CHAPTER I

INTRODUCTION

Background of the Study

The Asia Pacific is one of the quickest developing markets for non-mixed beverages. Non-mixed refreshments are otherwise called 'virgin beverages.' Soft drinks, juices, prepared to-drink tea and espresso, filtered water, and caffeinated beverages are the most-devoured non-mixed beverages comprehensively (Reportlinker, 2015).

Calamansi juices from three nations like Malaysia, Philippines, and Vietnam) are described by estimating their unpredictable substance, physicochemical properties, and non-volatiles (sugars, natural acids, and phenolic acids). A sum of 60 variable mixes was recognized. The outcomes showed that Vietnam calamansi juice contained the most elevated measure of volatiles. Among the non-unpredictable segments, these three calamansi juices could be, somewhat, separated by fructose and glucose focuses.

Thus, this investigation of calamansi juices could prompt a superior comprehension of calamansi organic products (Cheong, M. et al.,2010). Then again, Sweet potato (Ipomoea batatas) leaves give a dietary wellspring of nutrients, minerals, cancer prevention agents, dietary fibre, and fundamental unsaturated fats. Bioactive mixes contained in this vegetable assume a job in wellbeing advancement by improving safe capacity, lessening oxidative pressure and free extreme harm, diminishing cardiovascular sickness chance, and smothering malignant growth cell development. Right now, yam leaves are devoured principally in the islands of the Pacific Ocean and Asian and African nations (V. D. Truong, R. Y, et al., 2010)

Along this line, the scientists are impelled with a thought of creating and utilizing Camote Leaves with Calamansi Juice Extract as a solid non-fermented juice drink. In particular, this investigation plans to follow the conventional pattern and build up a mocktail bar drink utilizing Camote Leaves where customers are relied upon to disparage the item that could be a substitute to carbonated refreshments which means to diminish the last's opposite effects on the soundness of the shoppers. It would use the ordinary and natural assets for rural improvement,

which attempts to accomplish food and staple adequacy and veer away from additive based food items and suggest for utilization at Central Philippines State University-Main Campus.

Objectives of the Study

The main objective of this study is to develop a mocktail or non-alcoholic bar drink using the extract of Calamansi juice extract with Camote leaves for the market.

Specifically, this study aims to:

1. Determine the volume of Calamansi Juice with Camote Leaf extract produced from 1000ml of Calamansi fruit and 900 grams of Camote Leaves;
    A. At various proportions of Calamansi Juice Extract (200ml, 225ml, 275ml, 300ml).
    B. At various proportions of Sugar (170g, 240g, 280g, 325g).
    C. At various proportions of Camote leaf extract (150ml, 200ml, 250ml, 300ml).
    D. At various proportions of water (500ml, 600ml, 700ml, 800ml).

2. Determine its physico-chemical, microbial, and proximate analysis.

3. Determine its acceptability as to color, taste, aroma, general acceptability, and its significant difference among the five treatments.
4. Determine its cost-volume-profit analysis.

Theoretical Framework

This study is anchored on the Product and Development theory (NPD) by (Kotler and Armstrong, 2011) that process begins with ideas, proceed with idea screening, concept development, and testing, business analysis, product development, and product testing. The product development process requires a much higher integration of different departments. The final step of the NPD process is the commercialization of the product into the market. This refers to developing the product concept, its successful launch, and interaction with potential buyers (Virtanen, 2009). In this Study, Calamansi and Camote leaves are nutritious plants composed of vitamins and minerals that could be a potential

mocktail product in the market and recommended for use by the Food Agriculture Organization of the U.N. and the U.S. Department of Health, Education, and Welfare.

Conceptual Framework

This study will focus on the acceptability of Calamansi Juice Extract w/ Camote Leaves. In this study, each stage has procedures that produce outcomes to examine what constitutes a newly developed product. The newness of the product may be judged differently according to those who perceive it. Crucial to the discussion of product development is to recognize that "innovation" is contextual. The Product Development framework is a systematic, commercially oriented research to examine what constitutes a newly developed product that satisfies every consumer. Factors considered in the product testing included the appearance, taste, color, consistency, aroma, and general acceptability that distinguished food product development, which are the ethical considerations of producing a large volume of a safe and healthy food product for human consumption (Gaimon et al. 2011).

A significant feature that distinguishes food product

development is the ethical considerations of producing a large volume of safe and healthy food products for human consumption.

The Process flow of the product is conceptualized in Figure 1.

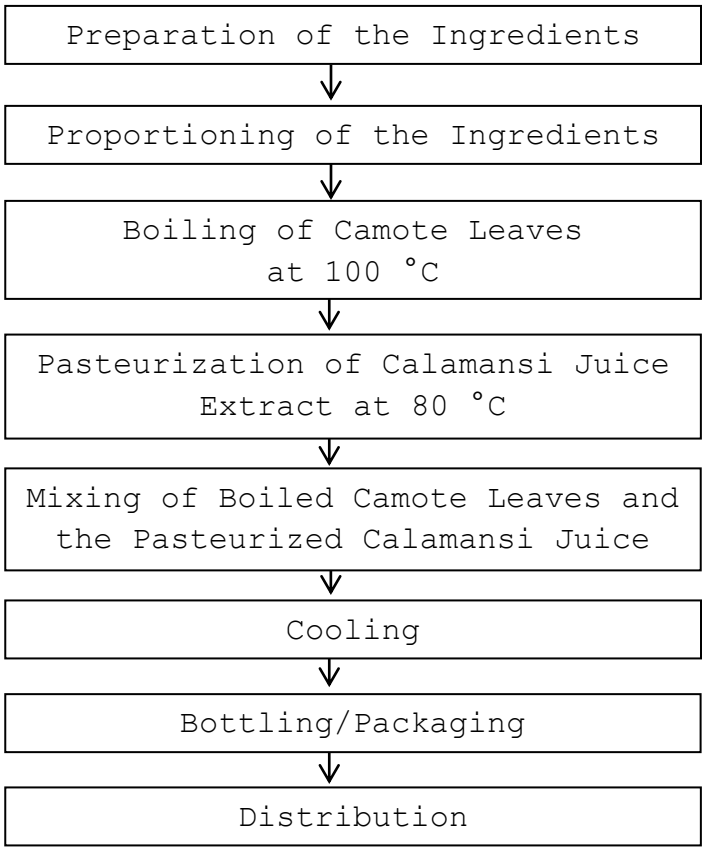

Figure 1. Process Flow of Calamansi Juice with Camote Leaf Extract.

Significance of the Study

The result of the study is significant to the following:

Students. This study can help the students taking Business and Hospitality related courses in their researches related to this topic.

Farmers. This study would also be beneficial to the farmers because it can provide them with new ideas in utilizing and cultivating Camote Leaves and Calamansi and inform them of its health benefits.

Consumers. This study would also benefit the consumers who are not fond of drinking alcoholic drinks since it has a different presentation of flavor, appearance, consistency, and nutritional value.

Entrepreneurs. This study is also beneficial to individuals who want to put up a business by giving them new innovative ways of thinking by utilizing Camote Leaves with Calamansi Juice.

Future Researchers. This study is beneficial to individuals who

wish to conduct further studies about Calamansi Juice with Camote Leaf extract.

Scope and Limitation of the Study

This study focuses on developing a mocktail drink using Camote Leaves with Calamansi Juice Extract and its acceptability to the market. It will be conducted at Central Philippines State University-Main Campus, Kabankalan City, Negros Occidental, Philippines.

This study will be participated by one hundred (138) students, ten (5) teachers, and ten (10) entrepreneurs. Thus, a sensory evaluation score sheet using the modified nine-point Hedonic Scale instrument will be used. Moreover, the data will be analyzed using Analysis of Variance (ANOVA) to determine the significant difference among samples and determine the level of sensory evaluation of the mocktail drink as to its color, taste, aroma, consistency, and general acceptability. Its Significance Level will be set to 0.05.

Definition of Terms

For the convenience of the readers, the following terms will be defined.

Mocktail. Operationally, it is usually an iced drink made with any of the various ingredients without alcohol content (Juice, herbs, and soda water)

Color. Conceptually, it is a quality of the product and can be determined through is appearance and usually determined by measurement (American Encyclopedia).

Aroma. Conceptually, it refers to the fragrance and the odor that can be perceived by our sense of olfactory (American Encyclopedia)

Taste. Operationally, it is the sensation of flavor perceived in the mouth and throat on contact with a substance.

Consistency. Conceptually, it is done in the same way over time, especially so as to be fair or accurate (Oxford Dictionary).

Acceptability. Conceptually, it is the quality of being satisfactory and able to be agreed to or approved of or the quality of being accepted (Cambridge Dictionary).

In this study, it refers to the mixture of Purified Water, Calamansi Juice Extract, Camote Leaves, and Refined Sugar)

Squeezing. Operationally, it is a method that applies a minimal pressure with fingers to extract a juice from a fruit (Such as Calamansi, Orange, and Grapes)

Boiling. Operationally, it is an action of bringing a liquid to the temperature (100 °C) at which it bubbles and turns to vapor.

Mixing. Operationally, it is a cooking technique that combine or put together to form one substance or mass.

Pasteurization. Operationally, it is a process in which water and certain packaged and non-packaged foods (such as milk and fruit juice) are treated with mild heat, usually to less than 100 °C (212 °F), to eliminate pathogens and extend shelf life.

Cooling. Operationally, it is a process which is to reduce or maintain the temperature of the food product in a lower level for a period of time in a room temperature.

In this study, it refers to the duration of Calamansi Juice Extract with Camote Leaves consumption.

Shelf life. Operationally, it refers how long it may be stored before the quality deteriorates.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Camote Leaves Health Benefits

According to the Study of Philippine Health Research in Region 5 and an article in the American Society for Horticultural Science, Camote leaves (Ipomoea Batatas) commonly known as "Talbos ng kamote" in Tagalog is one of the healthiest vegetables that are available all year round. Camote leaves are a good source of ascorbic acid (Vitamin C) and B vitamins that are considered essential to human health. It is also rich in vitamin B6, carotene, iron, calcium, zinc, protein, vitamin C, vitamin A, vitamin k, thiamine, riboflavin, niacin, and folic acid. In comparison to other leafy greens, it possesses more dietary fiber and nutrients.

Anti-Diabetes

One of the major diseases of adults is caused by the decrease in the secretion of insulin by the pancreatic Langerhans cells. Diabetes is a leading cause of heart disease, blindness, and kidney failure. Food with an anti-diabetic effect is desired for diet therapy. Several researchers report that Camote leaves have anti-diabetic compounds that reduce blood glucose content. Anti-Oxidant & Anti-Mutagens. Sweet potato leaves are an excellent supplementary resource of antioxidants and anti-mutagenic compounds. An investigation was conducted to examine the effects of 82 kinds of vegetable juice and plant components on the division and multiplication of cancer cells, and it was found that sweet potato leaves have an exceptionally high score in checking the growth of cancer cells.

Supports Bone Health

Vitamin K in Camote leaves helps maintain the calcium on bones and reduces the chances of osteoporosis; it can eradicate bone loss in osteoporosis patients.

Prevents Inflammation

Inflammation is the primary stage of infection, and it can lead to a significant health problem also, many studies have

done, and it is proven now camote leaves has an anti-inflammatory property which can prevent inflammatory issues.

Promotes Healthy Skin and Hair

Its Vitamin A content promotes healthy skin and also counteracts acne. It keeps the wrinkles and lines at bay with the production of more collagen, which helps to maintain the skin young.

Calamansi Juice Health Benefits

Calamansi is also known as calamondin, and scientifically known as Citrofortunella microcarpa. This fruit is a hybrid of a member of the citrus genus, that is to say, orange and kumquat, and widely cultivated in Southeast Asia, particularly in the Philippines. This sour fruit is rich in vitamin C and certain antioxidants, such as limonene, potassium, vitamin A, and calcium. Although this fruit's juice is incredibly sour, many people still consume it regularly due to its many impressive health benefits, as stated below (John Staughon, 2019).

Controls Cholesterol Level

Anecdotal evidence and some studies have found that this

juice can lower your cholesterol levels, which is an essential step towards weight loss and avoiding metabolic syndrome. It can also help reduce your risk of atherosclerosis, and heart attack.

Boosts Immunity

Packed with vitamin C and other beneficial nutrients, Calamansi juice has been used in folk medicine as an immune booster for generations. It can stimulate white blood cells' production and counter the adverse effects of free radicals, thanks to its antioxidant and antibacterial properties.

Lowers Acidity

Despite the high levels of this fruit's citric acid, many people drink it as a soothing substance for the stomach. A study published in the Journal of International Oral Health throws light on the anti-inflammatory property of tannins from the rind of Calamansi. It can help lower inflammation levels when consumed in moderation, lower your risk of developing ulcers, and protect you from acid reflux disease.

Promotes Collagen Production

Vitamin C is a crucial element in collagen production, which is the compound needed to create every tissue in the

body. This juice can deliver a burst of ascorbic acid that will facilitate your body's ability to grow and repair damage from injury, illness, or surgery.

Controls Diabetes

Research cited in the International Journal of Science and Research has been done on the blood sugar-moderating effects of Calamansi juice, as per a study published in the Journal Biomolecules in 2019. It has shown to have positive implications on regulating the release of glucose and insulin into the bloodstream, which is excellent news for those who have diabetes or those at risk of developing the disease

Weight Loss

This tropical juice is legendary in folk medicine for its impact on weight loss; as are many lemon and lime-based juices can boost not only a person's metabolism but also eliminate many of the toxins in the body can contribute to fat storage.

Improves Respiratory Health

The healthy citric acid level in Calamansi juice is considered by many cultures to cut through phlegm and mucus, where infections often live and propagate, while also soothing

inflammation in the throat and respiratory tracts. However, more research is needed to confirm this beneficial health claim.

Skin Care

People use Calamansi juice on their skin all over Asia, as it functions as a natural bleaching agent. In addition to clearing the skin of blemishes or discoloration, it can also deliver antioxidants to the surface to prevent wrinkles and other signs of aging.

Detoxifies the Body

Calamansi Juice is known to stimulate urination and flush out the kidneys. Calamansi juice is thought by many cultures to be a powerful detoxifying agent, strengthening your liver, kidneys, and gallbladder to help you eliminate excess toxins in the human body.

Uses of Calamansi

Calamansi is one of the tiniest and cheapest fruits that you will see in the market. It is a small fruit, but it does not reflect the many benefits it can give your body. This fruit helps in enhancing beauty, helps promote your immune system, and helps you lose weight (Yayang, 2014).

The following are the other uses of calamansi, calamansi can be used for hair growth. Before taking a bath, rub calamansi in your scalp, and after 15 minutes, you can already rinse it. Do

it every day to help your hair grow. If you have dandruff, you can use calamansi to reduce it. Just rub it to your scalp to reduce itching. It can also be used as a deodorant.
After taking a bath, rub the slice calamansi in your armpit and let it dry. It will also help lighten your armpit because sometimes deodorants tend to darken our armpits. It helps whiten your skin. If you are dizzy or nauseous, you can smell the peel of calamansi just squeeze it, just be careful not to squeeze it near your eyes. It can also remove stains in your clothes. Just dab some calamansi drops on the stained area. It also helps whitening white garments and helps removed acne (Yayang, 2014).

Calamansi Juice and Camote Leaves Nutritive Value

The nutritive value refers to the number of nutrients recommended by the nutritional experts to be consumed by an individual.

Like most plants, Calamansi Juice and camote leaves are rich in some nutrients. It is mainly rich in Phosphorus, Vitamin C, and Calcium. This juice could be integrated into the diet if

possible. A single calamansi fruit contains 89% Carbohydrate, 0.1 gm. of Fat, 0.8gm of protein, 40mg of calcium, 0.1mg of niacin, 6mg of iron, 22mg of Phosphorus, 37mg of potassium, 12%

of Vitamin A, 27mg of Vitamin C, and 0.04mg of thiamine. Camote Leaves is low in Saturated Fat and Sodium, and very low in Cholesterol. It is also a good source of Protein, Niacin, Calcium and Iron, and an excellent source of Dietary Fiber, Vitamin A, Vitamin C, Thiamine, Riboflavin, Vitamin B6, Folate, Magnesium, Phosphorus, Potassium, and Manganese. Camote leaves contain 13.0mg of calcium, 0.4mg of iron, 21.3mg of Magnesium, 32.9mg of Phosphorus, 181mg of potassium, 3.1mg of zinc, 30.1mg of Methionine, 79.8mg of Lysine, 1.4g of protein, 39.5mg of Total Omega-6 Fatty Acids, 7.4mg of Total Omega-3 Fatty Acids, and 28.0mcg Folate (Source: Nutrient data for this listing is provided by USDA SR-21).

Calamansi Juice Extract with Camote Leaves Processing

Calamansi juice with Camote leaves is pretty similar to lemonade and just as refreshing. It tastes more tropical and aromatic than Calamansi juice alone.

This mocktail could be branded as a nutritious and refreshing juice compared to any carbonated and canned juices in the

market. To prepare, first, wash the Calamansi fruit with chlorinated water then remove also the camote leaves with running water. The Calamansi fruit is being squeezed in a large

bowl or stockpot and strain it using an excellent filter to eliminate its pulp and another residue. Pasteurize the Calamansi juice extract to 80°C at medium heat to extend its quality. In a separate stockpot, boil the camote leaves to 100 °C, then remove the leaves from the stockpot after cooking, then strain to eliminate its residue. Preparing a large stockpot in a preparation table then mix the stock of camote leaves with the pasteurized Calamansi juice extract and refined sugar.
In 10 kilograms of Calamansi fruit, 12.5 gallons of purified water, 800 grams of camote leaves, and 3.2 kilograms of refined sugar could be bottled to 150 bottles at 310 ml of measurement per bottle. Production time of producing Calamansi Juice Extract with Camote Leaves is 5 hours up to the cooling and bottling stage.

Variety of Calamansi

The calamansi seed produces plants that originate mainly from the mother tissues giving rise to seedlings with the same characteristics as the mother tree. For this reason, the

calamansi trees in the country are believed to belong to only one variety (Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

Soil and Climatic Requirements

The calamansi thrives in warm to cool climates with an evenly distributed rainfall of 1,500-2,000 mm/year. It is generally grown in the lowlands. Calamansi can develop over a wide range of soil types from clay loam to limestone to sand. However, it grows best in a slightly acidic, well-drained sandy or clay loam soil rich in organic matter.

Harvesting and Post-harvest Handling

A three-year-old tree produces 0. 75 kg fruit; at six years, 10 kg; and at ten years, 50 kg. Calamansi fruits are available throughout the year; the peak season is from August – October. Harvest fruits by hand or by clipping with shears. Pack calamansi fruit in bamboo baskets lined with banana leaf sheaths or newspapers.

The fruit will keep in good condition for two to three weeks at 8?-10?C and 90% relative humidity (Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

Composition of Calamansi

The physicochemical and microbiological properties of Calamansi highly determine its sensory characteristics, shelf-life, and nutritive value. The Philippine National Standards are documents providing, for common and repeated use, rules, guidelines or features for activities or their results, aimed at the achievement of the optimum degree of order in a given context (Journal of Tropical Agriculture & Food Science)

CHAPTER III

RESEARCH METHODOLOGY

Research Design

Experimental research will be used in this study.

According to Ariola (2006), experimental research is a procedure used to find out something not presently developed. These are usually carried out to discover the cause of the phenomenon. In a real sense, experiments are a kind of structured observation to determine cause and effect relationships, and an effective way of developing an accurate description of behavior. Experimental research is research that has the purpose of finding the cause-effect relationship among variables in a controlled condition. The essential feature of experimental research is that investigators deliberately control and manipulate the conditions which determine the events in which they are interested, introduce an intervention, and

measure the difference that it makes.

Locale of the Study

This study will be conducted at the Central Philippines State University-Main Campus, Kabankalan City, Philippines. The school is situated along the national road going to Dumaguete City.

Respondents of the Study

The respondents of the study will be grouped to students, teachers, and entrepreneurs that will be randomly selected from the population.

Sampling Technique

In this research, Simple random sampling will be used where researchers will select a group of subjects (a sample) for study from a larger group (a population). Each individual is chosen entirely by chance, and each member of the community has an equal opportunity of being included in the sample. Every

possible example of a given size has the same chance of selection. (Valerie J. Easton and John H. McColl's Statistics Glossary v1.1)

Research Instrument

This study will use sensory evaluation score sheet using the modified nine-point Hedonic scale adapted by some researchers especially in the experimental researches on the development and acceptability of the product.

Data Gathering Procedure

The data gathering procedure will be divided into four phases:

Phase I.

The Table below are the ingredients that will be utilized in producing Calamansi juice with Camote Leaf Extract in different treatments and replications.

DESCRIPTION	QUANTITY
Calamansi Juice Extract	1000ml
Camote Leaf Extract	900ml

Refined Sugar	1015g
Water	2600ml

Table 1: The Ingredients that will be used in different treatments.

Phase II.

The table below shows the materials that will be used in producing Calamansi Juice with Camote Leaf Extract.

MATERIALS	DESCRIPTION
Knife	To be used for slicing and peeling
Chopping Board	To be used as a protective surface on which to cut or slice.
Beaker	To be used to hold liquids and measurements.
Strainer	Used to drain and strain residues.
Stock Pot	Used to make stock or broth.
Ladle	Used in stirring ingredients.
Bottles	To be used for packaging.
Mixing Bowl	To be used for storage and **mixing** ingredients.

Table 2: Materials used in the study

Phase III.

The table below shows the different treatments using different proportions of Calamansi Juice Extract, Camote Leaf extract, refined sugar, and purified water. It is noted that the Treatment A as seen in table below is the commercially available Calamansi Juice that will serve as a control in this study.

TREATMENT	Calamansi Juice extract (1000ml)	Camote Leaf Extract (900ml)	Sugar (1015g)	Water (2600ml)
A	-	-	-	-
B	200ml	150ml	170g	500ml
C	225ml	200ml	240g	600ml
D	275ml	250ml	280g	700ml
E	300ml	300ml	325g	800ml

Table 3: Different treatments at various proportions of ingredients with 2 replications per treatment.

Product Testing

To determine the acceptability of Calamansi Juice with Camote Leaf extract as to Taste, Color, Aroma, and General acceptability at various proportions of calamansi juice, camote leaves, sugar, and purified water. The researchers will conduct product testing within the College of Business and Management with 138 students, five faculty, and ten entrepreneurs' respondents who will be chosen purposively. The respondents will evaluate the samples and rate using the nine-point Hedonic scale.

The Rating and Description below will be given to the respondents during the product testing conducted by the researchers to determine its acceptability among the samples (Appendix-I).

Rating	Description
9	**Like extremely**
8	**Like very much**
7	**Like moderately**
6	**Like slightly**
5	**Neither like nor dislike**
4	**Dislike slightly**
3	**Dislike moderately**
2	**Dislike very much**

1 **Dislike extremely**

Phase IV.

The instruction below shows the procedures in making the Calamansi Juice with Camote Leaves.

1. Boil the *talbos ng kamote (Camote Leaves)* for 10 minutes. The water will turn into brown. Strain the *leaves* and keep the green water.

2. Squeeze the calamansi and take out the seeds. Stir in the calamansi juice into the green water, and the water will turn pink.

3. Stir in the sugar.

4. Drink up and enjoy

Data Analysis Procedure

Based on the objectives of this study, the researchers will formulate a number of treatments with two replications each treatment at various proportions of Calamansi Juice Extract, Camote Leaf Extract, Water, and Sugar to determine its consistency as to its color, taste, and aroma.
The product will be subjected to microbial, physicochemical, and proximate analysis to determine its chemical properties,

microbial forms, and nutrient content present on the product for safe consumption. Moreover, to find out the level of sensory evaluation of Calamansi Juice Extract with Camote Leaves, the

data that will be gathered from the instrument will be subjected to the statistical treatment. Mean will be used to determine the level of sensory evaluation of Calamansi Juice Extract w/ Camote Leaves as to color, taste, aroma, consistency, and general acceptability. The analysis of variance (ANOVA) with a 5% level of significance will be used to determine the significant difference in the level of sensory evaluation of Calamansi Juice Extract w/ Camote Leaves as to color, taste, aroma, consistency and general acceptability among the five treatments. Also, the Cost-Volume-Profit Analysis will be analyzed to find the most profitable combination of costs and volume.

Physico-Chemical Analysis

In this Study, Physico-chemical analysis will be determined to analyze the level of acidity, total soluble solids, and total titratable acidity content of the product before the product testing.

Microbial Analysis

In this study, a microbial analysis will be determined as part of the food safety management and to conduct conformity tests that define microbiological criteria or assess the

performance of control strategies based on the Hazard Analysis and Critical Control Point in which the Protocol for the Validation of Alternative (Stewart, 2010).

Proximate Analysis

In this study, a proximate analysis will be determined to analyze major food components by validating the nutrient content in a given product sample.

Cost-Volume-Profit Analysis

In this study, the Cost-Volume-Profit [CVP] analysis will be used to analyze the relationship between volume, cost, prices, and profits. It is very much an extension or even a part of marginal costing. It is an integral part of the firm's profit planning process that helps to determine the maximum sales volume to avoid losses and the sales volume at which the firm's profit goal will be achieved. As an ultimate objective, it helps management to find the most profitable combination of costs and

size. Moreover, CVP analysis is concerned with identifying a company's fixed costs, its variable cost per unit, the price of its product, and using this data to work out the following measures:

Contribution margin: The difference between the total revenue and total variable costs. It is the amount that sales contribute towards fixed costs and profit.

Contribution margin per unit: The difference between the sales price and variable cost per unit.

Contribution margin ratio: The ratio of contribution margin to total revenue.

Break-even point: The sales volume (in units and dollars) at which the company is neither making a loss nor earning any profit.

Target income sales: The sales level necessary to achieve a target income.

The margin of safety: The percentage (or dollars) by which sales volume exceeds its break-even point.

The fundamental cost-volume-profit relationship can be derived from the profit equation:

Profit = Revenue – Fixed Costs – Variable Costs

Where profit is P.R., revenue equals the product of price per unit P, and sales volume in units Q, fixed costs F.C. are constant and total variable costs equal the product of groups sold Q and variable cost per unit V, the following equation is a more elaborate representation of CVP relationships:

PR = Q × P – Q × V – FC

This is the most fundamental equation which can be used to working many CVP numbers. For break-even point, we need to set PR ad 0 and solve for Q, and we get:

Break-even Q = FC ÷ (P – V)

It shows that the break-even point is calculated by dividing the fixed costs by the contribution margin per unit.