

Development and Product Acceptability of Cookies from Sweet Potato (*Ipomea Batatas*), Squash (*Cucurbita Maxima*) and Carrots (*Daucus Carota*)

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Abstract:- The Utilization of Carrots (*Daucus carota*), Squash (*Cucurbita maxima*), and sweet potato flour (*Ipomea batatas*) in making Cookies was conducted to introduce a new product out of these macro nutrient raw materials. The significance of utilizing these three abundant and highly recognized vegetables for its excellent health contributions is the top priority of this study to encourage the community to become health conscious and to broaden their perspective in using these raw materials even in a simple way but optimizing its great benefits.

The instrument used in collecting data to determine the acceptability of the product was nine (9) point Hedonic Scale. A total of twenty (20) panelists composed of Food Service Management students and faculty members evaluated the product. Moreover, three treatments were made with different percentages in the amount used for the three main ingredients namely carrots, squash and sweet potato flour. Among the three trials conducted, Treatment 1 was the most acceptable which was rated by the evaluators as Liked very much while both Treatment 2 and Treatment 3 were rated as liked moderately.

The most acceptable product's nutrition content was computed considering the nutritional content present in the raw material used. The below-stated computations are attained in every 100 grams or by pieces which is nineteen pieces (19) of cookies per pack. The identified calories were 236.33, calories coming from fat 16.10, number of total fat 10.23, saturated fat 0.57, cholesterol 42.30, sodium 43.77, total carbohydrate 33.67, dietary fiber 1.54, sugars 7.08, protein 1.96, Vitamin A 222%, Vitamin C 4%, and Calcium 102 %.

Keywords:- Utilization, Acceptability, Cookies, Sweet Potato, Squash, Carrots.

I. INTRODUCTION

Several varieties of cookies have been developed in the country, from basic wheat flour, vegetables, root crops, fruits, and other raw materials. It is commonly consumed as a snack item, for pass time purposes as well as for some gatherings such as picnics, and other related consumptions. Cookies are one of the most consumed snack items in the world consumed by children and adults. Developing cookies out of well-known vegetables such as carrots, squash, and sweet potato will be a great step in converting cookies into a much healthier product, most especially if it is not just a single vegetable involved.

On the other hand, several interconnected elements, such as health, physical, social, economic, and others, contribute to malnutrition in the Philippines. The availability of food and how it is used by the community have a variety of effects on the nutritional status of the community. However, despite evidence to the contrary, many Filipinos continue to go without food and suffer from malnutrition as a result of insufficient dietary intake. The Food and Nutrition Research Institute (FNRI) of the Department of Science and Technology (DOST) is mandated to conduct research to define the nutritional status of the population, in particular the malnutrition problem and its causes and effects, and to identify alternative solutions to them, according to a report published by the Philippine Daily Inquirer. Even though it was able to reduce the incidence of hunger in the most recent SWS survey on Filipino families experiencing hunger, the Philippines is unlikely to meet any of the six nutrition targets set by the global World Health Assembly, according to the International Food Policy Research Institute's (IFPRI) 2014 global nutrition report.

Likewise, The Bicol Region ranked high in malnutrition among public school children and even among high school students during the last school year 2012-2013, it was stated by the Department of Education Health and Nutrition Center (HNC). The region also ranked third highest in malnutrition among elementary pupils with 5.37% or about 52, 310 pupils classified as severely malnourished and fourth in secondary 3.75 % in secondary or approximately 10,379 students also classified as severely malnourished.

Studies connected to the utilization of carrots, squash and sweet potato are numerous, but the combination of these three raw materials is very limited. This study attempts to make cookies out of nutritious vegetables to create a product particularly cookies that is suited for school children, high school, and adults. The country is fighting against malnutrition for a long time; therefore, this enriched product could be a response to this issue. It is also a good alteration of those existing or commercially known cookies that focuses on one raw material. It could now be the answer to several issues and concerns regarding food shortage and malnutrition because of children's low consumption of vegetable products and it emphasizes introducing new ways of utilizing our vegetable products to produce another product.

According to Krolner et al., a sizable fraction of kids does not consume the recommended 400 grams of fruit and vegetables (FV) per day as recommended by the World Health Organization. In order to encourage youngsters to consume more FV, it is critical to understand the variables that affect their consumption.

According to Rasmussen et al., eating plenty of fruits and vegetables helps to promote health and prevent chronic disease. Increasing fruit and vegetable consumption among children and adolescents is a significant public health concern since in the majority of Western countries, broad population groups—including children and adolescents—eat significantly less fruit and vegetables than is advised. Relatedly, Demydas, 2011" Consumer Segmentation based on the level and structure of fruit and vegetable intake: empirical evidence for US adults from the National Health and Nutrition Examination Survey (NHANES) 2005-2006", Public health Nutrition, 2011.

Likewise, the Department of Labor and Employment Food Company Inc. states that Carrots (*Daucus Carota*) are an excellent source of beta carotene (pro-vitamin A), fiber, proteins, and others. This help maintains eye and skin healthy and reduces the risk of certain cancer. They could be consumed either fresh, made into a salad, or cooked alone or with other products etc. On the other hand, squash (*Cucurbita Maxima*) is also known for its phytochemical constituents such as alkaloids, and flavonoids, have anti-diabetic, antioxidant, and anticarcinogen properties. Sweet potatoes are among the healthiest foods since they are high in provitamin A, B, C, and potassium. Additionally, it is a great source of vitamins and beta-carotene. It has one of the greatest nutritional values among the root vegetable categories. Similarly, it is an energy-giving food for the reason that it is high in carbohydrate content (De Jesus et. al).

Talabo and Kerylle (2007), on the other hand, said that squash (*Cucurbita maxima*) may be turned into flour, snacks, baked goods, and sauce. These goods' nutrient profiles are equivalent to those of bakery products sold in stores. The broad acceptance of prepared snacks for children makes these products a good vehicle for nutritional improvement. The results demonstrated that baking characteristics of baked goods including loaf bread, pan de

sal, hamburger buns, biscuits, and cookies are not significantly changed by the partial substitution of wheat flour with squash flour.

George Washington Carver created 118 goods from sweet potatoes, including adhesive for postage stamps and starch for sizing cotton garments, in keeping with the sweet potato. This simply means that this raw material could be developed not just for food production but also for other household and other institutional purposes. Additionally, North Carolina is the country's top producer of sweet potatoes, accounting for around 40% of the market. The official vegetable of North Carolina is sweet potatoes. On the other hand, sweet potatoes are a great method to eat healthily because they are free of fat and cholesterol.

Similarly, sweet potatoes have special health advantages. They are packed with antioxidant vitamins A, C, and E, which can help prevent cancer and heart disease, boost immunity, and even slow the aging process by supporting healthy vision and skin. Because of this, they have been recently reclassified as an "antidiabetic" food. They have anti-inflammatory properties and can fend off emphysema. It has a lot of beta-carotene as well. They were also regarded as superfoods and made great accompaniments to poultry, pig, cattle, lamb, or shellfish. They are an excellent source of copper, manganese, potassium, iron, and vitamin B-6. Almost every recipe that asks for apples, squash, or white potatoes can also use them in place of those ingredients (Wayne E. Bailey Produce Company).

According to Somoray, sweet potatoes fall under the category of macro nutrients food because of its contribution on the distribution of carbohydrates into the body. It serves as a source of energy, has a protein-sparing effect, is essential for healthy fat metabolism, and stimulates peristaltic movement in the gastrointestinal tract. Additionally, it takes up water to give the intestines bulk.

Significantly, carrots and sweet potatoes built a significant contribution on the 2014 FNRI and Uniliver Philippines collaboration about menu guide calendar which focuses the guide to supplementary feeding for children in the Philippines. Montejo also added that with these supplementary feeding recipes highlighted in the 2014 Calendar, will work as one towards creating a healthy environment that gives importance to children's

nutrition and well-being. This simple act ensures that children will live healthy and have productive lives; he also reiterated that it is important to invest in better nutrition among children that can also help families, communities, and countries break the cycle of poverty. This collaboration gave enough strength on the conduct of this study which also emphasizes on the health benefits that could be achieved by the consumption of these well-known vegetables. This means that these vegetables are contributors towards attaining healthy body specifically for children.

Capanzana also added that supplementary foods are given to schoolchildren to fill the inadequacy of food and nutrient intake. The act of giving food to kids in addition to their normal meals is known as supplemental feeding. This takes the shape of hot meals provided to kids during school breaks. The produced cycle menu can be used as a manual by feeding coordinators to help them plan and prepare wholesome meals for schoolchildren. This calendar has twelve dishes that can be added to the current menus at the school for a larger variety and range of foods to serve. The recipes include appetizers and hearty soup/snack items. This recipe includes mixed veggie Arroz, creamy macaroni soup, kiddie ginatan, veggie fritters, vegetable dumplings, veggie rice toppings, and others.

In a similar vein, the United States Department of Agriculture (USDA) cited the first lady of the United States' campaign on the healthy, hunger-free kids act, which was signed by President Obama. USDA made the first significant changes to school meals in 15 years, helping to raise a healthier generation of kids. The new guidelines link school lunches with the most recent nutritional research and the actual conditions seen in American classrooms. These ethical changes take care of children's health in a way that can be implemented in schools across the country. In order to have a better lifestyle, schoolchildren must eat fruit and vegetables.

Similarly, according to Zamora et al., the intake of fats, oils, and meats has increased while the consumption of vegetables, fruits, and starchy roots and tubers as rice alternatives or supplements has largely decreased. The most common form of malnutrition among Filipinos is stunting. For children, pregnant women, and nursing mothers, vitamin A deficiency, iodine deficiency disorder, and iron deficiency anemia continue to be major public health concerns. This simply indicates that there is a need to give more emphasis on the consumption of vegetables to the community.

The aforementioned programs were put into place to address food security and the dietary requirements of people, families, and communities. Numerous of these projects have been effective because they used best practices that might be used to create a superior strategy that maximizes the relationship between agriculture and nutrition.

In a similar way, according to Elizabeth Cohen (2011), Senior Medical Producer for CNN, youngsters should consume half of their diets as fruits and vegetables. Not hamburgers, hot dogs, or chicken fingers, but broccoli, squash, and other aliments derived from the earth.

The development and utilization of these three vegetables such as carrot squash, and sweet potato is the answer to some issues and concerns about nutrition and food shortage.

II. OBJECTIVES

This research focuses on the utilization and level of acceptability of the developed product made from sweet potato, squash, and carrots. Specifically, this study sought to Develop Vegetable cookies, Compute the nutrition information of the product and determine the level of acceptability of the developed product through sensory evaluation.

III. METHODOLOGY AND MATERIALS

This research focuses on the utilization and level of acceptability of the developed product made from squash, sweet potato, and carrots. Along with the processes the study was conducted inside the Sorsogon State College Food Service Management Laboratory Sorsogon City Campus. The procedure was divided into four parts, the production of grated carrots, grated Squash, sweet potato and the vegetable cookies.

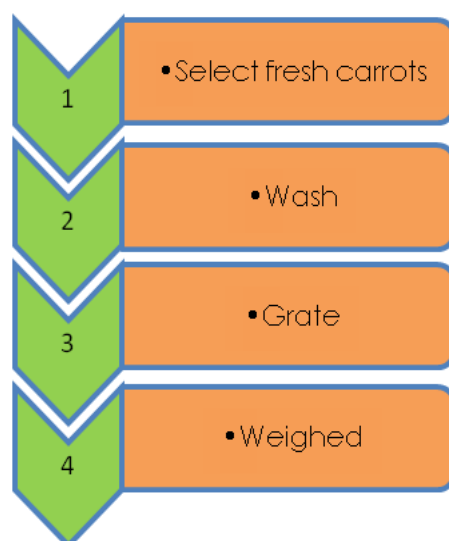




Fig. 1: Production of Grated Carrots

Figure 1 shows the production of grated carrots. The raw material used should be in good shape. The carrots should be smooth and a hearty orange color. It is best to choose carrots that contain some greens attached, as this means to taste fresher. The size should be medium since this is the easiest to cook; thick carrots are often tough and harder to cook with. Aside from this, it should be free from

blemishes or cracks, flabby or rubbery texture or carrots that have been sunburned since this will affect the product. The second step is washing the vegetable to lessen microbes that might be present on the surface of the raw material. Next step is grating the vegetable followed by weighing to get the exact proportion to be used in the product. An accurate and calibrated weighing scale is advisable.

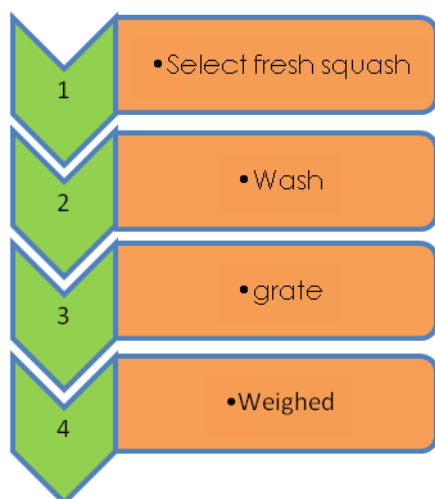


Fig. 2: Production of Grated Squash

Figure 2 shows the production of grated squash. Select good quality product, Squash must be free from defects and irregularities because this produces an unacceptable taste, It is also advisable to utilize squash that still has latex on its stem for the reason that this shows that squash is newly harvested. The second step is to wash the squash thoroughly

to minimize microbial contamination and remove any foreign material that might be present in the product. The next step is grating the vegetable to come up with uniform sizes. The next process is weighing the grated squash using an accurate weighing scale.

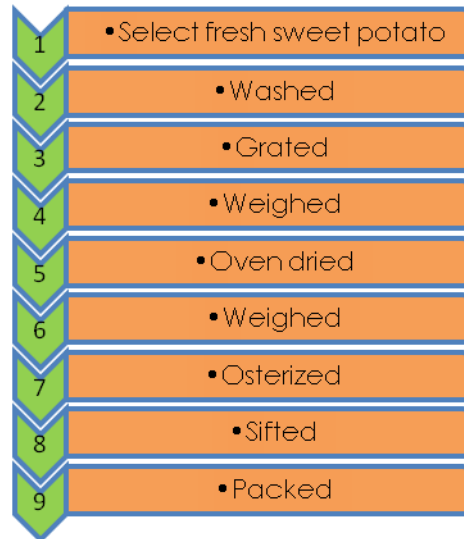


Fig. 3: Production of flour

Figure 3 represents the process making of sweet potato flour. After selecting good quality raw material, the first process is to wash raw material thoroughly. Knowing the fact that most sweet potatoes are sold in the market with bruises and sometimes covered with mud, then there is a very big possibility that most of the microbes will stick on the root crop, therefore a thorough washing is needed. The second step is to grate sweet potato to achieve even sizes and for a faster drying process. Weighing of the product is done before and after oven drying to determine the moisture

loss and the total yield as well. The grated sweet potato is placed into a clean and sanitized baking sheet and oven dried for 1 hour and 15 minutes at 150 C. It is advisable that the oven should not be opened once in a while for this may affect the character of the product. The following process is to weigh oven-dried sweet potato, and do the process of grinding. The grinder used was stainless and previously sanitized. The next process is to sift the flour using a 30 mesh flour sifter. Lastly, it is packed in a polyethylene bag, tightly sealed and stored in a room temperature

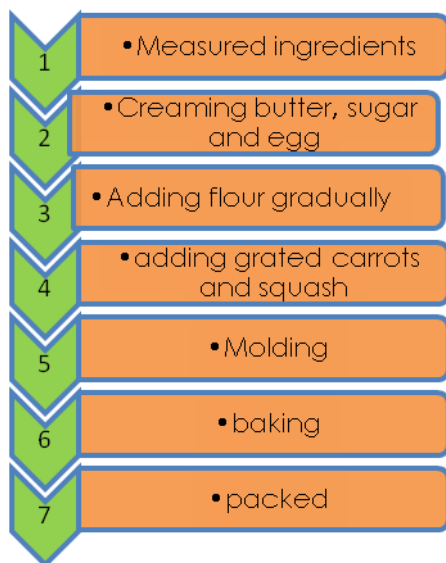


Fig. 4: Production of Vegetable Cookies

Figure 4 illustrates the production of vegetable cookies. The first step is to measure all the ingredients needed such as sugar, grated squash margarine, cheese cornstarch and carrots using an accurate weighing scale. The second step is to cream the butter, sugar and egg. This is followed by gradually adding the combined measured cornstarch and sweet potato flour. The next step is the addition of grated carrots and squash, If the mixture is dry enough and reaches the appropriate consistency for it to be molded it will be placed in a sanitized dredged table for molding. The molded cookies will be placed in a greased cookie sheet ready for baking for about 20 minutes or until it reaches golden brown in color. The last step is packing with the desired packaging material.

IV. DISCUSSIONS OF RESULTS

The development of cookies conducted three treatments. The study used variations in three raw materials utilized such as sweet potato flour, carrots and squash. The first trial was done with the highest proportion of sweet potato flour around 300g, but a bit lower in grated carrots and grated squash which has 100 g, as compared to the other two trials. The level of the likeness of the product as evaluated given by the panelists composed of Food Service Management students and faculty members was like very much using the nine (9) point hedonic scale. Moreover, most of the comments from the sensory evaluators are all positive such as sweet taste, crunchy, and is pleasing to the eye because of the different shapes.

The second trial has a lesser in measurement of sweet potato flour (285g), but higher in grated carrots and grated squash (105g and 111g respectively). Result shows that the outputs texture was higher in moisture and difficult to be

molded as compared to the first trial. The overall likeness as cited by the panelist was like moderate. Moreover treatment 3 was rated also as like moderately.

Ingredients	Treatment 1	Treatment 2	Treatment 3
	%	%	%
Sweet Potato Flour	30	28.5	27
Cornstarch	19.5	19.5	19.5
Butter	10.5	10.5	10.5
Carrots	10	10.5	11.5
Squash	10	11	11.5
Eggs	10	10	10
White sugar	5	5	5
Margarine	4	4	4
Cheese	1	1	1
Yield	83	80	78

Table 1: Grams and Percentage of Three Treatments made for Cookies

Tables 1 show the percentage and grams of vegetable cookies utilizing carrots, squash and sweet potato flour. The total weight of the identified treatments is 1000 grams; but the overall yield cited for Treatment 1 is 83% which is equivalent to 830g grams, 80 % (800 g) for Treatment 2, and

780 grams which is 78% for Treatment 3. It is noted that aside from the fact that Treatment 1 was the most acceptable product as evident in the result of the sensory evaluation; hence it has the highest percentage in yield indicating a much higher output.

9 Hedonic Scale	T1	T2	T3
Like extremely (9)			
Like very much (8)	✓ (10)		
Like moderately (7)		✓ (5)	✓ (5)
Like slightly (6)			
Neither like nor dislike (5)			
Dislike slightly (4)			
Dislike moderately (3)			
Dislike very much (2)			
Dislike extremely (1)			

Table 2: Cookies Sensory Evaluation Result

Table 2 shows the panelist evaluation result for the cookies. The nine (9) point hedonic scale by Peryam,1952 was utilized in the study. This has been used by the twenty (20) panelists in evaluating the three samples. The product acceptability was conducted after having three trials to come up with the most acceptable product. The sensory panelists chosen to evaluate the product must meet a number of requirements, including desire to taste the product,

availability during the evaluation, freedom from allergies, in good physical shape, and not smoking. After which, the evaluation was conducted, the area was free from noise and other disturbances for a more reliable result. The overall acceptability of the product presents that Treatment 1 got the highest acceptability while Treatment 2 and Treatment 3 demonstrated a like moderate result.

Nutrition Information

Size per serving (100g)

Products amount Per Serving

Fat from Calories 16.10

Calories 236.33**Percent per Daily Values***

Equivalent fat 10.23

16%

Total Saturated Fat 0.57

3%

Cholesterol 42.30

14%

Sodium 43.77

2%

Total Carbohydrate 33.67

11%

Dietary Fiber 1.54

6%

Sugars 7.08

Protein 1.96

4%

Content Vitamin A 222%

Content Vitamin C 4%

Calcium
composition
102%Percentag of
Iron 101%

* Percent Daily Values are based on a 2000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Table 3: Nutrition Information

The above table presents the computed nutritive value identified in the most acceptable vegetable cookies. The raw materials' nutritional content was the basis for the computation of the products nutrition facts; this includes grated carrots, grated squash and the sweet potato flour. Serving size is approximately nineteen (19) pieces weighted to 100 grams. The percentage of Daily Values is based on a diet of 2000 calories.

The vegetable cookies contains 16.10 calories from fat, 236.33 calories, 10.23 total fat (16%), 0.57 saturated fat (3%), 42.30 cholesterol (14%), 43.77 sodium (2%), 33.67 total carbohydrates (11%), 1.54 dietary fiber (6%), 7.08 Sugars, 1.96 protein (4%), 222% vitamin A, 4 % vitamin C, 102% calcium, 101% Iron.

V. CONCLUSION

Considering the findings of this study, the below conclusions are made:

- That the cookies were done by utilizing grated fresh carrots, squash and sweet potato flour.
- The computed Nutrition facts of the most acceptable product demonstrate that cookies are nutritious.
- Treatment 1 shows the highest level of acceptability of the developed product as shown by the evaluation given by the panelist.

VI. RECOMMENDATIONS

To further improve the production of vegetable cookies the following are recommended:

- Production of vegetable cookies be introduced to the community.
- Create a molder having different shapes but the same weight intended for cookies to attain uniform weight of the product even it is in different shapes.
- Improve the packaging of the developed product.
- Pursue another study concerning on the shelf life of the developed product.
- To come up with a more strong overall acceptability of the product by conducting a consumer test.

REFERENCES

- [1.] Gatchalian M.M. and Sonia De Leon (1992). Introduction to Food Technology. Manila: Merriam & Webster Bookstore, Inc.
- [2.] De Jesus et. al (2013). Development of Nutri Noodles Utilizing Tubers and tops of sweet Potato (*Ipomea batatas*).
- [3.] Habla, Fely, Concepcion J. Cambaliza, Tarcela F. Detera Mateo Luis G. Janer and Geraldine De Jesus (2012) "Development of an Enriched Lubi-Lubi

- (*Ficus pseudopalma*) Noodles, JPAIR Multidisciplinary Research. Vol. 10 · October
- [4.] Lupien, J.R (EDS), International Union of Food Science and Technology Robertson, G.L, Using Food Science and Technology to Improve and promote National Development.
- [5.] Elohor O. et.al, Studies on the Production and Utilization of dried cassava Chips as human Food.
- [6.] Suslow, T.V. and M. Cantwell. 1998. Squash (soft rind). Fresh produce facts, <http://postharvest.ucdavis.edu>.
- [7.] Warncke Darryl D., Nutrient Management for Cucurbits: Melons, Pumpkin, Cucumber and Squash, Department of Crop and Soil Sciences Michigan State University.
- [8.] MM Molla et.al, Study on the suitability of Banana Varieties in Relation to Preparation of Chips.
- [9.] Arganosa et.al Analysis of banana processing Business in their support environment in the Philippines.
- [10.] M.M Gatchalian and S.Y De Leon 1992, Introduction to Food Technology. <http://jmyinvestigatoryproject.blogspot.com/2009/04/feasibility-of-squash-as-additive-in.html?m=1>
- [11.] Talabo Anna Kerylle D. et. al 2007. Utilization of Squash Flour in Polvoron Making.
- [12.] Mette Rasmussen,¹ Rikke Krølner,¹ Knut-Inge Klepp,² Leslie Lytle,³ Johannes Brug,⁴ Elling Bere,² and Pernille Due¹ (2006) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies.
- [13.] Steinmetz KA, Potter JD. Vegetables, fruit, and cancer prevention: A review. J Am Diet Assoc. 1996;96:1027–1039.
- [14.] Bazzano LA. Dietary intake of fruit and vegetables and risk of diabetes mellitus and cardiovascular diseases Background paper for the joint FAO/WHO Workshop on Fruit and Vegetables for Health, 1–3 September Kobe, Japan. 2004.
- [15.] Rikke Krølner, Mette Rasmussen, Johannes Brug, Knut-Inge Klepp, Marianne Wind and Pernille Due (2011) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part II: qualitative studies.
- [16.] FNRI, Uniliver Philippines 2014, Menu Guide Calendar, Your Guide for Supplementary Feeding for Children (<http://www.fns.usda.gov/cnd/Governance/Policy-Memos/2012/SP10-2012ar6.pdf>), and to SP 28-2013 (<http://www.fns.usda.gov/cnd/Governance/Policy-Memos/2013/SP28-2013os.pdf>)
- [17.] Oscar B. Zamora, Lucille Elna P. de Guzman, Sue Liza C. Saguigui, Ma. Theresa M. Talavera, Normahitta P. Gordoncill, 2013 Leveraging agriculture to improve nutrition in the Philippines.