences are highly evident during both the dry and the wet seasons. The water content varies with the species and the variety, but it is also influenced by the ecological and cultivation factors such as climatic conditions, soil, fertilization, irrigation, storage and methods of harvesting, transportation and handling (Grubben, 2016).

Some fruits and vegetables are rich in indigestible cellulose and fibres which have a mild laxative effect when consumed. This is very useful in the tropical countries where constipation is the rule rather than an exception (Heil, 2014). Proteins present in the leafy vegetables are rarely mentioned because the quantities eaten are considered too small for a significant supply of proteins (Pasomore, 2014). However, regular supply of some grammes of leafy proteins per day to children suffering from protein deficiency may lead to substantial improvement in their health. Many leafy vegetables contain more proteins in un-boiled than boiled dishes (Grubben, 2016). This reasoning is understandable because once the cooking water is thrown away, most of the nutrients are lost since the vegetables do not only absorb water but also lose some cellulose water during boiling. Green leaves are often consumed in quantities which are too small to contribute significantly to caloric requirements (Grubben, 2016).

Mineral salts which are important nutritional components in foods are also found in fruits and vegetables. They are present in dark green leaves. Calcium and iron are seen to be the most important in the diet(s) of communities in tropical countries. Calcium and zinc are also pre-eminent materials in *Amaranthus*. Iron from *Amaranthus* is easily absorbed through the intestines. However, patients suffering from anemia are capable of absorbing more iron from this.

Tropical leafy vegetables are very rich in B-carotene, ascorbic acid and in some vitamins of B-complex like riboflavin and folic acid. Thiamine also is available in sufficient quantities. Eating green leaves also helps to control xerophthalmia which is frequently found in tropical countries. The seeds of some leafy vegetables such as *Amaranthus* are high in nutritive values. Leafy vegetables also contain some oxalic acid content and other noxious substances (Grubben, 2015).

#### **2.4 Storage of Fruits and Vegetables**

One of the most important functions of refrigeration is to control the rate of respiration in a produce. Respiration generates heat as sugars, fats and proteins are oxidized. The loss of these stored food reserves through respiration means decreased food value, loss of flavour, loss of salable weight and more rapid deterioration. The respiration rate of a produce strongly determines its postharvest life.

The rate of respiration of a stored produce increases with an increase in the rate of respiration for refrigeration to be effective in extending the shelf life of a commodity, it is important that the temperature in the storage room is kept as constant as possible. Exposure to alternating cold and warm temperatures may result in moisture accumulation on the surface of the produce which may hasten decay (Bachman and Earles, 2010). To reduce this effect, storage rooms should be well insulated and air circulated.

Acid degradation and ethanol production may be influenced by temperature during storage. Cold or warm storage were revealed in his research on the postharvest quality of orange as affected by pre-storage treatments with acetaldehyde vapour or anaerobic conditions.

The mode of storage employed by students during their use of fruits and vegetables immensely affects the quality of the vegetables and fruits they consume. It also affects greatly the quality of stored vegetables. Under different storage conditions, different fruits and vegetables may behave

differently (Kim *et al.*, 2010). In a modified atmosphere, different fruits and vegetables experience different levels of weight loss.

Alteration in carotenoid content varies also from one produce to the other (Kim *et al.*, 2010). Humidity is the greatest variable affecting matter loss, hence affecting the shelf life of fruits and vegetables (Kim *et al.*, 2010).

#### **2.4.1 Storage of Citrus**

Citrus been having low respiration rates and thus are amenable to long term storage. Nevertheless, storage conditions are also cultivar dependent and fruit quality changes occur during prolong storage (Davies and Albrigo, 2016). For instance, in some areas of the world, citrus fruits are held in common storage where the temperature remains constant all year round. Fruits such as sweet oranges and mandarins could be stored for two months or more at zero to four (0 - 4) degrees Celsius with very little loss of fruit quality (Davies and Albrigo, 2006)

Others also risk falling prey to chilling injury when kept under temperatures below 10 degrees celsius. A typical example of these are lemons and grape fruits (Davies and Albrigo, 2016). Consequently, lemons are best stored at (10-12) degrees celsius and grape fruits at (10-15) degrees celsius. Abscisic acid levels tend to decrease in the peels of citrus when harvested after January and the reducing sugar level tend to increase (Davies and Albrigo, 2016).

It must be well noted that, the required atmosphere for the storage of lemon is at a relative humidity of (95%). During the storage of citrus, the relative humidity should be kept between (85-95%) in order to retard water loss due to vapour pressure. In as much as humidity is required to be high, high humidity also promotes wound healing, the growth of mould and the sustenance of the lives of other decay organisms (Davies and Albrigo, 2016).

Controlled atmosphere storage has the modest benefits of storage for citrus. It is however not recommended since it appears not to be cost effective. The use of refrigerators is the most economical and widely used. Citrus fruits undergo internal quality changes during storage (Davies and Albrigo, 2006). These changes are a function of cultivar and the storage conditions. Components such as fresh water, total soluble solids (TSS) received some internal and external alterations in response to temperature changes. Even though waxing may reduce the rate of desiccation, waxed fruits also develop off flavours when stored at high temperatures for longer period (Hagenmaeir and Shaw, 2015).

## **2.5 Deterioration of Fruits and Vegetables**

The quality of horticultural produce has been based on external characteristics in terms of size, colour, flavour and the absence of defects such as bruises.

An increase in the rate of loss because of normal physiological changes is caused by conditions that increase the rate of natural deterioration such as high temperature, low atmospheric humidity and physical injury, abnormal physiological deterioration such as high temperature and low atmospheric humidity. This deterioration occurs when the fresh produce is subjected to extremes of temperature, atmospheric modification or contamination. Losses can also be caused by mechanical damage or diseases and pests (Beautmont-Smith *et al.*, 2014).

### **2.5.1 Losses Due to Preparation**

Losses occur during the preparation of fruits and vegetables. These losses can be distinguished in the following ways:

- i. Losses through inactivation caused by the application of leaf, especially of Vitamin C.
- ii. Dissolution of a part of mineral salts.

- iii. Losses through the diffusion of part of the nutritive substances which are soluble in cooking water. Examples are sugars, organic acids, pectin, mineral matter, vitamins, pigments and aromatic substances.

With this nutritionist's advice, the processing or preparation of vegetables in very little water is recommended in order to avoid throwing away the cooking water. Research has also revealed that in instances where people are forbidden by taboos to consume fruits and vegetables, other meals are also used to replace them in terms of their nutritional values.

### **2.5.2 Decay in Fruits and Vegetables**

Delay in cooling tends to increase decay losses. Damage to certain fruits and vegetables could be minimized by applying decay control treatments such as fumigation to reduce fungal infection. Plastic containers could be lined with plastic liners and sulphur dioxide generation pad. Free water with high humidity speeds up decay development in tree fruits and berries.

For example, in a room temperature, only four hours of contact with free water allows brown rot to penetrate fruit tissues. Decay prone fruits and vegetables should be protected from prolonged water contact and very high humidity during cooling delays. Low humidity could also be detrimental to produce, such as carrots which could be later on corrected by the fruit re-absorbing water during storage.

### **2.5.3 Water Loss in Fruits and Vegetables**

Shriveling and loss of fresh glossy appearance are the two most noticeable effects of cooling especially with regards to products that lose water easily and quickly and those that show visible symptoms of water loss like most leafy vegetables: For instance, *kantomire*, *amaranthus*, spinach and lettuce. However, moisture loss could be prevented by keeping produce in sealed containers. It must be noted that the liner must be vented to prevent temperature rise caused by damaging

levels of respiration. Some produce such as tomatoes can tolerate water contact and spraying with water to slow down product moisture loss and can rehydrate slightly wilted produce notwithstanding the fact that surface water tends to increase decay and mould development. Water loss though detrimental on some occasions, is also beneficial since produce such as carrots need some turgidity loss to reduce mechanical damage during handling and transportation (Thompson *et al.*, 2015).

#### **2.5.4 Taste components**

Fructose, sucrose and glucose are sugars that affect the perception of sweetness in fruits and vegetables. Fructose is the sweetest and glucose is less sweet than sucrose.

A single sucrose equivalent value is the weighted average of these simple sugars (Koehler and Kays, 2011). Quantification of sugars requires complicated laboratory analysis. Organic acids such as citrate in citrus and tomatoes, tartaric acid in grapes and malic acid in apples, give fruits and vegetables their sour flavour.

Some fruits like watermelon or banana are low in acid (Wyllie *et al.*, 2015). Different acids can affect sources and perception depending on their chemical structure. It has been realised that an increase in carboxyl groups decreased acidity, while an increase in molecular weight or hydrophobicity increased sourness (Hartwig and McDaniel, 2015).

#### **2.6 Texture of Fruits and vegetables**

Texture is an important component of fruit quality. Flavour may be affected by texture because the release of the taste components in fruits and vegetables is related to tissue structure (Molnar, 2016).



Texture is related to attributes of quality associated with the sense of feel as experienced by the fingers, the hand or in the mouth. Included in the texture are sensations such as loudness, softness, crispness, meatiness, juiciness and toughness.

### **2.6.1 Flavour in Fruits and Vegetables**

Often the same compounds are present in genetically unrelated fruits with their presence or absence, resulting in vastly different flavours. The combinations of flavours also result in the production of certain unique flavours of certain cultivars.

Flavour and aroma are perhaps the most elusive and subjective quality of fruits (Baldwin *et al.*, 2014). The flavour of a produce usually is composed of sweetness, sourness and aroma which corresponds to sugars, acids and volatiles ((Baldwin *et al.*, 2014). Other components of flavour include bitterness (Derovira, 2017). The flavour quality of nonclimacteric fruits and vegetables usually decline after harvest while climacterics can reach their best after harvest. In the order of importance, the following are the determinants of flavour in fruits and vegetables:

- Genetics
- Pre-harvest environment,
- Cultural practices; and
- and harvest maturity, (Romani *et al.*, 2014).

For instance, heavy rains prior to harvest dilute flavour components in tomato. In the same vein, produce harvested at an immature green stage results in ripened produce with lower volatile levels than mature green harvested ones.

Heat treatment of fruits like apples reduces physiological and pathological disorders of apples. It also inhibits the emission of volatile esters (Falik *et al.*, 2015). The vitamin; folic acid is obtained

from green leafy vegetables, oranges and orange juice. These and other outer layers play important metabolic roles in the synthesis of DNA (Baldwin *et al.*, 2014).

### **2.6.2 Aroma Components**

Aroma is said to be the sensation perceived when volatile compounds are sniffed through the nose. It must be noted that most fruits synthesize volatile chemicals as they ripen. Such chemicals give fruits and vegetables their characteristic odour and can be used to determine whether they are ripe or not (FAO, 2013). Examples include a. banana, tomatoes, pawpaw.

### **2.6.3 Cooling of Produce**

Quality of produce begins to deteriorate right after harvest. It is recommended that the cooling should begin as soon as possible after harvest. Delay in the cooling of produce is known to be the main causes of the following in a harvested produce:

- allowing respiration and its associated normal metabolism to continue at very high rates, consuming sugars, acids, vitamins and other constituents;
- fostering water loss; and
- increasing decay development

(Thompson, 2011)

Freshly harvested produce consumes photosynthates that are stored in the product before harvest. The rate of metabolism is therefore dependent on the respiratory activity of a commodity and its temperature. Commodities such as apples, cabbage, citrus, potatoes and grapes have low respiration rates compared to avocados, mushrooms and asparagus.

The climacteric or non-climacteric nature of a fruit or vegetable also affects its rate of respiration. This may be due to the exponential increase respiration rate. Different exposure of fruits and vegetables to high temperatures also causes sunburn and scald injury.

## **2.7 Determinants of Fruits and Vegetables Consumption**

Cultural habits and traditions are important determinants of food consumption with different countries and regions having different cuisines. Individual preferences also play a significant role.

### **2.7.1 Conceptual framework of determinants of fruits and vegetables consumption**

The determinants of fruits and vegetables usage consist of the following:

- Household income;
- Prices and availability;
- Consumer food preferences;
- Cost and feasibility of products of fruits and vegetables; and
  - Intra household decision-making process.

However, these factors do not affect all people with the same economic levels. The demand for fruits and vegetables increases with higher income although the share of total expenditure allocated to fruits and vegetables tend to decline (IARC, 2003). This implies that at low income levels, the demand for fruits and vegetables is small. This is largely due to the fact that low income households must prioritize the fulfillment of their basic energy requirements to aid hunger. Thus, fruits and vegetables tend to be an expensive source of energy compared to other staples such as cassava, cocoyam, plantain and rice. A study in Cambodia found out that vegetables cost between (10- 40) times more expensive than rice per kilocalorie, thus the rice and certain fruits were up to 100 times more expensive than rice per unit energy (Prescott and Pradham, 2017). Higher incomes are therefore associated with an increase in volume and diversity of fruits and vegetables consumed (Minot, 2012).

### **2.7.2 Relationship Between Income Levels and Consumption of Fruits and Vegetables**

Fruits and vegetables consumption increase with household income (Aimee, 2012). Although individuals with the lowest income levels are unable to meet the minimum requirements for consumption; at five servings daily, they are also unable to meet a minimum consumption of three servings daily (Aimee, 2012). Many factors influence food consumption. These include taste, nutrients, cost, convenience and weight control concerns. Researchers in a survey of 2,910 Americans found out that, in general, factors that influence consumption include the following in this descending order; (i) taste, (ii) cost (iii) nutrition, (iv) convenience and (v) weight control (Marie *et al.*, 2014).

Even though a multivariate analysis proved that the importance of the foregoing listed factors was not significantly related to income; income level did influence the purchasing power and convenience which were important factors considered by people with lower incomes as compared to those with higher income levels.

### **2.7.3 Prices and Availability of Fruits and Vegetables**

There is a conventional wisdom that lower income households are more sensitive to prices than higher income earners (Marie *et al.*, 2014)

It is imperative that policies to reduce the market price of fruits and vegetables can have a significant impact on the number of fruits and vegetables consumed. Considering the perishability of the fruits and vegetables and the infrastructure in many developing countries, another constraint to fruits and vegetables consumption is availability (Marie *et al.*, 2014). Their availability could also be increased throughout the year by the adoption of storage methods such as solar drying of pepper or adoption of technologies to extend either their storage or shelf life (Ali and Tsou, 2017).

#### **2.7.4 Consumer Preferences**

Other non-economic factors also affect fruits and vegetables consumption. These include sensory appeal, desirability, personal and food ideology, convenience and media advertising (Pollard *et al.*, 2002). Taboos, cultural beliefs and dietary restrictions during lactation are also likely to play a significant role in this affair. Another period of high vulnerability to micronutrients deficiencies are also widespread in developing countries. It often includes several fruits and vegetables because of their perceived harm to either the mother or the young infant (Pollack, 2011). It is imperative that mothers who have greater knowledge on nutrition devote a share of their budgets to foods that are rich in micronutrients which include fruits and vegetables (Block, 2012).

#### **2.7.5 Cost and Feasibility of Fruits and Vegetables Production**

Cultural habits and traditions are important determinants of food consumption, with different countries and regions having different cuisines. In some occasions, fruits and vegetables consumption is higher for urban places than rural communities and towns.

Even though there is little research on the degree to which conception pattern is affected by home production. Research to promote fruits and vegetables by home production increased consumption in Bangladesh (Ali and Tsou, 2017). It therefore seems plausible that in areas where markets work imperfectly, fruits and vegetables consumption could be promoted with the promotion of home production.

#### **2.7.6 Intra-household Decision-Making**

Research on intra-household allocation of resources indicates that households in which women have more control over resources, (due to legal rights, greater inheritance, high share of assets or simply the absence of the husband or higher social status) one tends to place a higher priority on child health and nutrition in allocating household resources. A study of household budget data

from Rwanda found female headed households allocated a larger share of their budgets to fruits and vegetables (Ministere du plan, 2018).

## **2.8 Sensory and physical attributes of fruits and vegetables**

Several studies from a range of countries highlighted sensory and physical attributes of fruits and vegetables as both promoters and barriers for fruits and vegetable consumption among children. Taste and flavour have been identified to be the main positive indicators. This is because generally, children appear to prefer the taste of fruits to vegetables because of their sweet flavour (Walker and Millman, 2013).

Predictors of low fruits and vegetables intake include low income, poor knowledge on nutrition, low level of education, living in an under privileged neighborhood and low socio-economic status.

## **2.9 Production and retailing of fruits and vegetables**

The most important influences on food consumption in Ghana are of course the major retailers because they are extremely influential in determining what, where and at what price we can buy food (Raven *et al.*, 2015). Major supermarkets in this country have considerably increased their share of fruits and vegetables market in recent times. Retailers would also prefer to trade in fruits and vegetables with a very high demand and are easily obtainable or in season. These factors would enhance the retail of fruits and vegetables. Losses of fruits and vegetables among retailers often occur in the course of transit by the crushing of some of the commodities and during storage through physiological deterioration, and diseases and pests infestation. Fruits and vegetables which over ripe or have less firmer skins are also often easily loss in the hands of retailers.

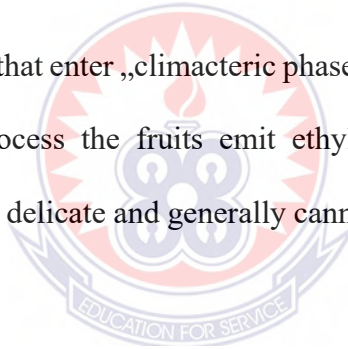
### 2.9.1 Terminologies

Composite foods: This refers to manufactured foods which include fruits and vegetables as their components. The inclusion of composite foods is as a result of the busy schedules of students and how feasible it is for them to consume whole fresh fruits and vegetables;

Frequency of consumption: It refers to the number of times a fruit or vegetable is eaten. In order to determine the frequency of consumption, it is imperative that consumption is combined with a quantitative estimate of the intake.

A serving of fruits or vegetables: This refers to 80g in quantity of fruits or vegetables. Five servings of this are needed to ensure that an individual consumes the expected quantity of fruits and vegetables in a day.

Climacteric fruits: These are fruits that enter „climacteric phase“ after harvest *that is*, they continue to ripen. During the ripening process the fruits emit ethylene along with increased rate of respiration. Ripe fruits are soft and delicate and generally cannot withstand rigors of transport and repeated handling.



## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Research Design**

The research design used in this study is quantitative descriptive survey. A descriptive survey is a type of conclusive research that has its major objective as description of phenomena associated with a subject, population or to estimate proportions of population that have certain characteristics (Malhotra, 2019). Quantitative approach was used in gathering the necessary information for the study.

#### **3.3 The Study Area**

The study was conducted in the Kwadaso community which is located in the Kumasi Metropolis. Kwadaso is a suburban town in the Ashanti Region of Ghana, located near Kumasi. The town is known for housing the largest estate in Ashanti Region. Several schools are located in Kwadaso, including the Kwadaso M/A Junior High School, (a Lower cycle institution), Prempeh M/A Junior High School and Jesus Only Int. School. There are supermarkets, shopping malls and departmental shops in the study area of which five were sampled for the study.

#### **3.4 The Population**

The population for this study covers the entire adult population residing in the Kwadaso Township who are aged 12 years and above. The population is estimated to be about 2000 according to the Ghana Statistical Service. This includes both males and females, educated and uneducated.

#### **3.5 Sampling Techniques and Sample Size**

The researcher used multi stage sampling technique for the selection of respondents for this study. First, five supermarkets were selected purposively from the Kwadaso community namely Great supermarket, Graceland, NsoNyameYe, Melcom and Bizy Supermarket. This was based on



proximity to researcher and access to customers or shoppers. After the selection of the five supermarkets, the researcher used convenience and simple random sampling to select the participants from each supermarket. In using the convenience sampling, the researcher visited the selected supermarkets on random days to sample randomly from the shoppers in the supermarkets at those specific days. Participants were selected from five supermarkets in the Kwadaso community. Twenty-five (25) respondents were selected from these four major supermarkets visited whilst 20 respondents were selected from Bizy supermarket because of its relatively smaller size compared to the other four. In total, 120 respondents were sample for the study. This was based on the estimated total customer populations of the five supermarkets which was 2000. According to Cohen, Manion and Morrison (2017), a minimum of 10% of the population is required as the sample to achieve a reasonable degree of accuracy and reliability.

### **3.6 Data Collection Instruments**

The following instruments were used for the purposes of eliciting information or data from the participants of the study:

- Observation
- Structured questionnaire

These instruments have been chosen because of the variations in the population samples to be used. The researcher collected quantitative data on the research questions through the use of questionnaires. Information such as consumer awareness of fruits and vegetables, importance of fruits and vegetables consumption trends and kind of information customers look out for on fruits and vegetables consumption trends were sought using questionnaires. Also, the researcher observed the participants of the study to see whether they actually check fruits and vegetables

consumption trends. The questionnaire was used to solicit for information which were not readily obtained through observation.

### **3.7 Data Collection Procedure**

The study relied on primary data sources. The researcher collected the primary data using a structured questionnaire and observation (see Appendices A & B). The questionnaire made use of multiple response options and Likert scale items. The researcher visited the supermarkets sampled for the study and briefed the management staff on the purpose of the study and its educational implications after permission was sought and granted by the Head of the establishment. The respondents were approached and informed of the study and its purpose. The researcher chose to administer the questionnaires to the respondents herself since it had the lowest cost and it gave respondents the opportunity to ask questions for clarification. On the whole, the researcher spent about two weeks for the collection of the data. The data collection yielded a 100% response rate since all the respondents selected for the study responded to the questionnaires.

### **3.8 Validity and Reliability**

Validity and reliability in research is the degree of stability exhibited when measurement is repeated under identical conditions (Burns & Grove 2020). Research validity refers to the researcher's objectivity in actually measuring what was supposed to be measured and not something else. The researcher in an attempt to come up with a very good work presented a draft of the questionnaires to her course mates to critique the questions. The comments and suggestions were taken in good faith and subsequently made the necessary modifications. The questionnaire was based on the research objectives and information obtained from literature review. This was to ensure that it was from a representation of elements from the topic under discussion (Polit & Hunger, 2019).

The questionnaire was further presented to the researcher's supervisor to look through and advise the researcher appropriately on necessary corrections and modifications. After these, the researcher pre-tested the questionnaire on some customers of nearby supermarket to see how well they understood the items and responded to them. All these processes ensured that the questionnaires were both reliable and valid.

### **3.9 Data Analysis**

The data collected was sorted and coded to ensure it was complete for analysis. The organized and coded data was then fed into the Statistical Package for Social Sciences (SPSS Software version 20) for analysis and interpretation. To answer the research questions simple frequencies, percentages and means were applied to analyse the data using descriptive statistics. This gave the researcher the opportunity to present detailed information on the collected data and described the results which is consistent with the focus of this study. The analysis and interpretation is presented under Chapter Four of this study.

### **3.10 Ethical Considerations**

The study paid attention to the ethics of research. Before the study took off, the researcher wrote officially to the department to seek for permission and cover letter to start the study. The researcher also ensured that the information provided was used only for the purposes of the study. Again, in line with ethical principles in research, respondents' rights to self-determination, anonymity, confidentiality and informed consent were observed. The respondents were informed of their rights to voluntarily participate or decline in the study. They were informed about the purpose of the study and were assured of not reporting any aspect of the information they provided in a way that will identify them. They were assured that there were no potential risks involved in the process. Finally, plagiarism has become a thorn in the flesh of researchers these days. To this end, the

researcher made references to works that are not the original work of the researcher. Such works were acknowledged for easy reference and also to make the study more credible.



## CHAPTER FOUR

### RESULTS AND DISCUSSION

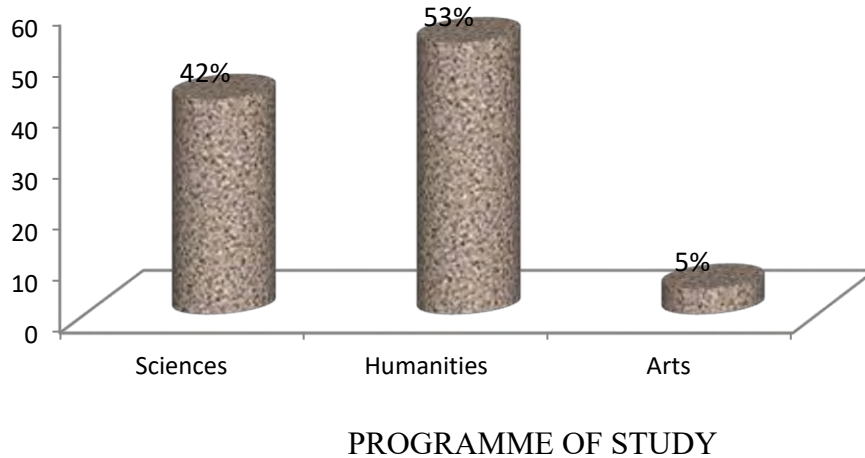
#### 4.1 Demographic Data of Respondents

The demographic background information was meant to give the researcher an understanding of the profiles of the participants. This also provided a basis for further discussions. The questionnaire presented to respondents sought the details about their gender, age groups, educational qualification, occupation and marital status for analytical purposes in this study.

**Table. 4.1: Sample distribution on the four Schools by gender**

<b>Gender</b>	<b>Kwadaso</b>	<b>SDA</b>	<b>Prempeh</b>	<b>Jesus Only</b>	<b>Total</b>
<b>Male</b>	74(28.24%)	5(1.90%)	33(12.66%)	31(11.83%)	54.63%
<b>Female</b>	62(23.56%)	9(3.46%)	46(17.65%)	2(0.76%)	45.40%
<b>Total</b>	<b>51.80%</b>	<b>5.30%</b>	<b>30.31%</b>	<b>12.59%</b>	<b>100%</b>

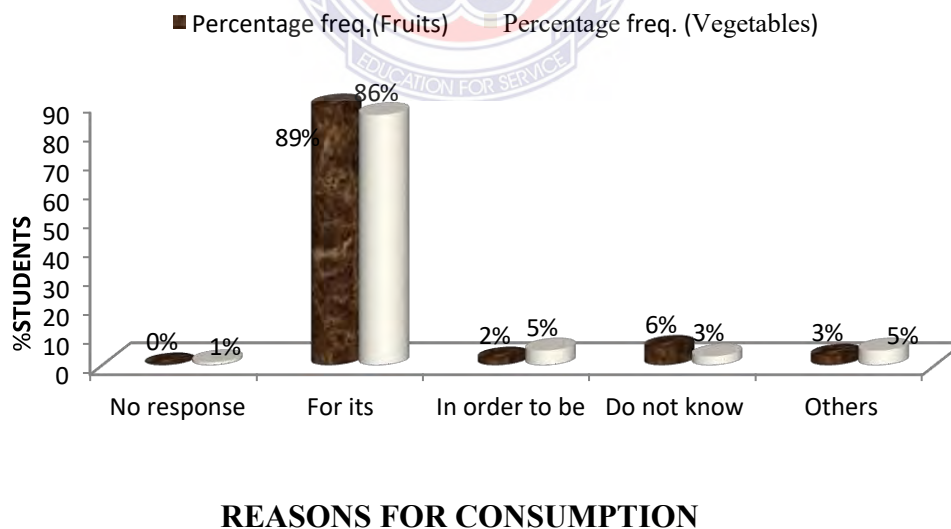
Programmes in the Basic Schools were put into three major groups into which all students were categorized; Science, BDT. Majority (53%) of the students belonged to the Science category; which included programmes such as the, Social Studies, English Languages, and other social related programmes. The second BDT (42%) also read Technology which included all pure Technology courses such as Home Economics, Pre – Technical Skill, Virtual Arts.



**Figure. 4.1: Distribution of the sampled students by their programmes of study.**

#### 4.2.1 Knowledge on Consumption of Fruits and Vegetables Consumption Trends

Figure 4.1 presents students' reasons for the consumption of fruits and vegetables consumption trends. From the study, majority of the students indicated that fruits and vegetables were consumed for their nutritional purposes (vegetable: 86% and fruits: 89%). Also, fruits (6%) and vegetables (3%) were consumed for no apparent reason and the least did so for satisfaction.



**Figure 4.2: Assessment of knowledge on fruits and vegetables consumption trend**

As indicated in Table 4.3 below, campus location had a significant effect on knowledge about the benefits derived from the consumption of fruits consumption trends.

Knowledge of consumption for other benefits was also higher among students on the Ashanti Region than all the other Municipal. The programme of study, the gender of respondents and the location of school however had no significant effect on the students' knowledge about the benefits of vegetables consumption trends.

A significant number of students on the Kwadaso Municipal and its Community Schools had knowledge on the benefits of fruits but was not significant for vegetables consumption trends.

**Table 4.2: Effect of the location of campus on the knowledge possessed by respondents on the benefits of fruits (Post-hoc test)**

<b>Location</b>	<b>No response</b>	<b>For nutritional value</b>	<b>its In order to be satisfied</b>	<b>Do not Know</b>	<b>Others</b>
SDA	.7	-.2	.5	.6	-.3
Prempeh	-.2	.5	-.6	-.9	-.6
Kwadaso M/A	-.5	.4	-.13	.5	-1.5
Jesus only Int.	-.4	-.4	1.4	-1.4	<b>3.3</b>

The study showed that gender and programme of study had no significant effect on students' knowledge on vegetables consumption trends (Appendix C1 and, C2). The programme of study however had a significant effect on the knowledge about fruits consumption trends.

**Table 4.3: Effect of programme of study on the knowledge on fruits consumption (Post-hoc test).**

<b>Programme</b>	<b>No response</b>	<b>For its nutritional value</b>	<b>In order to be satisfied</b>	<b>Do not know</b>	<b>Others</b>
Sciences	.9	<b>2.2</b>	-.8	.9	.6
BDT	-.7	.7	-1.8	-1.2	-.4
Virtual Arts	-.2	-.2	-.5	1.4	-.6

#### **4.2.2 Consumption of Fruits and Vegetable Trends**

Figure 4.2 revealed that consumption of fruits and vegetables once and twice daily was common among respondents. The percentage of students that consumed fruits and vegetables decreased with increased frequency by day. Others also indicated their irregular rates of consumption during the study. The highest percentage patronage of fruits and vegetables were 44% and 23% respectively. There was an inverse relationship between consumption and the percentage of students consuming the fruits and vegetables.



**Table 4.4: Campus location and the rate of fruits and vegetable trends**

<b>Campus Location</b>	<b>No response</b>	<b>Once a day</b>	<b>Twice a day</b>	<b>Thrice a day</b>	<b>Four times a day</b>	<b>Any other day</b>	<b>Once every three days</b>	<b>others</b>
Kwadaso M/A	1.3	.5	<b>-2.1</b>	-.3	1.1	1.5	1.9	-.8
SDA	-.5	-.5	1.7	-.7	-.4	-.3	-.7	-.9
Permpheh	-1.1	-.4	1.9	.2	-.9	<b>-2.8</b>	-1.5	<b>2.4</b>
Jesus only Int.	-.7	-.1	.2	.8	-.6	1.5	-1.0	-1.3

Gender had a significant effect on the consumption patterns of fruits (Table 4.4). A further test revealed that both female and male students did not eat fruits regularly.

**Table 4.5: Gender and the rate of fruits consumption (Post-hoc test).**

<b>Gender</b>	<b>No response</b>	<b>Once a day</b>	<b>Twice a day</b>	<b>Thrice a day</b>	<b>Four times a day</b>	<b>Five times a day</b>	<b>Any other day</b>	<b>Once every three days</b>	<b>Others</b>
Male	.9	-.4	-1.3	1.3	.2	-.2	.8	.8	-2.0
Female	-1.0	.5	1.4	-1.4	-.2	.2	-.9	-.9	<b>2.2</b>

Gender had a significant effect on the consumption patterns of vegetables.

**Table 4.6: Effect of gender on how often vegetables are consumed (Post-hoc test)**

<b>Gender</b>	<b>No response</b>	<b>Once a day</b>	<b>Twice a day</b>	<b>Thrice a day</b>	<b>Four times a day</b>	<b>Five times a day</b>	<b>Any other day</b>	<b>Once every three days</b>	<b>Others</b>
Male	.9	-.4	-1.3	1.3	.2	-.2	.8	.8	0
Female	-1.0	.5	1.4	<b>2.2</b>	-.2	.2	-.9	-.9	-1.4

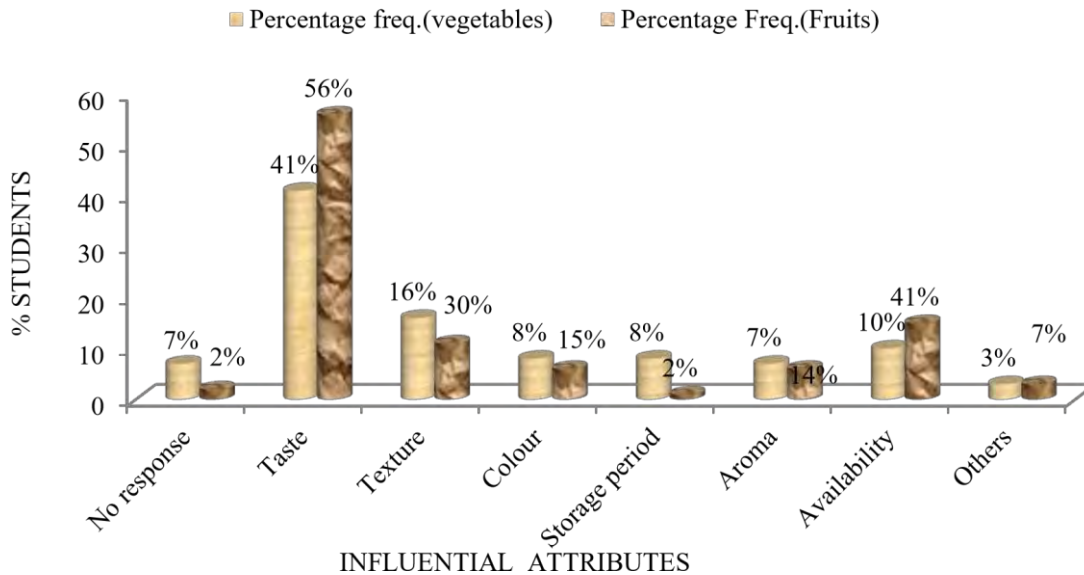
The programme of study also influenced consumption significantly (Table 4.5). It was observed that a significant number of arts students consumed vegetables thrice daily. A significant number of Science students also consumed vegetables once every day. A high number of Arts students surprisingly consumed vegetables thrice daily (Table 4.5).

#### **4.2.3 Consumption of different types fruits and vegetables**

Consumption of leafy vegetables was predominant among students on the Kwadaso Municipal. They were observed to consume high quantities of leafy vegetables than all the other schools.

#### **4.2.4 Influence of the physical attributes on consumption of fruits and *vegetable***

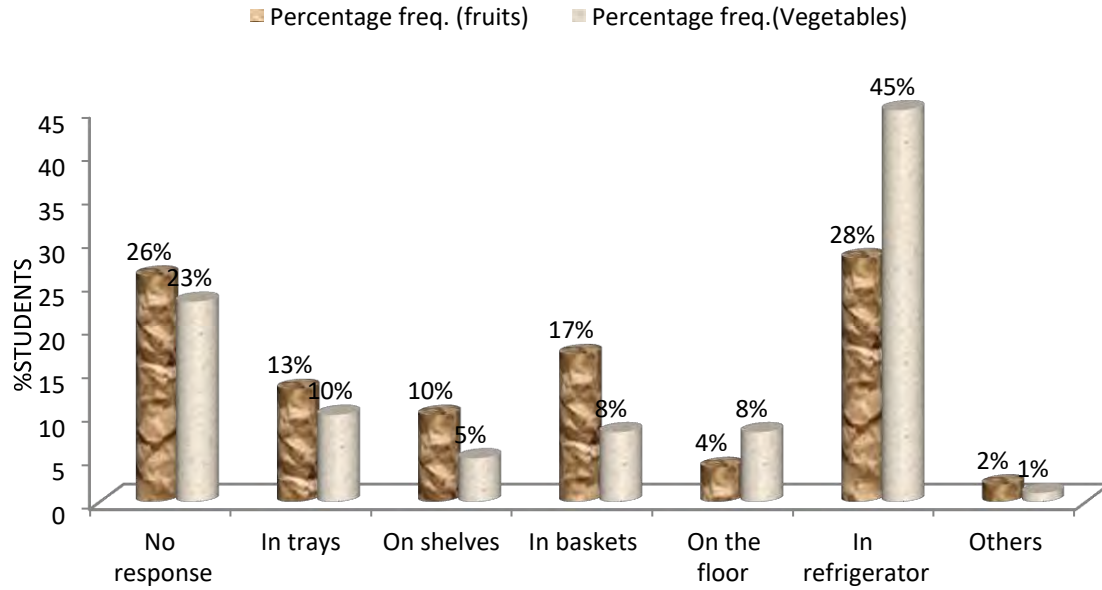
The most influencing factor among respondents from all the satellite schools on the patronage of fruits and vegetables trends was the taste of the produce. In a decreasing order of taste on preference was 56% for fruits and 41% for vegetables. The texture of fruits and vegetables also was also influential to the consumption (30% for fruits, 16% for vegetables). The last and the least influential factors to patronise fruits and vegetables included aroma and storage period (Figure 4.3).



**Figure 4.3: Extent to which selected attributes influenced patronage of fruits and vegetables.**

#### **4.3 Handling of Fruits and Vegetables**

From Figure 4.3, the most predominant method of storage employed by students was the use of refrigerators (fruits (28%) and vegetables (45%). Majority (a total of 49%) did not either store or use other unnamed means of extending the shelf life of produce. Some respondents also employed other means such as storage in baskets, on shelves and on the floor (Figure 4.4).

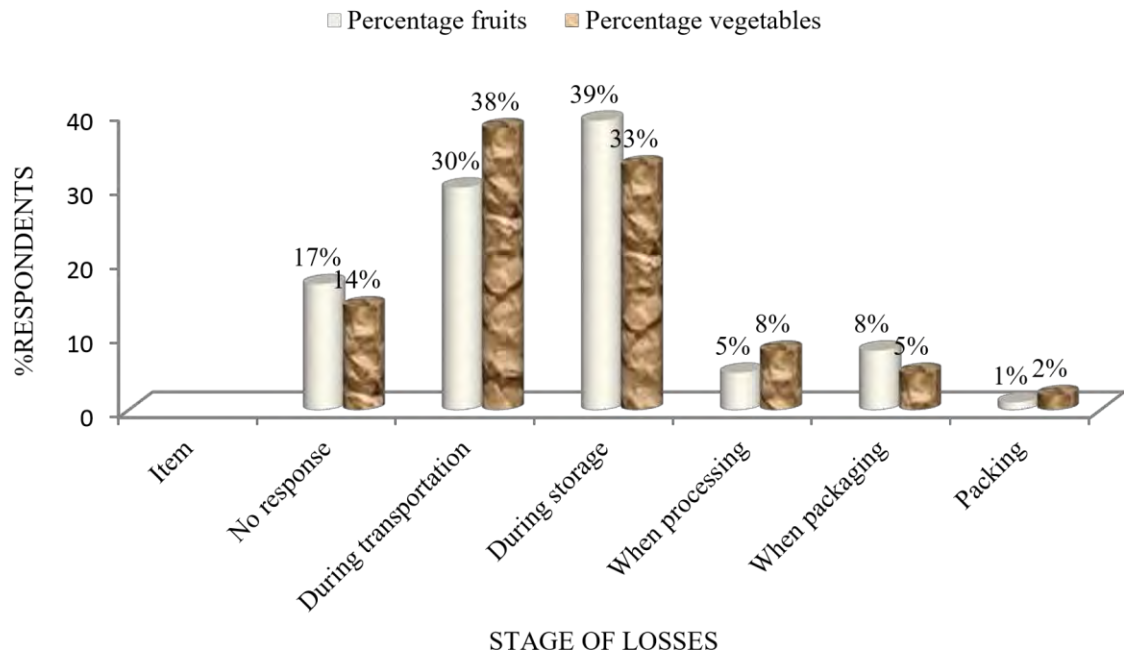


#### METHODS OF STORAGE

**Figure 4.4: Storage methods employed by students in their storage of fruits and vegetables.**

#### 4.3.1 Stages at which losses of fruits and vegetables occur

Losses of fruits and vegetables in transit and storage were observed to be the stage at which the highest losses in fruits and vegetables occurred among students. These were followed with losses during the stages of processing, packaging and packing in a descending order (Figure 4.5).



**Figure: 4.5 Stages at which losses occurred in postharvest handling of fruits and vegetables.**

#### **4.4 Producers and Retailers of Fruits and Vegetables**

A total of 38 respondents were chosen from the four study areas. The main occupation of these producers was farming. 87% of the producers being solely farmers while the others traded in addition to farming. A survey of producers during the study revealed that majority of the producers of fruits and vegetables were males (Table 4.4)

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Summary

A survey was undertaken to assess the fruits and vegetable consumption trends among basic school students. The survey sought to assess the influence of their knowledge on consumption, evaluate the handling methods and also to assess the losses that are recorded. This was done in Kwadaso Municipal Assembly.

A sensory attribute test was also conducted to ascertain the influential ability of the attributes (colour, taste, texture) on the consumption of some selected fruits and vegetables from the various fruits and vegetables food groups which were peculiar to the Kwadaso Municipal.

The survey revealed that majority of the students had profound knowledge about the nutritional benefits derived from fruits and vegetables consumption. It was also found that consumption of vegetables was in general higher than fruits. Students on basic school where the produce were available and affordable consumed more than other schools where there was none or where fruits and vegetables were available in limited quantities, even though their consumption patterns were mostly on irregular patterns.

The study also revealed that students conveyed their fruits and vegetables usually in polythene bags and jute sacs. It was also noticed that, the method of conveying was dependent on how longer or shorter the distances under consideration. It also depended on quantity of fruits and vegetables involved as well as the types and nature of the fruits and vegetables that were being dealt with.

## 5.2 Conclusions

Students, notwithstanding their programmes of study, had adequate knowledge of the nutritional benefits derived from fruits and vegetables consumption. They were aware of the nutritional and health benefits derived from the consumption of fruits and vegetables. Preference for the vegetable types available in their locality was high since students did not usually patronise fruits and vegetables that were far from their reach or accessibility. Students consumed more vegetables than fruits and the consumption rate of females was relatively higher than that of males. It was however deduced that they had little knowledge of the quantity of fruits and vegetables that needed to be consumed on daily basis. Students, for the sake of convenience, preferred to store their produce in refrigerators and conveyed them in polythene bags. Exotic fruits were hardly patronised by students.

Most of the losses that were recorded in fruits and vegetables consumption were mainly during the storage stage and in the course of transit. Most of the labour or workforce for the production of fruits and vegetables were aged people. The most influential sensory attribute to the consumption of selected fruits and vegetables was the taste of the produce.

## 5.3 Recommendations

The following recommendations are suggested:

1. The introduction of composite foods could be promoted in order to cater for students, e.g. science students, with too busy schedules to ensure that they also benefit from the consumption of fruits and vegetables.
2. Partly prepared fruits and vegetables could be prepared for students who are unable to consume due to their busy schedules so that they could carry them along in order to increase their consumption.

3. Research into the areas of quantifying fruits and vegetables consumed and the nutritional dynamics that take place in produce during storage.
4. The activities of hawkers and vendors could also be promoted to enhance students' access to fruits and vegetables.
5. To ease the promotional efforts to fruits and vegetables consumption, it is also imperative that the sensory attributes of fruits and vegetables are heightened in the supply of fruits and vegetables to students.
6. It is also recommended that the scope of a future research should be broadened to include a larger representative sample size in order to enhance the generalisability of findings.





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## APPENDIX A

### QUESTIONNAIRE FOR STUDENTS CONSUMERS.

#### Appendix A 1. Survey of Students

**THIS QUESTIONNAIRE IS AIMED OF FRUITS AND VEGETABLE CONSUMPTION  
TRENDS AMONG BASIC SCHOOL STUDENTS IN THE KWADASO MUNICIPALITY  
ASHANTI REGION OF GHANA**

By this research, the operational definition of the **fruits** and **vegetables**, examples of the staples under consideration are as listed below:

Vegetables among others include; Tomatoes, Garden eggs, Ginger, Okra, Pepper, Onion, Garlic, etc.

Fruits among others include; Orange, Pawpaw, Pear, Lemon, Lime, Guava, Banana, Apple, Water melon, Mango, Sugar cane etc.

#### **Section A: Bio-data of respondents (Students)**

1. Nationality.

.....

2. Region of origin. a. Eastern Region [ ] b. Ashanti Region [ ] c. Central Region [ ] d.

Western Region [ ] e. Northern Region [ ] f. Upper East Region [ ] g. Upper West

Region [ ] h. Brong – Ahafo Region [ ] i. Greater Accra Region [ ] j. Volta Region [ ]

3. District and town of origin.

.....

4. Sex of respondent. a. Male [ ] b. Female [ ]

5. Age of respondent, a.6-8 years [ ] b. 8-11 years [ ] c. 11-13 years [ ] d. 13-15 years [ ] e.

16-17 years [ ] f. 16-18 years [ ] g. 18-20 years [ ] h. above 20 years [ ]

6. Schools/Location. a. Kwadaso M/A Schools [ ] b. SDA Schools [ ] c. Prempeh Schools [ ]  
 d. Jesus Only Int. Schools [ ]

7. Educational level a. 1<sup>st</sup> year [ ] b. 2<sup>nd</sup> year [ ] c. 3<sup>rd</sup> year [ ]

**Section B: Knowledge.**

1. Is consumption of **fruits** necessary? a. Yes [ ] b. No [ ] c. Don't know [ ]

1. Why do you consume fruits? a. For its nutritional value (source of vitamins) [ ] b. In order to become satisfied [ ] c. Do not know [ ] d. Others [ ] Please specify

.....

2. Tick appropriately the fruits you usually purchase or use, rank your consumption on the scale of 15 in terms of how often you consume. *Scale (1) lowest and 5(highest).*

Criteria(classification)	Scale				
	1	2	3	4	5
<b>Indigenous</b> (Banana [ ] Citrus [ ] Mango[ ] Coconut[ ] Pineapple [ ] Sour sap [ ] Berries[ ] Cashew[ ] sugar Cane [ ] <b>Others [ ] pls.</b> <b>state</b> ..... .....					
<b>Exotic</b> ( Avocado Pear [ ] Sweet pepper[ ] Water melon [ ] Grapes [ ] Apple [ ] Papaya/Pear [ ] Guava [ ] Cherries[ ]) Others[ ] Please state..... .....					



3. When do you consume **fruits**? a. Before meals [ ] b. After meals [ ] c. With meals [ ]  
d. As a meal [ ] e. between meals [ ] f. Others [ ] Please, specify .....
4. When do you consume **vegetables**? a. Before meals [ ] b. After meals c. With meals [ ]  
d. As a meal [ ] e. between meals [ ] f. Others [ ] Please, specify  
.....
5. Is consumption of **vegetables** necessary? a. Yes [ ] b. No [ ] c. Don't know [ ]
6. Why do you consume **vegetables**? a. For its nutritional value (source of vitamins) [ ] b.  
In order to become satisfied [ ] c. Do not know [ ] d. Others [ ] Please specify  
.....
7. Tick appropriately the **vegetables** you usually purchase or use and rank your  
consumption on the scale of 1-5 in terms of how often you consume. *Scale(1) lowest  
and 5(highest).*

Type of Vegetable	1	2	3	4	5
Leafy vegetables(spinach[ ], Amaranthus[ ],Bitter leaf, Lettuce,[ ],Cabbage[ ] Kontomire [ ] others.....					
Root Vegetables(Carott[ ],Turnip[ ], Beetrot[ ],Ginger[ ] others.....					
Fruit Vegetable(Pepper[ ], Tomatoe[ ],Green pepper[ ], Okra[ ]Garden eggs [ ] ],Cucumber [ ] Dawadawa[ ] ) others[ ] Please specify.....					
Bulb Vegetable(Onion [ ], Garlic[ ],Shallot[ ] ) others[ ]Please state .....					
Tuber Vegetables(sweet potatoe[ ], potatoe[ ] ) others[ ] Please specify .....					

8. Rank the importance of **fruits**. a. 1-20% [ ] b.21-40% [ ] c. 41- 60% [ ] d.61-80%[ ] e. 81-100% [ ]
9. Rank the importance of **vegetables**. a. 1-20% [ ] b.20-40% [ ] 40- 60% [ ] c.60-80%[ ] e.80100% [ ]
10. How did you acquire the current knowledge you have on **fruits** consumption? a. From school [ ]
- b. From parents/guardians [ ] c. From friends [ ] d. From the Media [ ] e. From health professionals / experts [ ]. f. Others [ ] (specify) .....
11. How did you acquire the current knowledge you have on **vegetables** consumption.
- a. From school [ ] b. From parents/guardians [ ] c. From friends [ ] d. From the Media [ ] e. From health professionals or experts [ ]. f. Others [ ] Please (specify).....
12. Are you satisfied with the depth of knowledge you have on **fruits**? a. Yes [ ] b. No [ ]Please, explain .....
13. Are you satisfied with the depth of knowledge you have on **vegetables**? a. Yes [ ] b. No [ ] Please, explain .....
14. How different is the use of **fruits** from the use of other staples/foods/foodstuffs? a. They are easier to use compared to other staples [ ]. b. They are difficult to use compared to other staples [ ]. c. They are not easy to obtain (come by) [ ] d. They are easy to obtain (come by) [ ]. e. They are affordable and easy to handle [ ].f. They are not easily perishable [ ] g. They are easy to store [ ] h. Others [ ] Please, specify. ....

**APPENDIX B:**

**SENSORY ATTRIBUTES TEST SHEET.**

Appendix B: Sensory attributes test on fruits

After observation and tasting where necessary, tick the most appropriate response applicable

Which of these attributes influences most, your appetite for the consumption of the underlisted fruits?

Banana 2. Citrus 3. Pineapple 4. Water Melon

	FRUITS				
ATTRIBUTES	Banana	Pineapple	Orange	Grape	Water melon
Colour					
Texture					
Flavour					
Taste					
None of the above					
Others( specify)					

Appendix B. 2: Sensory attribute test on vegetables

After observation of the list of displayed items, tick the most appropriate response applicable.

Which of these attributes influence most, your appetite for the consumption of the underlisted vegetables?

	VEGETABLES					
ATTRIBUTES	Tomatoes	Onion	Carrot	Sweet potatoes	Cabbage	Lettuce
Texture						
Flavour						
Taste						
Colour						
None of the above						
Others(specify)						

