



TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
TESDA Complex, East Service Road, South Superhighway, Taguig City

DEVELOPMENT OF AFFORDABLE VEGETABLE-BASED SNACK FOOD RECIPES FOR GRADE SCHOOL AND HIGH SCHOOL STUDENTS

Conducted by:

CHARMAINE P. FIDER
Lead Researcher

MARIA CLARA B. IGNACIO
MYLENE H. SOMERA
LUCIA P. TABU
ARIES GLENN L. MONTESINES



TESDA Women's Center

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Prepared by:

**Maria Clara B. Ignacio
Mylene H. Somera
Charmaine P. Fider
Lucia P. Tabu
Aries Glenn L. Montesines**

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ABSTRACT

The research was focused on the development of vegetable-based snack recipes using affordable vegetables such as squash, sweet potato and some leafy vegetables as its main ingredients, that would be affordable and acceptable to school children. Acceptability of the products developed was determined by conducting consumer survey with 200 grade school children of the Maharlika Village Elementary School in Taguig City. It is expected that the products developed could provide parents and schools convenient, low cost, healthy options snack foods that could help address problem in malnutrition and nutrient deficiencies.

After a series of formulation of different recipes, three (3) recipes were the most acceptable based on food tasting evaluation using the nine-point hedonic scale, namely, vegetable burger (squash bun with mixed vegetable patty), squash tart and sweet potato has brown. The snack food samples with high preference and acceptability were analyzed for its nutritional value. The acceptability and preference of the elementary students were determined through consumer testing of the most preferred snack food samples. Product costing of each of the most preferred snack food samples was computed to determine its affordability and compare the cost with the prices of the snacks sold in school canteen.

CHAPTER 1

INTRODUCTION

Background of the Study

The Philippine government has been very serious in addressing the problem of malnutrition in the country. On January 30, 1987, through Executive Order no. 128, the function of the Food and Nutrition Research Institute (FNRI) of the Department of Science and Technology (DOST) were redefined to address the malnutrition problem in the country, particularly among the children (Inquirer.net, 2012).

The problem of malnutrition continues to be a serious concern of most schools in the country because the lack of proper nutrition among students negatively affects the learning process. The World Health Organization (April 2015) reveals 30.3% prevalence of stunting (moderate and severe) in the Philippines and under-five mortality rate: 30 per 1,000 live births. It is usually the poor children who lack proper nutrition caused by not having enough to eat or not eating enough of the right kinds of food. However, rich children whose parents have no time to check their nutritional intake can also be malnourished. Apart from this, the rise of consumerism and the proliferation of fast-food chains and ready-to-eat food play a great role in increasing malnutrition.

Stunting, iron and iodine deficiencies impact learning abilities and intelligence of children. Studies show that populations affected by iodine deficiency have 10-15 IQ points less than those not affected. This problem becomes even worse with the unhealthy eating habits and lifestyles of the young generation wherein they enjoy eating convenience and junk foods for snacks and prefer to eat in fast foods. Another escalating health concern in young people is obesity, which has increased risk of type 2-diabetes and coronary heart disease. Children are affected not only because of the lack of food but their lives are also placed at risk by poor feeding and care practices, lack of access to health services and unsanitary conditions.

Different government sectors and other institutions in the society are working hand in hand in promoting proper nutrition and in curbing the prevalence of malnutrition among Filipino school children through its various programs and

campaigns, such as the School-Based Feeding Program of Department of Education (DepEd), Supplementary Feeding Program of the Department of Social Welfare and Development (DSWD). These programs support Sustainable Development Goal No. 3, Good Health and Well-Being, which aim to eradicate extreme hunger, poverty and malnutrition in the country.

Importance of the Study

The DepEd issued Department Order 43 series of 2011 intended to strengthen its school health and nutrition programs, aligning it with other existing activities to come up with a more comprehensive approach in improving the health and nutrition of school children and translating this to better learning outcomes, reducing drop-out rate and improving school retention rate. (DepEd, 2011).

In support of the Department of Education's (DepEd) project of "Grand Gulay Cook-Off Challenge", the TESDA Women's Center participated in this activity by developing vegetable – based snack foods. The challenge was a contest aimed to encourage innovation in making healthy snacks made of vegetables from the "Gulayan sa Paaralan" Program in public schools. Participants from TESDA training institutions prepared nutritious vegetable dishes for some 100 elementary students from Taguig and Pasay Cities invited as judges. Part of the criteria required that the ingredients must not contain monosodium glutamate (MSG), ready-made breadings, soup stocks and liquid seasoning. TESDA believed that DepEd's program was a good opportunity to promote the skills and talents of TESDA Cookery trainees and graduates, while helping develop nutritious recipes for students.

Through this technology research, the TESDA Women's Center (TWC) was motivated to develop nutritionally delicious and affordable snacks using different vegetables as the basic ingredients. Nutritionally delicious and affordable food provides nourishment, promotes health and growth, and pleasing to taste buds at a reasonable cost. This research utilized the New Product Development (NPD) process as a model. Due to lack or limitation of references, the researchers assumed that no studies similar to this was done yet in the Philippines, therefore most of the references came from online journals of other countries.

Scope and Delimitation of the Study

The research was focused on the development of snack recipes using affordable vegetables as its main ingredients, which are available in any part of the country. Acceptability of the products developed was determined by conducting consumer survey with 200 grade school children of the Maharlika Village Elementary School in Taguig City. The population of students in Maharlika Elementary School was largely composed of Muslims due to its location. For this matter, the study did not take into account individual values and practices of respondents, which might possibly have a direct or indirect relation with their decision-making.

The TWC thought that it was also a good opportunity to conduct the survey and taste testing during the Nutrition Month because it supported the regular community outreach program of the TWC. The Community Outreach Program of TWC provided opportunities for the TWC trainees the experience to promote health and wellness and at the same time improve their developmental skills.

Both quantitative and qualitative data were gathered. Quantitative data were obtained from the results of the consumer survey and evaluations conducted with the students. Qualitative data were gathered also from the group discussion and meetings with staff members involved in the conduct of research and feedbacks of the students during the product testing. The conduct of consumer survey was limited only to 200 students because of limited budget.

CHAPTER 2

THEORETICAL/CONCEPTUAL FRAMEWORK

Review of the Related Literature

Children's poor nutritional condition and dietary habits is a prevalent problem in developing countries such as the Philippines where poverty and overpopulation persist. Studies show that four in ten Filipino households fail to provide nutritionally adequate meals to their children because of lack of money to buy enough food (Laguna, 2015). In effect, malnutrition, hunger and other health-related illnesses are growing at an alarming rate.

According to the Social Weather Station Survey (SWS) done in the first quarter of 2015, 36% of the Filipino population is "food poor" (Cepeda, 2015). Clearly children who have experienced hunger do not always have access to sufficient, safe and nutritious food to keep a healthy and active lifestyle.

The Philippines is one of the countries with the most cases of malnutrition worldwide. Based on the report of the United Nations (2011), the country has 3.6 million stunted children making it the top 9th country worldwide with the highest burden of stunting. It ranked 10th among the countries with the highest burden of wasting. This supports the staggering rate of stunting or shortness and wasting among Filipino children age 0-19 years old reflected in the 8th National Nutrition Survey (NNS) by the Food and Nutrition Research Institute (FNRI) of the Department of Science and Technology (DOST) (FNRI, 2015).

Child malnutrition increases the risk of damaged cognitive development, which can be harmful to the individual's schooling performance, labor force participation, and productivity later in life (Martorell, 2012). As a whole, this creates adverse effects on the community leading to slow economic growth and magnified cases of poverty through "direct losses in productivity from poor physical status, indirect losses from poor cognitive function and deficits in schooling and losses owing to increased health care costs (Martorell, 2010)."

Serious efforts, both at the national and international level, were implemented over the past years to eradicate chronic and acute child malnutrition

among poor households. Interventions and programs such as increasing public's awareness on healthy eating choices, providing health care services, food fortification and similar health advocacies (Anon., 2015; FAO, 2006; Official Gazette, 2011). However, setting the right to fair and equal access to nutritious food recommended for children is still far from being achieved due the interplay of socio-economic, environmental, and biological influences.

It is customary for Filipinos to eat five meals a day: breakfast, morning snack, lunch, afternoon snack, and dinner (Hamlett, 2015). Unlike other cultures, Filipinos love to eat snacks. Unfortunately, most snacks people consume are no less nutritious since urban diets have been introduced, consisting mostly of processed foods, refined carbohydrates and high-fat content. In fact, survey shows that Filipinos' consumption of cereals and cereal products, which comprise bakery products, noodles and snack foods made from wheat flour have increased, while fruits and vegetable intake have significantly reduced over the last thirty years (FAO, 2006). The gradual decline of vegetable consumption by Filipinos from 145 grams per day back in the year 1978 down to 110 grams per day in the year 2008 accounts for the rise of nutritional deficiency among children (Fernandez, 2015).

Vegetables are naturally high in fiber while low in fat, sugar, sodium and calories (Mayo Clinic, 2014). Serving vegetables on a daily basis helps maintain a healthy and balanced lifestyle.

Children need to be given all the opportunities to learn in order to acquire skills and abilities to fully develop their potentials. Good health and proper nutrition give children greater ability to learn and do more, thereby enhancing their physical, intellectual, social, emotional and moral development. Nutritionally at-risk children are already handicapped in terms of learning abilities and even opportunities. (Solon F., 2010).

Children need a diet sufficient in macro and micronutrients. *Macronutrients* refer to the three essential nutrients – carbohydrates, fats and protein – needed by the body in large amounts to provide the vital energy and body building elements for survival and development. *Micronutrients* on the other hand, are essential vitamins and minerals needed by the body in minute amounts to regulate physical and mental development (Inquirer.net, 2010). With micronutrient malnutrition on hidden

hunger, people become brain-damaged, blind or anemic for want of small amounts of iodine, vitamin A or iron in their daily diet. Inadequate nutrition impairs cognitive development and is associated with educational failure among impoverished children. Recent research findings show that malnutrition can affect brain development over a longer period of a child's development. Malnutrition also affects emotional development and the capacity to cope with stress.

The latest national nutrition survey reveals that the total prevalence of underweight Filipino pre-schoolers is 33%. About 8% of school children are moderately and severely underweight while 20% are mildly underweight. Even mild under-nutrition affects learning. The survey also revealed that iron deficiency anemia (IDA) is the most widespread nutritional deficiency in the Philippines affecting 20 million Filipinos including 30.8% of school children and 26.7% of pre-schoolers (UNICEF, 2013).

A recent study of the Nutrition Center of the Philippines (NCP, 2011) shows that aside from malnutrition, the leading ailments of school children are decayed teeth and infections of the skin, throat and ears. While they may look trivial, decayed teeth and infections of the skin, throat and ears may have devastating effects on the heart and kidney. These ailments have a disabling effect on the physical and mental capacity of school children.

Children of Payatas is said to have about 84.40% of school children are infected with intestinal parasites. Six out of ten Filipino children have at least one type of worm. Intestinal worm infestation results to IDA and has shown to decrease physical fitness and activity, work capacity and productivity. They retard growth and impair school performance. Decreased learning capacity and increased absenteeism are common among affected school children (*Delfin, 2013*). These revelations of various research studies call for greater partnership between and among parents, educators and other concerned sectors to work together in improving the health and nutrition of children that they may acquire quality education and be better prepared for life ahead.

In the GMA Network news *Delfin* (2013) reports that Antique, tops the list of provinces with the highest number of undernourished kids aged five to ten. The provinces of Sarangani, Sulu, Capiz and Northern Samar come after Antique in the

Top 5 list. Based on the data from Food and Nutrition Research Institute (FNRI), two in every five kids in Antique are underweight based on their age and their height, and almost two in every ten are stunted. In the same data from FNRI, seven of ten families in Antique are “food insecure,” or do not have enough food on the table. The government points to poverty as the main driver of such an unkind scenario. According to the National Statistical Coordinating Board, three of ten families in Antique province are poor. It is the same poverty that prompts little children to work for a living, and often in conditions that are unsympathetic to their frail physique and indifferent to their rights as children.

The malnutrition in the country makes Filipino children the third poorest and most disadvantaged sector in the Philippines, next to fishermen and farmers. The Department of Education (DepEd) revealed that 562,262 pupils in kindergarten and elementary levels currently enrolled in public schools are considered “severely wasted.” Data from the National Statistics Office revealed that there are 5.5 million Filipino children in the labor force.

Philippine Government’s Effort to Eradicate Malnutrition

Basic social services and policies concerning health and nutrition should be prioritized. This year, the social services sector was allotted P698.8 billion or 34.8% of the entire national budget. Improving health facilities and policies will enhance access to health services and contribute to the eradication of malnutrition (Rappler, 2014).

In the 2015 budget allocation, the Department of Agriculture (DA, 2014) increased the funding of farm-to-market roads (FMRs) from P5.2 to P12 billion. FMRs will improve the transaction and mobility of goods and people. The DA dubbed FMRs as the "catalysts in improving rural economy."

The FNRI-developed complementary food blends and snack food are mature food technologies, which are available for technology transfer to interested private entrepreneurs. The FNRI-DOST provides technical assistance for Local Government Units (LGUs), Non-Government Organizations (NGOs) and private organizations that

are interested to produce the complementary foods for livelihood and for use in their feeding programs (DOST, 2015).

This coming 17th Congress, Legarda is set to re-file bills aimed at improving the nutritional status of malnourished children in the Philippines. Among the measures she will file include the Child Nutrition bill, which aims to implement nutrition and health program in schools and barangay day care centers, consisting of complementary feeding program and other nutrition-related activities; the Gulayan sa Paaralan bill, which encourages all public elementary and secondary schools to conduct simultaneous vegetable gardening activities; and the Barangay Nutrition Worker bill, which will create the position of barangay nutrition worker in every barangay. The Senator will also re-file the Malunggay Development bill to spur the production, processing, marketing and distribution of malunggay in suitable areas of the country in order to acquire its benefits. (Senate of the Philippines, 2016)

Conceptual Framework

Product and Process Development (commonly referred to as Product Development) is systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need. Product development is a method of industrial research in its own right. It is a combination and application of natural sciences with the social sciences – of food science and processing with marketing and consumer science – into one type of integrated research whose aim is the development of new products. The most widely referenced normative product development models are those of Booz, Allen and Hamilton Inc. (1982) and that of Cooper and Kleinschmidt (1986). There are essentially four basic stages in these models for every product development process. These are:

- product strategy development;
- product design and development;
- product commercialization;
- product launch and post-launch.

Each stage has activities that produce outcomes (information) upon which management decisions are made. In practice, some of the activities performed in the product development process can be truncated, or some stages can be omitted or avoided based on a company's accumulated knowledge and experience. Having defined product development, it is now necessary to examine the issue of what constitutes a new or innovative product. Newness of a product may be judged differently according to those who perceive it. In the context of consumer goods such as food products, there are three groups of actors: consumers, distributors, and producers. Each may have a different view of whether or not a product is new.

Crucial to the discussion of product development is to recognize that "innovation" is contextual. The consumers' perception of product newness depends on the location of the consumer and the types of food products currently on the market.

The challenge for product development is to develop a product, which is acceptable to the target consumer. The specific flavors, ingredients and levels of spiciness or sweetness used in foods are significantly some of the factors that target customers are concerned about.

A major feature that distinguishes food product development is the ethical considerations of producing a large volume of safe and healthy food for human consumption especially the school age children. This is coupled to the fact that food raw materials are available at all times, affordable and are easy to prepare.

Product Development Trends

This year, we are moving beyond the "what's in/what's out" predictions typical of the past. There are too many overriding themes driving consumer demands in food product development.

According to at least one report, the global spread of both conditions has coincided with increased consumption of meats, "empty calories" (refined fats, oils and sugars) and total calories, according to a December 2013 article, "Global diets link environmental sustainability and human health" in the journal *Nature*. The research, led by David Tilman and Michael Clark, compared modern dietary patterns

of developed countries to several popular alternatives with regard to health, sustainability and carbon footprint.

The article portends that these three converging forces will ultimately shape food demands. Agriculture contributes at least 25 percent of greenhouse gases and is an unavoidable complicating factor when looking to upcoming food demands. We can see much of this future will playing out in predictions of food trends for 2015.

Millennials are increasingly uncertain about vague terms such as “natural,” and are seeking clarity and transparency. “Millennials are exerting their influence; they want more information about their food — where it comes from and what’s in it,” says Jennifer Lindsey, regional marketing director for DuPont Nutrition & Health Inc., New Century, Kan. ‘As a result, we believe we’ll see more health-conscious product development, with thoughtful ingredient choices. While weight management will be addressed, it won’t be in terms of ‘diet’ products. Instead, we’ll see products focused on delivering satiety, energy and positive nutrition, without empty calories.’

Millennials tend to be tech-savvy, well informed, mobile and anxious to try new things. Innova’s research predicts expanding choices for healthy snacks and convenience foods will be another trend, one that many ingredient providers already are gearing up for. “Consumers have come a long way in their understanding of the role that proper nutrition plays in long-term overall health and wellness,” says Patrick Morris, communications manager for the Fortitech Premixes division of DSM Nutritional Products Inc., Schenectady, New York. ‘Because our fast-paced lifestyles in many cases leave little time to regularly sit down for a well-rounded meal, fortified, functional products are an ideal vehicle to help fill the nutrient gaps most of us have,’ Morris continues. ‘Increasing health and wellness concerns have moved functional foods and drinks from a niche segment to a mainstream product now readily available in one’s local supermarket.’

New Product Development Process

Idea Generation

Basic survey questionnaire are utilized in this process to identify the needs of the intended clients and describe the problems that might occur when these needs

are not addressed. Ideas from other members of the organization are also generated as a significant part of this process that will take on affordability, accessibility and other specifics of the product development.

Idea Screening

This step is crucial to ensure that unsuitable ideas, for whatever reason are rejected as soon as possible. Ideas are considered objectively; ideally by a group or committee focusing mainly on the needs of the intended clients as a result of the survey done. Shortlists of ideas were documented.

Concept Development and Testing

Once the ideas have passed the screening stage, a small group discussion is conducted. The idea is now a concept, with enough in-depth information that the consumer can visualize it. A sample of the products is pre-tested by the group.

Aside from patent research, design due diligence, and other legalities involved with new product development, knowing where the product will be work best - who are the consumer? How will the consumer accept the new product? Do they really want or need it? This stage will be a chance to develop the concept further.

Product Development

In this process, the trainer involved used various raw materials for product development. Number of products were produced and presented initially to a small group for a selection process. Selection is also considered as elimination process.

Product Testing (Internal Clients)

Product testing were participated by selected members of TWC staff and faculty with the consideration that this group are all mothers with school age children who knows best what a child wants (target consumer). This process aims to gather feedbacks on the taste, texture, and visual presentation of the product. The top three most acceptable products are considered the final products to be improved.

Product testing (Other Agency)

The final food products selected are subjected to another testing. The Food and Nutrition Research Institute (FNRI) of the Department of Science and Technology

(DOST) do the testing for the nutrition facts of the products. Again, third party feedback is necessary for possible adjustments of ingredients used in the products.

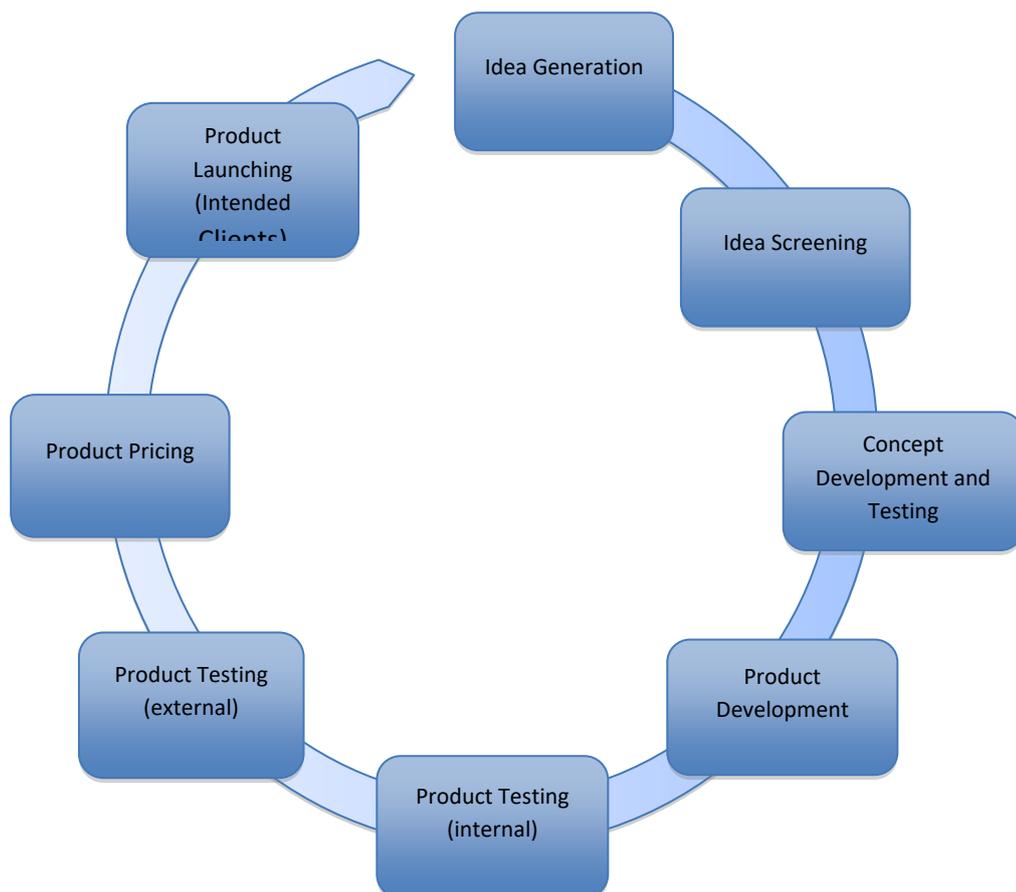
Product Pricing

At this stage, new product developed have gone mainstream. Once the consumers are purchasing the products, it should be at a reasonable cost. The cost should at least the same as the daily cost of snacks a public school child could afford with an appetizing taste while gaining the proper nutrients they needed.

Product Launching (Intended Clients)

The products were launched on July 21, 2016 with two hundred (200) Grade Six students of Maharlika Village Elementary School in Taguig City. A team of TWC Staff and trainees of Cookery program gathered to conduct the product launching. Evaluation of the products was done by placing a smiley stickers on the products that student likes the most. Those with most numbers of smiley stickers are considered to be the most acceptable product to the students. Group discussions for further comments were also facilitated.

Conceptual Framework of New Product Development



Statement of the Problem

Fruits and vegetables intake among children is decreasing with age. Younger children are likely consuming less than the recommended number of serving sizes of fruits and vegetables per day. Due to bland and some bitter taste of vegetable, and the way it usually cooked and presented, vegetables become less attractive to children. As a result, under-nutrition among children is prevalent especially in households with experiences in food insecurity. Because of this situation, there is a need to combat malnutrition and nutrient deficiencies through promotion of vegetables and fruits in the regular diet. The development of healthy and nutritious snack foods can help address this health issue.

The objective of this research is to create three nutritious vegetable-based snack foods, appropriate for school children ages six to twelve years old. Factors considered in the formulation of recipes include creating an attractive, nourishing, and palatable to snack that should consist of sustainable and low cost produce. The developed products were expected to provide children as well as adults healthy alternative foods at meal and snack time.

Hypothesis

Our hypothesis is that the developed vegetable-based snack products would be acceptable and could also be as tasty and nutritious snacks similar to that of commonly snack foods consumed by school children. These alternative snacks would help parents increase the consumption of vegetables and whole grains in their children's diet while also providing adequate amounts of protein and low amounts of fat.

Definition of Terms

1. *Blanching* – to partially cook vegetables in boiling water or steam. Immediately after blanching vegetables are usually placed in ice water to stop the cooking process.
2. *Blending* – to mix ingredients just until thoroughly combined.

3. *Dredging* – to coat before cooking with dry ingredients such as flour, corn meal, bread, cracker crumbs or other mixture.
4. *Kneading* – the process of working a dough to activate the gluten, which is the protein in flour that makes the dough cohesive.
5. *Leaven* – to add an ingredient such as yeast, baking powder or baking soda, which adds gas to a dough or batter causing it to expand or rise and lighten the texture of the finish product.
6. *Pre-heat* – to heat the oven to the specified temperature before adding the food. Most recipes require preheating the oven.
7. *Proofing* – to activate yeast or other leavening agent, before using in a recipe.
8. *Punch down* – to deflate risen dough with your hand, press on the dough until the gas escapes.
9. *9-point hedonic scale* – scale used for measuring food acceptability; scale of liking used to measure preference.
10. *Brunoise* – finely diced vegetables that are cooked in butter and used to flavor soups and sauces
11. *Chiffonade* – a preparation of shredded or finely cut leafy vegetables, used as a garnish for soup.

CHAPTER 3

METHODOLOGY

1. Recipe Formulation and Experimental Stage/Development of the Vegetable-based Snack food

The experimental stage involved formulation of different recipes and exploration of the most suitable vegetable to be used as base ingredient. The research team was composed of the TESDA Women Center (TWC) trainer in Cookery who led the conduct of development of vegetable-based snack foods with technical assistance from another TWC Cookery expert. The TWC Center Chief provided technical guidance in the research design and methodology while the team of TWC Research and Advocacy Unit provided assistance in the conduct of consumer survey and technical writing. Some selected TWC Cookery trainees participated also as part of the research team in the conduct of experiments on recipe modification, costing and consumer testing to encourage them and experience the conduct of research.

In order to avoid price and resource constraints, vegetables with stable prices and long-term supply were chosen and sourced as the base ingredients for the snack foods. The ingredients and raw materials were purchased from local supermarkets. The formulation of the vegetable-based snack food products considered various vegetables such as squash, sweet potato, horseradish or “malunggay” and potato as base or main ingredients due to its health benefits and ease in preparing the recipes.

Another important consideration in the experimental stage was the development of healthy recipes that best fits the chosen vegetables in relation to satisfying the palate of children and urban food habits. Given the challenge of modernization and the almost endless food options currently in the market, it was crucial to adapt the chosen vegetables into distinctive, tasty snacks that could encourage children to value vegetables, raise children and teachers’ exposure and awareness to healthy food choices. Ultimately, this could help change the course of the young generation’s poor dietary habits and decrease cases of malnutrition.

The Cookery trainees were asked by their trainer to submit recipes, which they thought would be acceptable snack food for school children. The process of

elimination was used and during the first phase of product testing and elimination, the trainer selected which recipes prepared by the trainees could proceed to the next phase. A control group did the second phase of elimination where recipes with the highest number of votes would proceed to the final product evaluation to be validated by school children.

Initially, five (5) different snack recipes, namely 1) tart with squash filling, 2) sweet potato hash brown, 3) potato croquette, 4) rolled rice cake with squash filling, and 5) vegetable burger were formulated and explored by the trainees. These were presented to the trainer for evaluation in terms of taste, texture and appearance of each snack-product. Those recipes selected by the trainer based on initial evaluation were improved and tested once again for the next round of elimination. The recipes of these five snack food products are shown in Annex 1. Food safety practices were carefully observed during the entire experimental and formulation stage.

2. Sensory Evaluation

The next round of product elimination involved conducting food tasting with a control group consisted mainly of TWC faculty members and trainees. The experimental products were subjected to sensory testing. A sensory evaluation sheet using the nine-point hedonic scale (Annex 2) was devised for the conduct of taste testing of the snack food samples to establish the overall preference and acceptance of snack food products from the panelists. TWC personnel and other trainees from other courses served as panelists. The evaluators used a check mark in the appropriate scale to express their feeling on how much they like or dislike the sample snack food products. The snack food products with very high preference and acceptability as a result of the sensory testing were subjected for consumer testing with the target grade school students.

3. Consumer Testing

To determine the acceptability and preference of the elementary pupils of the developed snack foods, consumer testing of the most preferred snack food samples was conducted to a total of 202 Grade 6 pupils comprising Sections Bonifacio, Rizal, Mabini and Jacinto from the Maharlika Elementary School, Taguig

City. The product evaluation was conducted on July 21, 2016 to four groups or class sections of grade 6 students. Four (4) members of the research team facilitated the consumer survey with assistance from the Cookery trainees. The acceptability test could forecast buying intent from the students. Questions were asked to see if they would eat the snack food again and if they would ask their parents to buy this food for them.

After the preparation and cooking of the sample food products by the TWC trainer and trainees in Cookery, a brief orientation was conducted on the purpose of the activity. Initially, the names of the sample food products were not revealed yet but it was just labeled as Product A, Product B and Product C. The sample food products were then packaged and served to the pupils. The products were tasted individually and simultaneously. Bottled drinking water was also distributed to help the pupils distinguish the taste of one food sample after the other. After the food tasting the pupils were asked to post a sticker on the most acceptable snack food. The sample with the most number of smiley stickers was considered as the most preferred product of the students. Feedback regarding the serving size and general comments were gathered from the students in a plenary after the taste testing. The students were asked to guess what were the main ingredients in the samples and if the serving size just right for kids. Those students who guessed correctly were given cup cakes as prizes.

4. Nutritional Analysis

The snack food samples with high preference and acceptability were analyzed for its nutritional value. Freshly prepared samples were submitted to the Standards and Testing Division of the Department of Science and Technology (DOST) to determine the % moisture, % ash, % protein, % fat, % total carbohydrate and food energy (kcal/100g).

5. Product Costing

Product costing of each of the most preferred snack food samples was computed to determine its affordability and compare the cost with the prices of the snacks sold in school canteen.

CHAPTER 4

RESULTS AND DISCUSSION, CONCLUSION AND RECOMMENDATION

1. Recipe Formulation/Development of the Vegetable-based Snack food and Results of Product Evaluation

Of the five (5) recipes that were initially tried by the research team, three (3) recipes were the most acceptable based on food tasting evaluation using the nine-point hedonic scale:

- a) vegetable burger (squash bun with mixed vegetable patty);
- b) squash tart; and
- c) sweet potato has brown.





Squash Tart

Table 1 shows the results of evaluation of the five recipes that were tried by the research team in terms of percentage (%) of responses in liking of the respondents/panelists.

Table 1. Percentage (%) Liking of Panelists By Product.

Description of Preference	% Liking				
	Potato Croquette	Squash Rolled Rice Cake	Vegetable Burger	Sweet Potato Hash brown	Squash Tart
1 - Like Extremely	-	-	35.0 %	22.5 %	20.0 %
2 - Like Very Much	12.5 %	37.5 %	47.5 %	45.0 %	45.0 %
3 - Like Moderately	50.0 %	25.0 %	12.5 %	32.5 %	27.5 %
4 - Like Slightly	37.5 %	37.5 %	-	-	7.5%
5 - Neither like nor Dislike	-	-	-	-	-
6 - Dislike Slightly	-	-	-	-	-
7 - Dislike Moderately	-	-	-	-	-
8 - Dislike Very Much	-	-	-	-	-
9 - Dislike Extremely	-	-	-	-	-

The 9-point hedonic scale of liking was considered as the most appropriate to use in this study because of its usefulness in planning and choosing the right recipe. Foods that were liked by the panelists were selected while those that were disliked could be removed. The goal here was not to compare the comparative degree of liking between foods but merely to register whether a food under study was liked well enough to remain on the list of recipes. The judgments were more absolute

than comparative. It can be inferred from Table 1 that vegetable burger, sweet potato hash brown and squash tart were liked more or preferred more over potato croquette and squash rolled rice cake. Most of the panelists commented that potato croquette was oily and had bland taste while the squash-rolled rice cake was very sticky and messy to eat.



Food tasting of snack food products with TWC trainees



Food tasting of snack food products with TWC trainees

Vegetable Burger

In the development of vegetable burger, the researchers formulated also a burger bun or "*pandesal*" infused with vegetable that would go with the vegetable patty. In the first trial, the researchers tried using horseradish or "*malunggay*". The burger bun with horseradish was a bit tough because of too much flour added in the

dough mixture. The researchers decided to modify the formulation of the burger bun by using squash instead of horseradish considering that squash had higher nutrient content. The weight of the burger bun was also reduced from 30 grams to 25 grams, a serving size just enough to consume by school children.

Modifications on the recipe of the vegetable patty were also done because the patty after cooking was bland in taste, thus the amount of salt and other seasonings were adjusted until the taste became acceptable. It was also recommended to adjust the cut of celery stalks, onion and garlic into brunoise cut to make it a little smaller so that it would not be very obvious while eating by the target consumer. All other vegetables (*saluyot*, *malunggay*, spinach) used for the burger patty were finely chopped except for the carrots that were grated and the cabbage cut into chiffonade. Finally, the researchers decided to prepare barbeque sauce that was eaten together with the patty.

Sweet Potato Hash Brown

The development of this recipe made use of sweet potato instead of potatoes as the main ingredient of the snack food. The snack food was served with Tonkatsu sauce. The researchers considered sweet potatoes because of its sweet unique flavor and texture besides being it more nutritious than potatoes.

Szalay (2014) reported an interview with U.S. nutritionist Laura Flores on the health benefits of sweet potatoes. Studies showed that sweet potatoes were a great source of vitamin A, vitamin B5, B6, thiamin, niacin, riboflavin, and, due to their orange color, were high in carotenoids. The report also indicated the health impacts of sweet potatoes which included good heart maintenance, steady source of energy, stabilizes blood sugar, has de-stressing minerals, improved digestion, has immunity and anti-inflammatory properties, encouraged healthy and glowing skin and hair, and could help prevent cancer. In addition, the report emphasized how sweet potatoes are fat-free, relatively low in sodium and contains fewer calories than white

potatoes. Although they have more sugar, these have low glycemic index, meaning levels of blood sugar would not spike when consumed.

On top of the health benefits gained from sweet potatoes, it is also considered as one the world's highest yielding crops and yet it only requires low inputs to plant (Cabanilla, 1996). It is a staple crop for tropical countries such as Philippines. As a native root crop, farming of sweet potato has been one of the steady drivers of the country's agricultural economy (Cardinoza, 2016).

Squash Tart

The formulation of recipe for this product made use of squash as substitute to fruit in preparing the pastry cream. The standard ingredients and procedure in preparing the tart shell was used. The serving size of tart shell per piece was 20 grams topped with 5 grams squash pastry cream filling. Thus, the total serving size per piece was 25 grams. It was noted that most of the students said that the product's sweetness needed some improvement. Based on the comments gathered, they preferred a sweeter and milky taste squash tart, which was normally observed in schoolchildren.

2. Result of Consumer Testing

The top three (3) preferred snack food samples which were subjected for consumer testing with two hundred two (202) Grade 6 students were: a) mini-burger with vegetable patty labeled as Product A; b) sweet potato hash brown labeled as Product B; and c) squash tart labeled as Product C. The consumer survey was conducted to determine the over-all acceptability and which among the 3 snack foods was the most preferred by the school children in Maharlika Elementary School.

Tables 2 and 3 show the profile of students who participated in the consumer testing. There were more female students (56.44%) compared to male students (43.56%) with age ranging from 10 to 17 years old. Majority of the students were 11 years old.

Table 2. Profile of Students By Sex

Class Section	Male	Female
Bonifacio	20	33
Rizal	19	31
Mabini	27	22
Jacinto	22	28
Total	88	114
%	43.56	56.44

Table 3. Profile of Students By Age

Class Section	# per section	Age							
		10	11	12	13	14	15	16	17
Bonifacio	53	9	25	13	4	1	-	-	1
Rizal	50	4	28	11	2	3	1	1	-
Mabini	49	4	25	11	8	1	-	-	-
Jacinto	50	7	25	13	4	1	-	-	-
Total	202	24	103	48	18	6	1	1	1

The age of the students was really considered in this study to be able to get accurate sensory evaluation results. Thus, it was expected that Grade 6 students with age ranging from 10 to 16 would be more mature in choosing their preference compared to children between ages 5 to 8 years old.

Results of consumer testing is shown in Table 4 where mini-squash burger got the highest ranking with sweet potato hash brown and squash tart as number 2 and 3 in ranking respectively. Generally, most of the students preferred mini-squash burger because of its crispy texture, nutritious and there was no taste of squash.

Table 4. Number of smiley 😊 stickers per Product

Class Section	# of Pupils	Product A	Product B	Product C	Total
Bonifacio	53	28	33	10	71
Rizal	50	25	40	6	71
Mabini	49	33	13	2	48
Jacinto	50	34	11	5	50
Total	202	120	97	23	240
Rank		1	2	3	
		(Mini-Squash Burger)	(Sweet Potato Hash Brown)	(Squash Tart)	

The responses of the students when asked what was the main ingredient of each product, the results are shown in Table 5 below. It was not easy for the students to guess the main ingredient in the products, which only indicated that they were not able to detect and/or taste the vegetable ingredient.

Table 5. Responses of the Students About the Main Ingredient of Each Product

Product A	Product B	Product C
Ampalaya Broccoli Cabbage Carrots Gabi Kangkong Leeks Lettuce Malunggay Onion Pechay Potato Spinach	Potato Sweet Potato	Carrots Corn Jack Fruit Malunggay Peanut Pili Potato Squash Sweet Potato Yema

The general comments of the students and photos taken during the conduct of consumer testing are presented below.

Mini Squash Burger	Sweet Potato Hashbrown	Squash Tart
<ul style="list-style-type: none"> Liked the crispy texture Liked the assortment/ variety of vegetables Cute shape Liked the serving size Very nutritious Ang cute ng burger, masarap at masustansiya Masarap pala ang burger kahit gawa sa gulay Halata na gawa sa gulay pero hindi nakakatakot kainin 	<ul style="list-style-type: none"> Ang akala sa sweet potato hashbrown ay nuggets Akala ko nuggets Masarap, sakto lang ang lasa, hindi maalat, hindi matabang Nagustuhan ko yung shape ng hashbrown Tama lang yung dami ng serving Masarap, gusto ko pa 	<ul style="list-style-type: none"> Not milky enough Not sweet enough Nakaka-umay Masarap and tart Nakakabusog Tama lang ang lasa, hindi ganun katamis Masustansiya at masarap

<ul style="list-style-type: none"> • Hindi ako kumakain ng gulay pero naubos ko ang burger • Di kinakain kasi hindi mahilig • Masarap • Masustansiya • Kakaiba sa ibang burger, maliit • Kakaiba sa lahat ng natikman kong burger 		
<p>General Comments</p> <ul style="list-style-type: none"> • Masustansiya, may mga gulay • Masustansiya at pampalakas • Maraming gulay, maganda sa katawan 		

When asked if they would eat the squash mini-burger again, almost all of the students said they would eat the burger again. When asked if they would buy the mini-burger, most of them said they would buy the product. The students also said that the serving size of the mini-burger is just right for them.



TWC Research Team with the Principal of Maharlika Elementary School



Taste Testing of Vegetable-Based Snacks Food by Grade 6 Students



Grade 6 Students who participated in the Consumer Survey

Another group composed of 40 faculty members, all females, with varied age group ranging from 18 to 57 years old evaluated the three snack foods to compare the results of their preference and acceptability with that of the preference of school children. Table 6 presents the % liking of the 40 teachers by product. It was noted that the teachers preferred vegetable burger more than sweet potato hash brown and squash tart, which was the same product preferred by the students.

Table 6. Percentage (%) Liking of Teachers By Product.

Description of Preference	% Liking		
	Vegetable Burger	Sweet Potato Hash brown	Squash Tart
1 - Like Extremely	40.0 %	-	-
2 - Like Very Much	47.50 %	45.0 %	45.0 %
3 - Like Moderately	12.5 %	32.5 %	27.5 %
4 - Like Slightly	-	22.5 %	27.5 %
5 - Neither like nor Dislike	-	-	-
6 - Dislike Slightly	-	-	-
7 - Dislike Moderately	-	-	-
8 - Dislike Very Much	-	-	-
9 - Dislike Extremely	-	-	-

2. Nutritional Analysis

The laboratory report of DOST on the nutritional value of mini-burger and sweet potato hash brown is shown in Table 7.

Table 7. Proximate amount of nutritional value of the vegetable-based snack food products

Amount per serving	Vegetable Patty	Squash Pandesal	Sweet Potato Hash Brown
Moisture, % w/w	49.1	25.10	45.1
Ash, % w/w	2.25	0.70	2.32
Protein (N x 6.25) % w/w	6.03	7.70	2.54
Fat, % w/w	14.5	7.17	8.92
Total Carbohydrate, % w/w	28.1	59.3	41.1
Food Energy, kcal/100 g	267	333	255



Photos taken during the consumer testing with

3. Product Costing

The cost of ingredients, labor and miscellaneous expenses of vegetable burger, sweet potato hash brown and squash tart were computed based on the current market price. Table 8 presents the summary of costing with suggested selling price.

Table 8. Summary of Costing of Vegetable-Based Snack Food Products.

Cost	Vegetable Burger	Sweet Potato Hash Brown	Squash Tart
Serving size	50 grams per piece (burger and pandesal)	30 grams (3 pieces)	20 grams per piece
Unit Cost	Php 5.35	Php 4.85	Php 3.38
Selling Price	Php 11.00	Php 12.73	Php 6.00

The detailed costing of these three snack foods is presented in Annex 3. A mark up of 45% to 65% was used to compute the selling price.

Conclusion

In conclusion, the vegetable-based snack food products developed namely, vegetable burger, sweet potato hash brown and squash tart could provide children as well as adults healthy alternative and affordable snacks at meal and snack time. The snack products are easy to store, prepare and purchase for busy parents as well as convenient for schools. Finally, it would be appealing to consumers, especially children, in taste, appearance and overall acceptability.

Recommendations

Since the results of the study proved that the developed vegetable-based snack foods (vegetable burger, sweet potato hash brown and squash tart) were generally acceptable both for the school children and the adults in terms of taste and appearance as well as nutritional value, it is recommended for that these products be sold in the school canteen or cafeteria and continue promoting eating of healthy and nutritious foods. The TWC research team would be willing to provide the recipes and conduct a training of DepEd teachers, specifically for the TLE teachers on how to prepare these recipes. Furthermore, it is recommended that the TLE teachers include in their learning activities simple researches such as developing recipes to encourage the students to be creative and expose them early in doing researches.

The products developed out of this research are recommended for more comprehensive tests in nutritional contents and suggested serving portion to acquire accreditation or approval from authorized agencies, which is a requirement for commercialization of this product.

References

- Cabanilla, L. 1996. "Sweet potato in the Philippines: production, processing, and future prospects". International Potato Center, Lima, Peru. In <http://cipotato.org/library/pdfdocs/SW51863.pdf>. Accessed 3 August 2016.
- Cardinoza, G. 2016. "Profit follows farmers who went home to plant 'camote'". In <http://newsinfo.inquirer.net/777898/profit-follows-farmers-who-went-home-to-plant-camote>. Accessed 3 August 2016.
- Cepeda, M. 2015 "SWS: 36% of Filipinos identify themselves as 'food poor'.Rappler. In <http://www.rappler.com/move-ph/issues/hunger/92207-sws-foodpoverty-survey-first-quarter-2015>. Accessed 3 August 2016.
- Fernandez, R. 2015. "Pinoys eating less vegetables – study". In <http://www.philstar.com/headlines/2015/04/06/1440779/pinoys-eating-less-vegetables-study>. Accessed 3 August 2016.
- Food and Nutrition Research Institute- Department of Science and Technology (FNRI-DOST). 2012. Philippine Nutrition Facts and Figures 2011. DOST Complex, FNRI Bldg., Bicutan, Taguig City, Metro Manila, Philippines.
- Food and Nutrition Research Institute- Department of Science and Technology (FNRI-DOST). 2015. "2015 annual report". DOST Complex, FNRI Bldg., Bicutan, Taguig City, Metro Manila, Philippines. In <http://www.fnri.dost.gov.ph/images/sources/AnnualReports/AR-2015.pdf>. Accessed 3 August 2016.
- Laguna, E. 2015. "Sizing up: the stunting and child malnutrition problem in the Philippines". In https://www.savethechildren.org.ph/_data/assets/pdf_file/0007/109834/Save-the-Children-LahatDapat-Sizing-Up-the-stunting-and-child-malnutrition-problem-in-the-Philippines-Report-September-2015.pdf. Accessed 2 August 2016.
- Hamlett, C. "Food culture in the Philippines". In <http://traveltips.usatoday.com/food-culture-philippines-17408.html>. Accessed in 3 August 2016.
- Martorell, R and Amanda Zongrone. 2012. "Intergenerational influences on child growth and undernutrition". Paediatric and Perinatal Epidemiology. 26(Suppl.1). 302-314. Doi:10.1111/j.1365.2012.01298.
- Mayo Clinic. 2014. "Nutrition and Healthy Eating". In <http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/basics/healthy-diets/hlv-20049477>. Accessed 3 August 2016.
- Pedro, MRA; Benavides, RC; Barba, CVC. 2006. "Dietary changes and health implications: an emerging double burden of under- and over-nutrition. FAO Food and Nutrition Paper 84. Food and Agriculture Organization of the United Nations, Rome.

<http://www.fao.org/docrep/009/a0442e/a0442e0p.htm#TopOfPage>.
Accessed 3 August 2016.

Szalay, J. 2014. "Sweet potatoes: health benefits, risks & nutrition facts". In <http://www.livescience.com/46016-sweet-potato-nutrition.html>. Accessed 3 August 2016.

United Nations System in the Philippines. 2011. "Supporting inclusive, sustainable and resilient development: the United Nations development assistance for the Philippines". In http://www.un.org.ph/UNDAF%20launch_FINAL%20printing.pdf. Accessed 3 August 2016.

World Bank. 2006. "Repositioning nutrition as central to development".

Annexes

Annex 1 – Recipes

Name : Vegetable Patty (mini-burger)

Yield: 60 pcs

Weight Per Yield: 20 grams

INGREDIENTS	QUANTITY
Cabbage	300 g
Carrots	165 g
Spinach	190 g
Celery	65 g
Saluyot	40 g
All purpose flour	250 g
Egg	2 pcs.
Fresh milk	240 ml
Salt	5 g
Pepper	.625 g
Onion	35 g
Garlic	25 g
Malungay leaves	20 g
Bread crumbs	250 g
Oil for frying	500 ml

Mise en Place:

- Wash, clean and sanitize all vegetables
- Sift the all purpose flour
- Measure the dry ingredients
- Wash and clean the egg
- Cut the cabbage into chiffonade cut
- Wash, clean, peel and grate the carrots
- Blanch the spinach, saluyot and malungay separately and cut finely
- Cut celery stalks, onion and garlic into small dice

Method :

1. In a mixing bowl combine cabbage, blanch saluyot, malungay, spinach and grate carrots, chop onion and garlic. Season with salt and pepper, set aside.
2. Another mixing bowl, combine and mix all-purpose flour, fresh milk and beaten eggs.
3. Add the batter mixture into vegetable mixture.
4. Portion the vegetable patty and roll into breadcrumbs.
5. Chill the patty for 30 minutes,
6. Deep-fry the vegetable patty for 4 to 7 minutes or until cook, with 170 °C.

Name : BBQ Sauce

Yield : 500 ml

INGREDIENTS	QUANTITY
Vinegar	30 ml
Soy sauce	30 ml
Oyster Sauce	30ml
Water	960 ml
Dijon Mustard	30 ml
Salt	5 g
Pepper	.625 g
Honey	150 ml
Cornstarch	62.5 g

Mise en Place

- Measure all the ingredients

Method:

1. In a mixing bowl, mix all the ingredients.
2. Place all the ingredients in a saucepan and reduce until it is reduced to half of the liquid
3. Mount the mixture with cold butter nuggets, adding the last bits of butter off the heat and strain it.
4. Correct the seasoning.

TO HOLD: Place in a warmed thermos for up to four hours keep on a stove shelf, warm not hot. A commercial bain marie is too hot. Do not let it cool or it will solidify.

Name : Squash Pandesal

Yield : 40 pcs

Weight per Yield : 30 grams

Ingredients:

Yeast Mixture :

1 cup lukewarm water
2 tsp instant dry yeast
2 tsp sugar

For the Dough:

500 g All-purpose flour
1 tsp salt
½ cup sugar
½ cup corn oil
2 pcs slightly beaten egg yolks
4 tbsp Puree Squash
Bread crumbs

Mise en Place :

- Sift all-purpose flour
- Measure dry and wet ingredients separately
- Wash, clean and sanitize egg

Method :

1. Mix together yeast mixture. Let rest for 10 minutes
2. Add the rest of the ingredients and knead until smooth and elastic. Let rest until double in bulk.
3. Punch down and roll into a baston. Cut into desired size.
4. Roll in bread crumbs
5. Place in cookie sheet with glad baker paper. Let rise until double.

PRODUCT NAME: Sweet Potato Hash brown/Smiley with Tonkatsu Sauce

Yield : 40 pcs

Ingredients :

Sweet Potato	500.00	g
Rice Flour	72.00	g
Onion Powder	3.00	g
Cinnamon Powder	0.05	g
Nutmeg, ground	0.05	g
Allspice Powder	0.05	g
Vegetable Oil	500.00	ml
Pepper	0.50	g
Salt	4.50	g

Method:

1. Submerge peeled sweet potatoes in a pot of cold water and let it boil (lid off) until slightly cooked.
2. Grate sweet potatoes using a cheese grater or any grater with small holes when slightly cooled.
3. In a bowl, place the grated sweet potatoes, onion powder, cinnamon powder, nutmeg, allspice, salt and pepper. Blend well into the sweet potatoes.
4. Add the rice flour last and blend well until the mixture has a dough like consistency.
6. Place the mixture in between two parchment papers and flatten until it is 1cm thick. Place on a tray/pan and freeze for 3-4hrs.
7. Using a round cookie cutter, cut the smiley's face and poke two holes on each face to make the eyes. Draw smiles using a spoon to form the lips.
8. Keep on repeating this procedure until all the sweet potato dough is used up.
1. 8.. Deep fry each piece until it turns into a red-orange shade, and the exterior turns crisp. Serve immediately.

Tonkatsu Sauce

Yield:	500ml
Serving Size:	5ml
	PHP
Portion Cost:	0.85

Ingredient	Metric
Ketchup	348.00 g
Ginger, powder	4.80 g
Garlic, powder	2.40 g
Worcestershire Sauce	48.00 g
White Sugar	36.00 g
Salt	1.60 g
Water	80.00 ml

Rice Wine

161.60 g

Procedure

1. Boil sweet potatoes for 15-20mins.
2. Take boiled sweet potatoes and grate/mash them. Now take them in a bowl along with all the other ingredients except rice flour and oil. Mix this really well.
3. Add in rice flour and mix well. Gather dough then flatten in between two parchment papers until 0.5cm thick.
4. Put this dough in fridge and let it rest and chill for 30mins. to 1 hour.
5. Using a small round cookie cutter, start cutting out round shapes on the flatted dough.
6. Use a straw to make two eyes and a spoon to make smile.
7. Heat oil for deep-frying. Drop the smiles in hot oil and fry till it is crispy.
8. Drain in paper towel.

Name : Tart Shell (For Squash Tart)

Yield : 60 pcs

Serving Size : 15 grams

Mise en Place :

- Pre-heat the oven at 300 F for 20 minutes
- Sift the all-purpose flour and confectioner sugar separately
- Weight and measure dry ingredients
- Grease tart pan
- Wash, clean and sanitize fresh egg
- Wipe dry the mixing bowl and paddle. Set aside

Method :

1. Combine sifted confectioner's sugar and butter and place in a mixing bowl fitted with paddle attachment.
2. Add the mixture all-purpose flour & salt, vanilla and egg and then beat on low speed. Scrape side down of the bowl and beat until; evenly blend on low speed.
3. Beat until smooth on low medium speed until stiff, texture should be firm and smooth, remove bowl from the mixer as well as the paddle attachment.
4. Transfer in a clean and dry tray and cover with cling wrap and chill for 30 minutes.

ROLLING OUT THE DOUGH:

1. Don't overwork it. If you need a very thin sheet from a big disc of dough, cut it in half horizontally first.
2. Turn dough with each roll: 1/4 turns = square, 1/8 turns = round.
3. After lining tart pan chill or freeze dough 30 M.

BAKING THE TART SHELL (300°F):

1. Put the tart pan on pre-heated baking sheet for a drier/ flakier crust.
2. Baking Times: Partially cooked: 8 – 10 minutes
Fully cooked: 15- 20 minutes

3. If shell is to have liquid filling, brush inside with beaten whole egg when almost baked, then bake 2-3 minutes more to seal crust.
4. For a fully baked shell, unmold onto rack immediately.

Name: Pastry Cream with Squash Flavor for Squash Tart

Yield: 400 grams

Ingredients	Quantity
Squash	500g
Fresh Milk	200ml
Confectioner Sugar	3/4cup
Egg yolk	2 pcs
Cornstarch	1/8 cup
Vanilla	1 tsp
Salt	1/8 tsp

Mise-en-Place:

- Remove skin of squash and cut squash into small cubes and bake for 30 minutes until soft.
- Puree roasted squash with milk in blender.
- Wash and clean the egg
- Measure dry and liquid ingredients

Method:

1. In a bowl, combine together the sugar, milk, vanilla, salt, confectioner sugar , puree squash, egg yolks and cornstarch and simmer into double boiler, whisking gently but constantly.
2. Stir mixture with whisk until pastry cream comes to a boil and thickens and add butter then stir gently to incorporate.
3. Strain pastry cream into bowl. Smooth top with spatula and cover with plastic wrap touching the surface so that a crust will not form. Refrigerate for 4 days. The pastry cream has to be loosened before it is used and has gotten stiff.

Annex 2

Name of Panelist (Optional): _____

Date: _____

Sex: M F

Age: _____

Instructions: Taste test the given samples and check how much you like or dislike the product. Use the appropriate scale to show your attitude by checking the point in the scale which best describes your feeling. Take a drink of water after each product tasted.

	Squash Tart	Rolled Rice Cake	Mini Burger with Vegetable Patty	Sweet Potato Hash brown	Potato Croquette
Like Extremely					
Like Very Much					
Like Moderately					
Like Slightly					
Neither like nor Dislike					
Dislike Slightly					
Dislike Moderately					
Dislike Very Much					
Dislike Extremely					

Comments:

Annex 3 – Product Costing

Product name: Sweet Potato Hashbrown

Ingredients	Quantity	Unit	Unit Cost, Php	Total Cost, Php
Sweet Potato Hash Brown				
Sweet Potato	350	g	0.050	17.5
Rice Flour	18	g	0.075	1.35
Potato Flour/Starch	8	g	0.096	0.77
Cornstarch	6	g	0.005	0.31
Sugar	4	g	0.056	0.22
Onion Powder	0.50	g	2.050	1.02
Garlic Powder	0.30	g	2.050	0.61
Vegetable Oil	125	ml	0.094	11.72
Butter	25	g	0.218	5.44
Salt	1.25	g	0.022	0.03
			Sub-total	38.97
Tonkatsu sauce				
Ketchup	348	g	0.099	34.37
Ginger, powder	4.80	g	2.22	10.67
Garlic, powder	2.40	g	2.22	5.33
Worcestershire Sauce	48.0	ml	0.315	15.14
White Sugar	36.0	g	0.056	2
Salt	1.60	g	0.021	0.03
Water	80	ml	0.005	0.41
Rice Wine	161.60	g	0.107	17.27
			Sub-total	85.22
Packaging material				
Parchment paper	48	pcs	4.90	4.90
			Sub-total	4.90
			Total	129.09
Yield	60	Pcs		
Cost per serving				4.85
Selling Price				12.73

Product name: Sweet Potato Hashbrown

Ingredient	Quantity	Unit	Unit Cost, Php	Total Cost, Php
Tart Shell				
All Purpose Flour	750g	G	0.05	36.75
Butter	250g	G	0.22	54.44
Confectioner Sugar	125g	G	0.04	5.25
Egg	1 pc	Pc	6.00	6.00
Salt	1/8 tsp	tsp	0.02	0.013
Vanilla	1 tsp	tsp	0.48	2.40
			Sub-total	104.85
Pastry cream with squash flavor				
Squash	500	G	0.04	20.00
Fresh Milk	200	ml	0.08	16.20
Confectioner Sugar	$\frac{3}{4}$	cup	0.07	13.50
Egg yolk	2	Pc	6.00	12.00
Cornstarch	1/8	cup	0.05	1.62
Vanilla	1	tsp	0.48	2.40
Salt	1/8	tsp	0.02	0.013
			Sub-total	65.73
Packaging material				
Cellophane	4	Pcs	8.00	32.00
			Sub-total	32.00
			TOTAL	202.58
Yield	60	Pcs		
Cost per serving				3.38
Selling price				6.00

Product name: Vegetable burger and squash pandesal

Ingredients	Quantity	Unit	Unit Cost, Peso	Total Cost, Peso
Vegetable Patty				
Cabbage	300	g	0.08	24.00
Carrots	165	g	0.064	10.86
Spinach	190	g	0.052	10.00
Celery	65	g	0.131	8.53
Saluyot	40	g	0.25	10.00
All-purpose flour	250	g	0.049	12.25
Egg	2	pc	3	6.00
Fresh milk	240	ml	0.078	18.72
Salt	5	g	0.02	0.10
Pepper	0.625	g	1.33	0.83
Onion	35	g	0.12	4.20
Garlic	25	g	0.08	2.00
Malunggay leaves	20	g	0.5	10.00
Bread crumbs	250	g	0.07	17.50
Oil for frying	500	ml	0.096	48.00
			Sub-total	182.89
Barbeque sauce				
Vinegar	30	ml	0.35	1.05
Soy sauce	30	ml	0.04	1.2
Oyster Sauce	30	ml	0.17	5.1
Water	960	ml	0.005	5.07
Dijon Mustard	30	ml	0.869	26.08
Salt	5	g	0.02	0.1
Pepper	0.625	g	1.33	0.833
Honey	150	ml	0.175	26.25
Cornstarch	62.5	g	0.052	3.25
			Sub-total	71.18
Squash Pandesal				
All-purpose flour	750	g	0.05	36.75
Yeast	15	g	0.24	3.60
Sugar	80	g	0.04	3.36
Lukewarm water	300	ml	0.01	1.58
Unsalted butter	60	g	0.21	12.80
Salt	5	g	0.02	0.10
Bread crumbs	60	g	0.07	4.20
Squash	500	g	0.04	20.00
			Sub-total	82.39

Product name: Vegetable burger and squash pandesal

Packaging material				
Parchment paper	48	pcs	0.102	4.90
			Sub-total	4.90
			TOTAL COST	341.56
Yield	60	pcs		
Cost per serving				5.35
Selling price				11.00

Annex 4
DOST Results of Nutritional Analysis



Department of Science and Technology
INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE
STANDARDS AND TESTING DIVISION



REPORT OF ANALYSIS
No. ITDI-072016-OCS-0496

Customer's Name : Tesda Women's Center
 Address : Tesda Complex, East Service Road, South Super Highway,
 Taguig City
 Sample : **Food** (2 samples)
 Description and Identification : a. Boat-shaped individually wrapped yellow food material
 placed in plastic containers labeled as *Squash Tart*
 b. Round yellow food material with seed on top
 placed in plastic containers labeled as *Squash Pandesal*
 Date Received : July 11, 2016
 Date/s Tested : July 29 - August 11, 2016

	Result		Test Method
	OCS-2016-0798 <i>Squash Tart</i>	OCS-2016-0799 <i>Squash Pandesal</i>	
Moisture, %w/w	22.4	25.1	925.09 ^a
Ash, %w/w	1.23	0.700	923.03 ^a
Protein (Nx6.25), %w/w	6.74	7.70	Block Digestion-Kjeldahl
Fat, % w/w	17.3	7.17	Acid Hydrolysis
Total Carbohydrate, %w/w	52.4	59.3	By difference
Food Energy, kcal/100g	392	333	By calculation

VALIDITY OF THE REPORT: The test results are those obtained at the time of the test and pertain only to the sample(s) received by this Laboratory. *Codes and words in italics* are quoted solely for the customer's reference; significance of these codes and words are not verified by this Laboratory. This report is not to be used for advertising purposes or sales promotion.

ROSARIO T. FUERTES
 Head, Organic Chemistry Section

NATIVIDAD R. MAMPLATA
 Head, Chemistry Laboratory

Issued under the Authority of:

DR. CYNTHIA M. NALO-OCHONA
 Authorized Officer

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 8/15/2016 Page 1 of 1



REPORT OF ANALYSIS
No. ITDI-072016-OCS-0497

Customer's Name : Tesda Women's Center
Address : Tesda Complex, East Service Road, South Super Highway,
Taguig City
Sample : **Food** (2 samples)
Description and Identification : a. Round brown food material with crumbs placed in a plastic container labeled as *Vegetable Patty*
b. Round smiley-designed brown food material placed in a plastic container labeled as *Sweet Potato Hashbrown*
Date Received : July 11, 2016
Date/s Tested : July 29 - August 11, 2016

	Result		Test Method
	OCS-2016-0800 <i>Vegetable Patty</i>	OCS-2016-0801 <i>Sweet Potato Hashbrown</i>	
Moisture, %w/w	49.1	45.1	925.09 ^a
Ash, %w/w	2.25	2.32	923.03 ^a
Protein (Nx6.25), %w/w	6.03	2.54	Block Digestion-Kjeldahl
Fat, % w/w	14.5	8.92	Acid Hydrolysis
Total Carbohydrate, %w/w	28.1	41.1	By difference
Food Energy, kcal/100g	267	255	By calculation

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8/15/2016 Page 1 of 1