United States Agency for International Development
Peanut Collaborative Research Support Program

USA ✦ PHILIPPINES

MONOGRAPH SERIES
No. 9

IMPACT ASSESSMENT OF PEANUT-CRSP PROJECTS IN THE PHILIPPINES - PART 2

Department of Food Science and Technology
University of Georgia
Griffin, Georgia
USA

The University of Georgia

Food Development Center
National Food Authority
Taguig, Metro Manila
Philippines

Department of Food Science and Nutrition
University of the Philippines
Diliman, Quezon City
Philippines

Department of Agricultural Chemistry and Food Science
Leyte State University
Leyte
Philippines

April 2007

United States Agency for International Development
Peanut Collaborative Research Support Program
Project 04
(USA and Philippines)
MONOGRAPH SERIES
No. 9

Department of Food Science and Technology
University of Georgia
1109 Experiment St.
Griffin, Georgia 30223-1797
USA

Food Development Center
National Food Authority
Department of Agriculture
FTI Complex, Taguig City 1632
Metro Manila, Philippines

Department of Food Science and Nutrition
College of Home Economics
University of the Philippines
Diliman 1101
Quezon City, Philippines

Department of Food Science and Technology
Leyte State University
Visca, Baybay, Leyte 6521-A
Philippines

IMPACT ASSESSMENT OF PEANUT-CRSP PROJECTS IN THE PHILIPPINES
Part 2

Alicia O. Lustre[1]
Lutgarda S. Palomar[2]
Ma. Leonora dL. Francisco[3]
and
Anna V.A. Resurreccion [4]

[1]Co-Principal Investigator USAID Peanut-CRSP; Director, Food Development Center 1632, Philippines
[2]Professor, Leyte State University 6521-A, Philippines
[3]Assistant Professor, College of Home Economics, U.P. Diliman 1101, Philippines
[4]Principal Investigator USAID Peanut-CRSP; Professor, University of Georgia, Griffin, Georgia 30223-1797, USA

April 2007

ACKNOWLEDGEMENT

The authors acknowledge the Peanut Collaborative Research Support Program (Peanut-CRSP) of the United States Agency for International Development (USAID) for providing research funds through Grant No. LAG-G-00096-00013-00.

We would also like to thank Dr. Tim Williams, Program Director of Peanut-CRSP for his support of our research activities, Dr. Anna V. A. Resurreccion, for her leadership as principal investigator of this Peanut-CRSP project, and Dr. Manjeet S. Chinnan and Dr. Larry R. Beuchat for their valuable contribution to the project.

Our gratitude is extended to all our industry collaborators for their cooperation in the implementation of these research studies.

We are grateful to the respondents who provided the necessary data for the completion of the survey part of the project, and all the interviewers for their efforts in data collection.

The support of Ms. Marina Escaño, Division Chief, Food Development Center (FDC) Support Services, for assistance in monitoring and reporting expenses is greatly appreciated.

We thank Ms. Jocelyn M. Sales for editing the manuscript and for making all arrangements for its printing, and Ms. Edith San Juan for her technical support in the preparation of this monograph.

TABLE OF CONTENTS

IMPACT ASSESSMENT OF PEANUT-CRSP PROJECTS IN THE PHILIPPINES - Part 2

LIST OF TABLES

Chapter 1. Impact Assessment and Shelf Life of Stabilized Vitamin A Fortified Peanut Butter

Chapter 2. Impact Assessment of the Development, Technology Transfer, and Adoption of Fine Peanut Bar and its Shelf Life

Chapter 3A. Impact Assessment of Stabilized Peanut Butter by a Small Company in Metro Manila

Chapter 3B. Impact Assessment of Stabilized Peanut Butter

Chapter 4. Shelf Life of an Improved Peanut Brittle from Mindanao

Chapter 5. Impact Assessment of Peanut Cookies

Chapter 6. Impact Assessment and Shelf Life of a Peanut Brittle from the Visayas

LIST OF FIGURES

Chapter 1. Impact Assessment and Shelf Life of Stabilized Vitamin A Fortified Peanut Butter

Chapter 2. Impact Assessment of the Development, Technology Transfer, and Adoption of Fine Peanut Bar and its Shelf Life

Chapter 3A. Impact Assessment of Stabilized Peanut Butter by a Small Company in Metro Manila

Chapter 3B. Impact Assessment of Stabilized Peanut Butter

Chapter 4. Shelf Life of an Improved Peanut Brittle from Mindanao

Chapter 5. Impact Assessment of Peanut Cookies

Chapter 6. Impact Assessment and Shelf Life of a Peanut Brittle from the Visayas

CHAPTER 1

IMPACT ASSESSMENT AND SHELF LIFE OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

Alberto R. Cariso [1]
Edith M. San Juan [2]
Amelita C. Natividad [3]
and
Anna V. A. Resurreccion [4]

[1] Division Chief, Food Development Center 1632, Philippines
[2] Supervising Research Specialist, Food Development Center 1632, Philippines
[3] Senior Research Specialist, Food Development Center 1632, Philippines
[4] Principal Investigator Peanut CRSP; Professor, University of Georgia, Griffin, Georgia 30223-1797, U.S.A.

ABSTRACT

This chapter is on the initial effect of the adoption of a technology for vitamin A fortification by a large peanut processor, Tobi Marketing Inc. (TMI) an industrial partner and collaborator that produces and sells different peanut butter product lines, some of which are fortified with vitamin A. The company is interested in obtaining the Department of Health (DOH) seal of approval for a fortified food, called the "*Sangkap-Pinoy"* seal.

The Peanut CRSP technology for vitamin A fortification, developed by Peanut CRSP investigators at FDC, was transferred to the collaborating industry earlier and is found in a separate report, Peanut CRSP USA-Philippines Monograph Series No. 5, Chapter 5b (PCRSP, 2006). After adoption of the technology in the collaborator's plant, an assessment of the potential impact of the technology transfer was carried out by interviewing the company's Head of Research and Development (R&D Head). Initial feedback from the R&D Head indicated that the company adopted the recommended procedures for adding the fortificant. Although the new technology increased the production time for peanut butter, TMI was willing to adopt the new peanut butter fortification process, as it was the only way to evenly distribute the vitamin A in the product.

TMI verbally declared that they would proceed to apply to get the fortification seal of approval of the government as soon as the shelf life of the product is known. Determination of shelf life of the product is a requirement set by the DOH for approval of the "*Sangkap Pinoy"* seal. A shelf life study using temperature acceleration methods was implemented in March 2007 and is ongoing. After 1 month of storage, the product remains acceptable.

INTRODUCTION

The technology for the manufacture of a stabilized vitamin A fortified peanut butter (Agustin *et al.*, 2006) published in Peanut CRSP USA-Philippines Monograph Series No 5, Chapter 5b (PCRSP, 2006), was offered to a large peanut processing industry, Tobi Marketing Inc. (TMI) the industry partner and collaborator based in Metro Manila, for adoption. The industry partner was identified by the Food Development Center (FDC) and is one of their existing clients. The industry partner agreed to transfer and adoption of the technology to the company as they made plans to apply for a fortification seal of approval or the "*Sangkap-Pinoy*" seal from the Philippine Department of Health (DOH). Officials at TMI believed that adoption of the Peanut CRSP technology would fast-track their efforts in obtaining the government seal on their fortified peanut butter products.

Prior to transfer of the fortification technology and adoption by TMI, the collaborator was involved in the development, through its own R&D unit, a technology for vitamin A fortification of their peanut butter products, namely: (a) peanut butter creamy, (b) peanut butter crunchy, (c) peanut butter cashew, (d) peanut butter cashew bits, (e) peanut butter sweet and creamy and (f) peanut butter chocolate.

The technology transfer was completed in December 2006 and the document "Procedural Guideline for the Vitamin A Fortification of Sweet and Creamy Peanut Butter" was submitted to TMI on February 13, 2007 for adoption. Following technology transfer, the shelf life of this product had to be established to ensure that it contained the required vitamin A content (1/3 of RENI, Recommended Energy and Nutrient Intake) when purchased by consumers.

OBJECTIVES

This chapter aims to assess initial impact of the transfer and adoption of the fortification technology by presenting the experience of the collaborator after adopting the technology, and to report the status of shelf life tests, conducted to satisfy DOH requirements for the "*Sangkap-Pinoy"* seal. Due to the shortness of time since technology transfer was accomplished, to the closing of the Peanut CRSP project, a full impact assessment on the broad, long term economic and social effects resulting from the research and technology transfer could not be carried out. Furthermore, results of the shelf life test, reported in this monograph, cover only a one month period.

METHODS

IMPACT ASSESSMENT OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

Interview with TMI's Head of Research and Development (R&D Head)

The initial impact of technology adoption for the manufacture of stabilized vitamin A fortified peanut butter (Fig. 1.1) was determined through interviews with TMI's R&D Head, in order to assess their experience in adopting the stabilized peanut butter fortification technology in relation to their production operations and manpower needs. The following is the list of questions asked by FDC researchers regarding TMI's production operations (Table 1.1) .

Table 1.1 Questions asked by FDC researchers regarding TMI's production operations after the adoption of Vitamin A fortification technology

Question No.	Question
1	What were the difficulties encountered by the company in adopting the FDC technology for vitamin A fortification of stabilized peanut butter?
2	Would you still be willing to follow the FDC technology even with the increase in production time?
3	What was the most beneficial result of the technology transfer to your operation?
4	When do you plan to apply for the "*Sangkap Pinoy"* seal of the Department of Health?
5	What improvements in the FDC technology would you like to see in the future?

Data Collection

Data on production volumes, product sales, marketing outlets were obtained through a letter to the collaborator's Operations Manager requesting for the information.

Fig. 1.1 Tobi stabilized vitamin A fortified peanut butter

SHELF LIFE STUDY OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

Procedure for Sample Storage

Samples of stabilized Vitamin A fortified sweet and creamy peanut butter were prepared by TMI. The jars were labeled with the product name, the date samples were received, date of storage, and storage temperature. The samples were stored in incubators maintained at accelerated temperatures of 35, 37.5 and 40^{o}C and in shelves representing ambient conditions of approximately 30^{o}C, at the FDC Shelf Life Testing Room. In addition, reference samples were stored in a low temperature incubator maintained at 0-4^{o}C to maintain initial product quality. The samples were positioned, in the incubators and shelves, such that each jar was directly exposed to the required temperatures and other conditions in the testing incubators and shelf life testing rooms.

Determination of Sampling Frequency for Product Testing During Storage at 40^{o}C, 37.5^{o}C and 35^{o}C

Sampling frequency for product withdrawals during shelf-life testing was calculated using the following equation (Taoukis *et al*. 1997):

$$f_2 = f_1 Q_{10}^{\Delta/10}$$

where f_1 = sampling frequency at highest storage temperature which is 40^{o}C calculated as follows:

$$f_1 = \frac{\text{Predicted shelf life at } 40^{o}\text{C}}{\text{No. of sampling times}}$$

where, No. of sampling times = 6 (Labuza and Schmidl, 1985)

f_1 = 15 days

Calculation of f_2, sampling frequency at other storage temperatures studied:

f_2 = sampling frequency at other storage temperatures which are 37.5 and 35°C
Q_{10} = 2 for sensory quality loss (Labuza, 1984)
Δ = highest storage temperature which is 40°C minus other storage temperatures which are 37.5 and 35°C

Example: f_2 at 37.5°C = (15 days)$(2^{40-37.5/10})$ = 18 days

For products stored at 37.5°C, the calculated sampling frequency (f_2) that the product has to be evaluated will be 0 day + 18 days + 36 days until 6 evaluations have been made as 6 is the recommended number of sampling times for product testing (Labuza and Schmidl, 1985).

The same was done for samples stored at the other storage temperature (35°C).

The predicted shelf life was calculated using the equation of Labuza and Schmidl (1985) below.

$$Q_{10}^{\Delta/10} = \frac{\text{Shelf life at lower temperature, } t_{s1}}{\text{Shelf life at higher temperature, } t_{s2}}$$

where Q_{10} = 2, for sensory quality loss (Labuza, 1984)
t_{s1} = target shelf life at 30°C which is 6 months
t_{s2} = predicted shelf life at 35, 40 and 45°C
$\Delta = t_{s2} - t_{s1}$

Substituting,

a. Predicted Shelf Life at 40°C $= \frac{\text{Target shelf life at } 30^{\circ}C}{Q_{10}^{\Delta/10}} = \frac{6 \text{ months}}{2^{40-30/10}}$

$= 3$ months or 90 days

b. Predicted Shelf Life at 37.5°C $= \frac{\text{Target shelf life at } 30^{\circ}C}{Q_{10}^{\Delta/10}} = \frac{6 \text{ months}}{2^{37.5-30/10}}$

$= 3.6$ months or 108 days

c. Predicted Shelf Life at 35°C $= \frac{\text{Target shelf life at } 30^{\circ}C}{Q_{10}^{\Delta/10}} = \frac{6 \text{ months}}{2^{35-30/10}}$

$= 4.2$ months or 126 days

Below in Table 1.3 is the estimated time for product testing at each storage temperature based on the calculated sampling frequency. A total of 209 jars were incubated at above temperatures. The breakdown of the number of jars incubated and the number of samples withdrawn every sampling period are shown in Table 1.2

Table 1.2 Breakdown of the number of jars incubated and withdrawn every sampling period for the shelf life study of Tobi peanut butter

Type of sample	Analysis	No. of jars for analysis	Total no. of jars incubated
Initial	Vitamin A Aflatoxin	2	2
	Dsecriptive test for training and initial evaluation	10	10
4°C During storage	Consumer tests	3 jars/test x 6 tests x 3 temperatures	54
	Contingency for consumer tests	3 jars x 2 tests x 3 temperatures	18
30°C (Verification test)	Vitamin A	2	2
	Consumer test	3	3
	Descriptive test	2	2
	Contingency for Vitamin A	2 jars x 2 tests	4
	Contingency for consumer tests	3 jars x 2 tests x 3 temperatures	18
	Contingency for descriptive tests	2 jars x 1 test x 3 temperatures	6
35°C	Vitamin A	2 jars/ test x 6 tests	12
	Consumer tests	3 jars/ test x 6 tests	18
37.5°C	Vitamin A	2 jars/ test x 6 tests	12
	Consumer tests	3 jars/ test x 6 tests	18
40°C	Vitamin A	2 jars/ test x 6 tests	12
	Consumer tests	3 jars/ test x 6 tests	18

Table 1.3 Estimated time for product testing of stabilized vitamin A fortified peanut butter at storage temperatures of 40, 37.5 and 35°C, based on calculations of predicted shelf-life at these temperatures.

Storage Temperature (°C)	Estimated Time for Product Testing (Days)					
40	15	30	45	60	75	90
37.5	18	36	54	72	90	108
35	21	42	63	84	105	126

Product Tests Conducted

The quality of the product was evaluated initially (day 0) for packaging condition, sensory quality through descriptive analysis and consumer testing, vitamin A (Retinol) content, and aflatoxin content. Products stored at 40, 37.5, and 35°C were evaluated for acceptability through consumer tests, and vitamin A (Retinol) content after every sampling period.

Description of Product Tests Conducted

Tests for Initial Product Quality

Packaging condition. The packaging condition of the product was evaluated visually for presence of defects such as improperly sealed jars (USFDA, Bacteriological Analytical Manual, 2001).

Sensory evaluation.

Sensory evaluation by consumer testing. Consumer tests were conducted using 9-point hedonic scales (Peryam and Pilgrim, 1957). Thirty (30) consumers who were employees at the Food Terminal Inc. (FTI) were recruited to participate in the test. The criteria for the selection of the consumer panel were as follows: (1) had no food allergies, (2) were between the ages of 18 and 70, and (3) were consumers of peanut butter. The consumer test was conducted in an open room, at the Multipurpose Hall of the Food Terminal Inc. (FTI Complex, Taguig City).

Twenty-four grams of stabilized vitamin A fortified peanut butter in a 28 mL plastic sample cup, with lid, was presented to each of the 30 panelists for evaluation of its acceptability. The samples were coded with three digit random numbers and assigned randomly to each panelist. Each panelist evaluated 2 different samples at a time, a control sample and a sample stored at a test temperature.

The samples were evaluated in the order designated on each ballot. Consumers evaluated each sample for acceptance of odor, color, appearance, flavor/taste, texture/mouthfeel, and spreadability. Finally, consumers rated overall acceptance. The ballot in Appendix A was used by the panelists in evaluating the samples.

Sensory evaluation by descriptive analysis. Descriptive analysis using 150 mm unstructured line scales, was conducted prior to storage (day 0) at accelerated temperatures. The procedure for used in the descriptive analysis was similar to that used in the sensory profiling of peanut brittle published in Peanut CRSP USA-Philippines Monograph Series No. 7 (PCRSP,

2007). Panelists evaluated samples for the appearance attributes: brown color and oiliness; texture attributes: stickiness to lips, firmness and adhesiveness; Aromatics: roasted peanutty, peanut butter and oxidized; the tastes: sweet, salty and bitter; and spreadability. The ballot used is shown in Appendix B.

Vitamin A (Retinol) content. The method used was AOAC Official Method No. 974.29 (AOAC, 2005), using high performance liquid chromatography (HPLC), described in Chapter 4 of Peanut CRSP USA-Philippines Monograph Series No. 5 (PCRSP, 2006) .

Aflatoxin content. The thin layer chromatography method AOAC Official Method No. 970.45 (AOAC, 2005) was used in the analysis of aflatoxin content.

Tests for Determining Change in Product Quality During Storage at 40, 37.5 and 35^{o}C

Consumer sensory evaluation and Analysis of Vitamin A were as described above.

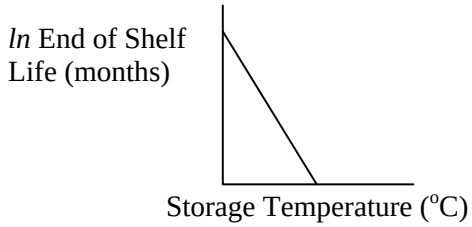
Determination of the End of Shelf Life at Three Accelerated Temperatures

The shelf life of a food product is defined as the period at which it will retain an acceptable level of eating quality from a safety and sensory point of view (Labuza, 2002). The end of shelf life of the product is established when the average rating of 30 consumers is less than 5, which corresponds to "dislike slightly" on the 9-point hedonic scale used in the consumer testing, on overall acceptance. Descriptive analysis described the properties of the control sample and the product at the end of its shelf life.

Construction of a Shelf Life Plot at Accelerated Temperatures of 40, 37.5, and 35^{o}C

A shelf life plot of the natural logarithm (ln) of the end of shelf life at the three accelerated temperatures of 40, 37.5 and 35^{o}C in months versus storage temperatures (Labuza and Schmidl, 1985) is constructed when product becomes unacceptable at the above temperatures.

Shelf Life Plot



Prediction of Shelf Life at 30^{o}C

The shelf life of the product at 30^{o}C was predicted using linear regression of the shelf life plot constructed as above.

Calculation of Q_{10} Value

The Q_{10} value is calculated based on the end of shelf life at 35°C and 40°C using the equation of Labuza and Schmidl (1985) below.

$$Q_{10}^{\Delta/10} = \frac{\text{Shelf Life at Lower Temperature}}{\text{Shelf Life at Higher Temperature}} = \frac{\text{Shelf Life at } 35^{o}C}{\text{Shelf Life at } 40^{o}C}$$

RESULTS

IMPACT ASSESSMENT OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

Impact on Production of the Collaborator in Adopting the Technology for the Vitamin A Fortification of Peanut Butter

The responses to questions of the Head of Research and Development (R&D Head) of a large industry collaborator are shown in Table 1.4. The table shows production time in the manufacture of stabilized vitamin A fortified sweet and creamy peanut butter at TMI increased, thus slowed down production. A follow-up interview revealed that this was due to a recommended four-time addition of the vitamin A fortificant to peanut butter at the cooling tank, using a mixing time of ten (10) minutes per addition. However, the company, was willing to adopt the recommended procedure with the realization that this was the only way to evenly distribute the vitamin A in the peanut butter.

Table 1.4 also shows that the most beneficial result of the technology transfer was the recommendation, by Peanut CRSP researchers at FDC, to add fortificant at the cooling tank rather than at the mixing tank, as previously practiced by TMI. The industry collaborator immediately adopted the recommended practice in their process.

When company officials were asked when they plan to apply for the "*Sangkap-Pinoy"* seal, they indicated they are only waiting for the completion of the shelf life test being done by Peanut CRSP before applying for approval of the fortification seal by the government. The above response indicates that the technology adopted by the company resulted in a product that gave the industry collaborator, TMI, the confidence to obtaining the DOH seal of approval for their fortified product.

Table 1.4 Responses to questions by the large industry collaborator on the initial effects of vitamin A fortification of stabilized peanut butter on the production operations.

Question No.	Question	Response [a/]
1	What were the difficulties encountered by the company in adopting the FDC technology for vitamin A fortification of stabilized peanut butter?	The production time has increased
2	Would you still be willing to follow the FDC technology even with the increased in production time?	Yes, as this was the only way to evenly distribute the vitamin A in the product
3	What was the most beneficial result of the technology transfer to your operation?	The identification by the Project to add the vitamin A fortificant at the cooling tank rather than at the mixing tank as we were previously doing.
4	When do you plan to apply for the "*Sangkap-Pinoy"* seal of the Department of Health?	As soon as we get the FDC report on the result of shelf-life testing, we will apply for the "*Sangkap Pinoy"* seal.
5	What improvements in the FDC technology would you like to see in the future?	Improvements on how to simplify the addition of the vitamin A fortificant and to shorten the production time.

[a/] Respondent: Research and Development (R&D) Head of the collaborator.

Impact on the Market

Although technology transfer to TMI had not resulted in commercial manufacture of stabilized vitamin A fortified sweet and creamy peanut butter, Peanut CRSP has brought the collaborator closer to obtaining the "*Sangkap-Pinoy*" seal and therefore being able to market peanut butter labeled as vitamin A fortified. This will have potential impact through availability of a peanut butter product in the market that will minimize Vitamin A deficiency (VAD) symptoms that affect a large percentage of children in the Philippines.

QUALITY AND SHELF LIFE OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

Results of Tests for Initial Product Quality (see Table 1. 5)

The packaging condition, chemical and sensory qualities of the stabilized vitamin A fortified peanut butter are shown in Table 1.5. Table 1.5 shows that the product package had no defects. Aflatoxin was not detected in the samples, and the vitamin A content was 13.0 μg RE/g, which was much higher than their declared value of 6.11 μg RE/g.

The consumer acceptance of the fortified peanut butter before storage was rated 7.0 or "like moderately." The sensory properties of the peanut butter, expressed in intensity ratings based on the reference samples prior to storage are: brown color, 90; oiliness, 30; stickiness to lips, 41; firmness, 122; adhesiveness of mass, 145; roasted peanutty aroma, 58; peanut butter aroma, 62; oxidized aroma, 0; sweet taste, 75; salty taste, 38; bitter taste, 5; and spreadability, 58.

Table 1.5 Quality characteristics of stabilized vitamin A fortified peanut butter packed in plastic jars prior to storage at 40, 37.5, and 35°C

Parameters	
1. Packaging condition	
Presence of defects such as improper sealing of plastic jars	None
2. Chemical quality	
2.1 Aflatoxin content (ppb) [a]	0
2.2 Vitamin A content (μg/g RENI)	13.0
3. Acceptability of the product [b]	Mean Ratings
3.1 Odor	7.1
3.2 Color	7.2
3.3 Appearance	7.2
3.4 Flavor/Taste	7.0
3.5 Texture/Mouthfeel	6.9
3.6 Spreadability	7.2
3.7 Overall liking	7.0
4. Sensory characteristics of the product [c]	Mean Intensity Ratings
4.1 Appearance	
Brown color	90
Oiliness	30
4.2 Texture	
Stickiness to lips	41
Firmness	122
Adhesiveness	145
4.3 Aromatics	
Roasted peanutty aroma	59
Peanut butter	62
Oxidized	0
4.4 Tastes	
Sweet taste	75
Salty taste	38
Bitter taste	5
4.5 Spreadability	58

[a] Limit of Detection (LOD) = 5 ppb

[b] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability mean ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely).

[c] Means are from ratings of 8 panelists in two replications. The test was conducted using unstructured line scales with anchors 12.5 mm from each end for the attributes of (4.1) appearance: brown color (12.5 = light brown, 137.5 = dark brown); oiliness (12.5 = less oily, 137.5 = very oily); (4.2) texture: stickiness to lips (12.5 = not sticky, 137.5 = very sticky); firmness (12.5 = soft, 137.5 = firm) ; adhesiveness (12.5 = less adhesive, 137.5 = very adhesive); (4.3) aromatics: perceptible (=12.5) and strong (= 137.5) for roasted peanutty, peanut butter and oxidized aroma; (4.4) taste: perceptible (=12.5) and strong (=137.5) for sweet, salty and bitter tastes; (4.5) spreadability (12.5 = not spreadable, 137.5 = very spreadable)..

Results of Tests for Product Quality During Storage (see Tables 1.6 to 1.8)

Tables 1.5, 1.6 and 1.7 show the mean ratings for acceptability, frequency of responses from the consumer tests, and vitamin A content of the product during storage.

Table 1.6 Mean ratings for acceptability of stabilized vitamin A fortified peanut butter packed in plastic jars during storage at 40, 37.5, and 35°C

Storage temperature (°C)	Storage time (days)	Mean ratings [a]						
		Odor	Color	Appearance	Flavor/ taste	Texture/ mouthfeel	Spreadability	Overall liking
4 (control)	0 (initial)	7.1	7.2	7.2	7.0	6.9	7.2	7.0
35	21	6.9	7.0	7.0	6.9	6.9	6.9	6.7
37.5	18	6.7	6.9	7.0	6.9	7.0	6.7	7.1
40	16	6.8	6.8	6.9	6.7	6.6	6.7	6.7

[a] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability with mean ratings of 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

Table 1.7 Frequency of responses for mean consumer ratings 6 and above, 5, and 4 and below for the acceptability of stabilized vitamin A fortified peanut butter packed in plastic jars and stored at 40, 37.5, and 35°C

Storage temperature (°C)	Storage time (days)	Rating [a]	Number of Responses						
			Odor	Color	Appearance	Flavor/ taste	Texture/ mouthfeel	Spread-ability	Overall liking
4 (control)	0 (initial)	6 and above	30	29	29	27	27	29	28
		5	0	1	1	1	0	1	1
		4 and below	0	0	0	2	3	0	1
35	21	6 and above	27	29	29	27	28	27	27
		5	2	1	1	1	1	2	2
		4 and below	1	0	0	2	1	1	1
37.5	18	6 and above	28	28	28	27	27	27	28
		5	1	1	1	1	1	1	1
		4 and below	1	1	1	3	3	3	1
40	16	6 and above	26	28	28	27	25	26	27
		5	2	0	0	0	1	1	0
		4 and below	2	2	2	3	4	3	3

[a] A 9-point hedonic scale was used for acceptability ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely)

Table 1.8 Vitamin A (retinol) content (μg/g) of stabilized peanut butter packed in plastic jars during storage at 40, 37.5 and 35°C

Storage temperature (°C)	Storage time (days)	Vitamin A (Retinol) content (μg/g)	Percent Vitamin A Loss (Initial content: 13.00 μg/g)
35	21	12.60	3.08
37.5	18	9.46	27.23
	36	9.36	28.00
40	16	8.78	32.46

Declared Vitamin A content on product label = 6.11 μg RE/g or 1/3 of Recommended Energy and Nutrient Intake (RENI)

The results in Tables 1.6 to 1.8 showed the following: (1) After storage for almost one month, the product remained acceptable to the consumer panel; (2) The vitamin A content decreased during storage from 13.00 to 8.78 μg RE/g at the highest temperature tested of 40°C. This represents a 32% decrease from its initial level, although the level, remained above the product label declaration of 6.11 μg RE/g. At 35°C, the decrease in initial level of vitamin A after one month is 3.08% or 12.6 μg RE/g; (3) This accelerated shelf-life study will continue to the end of shelf life, to be able to predict the shelf life at 30°C and to determine the actual Q_{10} of the product.

CONCLUSIONS

The industry collaborator, TMI, adopted a fortification technology developed by the Peanut CRSP project, that ensures consistent and appropriate levels of vitamin A in peanut butter. This technology brings TMI closer to marketing Vitamin A fortified peanut products bearing the . Department of Health (DOH) seal of approval for a fortified food, called the *"Sangkap Pinoy" s*eal. The delay in the marketing of a labeled Vitamin A fortified product by TMI is the requirement for the shelf-life of the product to be determined. These studies are ongoing and results will soon be available. The marketing of a Stabilized Vitamin A fortified peanut butter by a large scale manufacturer of peanut butter, such as TMI, the industry partner in this research project will likely increase the availability of a peanut butter to Vitamin A deficient consumers and improve their health status.

REFERENCES

Agustin, G. M., Lustre, A. O., Tenorio, L. C., and Resurreccion, A.V.A. 2006. Improvement of a Process for Vitamin A Fortification of Peanut Butter for a Large Company. Chapter 5b. In PCRSP (Peanut Collaborative Research Support Program). Monograph Series No. 5 Vitamin A Fortified Peanut Butter. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

AOAC (Association of Official Analytical Chemists). 2005. Official Methods of Analysis of AOAC International. 18th Ed. AOAC International. Gaithersburg, MD. USA.

Impact Assessment and Evaluation Group (IAEG) of the Consultative Group on International Agricultural Research (CGIAR), 2002. "Impact Assessment of Agricultural Research: Context and State of the Art". Paper prepared for the Workshop on Impact Assessment of Agricultural Research on Eastern and Central Africa (Uganda, November 1999). Food and Agriculture Organization, Rome.

Labuza, T.P. 2002. Determination of Shelf Life of Foods. Downloaded from http://www/courses.che.umn.edu/00fscn8334_1f/Pdf.Folder/General20%Shelf20%LifeReview.pdf on July 27, 2002.

Labuza, T. P. and Schmidl, M. K. 1985. Accelerated Shelf-life Testing of Foods. Food Technology. 39:57-63

Peryam, D.R. and Pilgrim, F.J. 1957. Hedonic Scale Method of Measuring Food Preferences. Food Technology. 11 (9): 9-14.

PCRSP (Peanut Collaborative Research Support Program). 2006. Improvement of a Process and Technology Transfer of Vitamin A Fortified Stabilized Peanut Butter for a Large Company, Chapter 5a. Monograph Series No. 5 Vitamin A Fortified Peanut Butter.. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

PCRSP (Peanut Collaborative Research Support Program). 2007. Consumer Acceptance, Sensory Profiling, Technology Transfer and Shelf Life of Peanut Brittle for the Manila Market. Chapter 4. Monograph Series No. 7 Peanut Confections and Snacks. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

Taoukis, P. S., Labuza, T. P. and Saguy, S. 1997. Kinetics of food deterioration and shelf-life prediction. Chapter 12 in Handbook of Food Engineering Practice, Valentas, K., J. Rotstein, E and P.R. Singh (Ed.), pp.361-403, CRC Press.

USFDA (United States Food and Drug Administration). 2001. Examination of Containers for Integrity. Chapter 22c in Bacteriological Analytical Manual (BAM) Online. Downloaded from http://www.cfsan.fda.giv/~ebam-22c.html on May 23, 2005.

APPENDIX A

BALLOT FOR THE CONSUMER TEST OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

Panelist # _____

CONSUMER TEST- Date:___ Sample # _____

Please answer the following questions by putting a check mark in the square that best reflects your feelings about this sample. Please smell the sample inside the package immediately after opening and answer the first question. Look at the sample and answer Questions 2 and 3; eat a spoonful of the sample and answer Questions 4 and 5; spread the rest of the sample on sliced bread and rate the spreadability of the sample; lastly, based on your responses for Questions 1 to 6, answer Question 7.

1. How would you rate the <u>ODOR</u> of the sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

2. How would you rate the <u>COLOR</u> of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

3. How would you rate the <u>APPEARANCE</u> of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

4. How would you rate the <u>FLAVOR/TASTE</u> of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

5. How would you rate the <u>TEXTURE/MOUTHFEEL</u> of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

6. How would you rate the <u>SPREADABILITY</u> of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

7. OVERALL, how would you rate this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

THANK YOU!

APPENDIX B

BALLOT FOR THE DESCRIPTIVE TEST OF STABILIZED VITAMIN A FORTIFIED PEANUT BUTTER

BALLOT FOR THE DESCRIPTIVE TEST OF PEANUT BUTTER

NAME:______________________ CODE:_____________

Date:________________________

Please put a vertical mark through the line scale to indicate the INTENSITY of each attribute (the scale is from 0 to150mm)

Appearance

Brown color

0 150

|____

Definition:
Brown color: Intensity of strength of brown color from light to dark brown
Reference/ Intensity Rating- Paper on tray= 0; JIF peanut butter = 35; Hershey"s chocolate syrup = 150; Warm-up = 90

Oiliness

0 150

|____

Definition:
Oiliness: Amount of oiliness on surface
Reference/ Intensity Rating- JIF peanut butter= 45; Miracle whip = 60; Vegetable oil = 150; Warm-up = 30

Texture

Stickiness to lips – Hold ¼ tsp on spoon; feel surface with lips

0 150

|____

Definition:
Stickiness to lips – amount of product adhering to lips
Reference/ Intensity Rating: JIF Peanut butter = 60; Warm up= 41

Firmness

0 150

|____

Definition:
Firmness: Force to compress sample
Reference/ Intensity Rating: Miracle whip= 50; JIF peanut butter= 110; Warm-up = 122

Adhesiveness

0 150

|____ _____ ______________ ____

Definition:
Adhesiveness: Degree samples sticks to palate
Reference/ Intensity Rating: Cream cheese=45; JIF peanut butter= 135; Warm-up = 145

Aromatics

Roasted Peanutty

0 150

|____ _____ ______________ ____

Definition:
Roasted peanutty - the aromatic associated with medium roasted peanuts
Reference/ Intensity Rating- Raw Peanut- 0; Planter's Peanut = 70; Warm-up = 59

Peanut butter

0 150

|____ _____ ______________ ____

Definition:
Peanut butter aroma – the aromatic associated with peanut butter containing 90% medium roasted peanuts
Reference/ Intensity Rating- JIF peanut butter = 70; Warm-up= 60

Oxidized

0 150

|____ _____ ______________ ____

Definition:
Oxidized- the flavor associated with oxidized fats an oils
Reference/ Intensity Rating- Oxidized oil = 45; Warm-up = 0

Tastes

Sweet

0 150

|____ _____ ______________ ____

Definition:
Sweet taste – the taste stimulated by sucrose
References/Intensity Rating: 2% sucrose solution= 20; 5% sucrose solution = 50;
10% sucrose solution = 100; 16% sucrose solution = 150;
Warm-up = 100

Salty

0 150

|____

Definition:
Salty taste – the taste stimulated by sodium chloride
Reference/Intensity Rating: 0.2% sodium chloride solution = 25; 0.35% sodium chloride solution = 50;
0.5% sodium chloride solution = 85; Warm-up= 38

Bitter

0 150

|____

Definition:
Bitter taste- the taste stimulated by caffeine
Reference/ Intensity Rating: 0.05% caffeine solution= 20; 0.08% caffeine solution= 50;
0.15% caffeine solution= 100; Warm- up= 5

Physical Test

Spreadability

0 150

|____

Definition:
Spreadability- Ease of spread of sample on bread
References/Intensity Rating: JIF peanut butter=75; Cream cheese =95; Mayonnaise = 145;
Warm-up = 58

Thank you!

CHAPTER 2

IMPACT ASSESSMENT of the DEVELOPMENT, TECHNOLOGY TRANSFER and ADOPTION of FINE PEANUT BAR and its SHELF LIFE

Alberto R. Cariso [1]
Edith M. San Juan [2]
Amelita C. Natividad [3]
Alicia O. Lustre [4]
and
Anna V. A. Resurreccion [5]

[1] Division Chief, Food Development Center 1632, Philippines
[2] Supervising Research Specialist, Food Development Center 1632, Philippines
[3] Senior Research Specialist, Food Development Center 1632, Philippines
[4] Co-Principal Investigator Peanut CRSP; Director, Food Development Center 1632, Philippines
[5] Principal Investigator Peanut CRSP; Professor, University of Georgia, Griffin, Georgia 30223-1797, U.S.A.

ABSTRACT

The impact of technology adoption for the manufacture of a type of peanut brittle called Fine Peanut Bar by a small industry collaborator, Nutcracker Homemade Products, was determined by evaluating the monthly reports on its production volume, market sales, manpower and operations.

The industry collaborator produced this new product for the first time for Philippine markets. The product was developed by adopting a peanut brittle technology from a Peanut CRSP project in Thailand (PCRSP, 2003) and referred to as "Tuub-Taab." The process for fine peanut bar was standardized in the collaborator's processing plant and the report is published in Chapter 5 of the Peanut CRSP USA-Philippines Monograph Series No. 7 (PCRSP, 2007). After the technology was adopted in September 2005, the industry collaborator began producing 106 Kg to 630 Kg per month of the Fine Peanut Bar for the Cagayan de Oro market in the northern part of Mindanao of the Philippines.

The industry collaborator was able to sell approximately 900 packs to 6,190 packs of the product, monthly from October 2005 to January 2007, and valued at about PhP18,000.00 to PhP129,000.00 pesos per month—resulting in a net profit of PhP6,000.00 to PhP63,000.00 every month. Adoption of the product technology developed in this project resulted in increased monthly income for the industry collaborator.

Retail sales of the Fine Peanut Bar to consumers was through the use of a company leased "island cart", in a large supermarket in Cagayan de Oro. The industry collaborator also allowed independent dealers to sell their product. This practice provided a business opportunity to additional individuals in the locality. In addition, to sustain production, the industry collaborator needed to employ a total of two to four employees, every month of production, and contributed stable jobs in its neighboring areas.

The industry collaborator reported that they could not expand production as their production area was small. Their decision was not to expand their production area, to control their expenditures, because they wanted to operate without loans. Any increases in production volume were derived from monthly earnings that were reinvested in raw materials and ingredients. The industry collaborator is planning to expand, in the future, through exports and use of a new packaging material, made from laminated foil, that could extend product shelf life.

A shelf life study on the Fine Peanut Bar product was conducted. The samples used in the study were prepared at the collaborator's plant in Cagayan de Oro City in Northern Mindanao. The product was packed in 135 mm x 87 mm (length x width, inner dimensions) laminated foil provided by the collaborator. The laminated foil had an average thickness of 0.1 mm. The product was stored at temperatures of 35, 37.5 and 40°C. Each pack contained 8 pieces of the product weighing 70 grams per pack.

Results of the shelf-life study of the product packed in laminated foil showed that the product remained acceptable up to 385 days of storage at 40°C, equivalent to 25 months at ambient conditions. At the end of the 25 month period, the product remained still acceptable to the consumer panel with mean ratings equivalent to "like moderately" for the sensory attributes texture/crunchiness, color, appearance, flavor/taste and overall liking. The product has exceeded the target shelf life of six (6) months at 30°C when packed in laminated foil with an average

thickness of 0.1 mm. However, prediction of shelf life at 30°C and calculation of actual Q_{10} could not be made at this time because the product has not reached the end of its shelf life at the accelerated temperatures.

INTRODUCTION

The technology for the manufacture of Fine Peanut Bar, a type of peanut brittle developed by Peanut CRSP investigators in Thailand, and referred to as "Tuub-Taab" was transferred to other Peanut CRSP investigators, including those from the Philippines, and was offered for adoption to a small industry collaborator, Nutcracker Homemade Products, in Cagayan de Oro in the northern part of Mindanao Island of the Philippines. The objective of the technology transfer was to provide simple and easily adoptable technologies to small and medium scale entrepreneurs that would open new opportunities to increase their household incomes and, by way of introducing a new product in the market, increase utilization of peanuts.

Through a collaborative agreement between the Northern Mindanao Peanut Industry Association, Inc. (NMPIA) of Cagayan de Oro, the Food Development Center (FDC), and the University of Georgia, the NMPIA assisted in identifying a suitable small industry collaborator for the project, among its member associations.

The technology for production of the Fine Peanut Bar was standardized by Peanut CRSP researchers at the Product Development Laboratory of FDC. The technology transfer was undertaken on September 27 to 30, 2005 at the Nutcracker Homemade Products processing plant and the collaborator began selling the product, up to this period at which the impact assessment was conducted.

An important aspect of technology transfer in the Peanut Collaborative Research Support Program (Peanut CRSP) is the measurement of the impact of the technology on identified economic and social factors. Collaborative agreements to transfer a Peanut CRSP technology to an industry collaborator included an agreement for the collaborator to provide production, sales, markets and other data relative to the marketing of the product, to the investigators, after adoption of the technology.

Another factor that affects the marketability of products is its shelf life. Knowledge of shelf-life is necessary in order to develop an appropriate marketing plan for the product. The shelf life of a food product varies, with the type of packaging material used, raw materials and ingredients, and the conditions of processing and storage. A previous study on peanut bar showed that the product will be acceptable only up to 83 days or 2.7 months at ambient condition using traditional polypropylene bags as packaging material. This study was conducted using a laminated foil as packaging material to establish the extension in shelf life that can be achieved.

OBJECTIVES

The objectives of this activity were to: (1) present the results of impact evaluation of the adoption, by a small industry collaborator, of the technology for the manufacture of fine peanut bar and marketing of the Fine Peanut Bar in Northern Mindanao, and (2) to determine the extension in shelf life of the product by using an alternate package of laminated foil.

METHODS

IMPACT ASSESSMENT OF FINE PEANUT BAR

Submission of Data on Production Volume, Market Sales, Manpower, and Operations

Every quarter, the collaborator-- Nutcracker Homemade Products, was requested to submit data on the following to determine the impact of the technology adoption: (1) Production Report, which includes the number of personnel, number of days of production, number of average batches produced in a day, average actual daily production in kilogram, total weight of incoming ingredients in kilograms, total weight of finished product produced in kilograms, and total weight of trimmings which were used as samples for tasting; (2) Marketing Report, which includes totals sales in number of packs, actual sales in pesos from direct sales to consumers, sales through independent dealers or peddlers, and sales through market outlets or stores, and total expenses per Kg of product; and (3) Evaluation/Remarks on Operations.

Collation and Evaluation of Data

The above monthly reports submitted by the collaborator were collated by Peanut CRSP researchers at FDC who evaluated the data. In addition, the FDC researchers visited the locality at Cagayan de Oro to verify the distribution areas and outlets of the industry collaborator. Market samples of products were collected from the sales areas to determine the aflatoxin content of the product and its sensory characteristics.

Fig. 2.1 The Nutcracker Homemade Products fine peanut bar

SHELF LIFE STUDY OF FINE PEANUT BAR

Procedure for Sample Storage

All samples for the shelf life study were properly labeled with the product name, Fine Peanut Bar, the date test samples were received, the date of storage, and storage temperature. Samples were stored in incubators maintained at accelerated temperatures of 35, 37.5, and 40^{o}C and on shelves representing ambient conditions about 30^{o}C, at the FDC Shelf Life Testing Room. Reference samples were stored in a low temperature incubator maintained at 0-4^{o}C. The samples were positioned, in the incubator shelves, such that the complete package was directly exposed to the required temperatures and other conditions of the testing incubators and Shelf Life Testing Rooms.

Determination of Sampling Frequency for Product Testing During Storage at 40, 37.5, and 35^{o}C

The procedures for calculating sampling frequency are as described in Chapter 1 of this Monograph. The estimated times for product testing are shown in Table 1.2 of Chapter 1 in this Monograph.

Product Tests Conducted

The quality of the product was evaluated initially (day 0) for packaging condition, sensory quality through descriptive analysis and consumer testing, and aflatoxin content. During storage at 40, 37.5, and 35^{o}C, the acceptability of the product was evaluated through consumer tests. The procedures for product tests conducted are as described in Chapter 1 of this Monograph, except that fine peanut bar rather than peanut butter samples were evaluated.

Determination of the End of Shelf Life at Three Accelerated Temperatures, Prediction of Shelf Life at 30^{o}C, and Calculation of Q_{10}

The shelf life of the fine peanut bar is the period at which it will retain an acceptable level of eating quality from a safety and sensory point of view (Labuza, 2002). The end of shelf life of the product is established when the average rating of 30 consumers is less than 5, which corresponds to “dislike slightly” in the 9-point hedonic scale used in the consumer testing, on overall acceptance. Descriptive analysis was used to quantify the attributes of the control sample and the product at the end of its shelf life.

Construction of a shelf life plot was as described in Chapter 1 of this Monograph. Likewise, the procedures for prediction of shelf life at 30^{o}C and calculation of Q_{10} value are as described in Chapter 1 of this Monograph.

RESULTS

IMPACT ASSESSMENT OF FINE PEANUT BAR

Table 2.1 shows the results of the monthly reports provided by the collaborator from October 2005 to January 2007.

Findings

Impact on Production

Figure 2.2 shows the monthly production volumes reported as the total weight of formulation that was mixed and the total net weight of products produced in kilograms. Production ranged from a low of 106 Kg to a high of 630 Kg. Incoming materials and ingredients used ranged from a low of 144 Kg to a high of 900 Kg. This represents an increase the demand of raw peanuts utilization in the locality brought about by the introduction and manufacture of the new product.

It also indicated the continued consumption of the product by the consumers. As reported by the collaborator, the hiring of an "island cart" in a big supermarket in Cagayan de Oro for selling the product, and massive marketing campaign and free product tasting in market areas greatly contributed to increasing demand for the product.

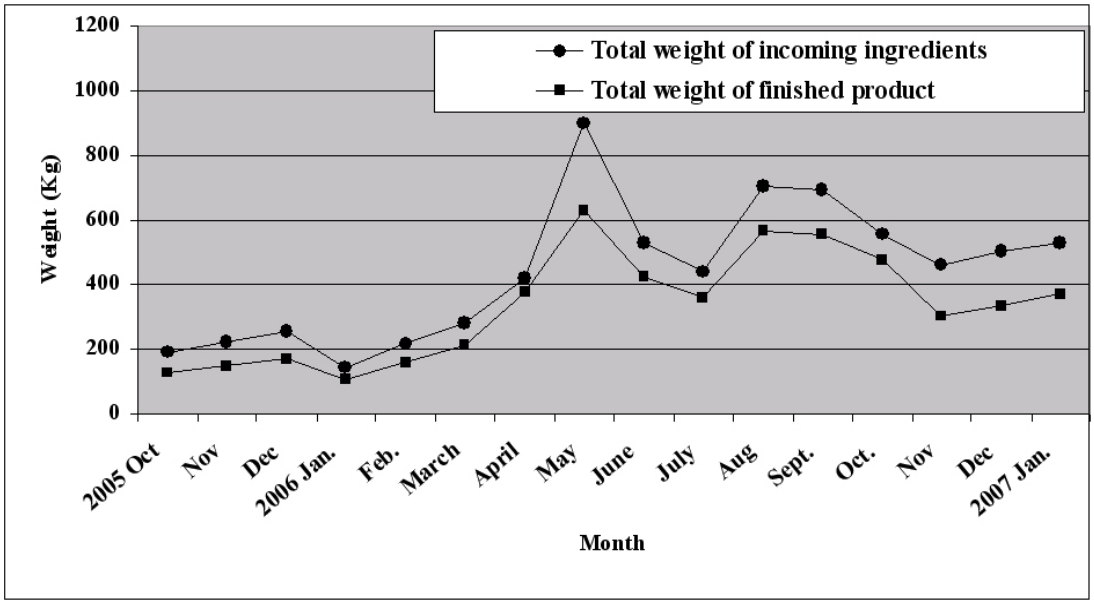


Fig. 2.2 Total weight of incoming ingredients and of finished product produced in the production of fine peanut bar, CY 2005, 2006 and 2007.

Table 2.1 Production and sales data for fine peanut bar, CY 2005, 2006 and 2007 of a small peanut product manufacturer

Parameters	Year and Month												
	2005			2006									2007
	Oct	Nov	Dec	Jan	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
I. PRODUCTION													
1. No. of personnel per day	3	2	2	2	4	3	2	3	2	2	3	3	2
2. No. of production days per month	16	14	16	12	30	22	20	22	30	23	20	20	22
3. Average no. of batches produced per day	2	2	2	2	4	3	3	4	3	3	3	3	3
4. Actual average production/in kilograms per day	12	16	16	12	30	24	22	32	24	24	23	25	24
5. Total weight of incoming ingredients in kilograms per month	192	224	256	144	900	528	440	704	695	556	460	500	528
6. Total weight of finished product produced in kilograms per month	128	147	167.2	106	630	424	357	563	554	475	299	335	370
7. Total weight of trimmings in kilograms per month	8	10	12	10	15	10	14	17	5	10	10	12	12
II. PACKAGING – Net weight of product per pack	100g	100g and 60g	60-70g	60-70g	50g	50g	50g	50g	50g	50g	50g	50g	50g

Table 2.1 *continued…*

Parameters	Year and Month												
	2005			2006									2007
	Oct	Nov	Dec	Jan	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
III. MARKETING/													
1. Sales in packs	1,280	2,480	1,342	901	5,705	4,237	3,579	6,190	6,094	5,228	3,220	2,990	4,120
2. Total sales in PhP (Philippine pesos)	38,300	54,050	27,875	18,305	118,282	87,860	73,960	127,908	110,124	107,648	67,650	63,960	84,875
a. Direct sales to customers	22,050	13,350	5,175	1,425	53,042	37,840	26,620	47,168	36,564	33,968	16,250	21,000	13,375
b. Sales through independent dealers or peddlers	16,250	40,700	6,800	5,260	26,080	29,320	32,000	22,440	21,560	24,440	29,000	33,560	30,540
c. Sales through retail outlets	None	None	15,900	11,620	39,160	20,700	15,340	58,300	52,000	49,240	22,400	9,400	40,960
3. Product returns in packs	0	0	0	0	32	16	2	9	42	8	0	2	10
4. Net profits (PhP) = total sales - total expenses	23,580	37,145	8,647	6,115	45,832	39,100	32,905	63,163	46,414	53,023	33,265	25,435	42,325
4a. Total sales (see III.2)													
4b. Total expenses = total weight of finished product produced X PhP 115 total expenses per Kg	14,720	16,905	19,228	12,190	72,450	48,760	41,055	64,745	63,710	54,625	34,385	38,525	42,550

Impact on Market

Table 2.1 shows the results of actual monthly sales of the collaborator in number of packs per month. They were able to sell about 1280 packs on the first month and as much as 6,190 packs per month weighing 50 grams to 100 grams per pack from October 2005 to January 2007. This represents the increase in purchase and consumption of the product by the local consumers.

Figure 2.3 shows the corresponding monthly sales in pesos and the collaborator's net profits in pesos. The sales were valued at about PhP18,000 (PhP = Philippine pesos) to PhP129,000 generating a net profit of about PhP6,000 to 63,000 per month. The net profit on February 2006 was not considered as the lowest, as this was the time when the collaborator submitted samples for shelf life testing to FDC without charge as part of the collaboration. The net profit was calculated based on a PhP115.00 production cost per kilogram of product. This represents a large contribution to the income of collaborator brought about by the addition of just one new product to their product lines. The collaborator sold its product directly to consumers in a company hired "island cart" (Fig. 2.4) in a big supermarket in Cagayan de Oro. The industry collaborator also allowed independent dealers and retailers to sell their product. This practice provided a business opportunity to other individuals in their locality.

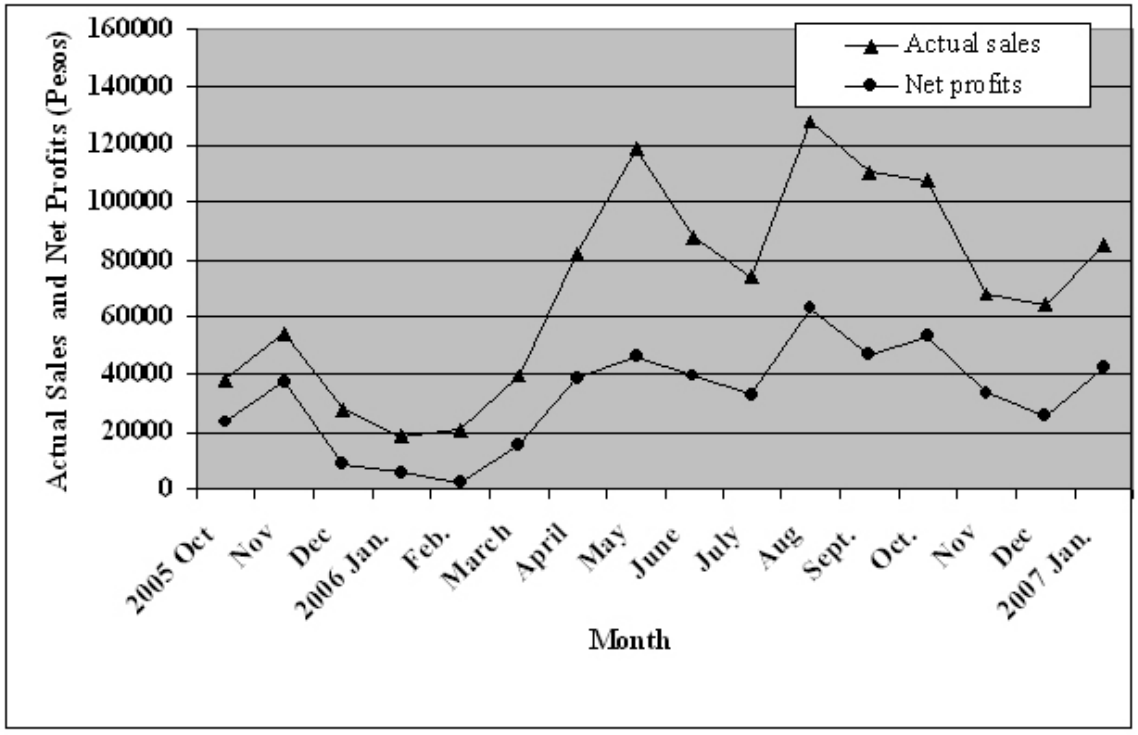


Fig. 2.3 Monthly actual sales and net profits, in Pesos, of fine peanut bar, CY 2005, 2006 and 2007.

Fig. 2.4 Nutcracker Homemade Products company hired "island cart" in a big supermarket in Cagayan de Oro.

The industry collaborator reported that in order to help promote and introduce the product, they did the following:

a. Used a local radio advertisement, four times a day, to introduce the fine peanut bar product
b. Joined a trade fair such as the "Fiesta Trade Fair" at a local mall that highlighted the products of the industrial partner, Nutcracker Homemade Products, including Fine Peanut Bar.
c. Co-sponsored a film premier showing in Cagayan de Oro, featuring MI-3 and Harry Potter films, which highlighted the product.
d. Distributed new fliers and brochures of Nutcracker including fine peanut bar among major products.

The promotional tools were found very useful in introducing the product to consumers and in creating awareness about the new product.

Impact on Manpower

In Table 2.2, the collaborator reported to have used 2 to 4 existing employees for their fine peanut bar production. These existing employees were able to work for additional 8 to 30 days per month for producing the fine peanut bar product. This provided stable jobs to their neighbors.

Problems Encountered After Adoption of Technology

The collaborator reported the following problems concerning the production of fine peanut bar:

1. After two weeks of production, there was moisture observed inside the plastic package of fine peanut bar, the product, however, was still good for consumption.
2. Product returns, though minimal, were due to softening of the product (although "soft to bite" was a quality characteristic associated with good quality product..
3. Some outlets were not allowed to obtain a credit line from the Nutcracker Homemade Products because the company has a policy to operate without credit. Increases in production volume were derived from monthly earnings, and part of which were invested in raw materials and ingredients. (No capital to establish a credit limit.)
4. Limitations in production capacity due to limited work area and lack of equipment such as a peanut blancher or deskinner and a silent cutter.
5. Limitations in launching a major sales promotional scheme due to limitations in capital and capacity. The increase in sales and investments were obtained from earnings of the fine peanut bar product. (Lack of capital)
6. Capital limitation for packaging since suppliers require a large volume of orders for laminated foil packaging material.

Lack of capital and the company policy of operating without borrowing or loans appeared to be the major constraints in expanding production of a small company.

Customers' Feedback About the Fine Peanut Bar Product

1. Good quality production in terms of "taste, brittleness, sweetness and soft to bite," (client description of the product)
2. Price is fair and competitive in the market
3. Good sample introduction
4. Pieces were not uniformly cut, thickness varies slightly

To address the uneven cutting, the collaborator has started discussion with the Philippine Department of Science and Technology (DOST) to help them with the fabrication of cutting machines.

Verification of the method of marketing of the product by the collaborator in Cagayan de Oro market was done. The FDC staff viewed their sales area in a large supermarket and visited some of its outlets. Market samples were collected and submitted for analysis for aflatoxin content at the FDC laboratory. Results obtained showed that there was no aflatoxin. This shows that the collaborator constantly implemented the sorting technology developed by Peanut PCRSP researchers to remove the aflatoxin contaminated nuts after dry blanching.

QUALITY AND SHELF LIFE OF FINE PEANUT BAR

Actual Time for Product Testing During Storage

Table 2.2 presents the actual sampling time for product testing during storage.

Table 2.2 Sampling schedule for product testing of fine peanut bar packed in laminated foil stored at accelerated temperatures (35, 37.5, and 40°C)

Storage Temperature (°C)	Basis of Sampling Schedule	Sampling Schedule (days)							
40	Based on client's targeted shelf life of six (6) months	0	15	30	45	90	147	155	158
37.5	Based on client's targeted shelf life of six (6) months	0	18	36	54	169	385		
35	Based on client's targeted shelf life of six (6) months	0	21	42	63	169	385		

Results of Tests for Initial Product Quality (see Table 2.3)

The packaging condition, sensory quality, and aflatoxin content of the product was acceptable and is shown in Table 2.3. The product had acceptable packaging condition as evidenced by the absence of defects. The sensory characteristics of fine peanut bar prior to storage at accelerated temperatures are presented in Table 2.3. Ratings of the different sensory attributes based on a 150 mm line scale were as follows: hardness on first bite, 90; fracturability on first bite, 70; hardness on first chew, 80; fracturability on first chew, 50; color, 95; surface shine, 95; roasted peanutty aroma, 55; sesame aroma, 15; caramel aroma, 100; salty taste, 35; and bitter taste, 5.

Results of Tests for Product Quality During Storage (see Tables 2.4 to 2.5)

The mean ratings for acceptability of the product during storage at accelerated temperatures are shown in Table 2.4. The frequency of responses for ratings 6 and above, 5, and 4 and below for the acceptability of fine peanut bar during storage is shown in Table 2.5.

After 385 days of storage at 40°C, fine peanut bar was still considered as "liked moderately" by the consumer panel with ratings ranging from 7.0 to 7.3 for the attributes texture/crunchiness, overall liking, color, appearance, and flavor/taste. Based on the above findings, the product is estimated to continue to have acceptable sensory quality up to 25 months at 30°C if packed in laminated foil with absence of defects such as improperly sealed ends and presence of punctures. The control samples after 385 days of storage were considered as "liked moderately" by the consumer panel.

The study will continue until end of shelf life is reached to be able to predict the shelf life at 30°C and to determine the actual Q_{10} of the product.

Table 2.3 Quality characteristics of fine peanut bar in laminated foil prior to storage at 35, 37.5 and 40°C

Parameters	Evaluation
1. Packaging condition	
Presence of defects such as improper sealing of laminated foil bags and presence of punctures	None
2. Chemical quality	
2.1 Aflatoxin content (ppb) [a]	None detected
3. Acceptability of the product [b]	Mean ratings
3.1 Texture/crunchiness	7.3
3.2 Overall acceptability	7.3
3.3 Color	7.1
3.4 Appearance	7.1
3.5 Flavor/taste	7.2
4. Sensory characteristics of the product [c]	Mean intensity ratings
4.1 Texture	
Hardness on first bite	90
Fracturability on first bite	70
Hardness on first chew	80
Fracturability on first chew	50
4.2 Appearance	
Color	95
Surface shine	95
4.3 Aromatics	
Roasted peanutty aroma	55
Sesame aroma	15
Caramel aroma	100
Rancid aroma	
4.4 Tastes	
Sweet taste	100
Salty taste	35
Bitter taste	5

[a] Limit of Detection (LOD) = 5ppb

[b] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability mean ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely).

[c] Means are from ratings of 8 panelists in two replications. The test was conducted using unstructured line scales with anchors 12.5 mm from each end for the attributes of (4.1) texture: hardness on first bite (12.5 = very soft, 137.5 = very hard); fracturability on first bite (12.5 = crumbly, 137.5 = brittle); hardness on first chew (12.5 = very soft, 37.5 = very hard); fracturability on first chew (12.5 = crumbly, 137.5 = brittle); (4.2) appearance: color (12.5 = off-white, 137.5 = brown) ; surface shine (12.5 = dull, 137.5 = glossy); (4.3) aromatics: perceptible (=12.5) and strong (= 137.5) for roasted peanutty, sesame, and caramel aroma; and (4.4) taste: perceptible (=12.5) and strong (=137.5) for sweet, salty and bitter tastes.

Table 2.4 Mean ratings for acceptability of fine peanut bar packed in laminated foil during storage at 35, 37.5 and 40°C

Storage temperature (°C)	Storage time (days)	Mean ratings [a]				
		Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
4 (control)	0 (initial)	7.3	7.3	7.1	7.1	7.2
	21	7.3	7.3	7.1	7.1	7.2
	30	7.7	7.8	7.6	7.7	7.8
	36	7.2	7.4	7.3	7.4	7.4
	45	7.2	7.1	7.2	7.0	7.1
	54	7.4	7.5	7.6	7.5	7.4
	63	7.7	7.6	7.7	7.6	7.4
	90	7.4	7.3	7.3	7.3	7.2
	147	7.3	7.4	7.0	7.2	7.6
	155	7.5	7.5	7.5	7.5	7.5
	170	7.5	7.4	7.5	7.4	7.4
	385	7.4	7.2	7.4	7.2	7.5
35	21	7.1	7.1	7.4	7.3	7.6
	42	7.1	7.1	7.1	7.1	7.0
	63	7.4	7.6	7.5	7.5	7.5
	385	6.0	6.4	6.2	6.4	6.0
37.5	18	7.0	7.0	7.2	7.2	7.1
	36	7.3	7.3	7.4	7.2	7.2
	54	7.2	7.3	7.4	7.4	7.3
	170	7.1	6.8	6.9	7.0	7.0
	385	7.0	6.8	7.1	7.0	7.0
40	15	7.0	6.9	6.9	7.0	7.0
	30	7.5	7.5	7.4	7.3	7.3
	45	7.3	7.2	7.1	7.1	7.2
	90	7.3	7.2	7.4	7.2	7.0
	147	6.2	6.7	6.8	6.6	6.6
	155	6.7	6.6	6.9	6.8	6.5
	170	7.1	6.9	7.1	7.2	7.0
	385	7.0	7.3	7.2	7.1	7.2

[a] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability with mean ratings where 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

Table 2.5 Frequency of responses for ratings 6 and above, 5, and 4 and below for acceptability of fine peanut bar packed in laminated foil and stored at 35, 37.5. and 40°C

Storage temperature (°C)	Storage time (days)	Rating [a]	Number of Responses				
			Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
4 (control)	0 (initial)	6 and above	28	28	28	28	29
		5	1	2	1	1	1
		4 and below	1	0	1	1	0
	21	6 and above	28	28	28	28	29
		5	1	2	1	1	1
		4 and below	1	0	1	1	0
	30	6 and above	28	29	29	28	29
		5	2	1	1	2	1
		4 and below	0	0	0	0	0
	36	6 and above	28	29	29	28	29
		5	0	0	0	0	0
		4 and below	2	1	1	2	1
	45	6 and above	29	29	29	28	28
		5	1	1	1	1	2
		4 and below	0	0	0	1	0
	54	6 and above	29	30	30	30	29
		5	0	0	0	0	1
		4 and below	1	0	0	0	0
	63	6 and above	30	29	30	30	28
		5	0	1	0	0	2
		4 and below	0	0	0	0	0
	90	6 and above	29	30	29	29	29
		5	0	0	0	0	0
		4 and below	1	0	1	1	1
	147	6 and above	28	28	26	27	28
		5	1	0	1	0	0
		4 and below	1	2	3	3	2

[a] A 9-point hedonic scale was used for acceptability ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely)

Table 2.6 *continued...*

Storage temperature (°C)	Storage time (days)	Rating	Number of Responses				
			Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
4 (control)	155	6 and above	29	29	29	29	29
		5	0	0	0	0	0
		4 and below	1	1	1	1	1
	170	6 and above	30	29	30	30	30
		5	0	1	0	0	0
		4 and below	0	0	0	0	0
	385	6 and above	29	29	30	28	29
		5	1	0	0	1	1
		4 and below	0	1	0	1	0
35	21	6 and above	26	27	28	27	28
		5	2	1	1	2	1
		4 and below	2	2	1	1	1
	42	6 and above	28	29	29	26	27
		5	0	0	1	2	2
		4 and below	2	1	0	2	1
	63	6 and above	28	29	29	30	30
		5	0	0	1	0	0
		4 and below	2	1	0	0	0
	385	6 and above	22	23	23	24	22
		5	2	3	3	2	3
		4 and below	6	4	4	4	5
37.5	18	6 and above	28	28	28	29	28
		5	0	1	1	0	1
		4 and below	2	1	1	1	1
	36	6 and above	28	28	29	27	29
		5	0	1	0	1	0
		4 and below	2	1	1	2	1

Table 2.6 *continued...*

Storage temperature (°C)	Storage time (days)	Rating	Number of Responses				
			Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
37.5	54	6 and above	30	30	28	30	30
		5	0	0	2	0	0
		4 and below	0	0	0	0	0
	170	6 and above	28	27	29	28	28
		5	0	1	0	1	1
		4 and below	2	3	1	1	1
	385	6 and above	27	24	27	27	26
		5	1	4	3	3	4
		4 and below	2	2	0	0	0
40	15	6 and above	27	27	26	27	27
		5	0	1	2	1	1
		4 and below	3	2	2	2	2
	30	6 and above	29	30	28	27	28
		5	0	0	2	2	1
		4 and below	1	0	0	1	1
	45	6 and above	28	28	29	29	30
		5	1	2	1	1	0
		4 and below	1	0	0	0	0
	90	6 and above	28	28	29	28	26
		5	0	1	1	1	1
		4 and below	2	1	0	1	3
	147	6 and above	22	25	25	23	24
		5	2	1	2	3	2
		4 and below	6	4	3	4	4
	155	6 and above	24	24	26	26	26
		5	1	1	1	1	0
		4 and below	5	5	3	3	4
	170	6 and above	27	27	29	29	27
		5	1	1	0	0	0
		4 and below	2	2	1	1	3
	385	6 and above	26	27	28	27	26
		5	1	2	1	1	2
		4 and below	3	1	1	2	2

CONCLUSIONS

The collaborator, The Nutcracker Homemade Products, was the first peanut processor to market Fine Peanut Bar in the Philippines, an adoption of a product developed by Thai Peanut CRSP investigators from a traditional product called “Tuub – Taab”.

The adoption of the technology helped the collaborator increase their monthly income, by PhP6,000 to PhP63,000, from the overall sale of Fine Peanut Bars. Employees were hired to work for an additional 8 to 30 days per month for producing the product. Adoption was easily implemented by the industry collaborator as the technology is relatively simple, required simple equipment, and available ingredients.

The use of promotional tools such as using radio advertisements, joining trade fairs, distribution of flyers, and brochures were found useful in introducing the new product to consumers. Lack of capital and the company policy of operating without borrowings or loans were the major constraints of a small industry in expanding production.

The Fine Peanut Bar product will continue to have acceptable sensory qualities up to 385 days at 40°C which is equivalent to 25 months at 30°C when packed in laminated foil with a thickness of 0.1 mm. The packaging materials should be properly sealed and free from other defects that could affect the storage stability of the product.

REFERENCES

AOAC (Association of Official Analytical Chemists). 2005. Official Methods of Analysis of AOAC International. 18th Ed. AOAC International. Gaithersburg, MD. USA.

Labuza, T.P. 2002. Determination of Shelf Life of Foods. Downloaded from http://www/courses.che.umn.edu/00fscn8334_1f/Pdf.Folder/General20%Shelf20%LifeReview.pdf on July 27, 2002.

Labuza, T.P. and Schmidl, M.K. 1985. Accelerated shelf life testing of foods. Food Technol. 39:57.

Meilgaard, M., Civille, G. V. and Carr, B. T. 1991. Sensory Evaluation Techniques. 2nd Ed. CRC Press, Inc., Boca Raton, Florida.

PCRSP (Peanut Collaborative Research Support Program). 2007. Standardization of a Process for Fine Peanut Bar for a Small Company. Chapter 5. Monograph Series No. 7. Peanut Confections and Snacks. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

PCRSP, 2003. Processing of Peanut Products. *In:* International Training Program Manual on Technology Transfer of Storage Handling, Processing, and Quality Measurement of Peanuts and Peanut Products. September 29- October 7, 2003. Bangkok, Thailand.

Taoukis, P. S., Labuza, T. P. and Saguy, S. 1997. Kinetics of food deterioration and shelf-life prediction. Chapter 12 in Handbook of Food Engineering Practice, Valentas, K., J. Rotstein, E and P.R. Singh (Ed.), pp.361-403, CRC Press.

USFDA (United States Food and Drug Administration). 2001. Examination of Containers for Integrity. Chapter 22c in Bacteriological Analytical Manual (BAM) Online. Downloaded from http://www.cfsan.fda.giv/~ebam-22c.html on May 23, 2005.

APPENDIX A

BALLOT FOR THE CONSUMER TEST OF FINE PEANUT BAR

BALLOT FOR THE CONSUMER TEST OF FINE PEANUT BAR

CENTRAL LOCATION TEST: February 1, 2005

Panelist # _____ Sample # _____

Instruction: Please answer the following questions by putting a check mark in the square that best reflects your feelings about this sample.
Please bite half of the sample and answer the first 2 questions; then look at the sample and answer questions 3 and 4; lastly, eat the rest of the sample and answer question 5.

1. How would you rate the TEXTURE/ CRUNCHINESS of the sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

2. How would you rate the COLOR of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

3. How would you rate the APPEARANCE of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

4. How would you rate the FLAVOR/TASTE of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

5. OVERALL, how would you rate this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

Thank you !

APPENDIX B

BALLOT FOR THE DESCRIPTIVE TEST OF FINE PEANUT BAR

BALLOT FOR THE DESCRIPTIVE TEST OF FINE PEANUT BAR

NAME:______________________ CODE:_______________

Date: ______________________

Please put a vertical mark through the line scale to indicate the amount of each attribute (the scale is from 0 to150mm)

Texture

First Bite

0 150

|____

Definition:
First Bite: Bite through a pre-determined size of sample with incisors
Hardness- the force to bite through the incisors
Reference/ Intensity Rating- Planter's Peanut= 95; Carrots= 110; Warm-up= 90

0 150

|____

Definition:
First Bite: Bite through a pre-determined size of sample with incisors
Fracturability- the force with which the sample breaks
Reference/ Intensity Rating- Graham crackers= 42; Corn chips= 55; Chichacorn= 65; Warm-up= 70

First Chew

0 150

|____

Definition:
First Chew: Bite through a pre-determined size of sample with molars
Hardness- the force with which the sample breaks
Reference/ Intensity Rating- Planter's Peanut= 90; Carrots= 100; Warm-up= 80

0 150

|____

First Chew: Bite through a pre-determined size of sample with molars
Fracturability- the force with which the sample breaks
Reference/ Intensity Rating- Graham crackers= 35; Corn chips= 45; Chichacorn= 60; Warm-up= 50

Appearance

Color

0 150

|____

Off-white Brown

Definition:
Off-white- the color associated with plain popcorn
Brown- the color associated with powdered cocoa
Reference/ Intensity Rating: Washed sugar= 20; Ludy's Peanut Butter= 90; Warm up= 95

Surface Shine

0 150

|____

Definition:
Glossy- not dull
Reference/ Intensity Rating:; Ludy's Peanut Butter = 130; Anchor butter =150; Warm-up= 95

Aromatics

Roasted Peanutty Aroma

0 150

|____

Definition:

Roasted Peanutty aroma- the aroma associated with medium roasted peanuts

Reference/ Intensity Rating- Raw Peanut- 0; Planter's Peanut = 70; Warm-up = 55

Sesame Aroma

0 150

|____

Definition:

Sesame Aroma- the aroma associated with sesame

Reference/ Intensity Rating- Raw Sesame= 0; Roasted Sesame Seeds= 25; Sesame oil= 150; Warm-up=15

Caramel Aroma

0 150

|____

Definition:

Caramel-like aroma – the aroma associated with caramelized sugar

Reference/Intensity Rating: 2% sucrose solution = 20; 5% sucrose solution = 50; 10% sucrose solution = 100; 16% sucrose solution = 150; Warm up= 100

Tastes

Sweet

0 150

|____

Definition:

Sweet taste – the taste stimulated by sucrose

References/Intensity Rating: 2% sucrose solution= 20; 5% sucrose solution = 50; 10% sucrose solution = 100; 16% sucrose solution = 150; Warm-up = 100

Salty

0 150

|____

Definition:

Salty taste – the taste stimulated by sodium chloride

Reference/Intensity Rating: 0.2% sodium chloride solution = 25; 0.35% sodium chloride solution = 50; 0.5% sodium chloride solution = 85; Warm-up= 35

Bitter

0 150

|____

Definition:

Salty taste – the taste stimulated by caffeine

Reference/Intensity Rating: 0.05% caffeine solution = 20; 0.08% caffeine solution = 50; 0.15% caffeine solution = 100; Warm-up= 5

Thank you!

CHAPTER 3A

IMPACT ASSESSMENT OF STABILIZED PEANUT BUTTER BY A SMALL COMPANY IN METRO MANILA

Alberto R. Cariso [1]

[1] Division Chief, Food Development Center, 1632, Philippines

ABSTRACT

The initial impact of technology adoption for the manufacture of stabilized peanut butter by a small industry collaborator, Choulya Foods in Metro Manila was determined through reports submitted and interviews with the collaborator on its production volumes, market sales, manpower and operations. The industry collaborator was producing and selling an unstabilized peanut butter before technology adoption but was experiencing customer feedback due to oil separation in the product. The company reported that they had considerable product returns of about 20% of the total volume of product sales due to oil separation. They agreed to collaborate on the project to help address the problem.

The previous intention of the collaborator was to stabilize and fortify the peanut butter with vitamin A. Due to changes in management priorities, the project focused on the provision of technology to prevent oil separation.

The collaborator reported that they had already adopted the technology for the stabilization of the product beginning in February 2007. A total of eight (8) cases or 48 Kg were initially produced immediately after technology adoption. Thereafter, an average of 50 cases or 300 Kg every month were produced and sold. The collaborator had not experienced product returns so far. The products were sold through a small supermarket chain in Metro Manila with their own marketing arm. The collaborator believed that the adoption of the technology helped them maintain the product visibility in the market and prevented them from going out of the peanut butter manufacturing business.

Samples of the stabilized peanut butter were also submitted by the collaborator to a large company for market testing. The large company wanted to tap the services of the collaborator in producing peanut butter using the label of the former. Unfortunately, negotiations did not push through due to disagreements on terms of conditions for partnership. The collaborator has decided to continue as a single proprietor to produce and sell the stabilized peanut butter using its own brand.

INTRODUCTION

The technology for the manufacture of vitamin A fortification of stabilized peanut butter was offered for adoption to a small industry collaborator, Choulya Foods in Metro Manila. The industry collaborator was producing and selling an unstabilized peanut butter before technology adoption but was experiencing customer feedback due to oil separation in the product. The company reported that they had considerable product returns of about 20% of the total volume of product sales due to oil separation. They agreed to collaborate on the project to help address the problem. The collaborator wanted to solve the problem of oil separation in a flowing type peanut butter and was interested on vitamin A fortification of the product. The research and development of the process for stabilized peanut butter is published in Peanut CRSP USA-Philippines Monograph Series No. 6, Chapter 4 (PCRSP, 2006).

In September 2006, management priorities changed so the project coverage was limited to the stabilization of the peanut butter. The technology transfer began in November 2006, the technology was adopted by Choulya Foods in January 2007, and the procedural guidelines for the stabilization of a flowing type peanut butter manufactured in the collaborators processing plant, was submitted to the collaborator on February 20, 2007.

OBJECTIVE

The objective of this chapter is to present the initial impact on production volumes, market sales, manpower, and operations of technology adoption for stabilized peanut butter by a small industry in Metro Manila.

METHODS

Interviews were carried out on March 16, 27, April 26 and May 10, 2007, with the plant manager to determine the initial effects of the adoption of technology for stabilization of flowing type peanut butter on the marketing and production operations of a small producer of peanut butter. Table 3A.1 shows the list of questions asked on the initial effects of technology adoption on the marketing and production operations.

RESULTS

Table 3A.1 shows the responses of the plant manager on the initial effects of technology adoption on their marketing and production operations.

Table 3A.1 Questions and responses on the initial effects of technology adoption to the Plant Manager of a producer of Stabilized Peanut Butter

Question No.	Question	Response [a/]
1	Before technology adoption, what was your average production volume in manufacturing a flowing type peanut butter?	100 cases every month. One case contains 24 bottles and one bottle contains 250 grams product
2	What were the customer feedbacks about the product?	Oil separation during storage was the usual complaint.
3	What were your problems in marketing the flowing type peanut butter?	We got many returns from the market; about 20 cases every month.
4	After technology adoption, how many cases or bottles of stabilized peanut butter were you able to produce and sell?	We produced eight (8) cases or 192 bottles of 250 grams each immediately after technology adoption. Thereafter, an average of 50 cases every month were produced and sold.
5	Why was there a decrease in production volume and sales after technology adoption?	We were still on the period of adjusting to the new process.
6	Where could we buy your stabilized peanut butter?	From the Cherry Supermarket in Quezon City
7	Who is distributing your product?	The marketing company owned by my father is distributing the product.
8	What other plans did you have in marketing the product?	We negotiated with a large company that became interested on our product and they wanted us to produce the product using their own label. We submitted product samples to them for a period of two months for their market evaluation. Unfortunately, our negotiations failed due to some disagreements on terms of conditions for partnership.
9	What are your plans now regarding the product?	We decided that we would just continue producing and selling the product under our own brand.

[a/] Respondent: Plant manager of the small company.

The collaborator reported that after technology adoption in February 2007, a total of eight (8) cases or 48 Kg of the stabilized peanut butter (Fig. 3A.1) had initially been produced and sold. Thereafter, an average of 50 cases or 300 Kg every month were produced and sold. The collaborator also reported that they had not experienced product returns. Prior to technology

adoption the equivalent sales was 100 cases or 600 Kg. However, an average of 20 cases or 120 Kg of the products were returned. The products were sold through a small supermarket chain in Metro Manila through their own marketing arm. The collaborator believed that the adoption of the technology helped them to sustain the product visibility in the market and prevented them from going out of the peanut butter manufacturing business. Without the technology for stabilizing the product they had an average of 20% product returns of the total volume of sales which was not financially sustainable.

Samples of the stabilized peanut butter were also submitted by the collaborator to a large company for market testing. The large company wanted to tap the services of the collaborator for the production of peanut butter under its label. Unfortunately, negotiations did not push through due to disagreements on terms of conditions for partnership. The collaborator has decided to go ahead as a single proprietor to produce and sell the stabilized peanut butter using its own brand.

Fig. 3A.1. Choulya Foods stabilized peanut butter

CONCLUSIONS

The technology adoption for stabilization of a flowing type peanut butter solved the problem of a small industry collaborator of oil separation in the product.

With the technology adoption, the collaborator has been able to produce an average of 50 cases or 300 Kg of peanut butter every month. Although there was a 50% reduction in production volume right after technology adoption, the company as a result of the product improvement was able to maintain product visibility in the market.

The improved technology prevented the collaborator from going out of the peanut butter manufacturing business. Without the technology for stabilizing the product they had an average of 20 cases or 120 Kg of product returns every month which was not financially sustainable.

The collaborator currently believes that they can now continue producing and selling peanut butter with greater confidence in their product quality.

REFERENCE

PCRSP (Peanut Collaborative Research Support Program). 2006. Standardization of a Process for Stabilized Peanut Butter for a Small Company. Chapter 4. Monograph Series No. 6. Peanut Butter and Spreads. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

CHAPTER 3B

IMPACT ASSESSMENT OF STABILIZED PEANUT BUTTER FOR A SMALL COMPANY IN THE VISAYAS

Lorina A. Galvez [1]
and
Lutgarda S. Palomar [2]

[1] Instructor, Leyte State University 6521-A, Philippines
[2] Co-Principal Investigator Peanut CRSP; Professor, Leyte State University 6521-A, Philippines

ABSTRACT

Stabilized peanut butter, previously developed by Peanut CRSP investigators for the Philippine market was transferred to a small company, the Lola Concordia Agro-Industrial Farm and Processing (LCA-IFP) in 2005. The technology was adopted and standardized at Visayas State University (VSU) formerly Leyte State University (LSU). Standardization of the roasting process using a peanut roaster, fabricated by Peanut CRSP investigators in Thailand, was conducted for a 10 kg /batch of peanuts.

The percent recovery and break-even price of PhP 46.20 (PhP=Philippine peso) plus mark-up showed potential for sustained business since the prices are competitive with a premium brand of stabilized peanut butter. In addition, customers like the product's texture and sweetness. However, during the commercial production, a problem was encountered due to unavailability of the fortificant. The minimum volume of fortificant that can be bought was 5 kg amounting to PhP20,000. The amount was too high for a small company considering that only a small quantity was needed per batch.

INTRODUCTION

Home-processed peanut butter products in Leyte are natural or unstabilized therefore resulting in the separation of oil and consequent change in texture and flavor. The identification of these problems were reasons for research and development with the aim of being able to transfer technologies for processing fortified stabilized peanut butter to interested peanut processors in Leyte. The technology transfer of stabilized peanut butter to Lola Concordia Agro-Industrial Farm and Processing (LCA-IFP), a mango processor, was conducted. In addition, Peanut CRSP researchers intended to transfer the technology for processing Vitamin A fortified stabilized peanut butter developed by Peanut CRSP researchers with the Food Development Center (FDC), National Food Authority (NFA), but was hindered by the lack of a suitable size of fortificant in the market for company use. Nevertheless, the company agreed to adopt the technologies for sorting to eliminate aflatoxin from the product, and the process for roasting peanuts for stabilized peanut butter, and was published as a note in Peanut CRSP USA-Philippines Monograph Series No. 5 (PCRSP, 2006). Because the inavailability of fortificant prevented transfer of the fortification technology, only the impact of stabilized peanut butter is reported in this monograph.

OBJECTIVES

The impact assessment was carried out to determine the overall impact of the adoption of the sorting technology to eliminate aflatoxin from stabilized peanut butter, the optimization of the roasting process and formulation, and the subsequent technology transfer of the process for a stabilized peanut butter. Specifically, this study aimed to: (1) assess the impact of the technology on the small business and in upgrading the status of the collaborating company, LCA-IFP; (2) evaluate the reasons for the acceptance by consumers on the quality of the product; and (3) recommend and determine upgrading and/or plans for upgrading.

METHODS

Collaboration and Impact Assessment

Discussions and Agreement

Since Visayas State University (VSU) had an earlier activity with LCA-IFP, the agreement for collaboration was reached easier and faster. The Memorandum of Agreement (MOA, Appendix A) signed in November 24, 2005, included the criteria and cost -sharing terms used as basis in the discussion for partnership between VSU and LCA-IFP.

Training of LCA-IFP workers

Workers of LCA-IFP were trained in the sorting technologies to eliminate aflatoxin in

peanut products and on the processing of stabilized peanut butter, at VSU and at LCA-IFP processing plants. One worker was trained at VSU and three other workers were trained at LCA-IFP processing plants. In addition, a lecture updating workers on current Good Manufacturing Practices (GMP), Sanitation Standard Operating Procedures (SSOP), and Hazard Analysis Critical Control Points (HACCP) was conducted.

One-on-One-Interview

Interviews were conducted with the owner/manager, workers, consumers and distributors.

Secondary Data (Production and Sales Record)

Production and sales records during the standardization and commercialization phases were scrutinized for possible information in order to determine the impact or potential impact of the project.

RESULTS

Pilot Production of the Stabilized Peanut Butter

At the beginning of the collaboration, roasting of peanuts and grinding were done at the Department of Food Science and Technology (VSU) for both the standardization and pilot processing of stabilized peanut butter using an electric roaster (Fig. 3B.1), fabricated by Peanut CRSP investigators in Thailand, and the peanut butter grinder following the process flow shown in Fig. 3B.2. After the electric roaster was loaned to LCA-IFP, commercialization was done in two separate activities with roasting done at the collaborator's plant, while grinding and final packing were done at VSU until LCA-IFP was able to have a higher capacity peanut grinder.

Fig. 3B.1 Peanut roaster (electric) used in the roasting of peanuts for stabilized peanut butter.

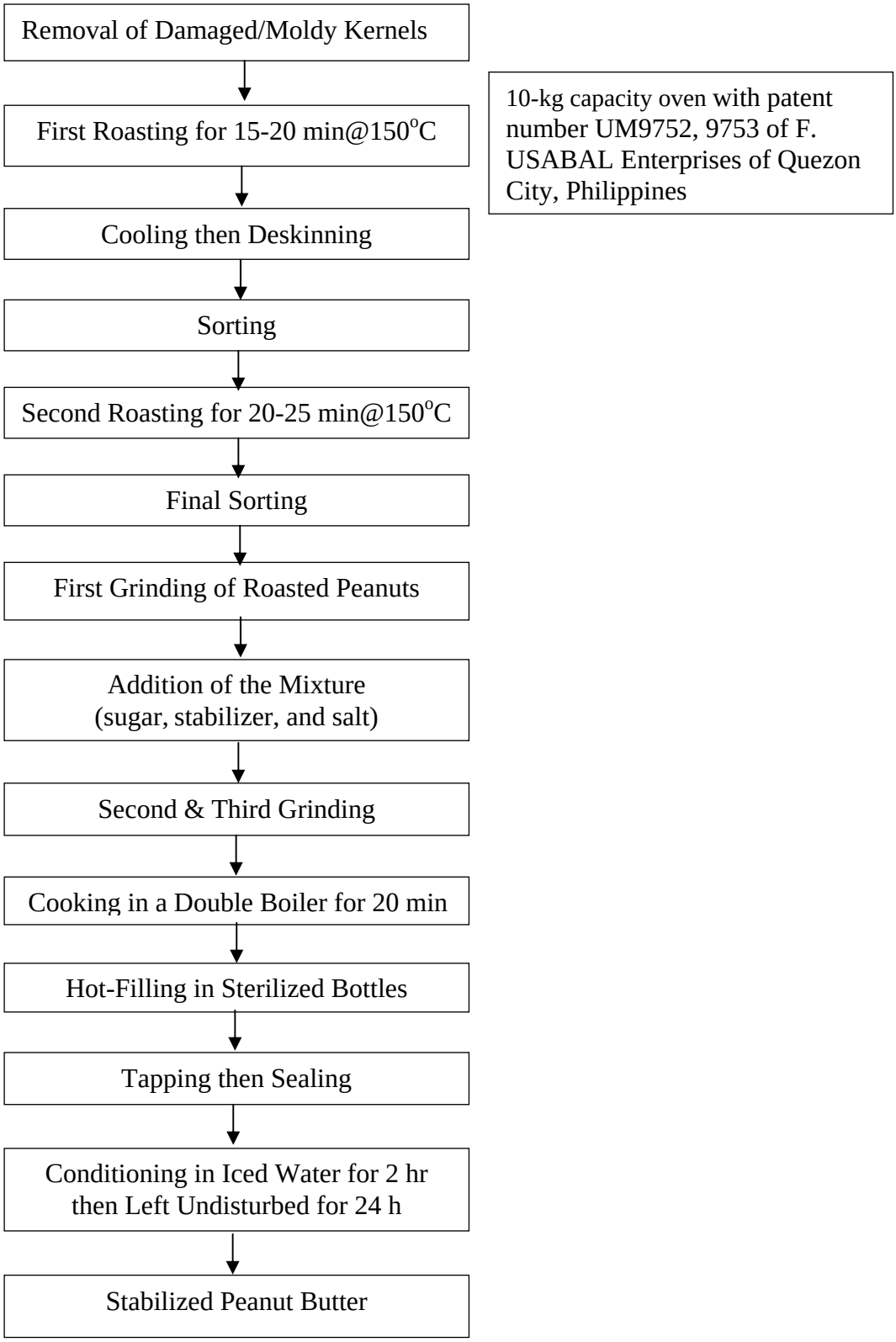


Fig. 3B.2 Steps in the processing of stabilized peanut butter using the 10-kg capacity oven.

Fig. 3B.3 Lola Concordia Agro-Industrial Farm and Processing stabilized peanut butter

Commercialization

Table 3B.1 shows the production batches produced by the collaborator, LCA-IFP. During the commercialization by LCA-IFP, a production volume of at least 10 kg per batch was recommended in order to get the highest percent recovery of peanut butter and lowest break-even price. A 10 kg batch is necessary to lower the break-even price of the peanut butter to PhP 43.18 with 250 g per bottle. If a smaller batch size is used, such as 10 kg. in two batches, the amount of material left, as waste, in the grinder will double. Thus LCA-IFP has to process at least 10 kg per batch to minimize such losses. Furthermore, the retail price of PhP55.00 or even PhP60.00 is competitive since the price of a premium brand stabilized peanut butter is PhP75.00 for a 250g-jar (Palomar *et al.*,2005).

Table 3B.1 Samples of the production batches of the Collaborator, Lola Concordia Agro-Industrial Farm and Processing

Batch	Total Formulation (Kg)	Recovery (kg)	Recovery (No. of bottle)	Total Cost of Production	Break-Even Price/ 250g (PhP)*
1	2.08166	1.475	5	308.476	61.70
2	2.7929	2.3	9	416.705	46.30
3	5.32544	4.600	18	819.339	45.52
4	6.92308	6.28	25	1103.35	44.13
5	9.21303	8.420	33	1450.69	43.96
6	9.46745	8.80	35	1518.17	43.38
7	10.000	9.280	37	1597.50	43.18
8	12.5444	12.05	48	2015.32	41.99
Average break-even price					**46.20**
Price after 20% mark-up					**55.52**
Retail Price					**55.00**

*PhP=Philippine peso

Production of peanut butter was limited by the availability of native peanuts in Bato, Leyte. Native peanuts are preferred over imported peanuts because in a report of Palomar *et al.* (2007), an 80 % roasting recovery was observed in native freshly harvested peanuts compared to that of imported peanuts bought from a peanut dealer in Bato, Leyte. The recovery of roasted peanuts from the imported peanuts was only 40%.

Product Outlets

One of the outlets of LCA-IFP for the stabilized peanut butter is Guadalupe gardeners in their *Pasalubong* Center (Fig. 3B.4), where products from LSU-assisted groups/processors including stabilized peanut butter, are sold. The promotion of the product by word of mouth since additional sales of products are made by peddling the product from one house to the other. At the same time, word of mouth is used to promote the peanut butter from manually sorted peanuts. The sales of stabilized peanut butter adds income to the women.

Fig. 3B.4 Pasalubong Center owned by the Guadalupe gardeners in Guadalupe, Baybay, Leyte.

Impact on Consumers

Aside from the LCA-IFP outlets in Bato, Leyte, the buyers of the product are the VSU community who are health conscious. Staff of VSU are repeat buyers of the LCA-IFP stabilized peanut butter, citing good taste and texture as the reasons for purchasing the product. Consumers did not mention product safety or the absence of aflatoxin from the peanut products due to implementation of sorting technologies.

Table 3.2 lists reasons cited by consumers for repeat purchases of the peanut butter. The reasons demonstrate the potential and the salability of the products.

Effect on the Collaborator and Vendor

Utilization of space, facilities and personnel were reasons by LCA-IFP, a mango processor, for adopting the stabilized peanut butter technology. The company needed to manufacture an additional product, using existing personnel when mangoes were not in season.

LCA-IFP workers trained by Peanut CRSP investigators at LSU were made aware of the importance of GMPs, SSOP and HACCP to ensure product quality and safety. Training in the sorting process to eliminate aflatoxin contaminated kernels increases the probability of safer peanut products for consumers.

LCA-IFP purchased a peanut butter grinder to meet the increasing demand of the products and is now ready for process standardization and equipment evaluation on a higher capacity. Responses to questions patterned from the impact study of Lustre *et al*. (2004) showed greater effects on the use of stabilizer.

Table 3B.2 List of repeat buyers at the Visayas State University (VSU), Visca, Baybay, Leyte

Name of Staff	No. of Bottles	Reason(s) for Repeat Buying
Tessie Manatad	2	Good texture and taste
Tessie Nunez	2	Enough sweetness
Edralin Malasaga	2	Very fine
Lina Posas	2	Texture is very okey
Conching A. Comon	2	Sweetness is very okey
Vilma Patindol	2	Not so very sweet
Catalina Pascual	2	Fine texture
Fe Calunangan	2	Just right sweetness
Marvin Lao	2	Sweetness is okey
Ivy Emnace	6	Produce from sorted peanuts
Jilly Regis	2	Very peanutty taste
Minerva Gabriel	2	Texture is good
Shecky Nillama	3	Likes the taste & texture
Jessa Balotite	2	Sweetness just right
May Dawat	3	Rich in peanut taste
Liezl Fernandez	4	Just right sweetness
Eileen Bandalan	2	Texture is very good

CONCLUSIONS

It was only in stabilized peanut butter that impact was reported. However since LCA-IFP is the only company that processes stabilized peanut butter, it adopted the brand name, Leyte's First. Another natural peanut butter processors in Leyte was interested in adopting the formulation, but this was not pursued by the investigators.

Purchase of the product by the VSU consumers was due to good texture, sweetness and intense peanut taste of the product, which even resulted in repeat purchases of the product. Adoption of the sorting technology ensures low levels of aflatoxin in the peanut butter. Training in GMPs, SSOP and HACCP ensured improved quality and safety. Irregular supply of native, raw peanuts in the locality is now a problem which should be looked into to sustain the processing activity.

REFERENCES

Galvez**,** L. A., Palomar, L.S., and Gravoso, R.S. 2006. Note on Adoption of the Improved Process for the Vitamin A Fortification of Stabilized Peanut Butter in a Small Company. In Peanut CRSP USA-Philippines Monograph Series No. 5. Vitamin A Fortified Peanut Butter. PCRSP (Peanut Collaborative Research Support Program).

Lustre, A. O., Cariso, A.R., Agustin, G.M. and Moxsley. R.L. 2004. Impact Assessment of the Vitamin A fortification of peanut butter on an Industry Innovator: A Final Report of a Peanut Collaborative Research Support Program Funded Project.

Palomar, L. S., Galvez, L.A., Paloma, L.B., Gravoso, R.S., Lustre, A.O. and Resurreccion, A.V.A. 2007. Development and Evaluation of Peanut Products for Industry Association. A Report presented during the 2005 LSU In-House Review.

Palomar, L. S., Galvez, L.A., Paloma, L.B., Gravoso, R.S., Lustre, A.O. and Resurreccion, A.V.A. 2007.Development of Peanut Products for Small Industry Association, Cooperative and Private Food Company in Eastern Visayas. A Report Presented during the 2007 LSU In-House review.

APPENDIX A

MEMORANDUM OF AGREEMENT BETWEEN VISAYAS STATE UNIVERSITY (FORMERLY LEYTE STATE UNIVERSITY) AND LOLA CONCORDIA AGRO-INDUSTRIAL FARM AND PROCESSING (LCA-IFP)

MEMORANDUM OF AGREEMENT

between

THE UNIVERSITY OF GEORGIA,

LEYTE STATE UNIVERSITY

and

LOLA CONCORDIA AGRO-INDUSTRIAL FARMS AND PROCESSING

concerning

"TECHNOLOGY TRANSFER OF VITAMIN A-FORTIFIED STABILIZED PEANUT BUTTER

KNOW ALL MEN BY THESE PRESENTS:

This **Agreement** entered into and made this 24th day of November 2005 at Baybay, Leyte, by and between:

The **University of Georgia, Department of Food Science and Technology**, herein referred to as the "UGA", with office address at 1109 Experiment Street, Griffin Campus, Griffin, Georgia, U.S.A., represented by Dr. Anna V.A. Resurreccion;

The **Leyte State University** thru **the Department of Food Science and Technology,** hereinafter referred to as the "LSU - DFST", with office address at Visca, Baybay, Leyte, Philippines, represented herein by its President Dr. Paciencia P. Milan

The **Lola Concordia Agro-Industrial Farms and Processing,** hereinafter referred to as the "Industry Collaborator", with plant address at Bato, Leyte, Philippines, represented by its Operation Supervisor, Mrs. Angelina Kuizon.

WHEREAS, the University of Georgia and the Philippine Department of Agriculture have signed a Memorandum of Understanding (MOU) establishing a collaborative research relationship for the implementation of the Project entitled "Peanut Collaborative Research Support Program" or (Peanut CRSP). The project is to provide technical assistance through a collaborative research effort between the U.S. and the Philippines as the host country institution. The combined goal of this effort is to allow the host country and the U.S. to improve the well being of the farmers and consumers through the use of peanut as a crop and food.

WHEREAS, the University of Georgia and the Department of Food Science and Technology of Leyte State University have entered into a sub-agreement under the above MOU to implement a research proposal on "Development of Peanut Postharvest Handling and Processing Technologies". The goal of the proposed research is to stimulate economic growth through expansion of markets for high quality products from peanuts.

WHEREAS, the UGA and the DFST have the technology for Vitamin A-Fortified Stabilized Peanut Butter.

WHEREAS, the Lola Concordia Agro-Industrial Farms and Processing, is a company engaged in the manufacture of dehydrated mangoes which is seasonal so has to expand product lines.

CHAPTER 4

SHELF LIFE OF AN IMPROVED PEANUT BRITTLE FROM MINDANAO

Edith M. San Juan [1]
Amelita C. Natividad [2]
Alberto R. Cariso [3]
and
Anna V. A. Resurreccion [5]

[1] Supervising Research Specialist, Food Development Center 1632, Philippines
[2] Senior Research Specialist, Food Development Center 1632, Philippines
[3] Division Chief, Food Development Center 1632, Philippines
[4] Principal Investigator Peanut CRSP; Professor, University of Georgia, Griffin, Georgia 30223-1797, U.S.A.

ABSTRACT

The peanut brittle samples used in the study were prepared at the industry collaborator, Monastery Farms processing plant in Malaybalay, Bukidnon, the formulation of which was obtained during the standardization of the peanut brittle process. The research and development of the process for peanut brittle is published in Peanut CRSP USA-Philippines Monograph Series No. 7, Chapter 5 (PCRSP, 2007).

Although the improved peanut brittle formulations developed by Peanut CRSP researchers at FDC had higher roasted peanutty aroma than in the existing commercial sample, Monk's Peanut Brittle, and had higher intensity ratings for caramel aroma and sweet taste than the commercial sample, the industry collaborator decided not to adopt the technology.

Nevertheless, efforts were continued to support the collaborator by conducting shelf-life studies on the improved product and to demonstrate that a packaging material that can provide a barrier to oxygen using laminated foil is needed to ensure longer product shelf life. A previous study on peanut brittle packed in its traditional packaging of cellophane as primary packaging and then packed in polypropylene jars as secondary packaging showed that the product was acceptable only up to 158 days or 5.3 months of storage at 30°C.

Peanut brittle, wrapped in 60 mm x 80 mm (width x length) cellophane with an average thickness of 0.014 mm and packed in four-sided seal laminated foil packs with an average thickness of 0.0685 mm, was stored at temperatures of 35, 37.5 and 40°C. Each laminated foil pack had inner dimensions of 100 mm x 180 mm (width x length) containing 20 pieces or approximately 5 grams per piece of peanut brittle.

The improved peanut brittle packed in laminated foil exceeded the target shelf life of 6 months at 30°C. Though the product had deteriorated at 40°C due to rancidity after 158 days, the product at 35 and 37.5°C were still acceptable after 385 days. Prediction of its shelf at 30°Cand computation of actual Q_{10} of the product will be made only when the end of shelf life at 35 and 37.5°C is reached.

INTRODUCTION

A peanut processing seminar which included the sorting technology developed by Peanut CRSP investigators was held for the Chamber of Agriculture, Fisheries and Food Industries of Northern Mindanao, Inc. (CAFFINORMIN), a collaborating cooperative in the Peanut CRSP project. Member organizations involved or interested in peanut processing attended the seminar. Peanut CRSP researchers at FDC used this opportunity to identify potential industry partners for transfer of peanut processing technologies.

One of the participants, the Monastery Farms of Malaybalay, Bukidnon, was identified based on their existing peanut brittle product sold in the Cagayan de Oro market, and locally called "*piniato*", and agreed to serve as an industry partner in the Peanut CRSP project. Details were published in Peanut CRSP USA-Philippines Monograph Series No. 7 Chapter 4 (PCRSP, 2007).

A process for peanut brittle was successfully modified and standardized to produce a safe peanut brittle product with consistent sensory quality. The peanut brittle formulation developed by Peanut CRSP researchers at FDC was modified based on the preferred sweet and salty tastes and roasted peanutty and sesame aroma in the product as requested by the collaborator. The improved peanut brittle formulation consists of 14.0% glucose syrup, 37.0% refined sugar, 34.0% roasted peanuts, 7.5% water, 4.0% butter, 1.5% roasted sesame seeds, 1.0% baking soda, 0.35% industrial salt, and 0.65% vanilla concentrate. Eleven plant personnel were trained on the standardized process emphasizing quality control points.

Although the improved peanut brittle formulations had higher roasted peanutty aroma than in the existing commercial sample, Monk's Peanut Brittle, and had higher intensity ratings for caramel aroma and sweet taste than the commercial sample, the industry collaborator decided not to adopt the technology for the following reasons: (1) fear of changing a product quality profile that is accepted by their market in Cagayan de Oro, (2) resistance to adopting new ways of doing things when the traditional way gives him a marketable product, and (3) the company was not interested in using an additional ingredient, glucose syrup, due to added production cost. The details of these constraints are reported in Peanut CRSP USA-Philippines Monograph Series No. 7 Chapter 4 (PCRSP, 2007).

Efforts by Peanut CRSP investigators at FDC continued to support the collaborator by conducting shelf-life studies on the improved product and to demonstrate that a packaging material that can provide a barrier to oxygen is needed to ensure longer product shelf life. The use of laminated foil is a good barrier to both oxygen and moisture (Shields, 1984). A previous study published in Peanut CRSP USA-Philippines Monograph Series No. 7, Chapter 5 (PCRSP, 2007) on peanut brittle packed in its traditional packaging of cellophane as primary packaging and then packed in polypropylene jars as secondary packaging showed that the product was acceptable only up to 158 days or 5.3 months of storage at 30°C. This study was conducted using a laminated foil as packaging material to establish the extension in shelf life that can be achieved. Knowledge of the shelf life of peanut brittle in this type of packaging will serve as basis for marketing strategies for this product and for other peanut products of similar type.

OBJECTIVE

The study was conducted to determine if the improved peanut brittle packed in a material made of PET/Foil/PE (polyethylene terephthalate/foil/polyethylene) would meet a target shelf life of 6 months at 30°C. This material made of PET/Foil/PE is referred to as laminated foil in this report.

METHODS

Procedure for Sample Storage

All samples for the shelf life study were properly labeled with the product name, Peanut Brittle, the date test samples were received, the date of storage, and storage temperature. The samples were stored in incubators maintained at accelerated temperatures of 35, 37.5, and 40°C and on shelves, representing ambient conditions at approximately 30°C, at the FDC Shelf Life Testing Room. Reference samples were stored in a low temperature incubator maintained at 0-4°C. The samples were positioned, in the incubator shelves, such that the complete package was directly exposed to the required temperatures and other conditions of the testing incubators and Shelf Life Testing Rooms.

Determination of Sampling Frequency for Product Testing During Storage at 40, 37.5, and 35°C

The procedures for calculating sampling frequency are as described in Chapter 1 of this Monograph. The estimated time for product testing are shown in Table 1.2 of Chapter 1 in this Monograph.

Product Tests Conducted

The quality of the product was initially (day 0) evaluated for packaging condition, sensory quality through descriptive analysis and consumer testing, and aflatoxin content. During storage at 40, 37.5, and 35°C, the acceptability of the product was evaluated through consumer tests. The procedures for product tests conducted are as described in Chapter 1 of this Monograph, except that peanut brittle rather than peanut butter samples were evaluated.

Determination of the End of Shelf Life at Three Accelerated Temperatures, Prediction of Shelf Life at 30°C, and Calculation of Q_{10}

The shelf life of the peanut brittle is the period at which it will retain an acceptable level of eating quality from a safety and sensory point of view (Labuza, 2002). The end of shelf life of the peanut brittle is established when the average rating of 30 consumers is less than 5, which corresponds to “dislike slightly” in the 9-point hedonic scale used in the consumer testing, on overall acceptance. Descriptive analysis was used to quantify the attributes of the control sample and the product at the end of its shelf life.

The construction of a shelf life plot was as described in Chapter 1 of this Monograph. Likewise, the procedures for prediction of shelf life at 30°C and calculation of Q_{10} value are as described in Chapter 1 of this monograph.

Fig. 4.1 Monk's peanut brittle (*piniato*)

RESULTS

Actual Time for Product Testing During Storage

Table 4.1 presents the actual sampling time for product testing during storage at three accelerated temperatures. The sampling schedule is based on the targetted shelf life of six months by the collaborator.

Table 4.1 Sampling schedule for product testing of peanut brittle packed in laminated foil stored at accelerated temperatures (35, 37.5, and 40°C)

Storage Temperature (°C)	Basis of Sampling Schedule	Sampling Schedule							
40	Based on client's targeted shelf life of six (6) months	0	15	30	45	90	147	155	158
37.5	Based on client's targeted shelf life of six (6) months	0	18	36	54	169	385		
35	Based on client's targeted shelf life of six (6) months	0	21	42	63	169	385		

Results of Tests for Initial Product Quality (see Table 4.2)

The packaging condition, aflatoxin content and sensory quality of the product are shown in Table 4.2. The product had acceptable packaging condition as evidenced by the absence of defects. Aflatoxin was not detected in the samples. The product, using the 150 mm line unstructured line scale, was described as follows: hardness on first bite, 100; fracturability on first bite, 70; hardness on first chew, 95; fracturability on first chew, 65; color, 100; surface shine, 80; roasted peanutty aroma, 65; buttery aroma, 60; sesame aroma, 25; vanilla aroma, 20; caramel aroma, 100; and rancid aroma, 0.

Table 4.2 Quality characteristics of peanut brittle packed in laminated foil prior to storage at 40, 37.5, and 35°C

Parameters	Evaluation
1. Packaging condition	
Presence of defects such as improper sealing of laminated foil bags	None
2. Chemical quality	
2.1 Aflatoxin content (ppb) [a]	0
3. Acceptability of the product [b]	Mean Ratings
3.1 Texture (crunchiness)	7.3
3.2 Overall acceptability	7.4
3.3 Color	7.2
3.4 Appearance	7.3
3.5 Flavor	7.3
4. Sensory characteristics of the product [c]	Mean Intensity Ratings
4.1 Texture	
Hardness on first bite	100
Fracturability on first bite	70
Hardness on first chew	95
Fracturability on first chew	65
4.2 Appearance	
Color	100
Surface shine	80
4.3 Aromatics	
Roasted peanutty aroma	65
Buttery aroma	60
Sesame aroma	25
Vanilla aroma	20
Caramel aroma	100
Rancid aroma	0

[a] Limit of Detection (LOD) = 5 ppb

[b] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability mean ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely).

[c] Means are from ratings of 8 panelists in two replications. The test was conducted using unstructured line scales with anchors 12.5 mm from each end for the attributes of (4.1) texture: hardness on first bite (12.5 = very soft, 137.5 = very hard); fracturability on first bite (12.5 = crumbly, 137.5 = brittle); hardness on first chew (12.5 = very soft, 37.5 = very hard); fracturability on first chew (12.5 = crumbly, 137.5 = brittle); (4.2) appearance: color (12.5 = off-white, 137.5 = brown) ; surface shine (12.5 = dull, 137.5 = glossy); (4.3) aromatics: perceptible (=12.5) and strong (= 137.5) for roasted peanutty, sesame, and caramel aroma; and (4.4) taste: perceptible (=12.5) and strong (=137.5) for sweet, salty and bitter tastes

Table 4.2 *continued…*

Parameters	Evaluation
4.4 Taste	
Sweet taste	90
Salty taste	42
Bitter taste	0

Results of Tests for Product Quality During Storage (see Tables 4.3 to 4.5)

Tables 4.3 to 4.5 show the mean ratings for acceptability, the frequency of responses for mean consumer ratings obtained from the consumer tests, and the quality characteristics of the product at the end of its shelf life at 40°C. Results showed the following: (1) The product was still acceptable up to 385 days at 35 and 37.5°C, but was no longer acceptable after 158 days at 40°C. Rejection was due to development of a rancid odor and flavor in the product; (2) The product had passed the target shelf life of 6 months at 30°C. At 40°C, the highest test temperature used in the study, the equivalent shelf life at 30°C was extended up to 10 months through the use of a laminated foil with a thickness of 0.0685 mm; and (3) The study will continue until end of shelf life at 35 and 37.5 is reached to be able to predict the shelf life at 30°C and to determine the actual Q_{10} of the product.

Table 4.3 Mean ratings for acceptability of peanut brittle packed in laminated foil during storage at 40, 37.5, and 35ºC

Storage temperature (ºC)	Storage time (days)	Mean ratings [a]				
		Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/taste
4 (control)	0 (initial)	7.3	7.4	7.2	7.3	7.3
	21	7.3	7.4	7.2	7.3	7.3
	30	7.1	7.0	6.9	6.8	7.0
	36	7.2	7.2	7.2	7.2	7.2
	45	7.6	7.8	7.5	7.5	7.5
	54	7.5	7.5	7.4	7.2	7.6
	63	7.2	7.3	7.2	7.2	7.3
	90	7.5	7.6	7.4	7.5	7.6
	147	7.4	7.2	7.3	7.3	7.1
	155	7.6	7.4	7.2	7.5	7.5
	158	7.6	7.5	7.6	7.5	7.7
	169	7.4	7.6	7.4	7.2	7.4
	385	7.6	7.5	7.5	7.5	7.7
35	21	7.1	7.1	7.2	7.2	7.2
	42	7.3	7.5	7.5	7.4	7.5
	63	7.2	7.1	7.1	7.2	7.2
	169	7.6	7.4	7.4	7.3	7.5
	385	6.6	6.1	7.1	6.5	6.0
37.5	18	7.1	7.2	7.2	7.1	7.3
	36	6.8	6.9	6.9	6.9	6.8
	54	7.0	6.9	6.9	7.0	7.1
	169	6.6	6.2	6.6	6.7	6.2
	385	7.2	7.2	7.3	7.3	7.2
40	15	7.2	7.0	7.0	6.9	7.0
	30	6.5	6.5	6.7	6.7	6.6
	45	7.4	7.5	7.3	7.4	7.4
	90	6.7	6.5	6.6	6.6	6.4
	147	7.0	6.8	7.2	7.1	6.7
	155	5.9	5.4	5.7	6.5	5.3
	158	5.2	4.7	5.0	5.1	4.3

[a] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability with mean ratings where 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

Table 4.4 Frequency of responses for mean consumer ratings 6 and above, 5, and 4 and below for the acceptability of peanut brittle packed in laminated foil stored at 40, 37.5, and 35ºC

Storage temperature (°C)	Storage time (days)	Rating [a]	Number of Responses				
			Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
4 (control)	0 (initial)	6 and above	30	30	30	30	30
		5	0	0	0	0	0
		4 and below	0	0	0	0	0
	21	6 and above	28	29	28	29	27
		5	1	0	1	1	0
		4 and below	1	1	1	0	3
	30	6 and above	27	26	27	26	26
		5	0	2	2	3	2
		4 and below	3	2	1	1	2
	36	6 and above	29	29	28	29	28
		5	0	0	1	0	1
		4 and below	1	1	1	1	1
	45	6 and above	30	30	30	29	29
		5	0	0	0	0	0
		4 and below	0	0	0	1	1
	54	6 and above	29	29	30	29	30
		5	1	1	0	0	0
		4 and below	0	0	0	1	0
	63	6 and above	27	27	28	27	26
		5	3	3	2	3	3
		4 and below	0	0	0	0	1
	90	6 and above	30	30	30	30	29
		5	0	0	0	0	1
		4 and below	0	0	0	0	0
	147	6 and above	29	29	28	29	29
		5	0	0	1	0	0
		4 and below	1	1	1	1	1

[a] A 9-point hedonic scale was used for acceptability ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely).

Table 4.4 *continued . . .*

Storage temperature (°C)	Storage time (days)	Rating [a]	Number of Responses				
			Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
4 (control)	155	6 and above	28	29	27	29	28
		5	1	0	0	0	0
		4 and below	1	1	3	1	2
	158	6 and above	29	29	30	29	30
		5	0	0	0	0	0
		4 and below	1	1	0	1	0
	169	6 and above	29	30	30	29	29
		5	1	0	0	1	1
		4 and below	0	0	0	0	0
	385	6 and above	30	29	30	29	30
		5	0	0	0	1	0
		4 and below	0	1	0	0	0
35	21	6 and above	27	27	28	28	27
		5	2	2	1	2	1
		4 and below	1	1	1	0	3
	42	6 and above	29	29	29	28	29
		5	1	1	1	1	1
		4 and below	0	0	0	1	0
	63	6 and above	29	29	29	28	29
		5	0	0	0	0	0
		4 and below	1	1	1	2	1
	169	6 and above	29	30	29	28	29
		5	1	0	1	1	1
		4 and below	0	0	0	1	0
	385	6 and above	25	21	28	24	22
		5	1	1	2	1	1
		4 and below	4	8	0	5	7
37.5	18	6 and above	28	29	30	29	30
		5	1	1	0	0	0
		4 and below	1	0	0	1	0

Table 4.4 *continued . . .*

Storage temperature (°C)	Storage time (days)	Rating [a]	Number of Responses				
			Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
37.5 continued	36	6 and above	26	26	28	28	27
		5	0 4	1	1	1	1
		4 and below		3	1	1	2
	54	6 and above	28	27	27	29	28
		5	1	1	2	0	1
		4 and below	1	2	1	1	1
	169	6 and above	26	23	28	27	22
		5	3	4	1	1	5
		4 and below	1	3	1	2	3
	385	6 and above	26	28	28	28	27
		5	3	1	1	1	1
		4 and below	1	1	1	1	3
40	15	6 and above	26	26	27	28	27
		5	1	1	1	1	1
		4 and below	3	3	2	1	2
	30	6 and above	22	23	25	27	26
		5	1	1	4	1	0
		4 and below	7	6	1	3	4
	45	6 and above	30	30	29	29	28
		5	0	0	1	0	0
		4 and below	0	0	0	1	2
	90	6 and above	23	23	26	25	23
		5	2	2	1	2	3
		4 and below	5	5	3	3	4
	147	6 and above	28	27	28	28	27
		5	1	1	1	0	1
		4 and below	1	2	1	2	2
	155	6 and above	20	17	19	28	18
		5	4	3	2	1	1
		4 and below	6	10	9	1	11
	158	6 and above	16	12	15	16	10
		5	2	5	3	2	3
		4 and below	12	13	12	12	17

Table 4.5 Quality characteristics of peanut brittle packed in laminated foil at the end of its shelf life at 40ºC

Parameters	Evaluation
1. Packaging condition Presence of defects such as improper sealing of laminated foil bags	None
2. Chemical quality	
2.1 Aflatoxin content (ppb) [a]	Not analyzed
3. Acceptability of the product [b]	Mean Ratings
3.1 Texture (crunchiness)	5.2
3.2 Overall acceptability	4.7
3.3 Color	5.0
3.4 Appearance	5.1
3.5 Flavor	4.3
4. Sensory characteristics of the product [c]	Mean Intensity Ratings
4.1 Texture	
Hardness on first bite	100
Fracturability on first bite	70
Hardness on first chew	95
Fracturability on first chew	65
4.2 Appearance	
Color	104
Surface shine	83
4.3 Aromatics	
Roasted peanutty aroma	62
Buttery aroma	59
Sesame aroma	15
Vanilla aroma	10
Caramel aroma	110
Rancid aroma	15

[a] Limit of Detection (LOD) = 5 ppb

[b] The sample was evaluated by 30 consumers in two replications for a total of 60 responses. A 9-point hedonic scale was used for acceptability mean ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely).

[c] Means are from ratings of 8 panelists in two replications. The test was conducted using unstructured line scales with anchors 12.5 mm from each end for the attributes of (4.1) texture: hardness on first bite (12.5 = very soft, 137.5 = very hard); fracturability on first bite (12.5 = crumbly, 137.5 = brittle); hardness on first chew (12.5 = very soft, 137.5 = very hard); fracturability on first chew (12.5 = crumbly, 137.5 = brittle); (4.2) appearance: color (12.5 = off-white, 137.5 = brown) ; surface shine (12.5 = dull, 137.5 = glossy); (4.3) aromatics: perceptible (=12.5) and strong (= 137.5) for roasted peanutty, buttery, sesame, vanilla, caramel and rancid aroma ; and (4.4) taste: perceptible (=12.5) and strong (=137.5) for sweet, salty and bitter tastes.

Table 4.5 *continued . . .*

Parameters	Evaluation
4.4 Tastes	
Sweet taste	102
Salty taste	27
Bitter taste	4

CONCLUSIONS

The industry collaborator did not adopt the Peanut CRSP technology for an improved peanut brittle developed for the company. The target shelf life of 6 months at 30°C was exceeded for the improved peanut brittle packed in laminated foil with a thickness of 0.0685 mm. However, it will be safe to predict its shelf life after the product had become unacceptable at the accelerated temperatures used (35, 37.5, and 40^{o}C). The information on shelf life obtained can be used as basis in the marketing strategies for the product. The study is continuing in order to predict shelf life at 30^{o}C and to determine the actual Q_{10} of the peanut product.

REFERENCES

AOAC (Association of Official Analytical Chemists). 2005. Official Methods of Analysis of AOAC International. 18th Ed. AOAC International. Gaithersburg, MD. USA.

Labuza, T.P. 2002. Determination of Shelf Life of Foods. Downloaded from http://www/courses.che.umn.edu/00fscn8334_1f/Pdf.Folder/General20%Shelf20%LifeReview.pdf on July 27, 2002.

Labuza, T.P. and Schmidl, M.K. 1985. Accelerated shelf life testing of foods. Food Technol. 39:57.

Meilgaard, M., Civille, G. V. and Carr, B. T. 1991. *Sensory Evaluation Techniques*. 2nd Ed. CRC Press, Inc., Boca Raton, Florida.

PCRSP (Peanut Collaborative Research Support Program). 2007. Consumer Acceptance, Sensory Profiling, Technology Transfer, and Shelf Life of Peanut Brittle for the Manila Market. Chapter 5. Monograph Series No. 7. Peanut Confections and Snacks. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

Shields, J.B. 1984. Foil, Aluminum. In *The Packaging Encyclopedia 1984*. p. 94. William C. Simms. (ed). Cahners Publishing company, Boston, MA.

Taoukis, P. S., Labuza, T. P. and Saguy, S. 1997. Kinetics of food deterioration and shelf-life prediction. Chapter 12 in Handbook of Food Engineering Practice, Valentas, K., J. Rotstein, E and P.R. Singh (Ed.), pp.361-403, CRC Press.

USFDA (United States Food and Drug Administration). 2001. Examination of Containers for Integrity. Chapter 22c in Bacteriological Analytical Manual (BAM) Online. Downloaded from http://www.cfsan.fda.giv/~ebam-22c.html on May 23, 2005.

APPENDIX A

BALLOT FOR THE CONSUMER TEST OF PEANUT BRITTLE

BALLOT FOR THE CONSUMER TEST OF PEANUT BRITTLE

CENTRAL LOCATION TEST: _____(date)

Panelist # _____ Sample # _____

Instruction: Please answer the following questions by putting a check mark in the square that best reflects your feelings about this sample.
Please bite half of the sample and answer the first 2 questions; then look at the sample and answer questions 3 and 4; lastly, eat the rest of the sample and answer question 5.

1. How would you rate the TEXTURE/CRUNCHINESS of the sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

2. How would you rate the COLOR of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

3. How would you rate the APPEARANCE of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

4. How would you rate the FLAVOR/TASTE of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

5. OVERALL, how would you rate this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

Thank you !

APPENDIX B

BALLOT FOR THE DESCRIPTIVE TEST OF PEANUT BRITTLE

BALLOT FOR THE DESCRIPTIVE TEST OF PEANUT BRITTLE

NAME:_____ CODE:_____

Date:_____

Instruction: Please put a vertical mark through the line scale to indicate the amount of each attribute (the scale is from 0 to 150 mm)

Texture

First Bite: Hardness (is the force to bite through the incisors)

Soft — Hard

First Bite: Bite through a pre-determined size of sample with incisors
Reference/ Intensity Rating: Planter's Peanuts= 95; Carrots= 110; Warm-up= 100;
Client's Peanut Brittle= 110

First Bite: Fracturability (is the force with which the sample breaks)

Crumbly — Brittle

First Bite: Bite through a pre-determined size of sample with incisors
Reference/ Intensity Rating: Graham crackers= 40; Corn chips= 55; Chichacorn= 65;
Warm-up= 70; Client's Peanut Brittle= 80

First Chew: Hardness (force to bite through with molars)

Soft — Hard

First Chew: Bite through a pre-determined size of sample with molars
Reference/ Intensity Rating: Planter's Peanuts= 90; Carrots= 100; Warm-up= 90;
Client's Peanut Brittle= 100

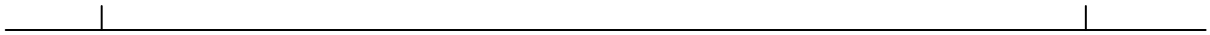
First Chew: Fracturability (force with which the sample breaks)

Crumbly — Brittle

First Chew: Bite through a pre-determined size of sample with molars
Reference/ Intensity Rating: Graham crackers= 35; Corn chips= 45; Chichacorn= 60;
Warm-up= 65; Client's Peanut Brittle= 75

Appearance

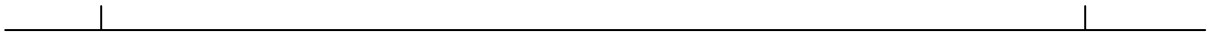
Color



Off-white
Brown

Off-white- the color associated with plain popcorn
Brown- the color associated with powdered cocoa
Reference/ Intensity Rating: Washed sugar= 20; Lady's Choice Peanut Butter = 30; Graham= 90; Ludy's Peanut Butter= 130; Warm up= 100; Client's Peanut brittle= 130; Cocoa Powder= 150

Surface Shine



Dull Glossy

Glossy- not dull
Reference/ Intensity Rating: Lady's Choice Peanut Butter = 40; Ludy's Peanut Butter = 120; Anchor butter =150; Warm-up=50; Client's Peanut Brittle= 100

Aromatics

Roasted Peanutty Aroma (aroma associated with medium roasted peanuts)

Perceptible Strong

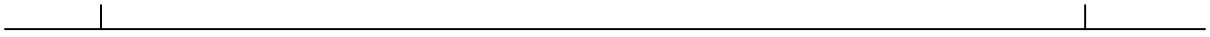
Reference/ Intensity Rating: Raw Peanut- 0; Planter's Peanut = 70; Warm-up = 50; Client's Peanut Brittle = 35

Buttery Aroma (aroma associated with unsalted butter)

Perceptible Strong

Reference/ Intensity Rating: Butterball= 110; Anchor butter= 150; Warm-up= 65; Client's Peanut Brittle= 10

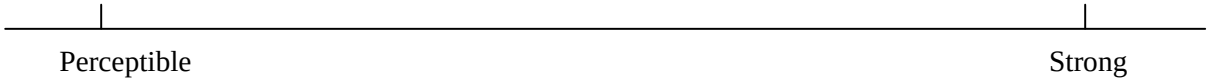
Sesame Aroma (aroma associated with sesame seeds)



Perceptible Strong

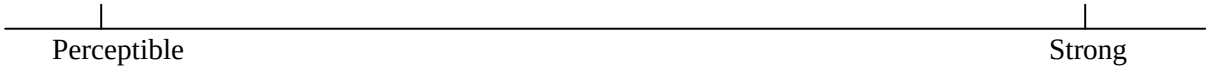
Reference/ Intensity Rating: Raw Sesame= 0; Roasted Sesame Seeds= 25; Sesame oil= 150; Warm-up= 10; Client's Peanut Brittle= 110

Vanilla Aroma (aroma associated with vanilla)



Reference/ Intensity Rating; 5% Vanilla= 35; Warm-up= 25; : Client's Peanut Brittle= 10

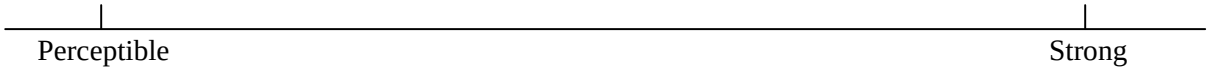
Caramel aroma (aroma associated with caramelized sugar)



Reference/Intensity Rating: 2% sucrose solution = 20; 5% sucrose solution = 50;
10% sucrose solution = 100; 16% sucrose solution = 150;
Warm up= 85; Client's Peanut Brittle= 50

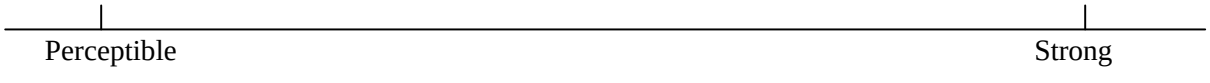
Tastes

Sweet Taste (taste stimulated by sucrose)



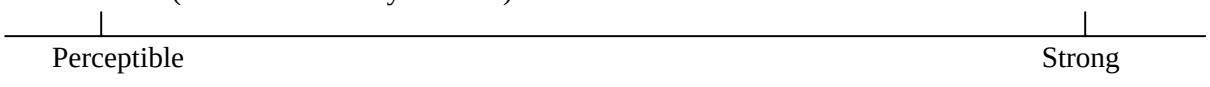
References/Intensity Rating: 2% sucrose solution= 20; 5% sucrose solution = 50;
10% sucrose solution = 100; 16% sucrose solution = 150;
Warm-up =120; Client's Peanut Brittle= 90

Salty Taste (taste stimulated by sodium chloride)



Reference/Intensity Rating: 0.2% sodium chloride solution = 25;
0.35% sodium chloride solution = 50;
0.5% sodium chloride solution = 85;
Warm-up= 35; Client's Peanut Brittle= 42

Bitter Taste (taste stimulated by caffeine)



Reference/ Intensity Rating: 0.05% caffeine solution= 20; 0.08% caffeine solution= 50;
0.15% caffeine solution= 100; Warm- up=5;
Client's Peanut Brittle= 15

CHAPTER 5

IMPACT ASSESSMENT OF PEANUT COOKIES

Lutgarda S. Palomar [1]
And
Anna V. A. Resurreccion [2]

[1] Co-Principal Investigator and Professor at Leyte State University 6521-A
[2] Principal Investigator Peanut CRSP; Professor, University of Georgia, Griffin, Georgia 30223-1797, U.S.A.

ABSTRACT

Peanut cookies are considered as a specialty in one of the cities in Central Visayas (Region 7), Philippines and has become very popular as a take-out product especially for those visiting the area. A collaborative project, published in PCRSP USA-Philippines Monograph Series No. 7 (PCRSP, 2007), was conducted with the industry partner in Tagbilaran, Bohol to optimize its baking process and to give suggestions and recommendations for improved product quality for the company to consider. An impact assessment was done in order to determine the status of the product in the market and the Collaborator. Furthermore, the extent in the adoption of the technology and other suggestions were also noted.

The technology transfer and impact assessment showed that there have been an increasing annual sales of the company up to the present with the highest increase, for two years, occurring right after the technology transfer. These might be attributed to the adoption of the project's recommendations such as using only one baking oven for both rising and final baking processes, purchase of peanut crusher and molder, availment of DOST's SET-UP Program for the packaging, use of cloth hair restraint instead of hairnets, and increasing the number of product outlets all over the country totaling to about 80 major outlets. The company through its production manager is still interested to collaborate especially in the utilization of its production wastes, peanut skin, and eggyolk and standardization and possible modification in its molding equipment.

INTRODUCTION

Peanut is a very popular item in the Philippines. It is often boiled or roasted either in oil or dry roasted in oven. It is used as the main ingredient in the production of a delicacy, Peanut Cookies, which has become very popular not only in the area but all over the Philippines. Earlier, the company used one oven for the rising process and another oven for the final baking process. A collaborative research project activity published as a note in PCRSP USA-Philippines Monograph Series No. 7 (PCRSP, 2007) was conducted to optimize oven baking temperature and time, and make recommendations to further enhance the company's product quality and its manufacturing process.

Results showed significant differences in terms of form, flavor, and overall acceptability as influenced by baking temperature and time of baking peanut cookies. The optimum zone included the company's existing baking process combination and both the lower temperature and shorter time of baking which could reduce production time and cost. Furthermore, a corresponding product quality enhancement especially at the bottom of the cookies was observed that was used as a quality index by the company if an optimized process would be followed during baking.

Form (as cookies) of the product seemed to be the limiting factor in the optimization procedure. Temperature and time combinations of 290^{o}F for 45 minutes and 300^{o}F for 75 min had the highest acceptability for form. All combinations of baking temperatures of 295-310°F and baking time of 51-75 minutes resulted in a product with consumer acceptability scores of ≥ 6.50.

After 2001 and several years of adoption of the processing technology, impact assessment has to be performed in order to determine impact as well as the status of the product and the company. Further collaboration can be resumed between the company and the Visayas State University (VSU, formerly Leyte State University)-Peanut CRSP Team.

OBJECTIVES

The study was conducted to: (1) conduct impact analysis of the technology transfer and commercialization of peanut cookies; and (2) document the status of the company commercializing peanut cookies.

METHODS

Technology Transfer and Commercialization

Development of the Guide Questions

Questions were developed as guide in the interview and visit to the Collaborator.

Visit and Discussion with Production Supervisor and Co-Investigator.

In 2001 or after the end of the project, the optimum baking temperature and baking time as a result of an earlier study was transferred. The Food Technologist was the contact person during the project period but before the transfer of the project was done, he left the company so it was the Production Manager who allowed the PCRSP researchers to transfer the technology to the chief baker.

Use of Secondary Data

A source book and other company's public documents as well as information from the management, observers and collaborator of the project were also used as bases in the discussion and conclusion.

Other Technical Recommendations

The extent of the adoption of technical and other recommendations such as using only one baking oven for both rising and final baking processes, purchase of peanut crusher and molder, availment of DOST's SET-UP Program, use of cloth hair restraint instead of hairnets, and increasing the number of product outlets all over the country were also determined.

RESULTS

Technology Transfer and Commercialization

Although, the exact extent of adoption of the technology and other technical recommendations cannot be determined due to a change in management, there were a number of recommendations that the project made which were followed such as:

Continuous Baking in One Oven

The company used two sets of oven before, one for the rising and another for the final baking. This was laborious and had higher risk for the workers for possible accidents. Furthermore, the texture of the product was harder. At present, the company is baking the product with one oven both for rising and final baking. However, they are using 350^{o}F at shorter time of 50 min instead of 300^{o}F at 60 min or higher temperature at shorter time. The company has new sets of ovens.

Purchase or Fabricate a Peanut Crusher and a Molder

Since the volume of production of peanut cookies was observed to be increasing, the purchase of a crusher was necessary. Instead of purchasing a branded crusher, the company was able to get a fabricated crusher (Fig.5.1). It has a capacity of 150 Kg of roasted peanuts per day.

Update on Current Good Manufacturing Practices

The workers of the company used hair nets. It was suggested that hair restraints should be used and was followed.

Availment of DOST's SET-UP Program

Due to continuous link of VSU with the Department of Science and Technology (DOST) and information on its SET-UP Program, VSU encouraged the Collaborator to contact DOST for possible assistance. The Company was able to avail of packaging/label assistance from DOST according to a recent information gathered by the researcher.

Fig. 5.1 Fabricated peanut crusher of the company.

Fig. 5.2 Peanut cookies in the biggest box-pack.

Product and Company's Present Status

Fig. 5.3 shows sales yearly percent increases from 2000 to 2006. The impact on packaging (Fig. 5.4) and expansion of product markets to all over the country and availability of the products through its product outlets (Table 5.1), for sure have contributed to its increasing annual sales. Product quality, pioneering and positioning of the product in the market were the reasons given on how the company's leadership in the market came about.

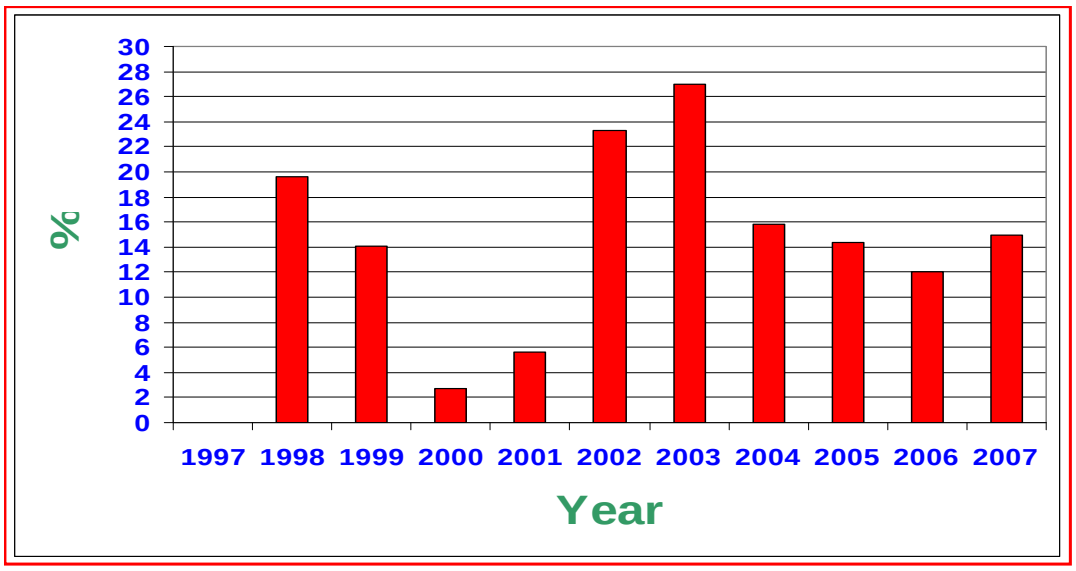


Fig. 5.3 The company's ten year percent increase in sales. The actual amount is on file. The 2007 figure is the company's goal of product sale increase for this year.

Fig. 5.4 Peanut cookies in the supermarkets: In box-packs (a), and family packs (b) in one of the outlets in Central Visayas.

Table 5.1 Major peanut cookies outlets all over the country[a].

Area	Number of Outlets/Stores
Mindanao	8-10
Cebu	30
Metro Manila Exclusively with SM	22 Branches
Bohol	15

[a] The figures were based on a phone interview with the Production Manager on May 09, 2007 but some other information are only kept on file for secrecy issue.

Possible New Initiatives and Collaboration

The management will continue to tie-up through its Production Manager with VSU, Visca, Baybay, Leyte in terms of waste (peanut skin and eggyolk) utilization and processing and updates on cGMP, SSOP and HACCP activities as well as standardization and possible modification of its molder. A letter to this effect is on file since management would like to have secrecy on these matters.

CONCLUSIONS

Due to the secrecy issue, a number of information was only kept on file. However, the leadership of the company and its product share in the market can be clearly observed. Introduction of the technology might have only a minor impact *per se* but other effects of the other recommendations could have contributed to the success and continuing expansion not only on the product market *per se* but to the company's expansion to other food chains and processing ventures.

REFERENCE

PCRSP (Peanut Collaborative Research Support Program). 2007. Note on Consumer-Based Optimization of Peanut Cookies. Monograph Series No. 7. Peanut Confections and Snacks. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

CHAPTER 6

IMPACT ASSESSMENT AND SHELF LIFE OF A PEANUT BRITTLE FROM THE VISAYAS

Lutgarda S. Palomar [1]
Lorina A. Galvez [2]
Lucy B. Paloma [3]
Rotacio S. Gravoso [4]
Edith M. San Juan [5]
Amelita C. Natividad [6]
and
Anna V.A. Resurreccion [7]

[1] Co-Principal Investigator and Professor at Visayas State University 6521-A, Philippines
[2] Instructor, Leyte State University 6521-A, Philippines
[3] Professor at Visayas State University 6521-A, Philippines
[4] Instructor, Leyte State University 6521-A, Philippines
[5] Supervising Research Specialist, Food Development Center 1632, Philippines
[6] Senior Research Specialist, Food Development Center 1632, Philippines
[7] Principal Investigator Peanut CRSP; Professor, University of Georgia, Griffin, Georgia 30223-1797, U.S.A.

ABSTRACT

Peanut brittle is a peanut product at Buray, Paranas, Samar, Philippines processed from whole roasted peanuts with sugar syrup and cream of tartar. A previous study published as a note in PCRSP USA-Philippines Monograph Series No. 7 (PCRSP, 2007) was done in order to optimize the process and formulation of this traditional product that has existed for more than 50 years already at Buray. The present study involved the evaluation of the impact of the technology transfer of an optimized product on an industry association collaborator, Wright Peanut Processors Association (WPPA) who has been involved in the expanded commercialization of peanut brittle for about 3 years now. The general objective was to determine the impact of the technology transfer and commercialization on the development of the association, as well its economic, social and environmental impacts.

The project started in 2003 through improvement of product quality with interventions in packaging. The present group was reorganized from the old group of about 30 members that became inactive due to management-related problems. Some members of the new group were members of the old one but with renewed vigor to continue with the new initiatives particularly in the operation of the DOLE-LGU-LSU partnership.

The group has been registered with the Department of Labor and Employment (DOLE). Each member was required to pay a total membership fee of PhP100.00 (i.e., PhP50.00 at first, additional PhP50.00 later; PhP=Philippine peso). Some members, however, reportedly could not pay this fee in full due to financial constraints. DOLE provided financial assistance to this group with the Local Government Unit (LGU) of Wright, Samar as the conduit of funds. The LGU arranged with a local wholesaler to provide the processing inputs to the processing group on a per order basis, as the need arose. The LGU then paid direct to the local wholesaler. The members said that this was a better arrangement than what they had with the old group since it assured them of operating capital as well as eradicating the risk of fund diversion when the fund was divided among the members as cash. This arrangement started in June 2006. Having been registered with the DOLE enabled them to be trained in record keeping and financial tracking. The members saw this as a significant achievement.

An association has been organized and DOLE-registered now with assets in terms of raw materials, supplies, some tools, and processing implements of over PhP100,000.00. This might appear very small but considering that there was nothing in 2003 (no organized group and no asset), this is something remarkable and only made possible through the association's effort, with guidance from the stakeholders, in writing a proposal for counterpart funding by DOLE.

Expansion of market is also determined by the shelf life of a product. The performance of a packaging material known to be a good barrier to oxygen and moisture, which are factors affecting the shelf life of peanut products, was evaluated.

The optimized peanut brittle samples were prepared at the collaborator's plant. The product, wrapped in 80 mm x 80 mm (length x width) wax paper and packed in 160 mm x 80 mm (length x width, inner dimensions) four-sided seal laminated foil bag with a thickness of 0.0685 mm were stored at 35, 37.5, and 40°C. Each pack contained 15 pieces of peanut brittle or approximately 4.6 grams per piece. After one month of storage at 35, 37.5, and 40°C, the product packed in laminated foil with thickness of 0.0685 mm, remains acceptable. Prediction of shelf life

at 30°C and computation of its actual Q_{10} value will be made when the end of shelf life at above accelerated temperatures is reached.

INTRODUCTION

Peanut brittle (peanut praline or *piniato de mani)*, is an indigenous peanut product in Buray, Paranas, Samar, Philippines which unlike other sweetened peanut products contains more than 80% peanuts in the formulation. Different families used different formulations in the production of peanut brittle, yet no group or agency has been reported to study and improve its formulation and process for the last half a century of its existence. Furthermore, the processors were not aware of any danger in the processing and use of low quality, infected peanut kernels.

Processing peanut and rice-based special *piniato* for many years has been the main source of income for the residents of Brgy. Buray, Paranas, Samar. With a large percentage of them as processors, this practice has trickled down even to the fourth generation, including vendors who run after buses and other vehicles that pass by. Their central location is very strategic for vehicles plying the North, South, and East thus, making them a popular stop over for travelers who pass by Samar.

Recognizing the potential of the industry, the Visayas State University (VSU, formerly Leyte State University) based in Visca, Baybay, Leyte through the Peanut Collaborative Research Support Program of the University of Georgia, U.S.A. and Food Development Center of the Philippine National Food Authority in coordination with the Department of Trade and Industry (DTI) Samar Provincial Office, conceptualized the peanut industry development project for small enterprise in Eastern Visayas in 2003 and organized a group called Wright Peanut Processors Association (WPPA) as its collaborator.

The industry produces 20.74 tons of processed peanut manufactured into peanut brittle roasted peanut, and peanut butter, utilizing approximately 290 sacks of peanuts annually by twenty four (24) peanut processors and vendor members of Wright Peanut Processors Association (WPPA).

WPPA has been assisted technically by the VSU-Peanut CRSP team to improve the quality of the product which is currently being produced by the existing member processors by standardizing the procedure - from raw material sorting, manufacturing process until the finished product packaging. During their initial stage of operation, among the identified problems of the association were its legal personality as an association through the DOLE and DTI's Business Name Registration, construction of production center, and procurement of equipment for a communal processing center, institutional strengthening and market expansion. The WWPA addressed these pressing problems with the implementation of the Peanut Industry Development Project.

The peanut processing industry enterprise development project for small-scale processors-entrepreneurs in Buray, Paranas (Wright) started with a visit by Dr. Jonathan (Tim) H. Williams, Program Director USAID Peanut-CRSP-Griffin, GA, USA to observe the actual peanut brittle processing and see its growth potentials. The subsequent visit in May 2002 by the Peanut-CRSP US Principal Investigator, Dr. Anna V. A. Resurreccion, resulted to the conceptualization of a research project "Development of Peanut Products for Small Industry Associations in Eastern Visayas" (Fig. 6.1).

The optimized process and formulation was transferred through a training first at LSU and later at WPPA's processing area. The members take turns in processing the products

especially for the outside Buray markets. With 25% or 6 members at a time, there has been an increasing volume of annual sales especially now that there are more product outlets aside from he Tacloban Pre-Departure Area Store and BAHANDI Pasalubong Center

The marketability of a product is affected by its shelf life which varies with the raw materials and ingredients, processing conditions and storage as well as type of packaging material. Rancidity is a major problem associated with peanut products, thus it is important that the packaging material is a good barrier to oxygen to ensure longer product shelf life. The use of a laminated foil is recommended as it is a good barrier to oxygen and moisture (Shields, 1984). Knowledge of shelf life in this type of packaging material will help producers of peanut brittle in their marketing strategies.

Fig. 6.1 Dr. Anna V. A. Resurreccion of the University of Georgia, USA (seated right) and representative from DTI, Samar (seated left) with some of the peanut brittle processors and VSU-PCRSP researchers (standing 2nd and 4th from right) on May, 2002.

OBJECTIVES

This study was carried out in order to assess the overall impact of the optimized peanut roasting process and formulation and the subsequent technology transfer to WPPA. Specifically, the project aimed to: (1) document the impact of the technology on the business and socio-economic status of members of the association; (2) evaluate the market and business expansion as an effect of the adoption of the technology; (3) assess the consumers' reactions on the quality

of optimized compared to unoptimized products; and (4) determine the effect of the optimized product on the business of product outlet owners.

The study also aims to report the status of shelf life tests conducted on peanut brittle after one month of storage. The study, however, will continue until product becomes unacceptable at 35, 37.5, and 40°C to be able to predict the shelf life at 30°C.

METHODS

IMPACT ASSESSMENT OF A PEANUT BRITTLE FROM THE VISAYAS

Consultations

In order to have leverage especially since Samar is far from VSU, consultations were made with the Department of Trade and Industry (DTI), Catbalogan, Samar, Philippines (Fig. 2a) and local government units (LGU), Barangay Buray (Fig. 6.2) and Municipality of Paranas, Samar (Fig. 2c).

(a) **(b)** **(c)**

Fig. 6.2 Consultations with the Department of Trade and Industry (DTI), Catbalogan, Samar, Philippines (a); and local government units (LGU), Baranggay Buray (b) and Municipality of Paranas, Samar (c).

Identification of Collaborator

There are only about five peanut processors in the Visayas with majority being located in Cebu City. In addition, these are mostly microprocessors (Lustre *et al*., 2002) who are not qualified as project collaborators since the project required that a company should be at least a small processor with a minimum capital of PhP 3 million. Due to the absence of an industry collaborator, an Industry Association could serve as collaborator as long as it meets the following criteria: (1) must be an organized group with at least 24 members, (2) must show willingness to adopt the optimum formulation and process including sorting technology, (3) must co-share cost with the project.

With assistance from the Department of Trade and Industry (DTI), the Wright Peanut Processors Association (WPPA) was organized and became the Collaborator (Appendix A) for this project.

Collection of Data and Impact Assessment

Face-to-face interview with the WPPA's President and Treasurer, and a Focus Group Discussion (FGD) using the Quick Resource Appraisal (QRA) instrument to determine the different impact of the introduction of the peanut project using the Most Significant Change (MSC) technique were done. The FGD session was conducted with 10 members of WPPA in Buray, Paranas, Samar. The QRA tool was explained to the participants. This consisted of the participants rating the group in terms of six areas. These include R & D (introduced technology), technology packaging, processing system (equipment and tools used), organization, management and linkages with raw material supplier and other inputs. The participants were grouped in pairs and each pair rated each item by consensus after discussing the issue. They could also use in-between ratings like 3.5 or 4.2, etc. depending on the degree of their assessment estimates per category. They were given about 20 min to discuss and rate in pairs. Sharing and feedback followed. Their ratings and qualifications were explained as follows:

(1) R & D (the *piniato* and the introduced aflatoxin eradication technology)

5 - already established
3 - being developed
1 - not yet established

(2) Technology packaging

5 - commerciability established
3 - being established
1 - not yet established

(3) Processing system (equipment and tools used)

5 - system in place, complete
3 - system being established
1 - system under study

(4) Organization

5 - active group
3 - being organized, not so active
1 - unorganized, inactive

(5) Management

5 - management in place, very good
3 - being trained, skills being developed
1 - poor management

(6) Linkages with raw materials (peanut) and other inputs

5 - well-linked, minimal constraints
3 - occasionally problematic, some lack in supply
1 - supply substantially lacking, problematic links

SHELF LIFE OF A PEANUT BRITTLE FROM THE VISAYAS

Procedure for Sample Storage

All samples of peanut brittle for the shelf life study were properly labeled with the product name, the date test samples were received, the date of storage, and storage temperature. The samples were stored in incubators maintained at accelerated temperatures of 35, 37.5, and 40^{o}C and on shelves representing ambient conditions about 30^{o}C, at the FDC Shelf Life Testing Room. The reference samples were stored in a low temperature incubator maintained at 0-4^{o}C. All samples were positioned, in the incubator shelves, such that the complete package was directly exposed to the required temperatures and other conditions of the testing incubators and Shelf Life Testing Rooms.

Determination of Sampling Frequency for Product Testing During Storage at 40, 37.5, and 35^{o}C

The procedures for calculating sampling frequency are as described in Chapter 1 of this Monograph. The estimated time for product testing are shown in Table 1.2 of Chapter 1 in this Monograph.

Product Tests Conducted

The initial (day 0) quality of the peanut brittle sample was evaluated for packaging condition, sensory quality through descriptive analysis and consumer testing, and aflatoxin content. During storage at 40, 37.5, and 35^{o}C, the acceptability of the peanut brittle was evaluated through consumer tests. The procedures for product tests conducted are as described in Chapter 1 of this Monograph, except that peanut brittle rather than peanut butter samples were evaluated.

Determination of the End of Shelf Life at Three Accelerated Temperatures, Prediction of Shelf Life at 30^{o}C, and Calculation of Q_{10}

The shelf life of peanut brittle is the period at which it will retain an acceptable level of eating quality from a safety and sensory point of view (Labuza, 2002). The end of shelf life of the product is established when the average rating of 30 consumers is less than 5, which corresponds to “dislike slightly” in the 9-point hedonic scale used in the consumer testing, on overall acceptance. Descriptive analysis was used to quantify the attributes of the control sample and the product at the end of its shelf life.

A shelf life plot will be constructed as described in Chapter 1 of this Monograph. Likewise, the procedures for prediction of shelf-life at 30^{o}C and calculation of Q_{10} value are as described in Chapter 1 of this monograph.

RESULTS

IMPACT ASSESSMENT OF A PEANUT BRITTLE FROM THE VISAYAS

Identification of Collaborator

Due to the situations shown earlier, an Industry Association, Wright Peanut Processors Association (WPPA) as collaborator was the most applicable in the Visayas situation. An industry association was the one identified as a group-collaborator. With the assistance from the Department of Trade and Industry (DTI), the Wright Peanut Processors Association (WPPA) was organized and it became the Industry Collaborator (Appendices A, B and C).

Formation of Organization

The earlier cooperative was mostly farmers, and the need for renewed enthusiasm was necessary. After several discussions, the association named Wright Peanut Processors Association (WPPA), was organized. Wright was the former name of the municipality of Paranas, Samar, Philippines where the collaboration site was located. It was formally organized and elected its officers (Fig. 6.3) on May 21, 2003 but its registration was approved only on May 04, 2004 (Appendix A) by the Department of Labor and Employment (DOLE), Regional Office No. VIII Tacloban City, Philippines with Registration Certificate No. RO800-04-04-RW A-825 (Appendix B). To further give strength to the association, an organizational structure was created (Fig. 6. 4).

Fig. 6.3 The elected officers of the Wright Peanut Processors Association (WPPA), Buray, Paranas, Samar, Philippines.

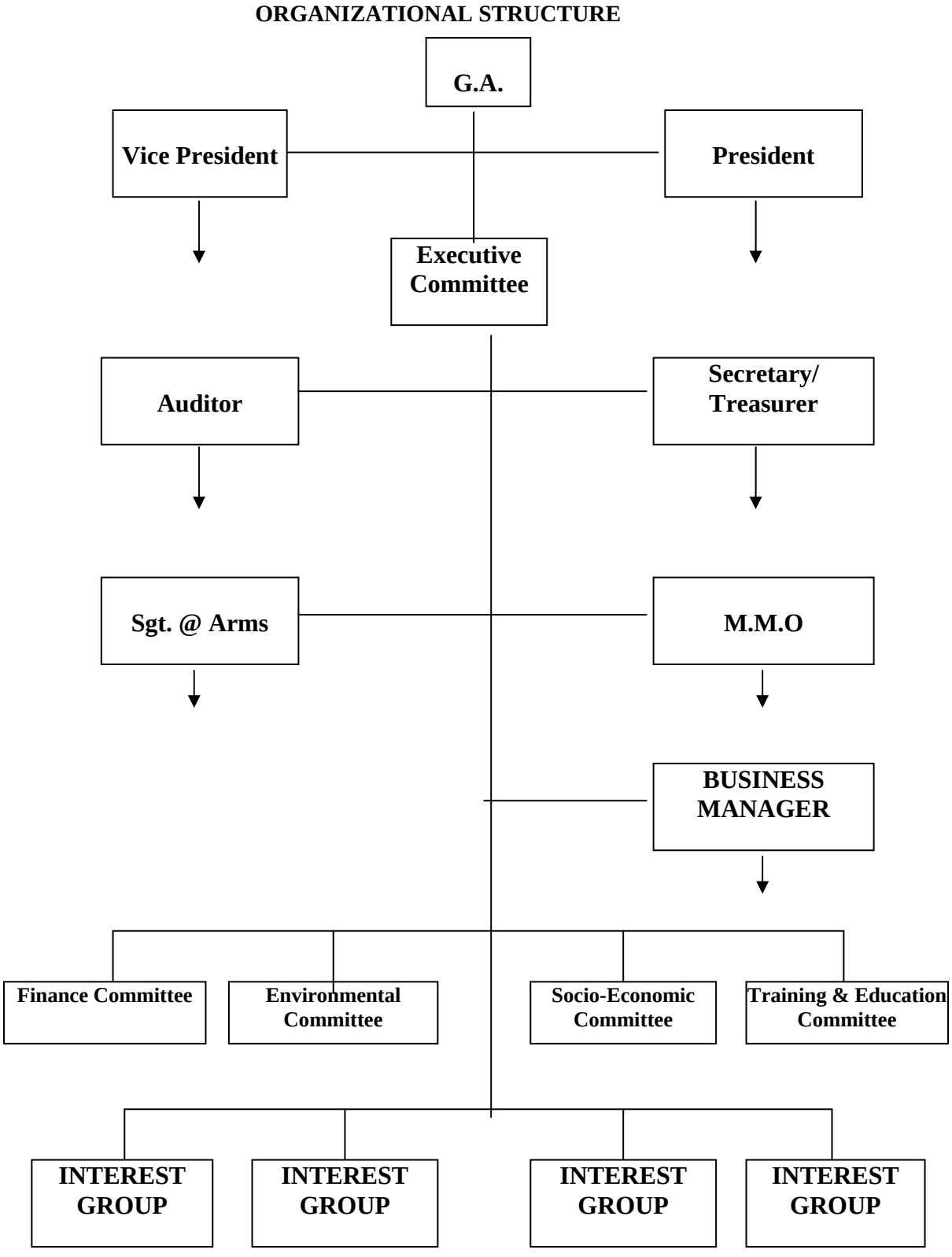


Fig. 6.4 The organizational structure of the Wright Peanut Processing Association.

Establishment of Collaboration for Technology Transfer

In order for the collaboration to be successful, several meetings and discussion were made and agreements between and among stakeholders were reached including co-sharing in funding some activities and stipulation of each role (Table 6.1). A Memorandum of Agreement (MOA) was developed and Dr. Paciencia P. Milan, LSU President, signed it on June 5, 2004.

Since the members of WPPA were mostly housewives who did not have continuous income especially at the start of the project, their counterpart support was to spare time to attend meetings, training, seminars, and other activities. However, sometimes they provided snacks or food while before this project they were paid by the sponsoring agency just to attend meetings. Cost sharing started with members attending meetings and entertained visitors for free or without asking for remuneration, an improvement from the PhP10.00 per meeting earlier observed. As the project progressed, cost sharing had been established, no matter how small, in terms of WPPA spending for either snacks or resource persons' lunch or both. This practice evolved due to stakeholders' modeling and since the research and DTI staff did not receive any honorarium and even spent for some activities.

Table 6.1 Chronological sequence of events

Date	Activity
May, 2002	Visit of Dr. Anna V. A. Resurreccion of the University of Georgia, U. S. A
May, 2003	WPPA was organized and officers were elected
Oct., 2003	Enhancement Training
May, 2004	WPPA was registered at the Dept. of Labor and Employment (DOLE)
June 05, 2004	Signing of MOA by LSU President, Dr. Paciencia P. Milan and Director Cynthia R. Nierras, DTI, Region 8
Feb. 2006	Conduct of the DOLE approved training proposals on Social Preparedness and Enhancement of Peanut Products
Nov. 2006	Impact Assessment by Prof. J. R. Roa and Ms. L. A. Galvez

Identification/Establishment of Stakeholders

Even at the pre-project conceptualization, the distance of VSU and Samar was already a major consideration not only in relation to funding but especially in the access for clarification and guidance by the WPPA. With this constraint and the synergistic effect of more people being involved made the team pursue the establishment of stakeholders.

Writing of Proposals for Counterpart Funding

Due to the need for a more and quicker economic advantages and effects on the lives of the members and families of WPPA, involvement and subsequent counterpart funding to the Department of Labor and Employment (DOLE) were sought.

Preparation of Supporting Documents and Endorsements

The following documents were prepared: (1) Proposals for DOLE's funding required endorsement from the LGU and other requirements. Meetings and discussion were also done with LGU-Paranas, Samar and LGU-Buray, Paranas, Samar which later on submitted resolutions to

DOLE; and (2) Barangay (Buray) and Municipal (Paranas) profiles which formed part of the requirements by DOLE. Assistance was also given to WPPA in order to comply with these requirements at the soonest possible time.

Proposal Evaluation by DOLE

Evaluations were done by DOLE on the proposals and decisions made before the on-site evaluations on the potential beneficiary were done.

Approval of Social Preparedness and Enhancement Training Among WPPA Members

The proposals for Social Preparedness Training and Enhancement Training submitted to DOLE were approved in 2005 but were implemented in 2006 (Fig. 6.5). Aside from DOLE and LGU, DTI and TESDA also served as co-sponsors.

Fig. 6.5 Skills enhancement training with a VSU-PCRSP staff as speaker.

Technology Transfer

Peanut Roasting

The technology that was transferred to WPPA included the peanut roasting process for both peanut brittle and peanut butter processing. A liquid petroleum gas (LPG)-fed oven was loaned to the association on rent-to-own scheme since the optimized process required the use of LPG-fed oven instead of the firewood-fed stove. Results showed that almost similar % recovery was obtained for roasted peanuts prepared during the standardization of the process at VSU and at WPPA (Table 6.2).

Table 6.2 Percent recovery of roasted peanuts at VSU and at collaborator's (WPPA) site using native, newly harvested peanuts for peanut brittle and butter processing

Particulars	At VSU			At WPPA		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
Raw Peanuts (g)	2000	2000	1000	4000	2000	2000
Sorted out	75	75	40	80	70	30
Wt after Roasting	1925	1925	960	3920	1930	1970
% Recovery	96.25	96.25	96.00	98.00	96.50	98.50
Average Recovery		**96.17%**			**97.67%**	

WPPA= Wright Peanut Processors Association; Leyte State University.

Trainings and Workshops

The continuing activity at VSU in Visca, Baybay, Leyte, Philippines was focused on the enhancement of peanut products in Eastern Visayas and development of the Wright Peanut Processors Association (WPPA). One of the major activities especially on development of proposals for counterpart funding with the other stakeholders consisting of various agencies whose roles had been defined was also established in this project.

Table 6.3 shows the trainings and workshops conducted. In cooperation with the other stakeholders as follows: (1) Entrepreneurial Development – October 26-28, 2005 at DTI-Samar, Catbalogan City, Samar, Philippines; (2) Social Preparedness Training funded and conducted by DOLE on February 21-22, 2006; and (3) Enhancement Training – February 23-24, 2006 – Funded by DOLE, LGU-Paranas, Samar and TESDA and Conducted by DFST, LSU.

Table 6.3 Trainings and workshops conducted

Date	Title of Training	Observed/Seen Results/Effects
July, 2003	Training- Workshop on Basic Recording	Inclusion of labor in the computation of product cost
July, 2003	Record Keeping	Inclusion of labor in the computation of product cost
October, 2003	Training-Workshop on Peanut Food Quality & Safety (Fig. 6.5)	Positive environment impact of burying aflatoxin contaminated peanuts instead of throwing it anywhere or feeding them to pigs
	Hazards in Foods (Dr. Lutgarda S. Palomar)	Awareness of safety requirements and the application cGMP and SSOP
	Sorting Technology for Aflatoxin Control (Prof. Lotis dL. Francisco)	Peanut sorting to eliminate aflatoxin and purchase of good and better quality raw peanuts
	Demonstration of ELISA Test Kit Aflatoxin Detection (Ms. L. A. Galvez)	
January 2004	ID on Training Needs/Capability Build-Up/ Delineation of Roles through a Workshop participated	With VSU-PCRSP Team,Training Coordinator of the Dept. of Trade & Industry (DTI) both Provincial and Regional levels and LGU
May, 2004	WPPA's registration with DOLE	
	Unoptimized/ Optimized Roasted Peanut Formulations	Preference of oven roasted over oil roasted peanuts
	BEST Game	The members realized that there are many strategies to be used in their business to make it more profitable
February, 2006	Enhancement Training	The training did not only enhance the members' technical capability but also increased their capital and assets since the Department of Labor and Employment approved the proposals written with the assistance of VSU Researchers and DTI Staff.

TRAINING ON FOOD QUALITY AND SAFETY

27 October 2003

Sponsoring Agency:

- USAID-Peanut-CRSP
- University of Georgia
- Food Development Center
- University of the Philippines
- Leyte State University
- Wright (Paranas) Peanut Processors Association

PROGRAM OF ACTIVITIES

09:30	REGISTRATION
10:00 - 10:30	OPENING PROGRAM
	Invocation *National Anthem* *Welcome Remarks* *Message*
10:31	**Hazards in Food** *Dr. Lutgarda S. Palomar*
	Peanut Sorting Technology *Ms. Maria Leonora dL. Francisco*
12:00 - 01:00	NOON BREAK
01:30 - 02:30	**Practicum on Peanut Sorting**
02:30 - 03:30	**Aflatoxin Analysis** *Ms. Lorina A. Galvez*
03:30	CLOSING PROGRAM
	Emcee:

Fig. 6.6 Programme of the Training-Workshop on Peanut Food Quality and Safety conducted on October 27, 2003.

Fig. 6. 7 Wright Peanut Processors Association peanut brittle (piniato)

Fig. 6.8 Training on food quality and safety.

Impact on Employment, Facilities and Raw Materials

Effect on Product Quality

According to some observers and even the WPPA officers, the optimization study on peanut brittle (Fig. 6.7) improved its sensory quality and marketability especially in terms of appearance/color and taste. The products from the unoptimized formulation had non-uniform appearance with dark brown to black spots and bitter taste.

Furthermore, the shelf-life of the unoptimized product was very short (less than 1 week) while that of optimized could last for at least one month according to the study conducted at FDC but at least two months according to actual observations even from the product outlets.

Table 6.4 shows the questions and answers relevant to product quality and safety.

Table 6.4 Questions and responses relevant to the effect on product quality and safety

Question No.	Questions	Response
1	Did optimization improve the appearance and color of peanut brittle / / More uniform / /Less unifrom / /No change	[a] More uniform
2	Did optimization change the typical characteristics of the color of peanut brittle in the market	
3	What are the impact in terms of commercialization of peanut brittle in terms of volume / / Increased / /Decreased / /No change	[b]Increased
4	What are the impact in terms of store sales / / Increased / /Decreased / /No change	Increased
5	Did you engage in product promotion / / Yes / /No	Yes
6	Did you have other products developed because of technology transfer / / Yes / /No Please specify:	[a]Yes [a & d]Natural peanut butter and peanut-flavored polvoron
7	Please specify the products / / Natural peanut butter and peanut-flavored polvoron	

Respondent: [a] WPPA President; [b] Product Outlet Owner; [c] Pasalubong Center Women's Group; [d] WPPA member/processor/vendor.

Effect on Employment and Worker's Morale

Due to orders from product distributors and outlets, members who were not regularly processing the products became workers during the processing or specifically in the wrapping of products and earned some income instead of staying idle at home. According to the WPPA treasurer, the members who did the wrapping, packaging and even assisted in the distribution, earned at least PhP100 a day for one month, an improvement since earlier, they just stayed at home.

Furthermore, "the group members also benefited in terms of better social status, and have gained confidence that they were able to get support from various agencies" and they also felt "good" with visitors getting interested in their business, and their own contribution to the

improvement of the *piniato* micro-industry, of which Buray has been known for a long time (Roa and Galvez, 2006).

Expanded Peanut Brittle Markets

As an effect of optimized product, the market of the peanut brittle has expanded from just bus peddling (Fig. 6.9) to an additional of at least 8 other distributors and product outlets. The questions and answers related to marketing system and volume are presented in Table 6.5.

Fig. 6.9 Bus peddling as a product selling strategy.

Fig. 6.10 VSU Bakery, Visca, Baybay, Leyte, Philippines. Peanut brittle in packs of four in polypropylene.

Fig. 6.11 Pasalubong Center, Guadalupe, Baybay, Leyte, Philippines.

Fig. 6.12 Product with header label and with 10 sticks per pack at Pre-Departure stores, Tacloban Airport, Leyte, Philippines.

(a)

(b)

Fig. 6.13 (a) Peanut brittle (*piniato*) at Bahandi Pasalubong Center, Tacloban City, Leyte, Philippines; (b) product in 0.003 inch, yellow printed polypropylene packs.

Fig. 6. 14 Peanut (*piniato*) at a) at NQ Trading and b) Yoyi's Ormoc City, Leyte, Philippines.

Table 6.5 Questions and responses relevant to the effect on marketing system and volume

Question No.	Question	Response
1	What are the effects of optimization in terms of sales especially the markets outside of Buray / / Increased / /Decreased / /No change	[a]Increased
2	What are the impact in terms of commercialization of peanut brittle in terms of volume / / Increased / /Decreased / /No change	[a]Increased
3	What are the impact in terms of store sales / / Increased / /Decreased / /No change	[b]Increased
4	Did you engage in product promotion / / Yes / /No	Yes
5	Did you have other products developed because of technology transfer / / Yes / /No	[a]Yes
6	Please specify the products	[a & d]Natural peanut butter and peanut-flavored polvoron

Respondenst: [a] WPPA President; [b] Product Outlet Owner; [c] Pasalubong Center Women's Group; [d] WPPA member/processor/vendor.

Volume of Sales

Although there was a seminar on record keeping, there was still a need to remind them of the importance of keeping track of activities especially the business aspect. However, the record of the treasurer is shown in Table 6.6 which according to them excludes the products that the members also process for the Buray and other markets. These volumes are the products sold by the outlets outside of Buray, earlier mentioned. The volume seemed low but these are the products of only 5 members. The remaining members are processing 100 to 150 5-piece packs at least three times a week which translate into 1800 per month per processor and there are at least 10 of them. It should be noted that the price of the optimized product is higher than the unoptimized products. The questions and responses relevant to product sales are shown in Table 6.7.

Table 6.6 Annual volume of peanut brittle processed and sold outside of Buray, Paranas, Samar

Year	No. of 5-pc Packs	% Increase[a]
2002	1800	
2003	3300	45.45
2004	3700	10.81
2005	3800	2.63
2006	8081	52.98

[a]The optimized product costs higher than the unoptimized products especially in 2007.

Table 6.7 Questions and responses relevant to the effect on product sales

Question No.	Question	Response
1	What are the effects of optimization in terms of sales especially in markets outside of Buray? / / Increased / /Decreased / /No change	[a]Increased
2	What are the problems of the group in selling the product at Buray, Samar?	[c]Competition with unoptimized products
3	What are the impact in terms of commercialization of peanut brittle? / / Increased / /Decreased / /No change	[b]Increased
4	Did you engage in product promotion? / / Yes / /No	[a]Yes
5	Please specify the activities / / Exhibits and Food Trade Fairs / / /No	[a]Exhibits and Food Trade Fairs

Respondents: [a] WPPA President; [b]Product Outlet Owner; [c] Pasalubong Center Women's Group; [d] WPPA member/processor/vendor

Comparative Assessment [Wright Peanut Processors Association (WPPA)]

The Pro-Forma Income Statement

Pro-forma income statements for one batch of peanut brittle production applying the traditional peanut processing method and another for the optimized peanut processing method were prepared to compare differences in the net operating income earned from each process.

The assumptions made from the cost and expenses were based on the following:

1. One LPG tank (11Kg) costs PhP500 which can oven roast 500 Kg of raw peanuts
2. The monthly water bill of PhP500 was used for 100 batches of peanuts processed
3. The monthly electric bill of PhP1,000 was utilized for 500 hours or 16 hours per day
4. The monthly space rental of PhP1,000 for 500 Kg of raw peanuts processed per month or 15 Kg per day
5. The office supplies used was PhP2 per batch process
6. The telephone/mobile phone expense of PhP2 per batch process
7. The miscellaneous expense of PhP2 per batch process included expenditure for soap, detergent, brush, and etc.
8. The transportation expense of PhP20 was charged for a round trip fare.
9. The total roasting fee of PhP10 was from roasting wage of PhP2 + LPG gas expense of PhP5 + oven maintenance fee of PhP3.
10. The wrapping/packaging/sealing wage was PhP15 for members and PhP10 for hired non-members.
11. The unit price of commodities was as of the first week of June 2005.
12. At least 3 members regularly process peanut .

Findings:

Based on the comparative assessment for one batch of peanut brittle production using the two methods of production the results and findings were as follows:

Traditional Process	Optimized Process
1. Sugar added for one mixture: 2 kg	1. Sugar added for one mixture: 1.25 kg
2. Bond Paper 87 pcs @ PhP0.40/pc = PhP35.00	2. Waxed Paper 10 pcs @ PhP2.50/pc = PhP25.00
3. Roasting time 20 min/k or 100 min	3. Roasting time 5.5 min/k or 27.5 min
4. Some kernels burn in roasting	4. Kernels evenly roasted
5. Firewood produced uneven heat	5. LPG gas produced constant heat
6. Firewood stained carajay with soot	6. Carajay with minimal soot
7. Peanut not sorted	7. Peanut sorted
8. Shelf-life – 3 days	8. Shelf-life – 1 month
9. Slow process to mass produce	9. Mass production fasted
10. Taste, color, aroma vary	10. Taste, color, aroma maintained

1. The amount of sugar used in the optimized process was lesser by 0.75 kg which would decrease the total cost of sugar by 62.5%.
2. The cost of waxed paper used in the optimized process was lower by PhP10 (7%) than the bond paper used in the traditional process.

3. The roasting time was greatly reduced from 100 minutes to 27.5 minutes in the optimized process.
4. The oven roasted kernels in the optimized process produced high quality product.
5. Firewood used in cooking caramel cost higher than LPG because of the longer cooking time from 1 ½ hours in the traditional process to 45 minutes in the optimized process.
6. With minimal soot stains the cleaning of the carajay used in cooking caramel was shorter.
7. An additional sorting cost would be charge in the optimized process.
8. The shelf-life for the optimized process was longer to last for over a month.
9. Mass production is faster with a sorter production time involved.
10. The income earned for one day is not enough to purchase the ingredients needed to process peanut praline the next day. With an income ranging from PhP172 to PhP200 the cost of peanut, a major ingredient, which is PhP300 aside from the cost of minor ingredients would be inadequately covered by the day's earnings. Other costs for nondurable equipment like ladle knife and cutter, wood frame, and etc. have to be provided.

Social and Economic Impacts

Indicators	Past	Present	% Change
Membership to peanut processor association	3	24	800 % increase
Production cost	PhP7.71 /pack (10 bars)	PhP7.33 /pack (10 bars)	5 % decrease
Stakeholders assisting the group	2	11	550 % increase
Length of roasting	20 min/kg	5.5 min/kg	363% decrease
Volume of production per member	1 batch / day 9 batches /wk average 36 batches / month	1 batch / day 9 batches /wk average 36 batches / month	
Income per member	PhP172 /day PhP1548 /wk PhP6192 /month	PhP200 / day PhP1800 /wk PhP7200 /month	
Manufacturing cost needed to produce 1 batch	PhP535 / batch	PhP507 / batch	

Problems and Constraints (Roa and Galvez, 2006)

The following were the constraints encountered during the adoption of the technology: (1) as members, there is a lack of common time available for work; and (2) lack of market due to increased capacity of the group to process, processing shed, slicing tool, market negotiation, and native peanut (preferred) supply. The details are presented in Appendix D.

QUALITY AND SHELF LIFE OF A PEANUT BRITTLE FROM THE VISAYAS

Actual time for Product Testing During Storage

The actual time for product testing during storage for almost a month was as follows: 21 days at 35°C, 18 days at 37.5°C, and 16 days at 40°C.

Results of Tests for Initial Product Quality (see Table 6.8)

The packaging condition, sensory quality and aflatoxin content of the product are shown in Table 6.9. The product had acceptable packaging condition as evidenced by the absence of defects. The product was described as follows using the 150 mm line unstructured line scale: hardness on first bite, 122; fracturability on first bite, 77; hardness on first chew, 114; fracturability on first chew, 77; color, 52; roasted peanutty aroma, 55; caramel aroma, 10; and rancid aroma, 0. Aflatoxin was not detected in the samples.

Table 6.8 Quality characteristics of peanut brittle packed in laminated foil packs prior to storage at 35, 37.5 and 40°C

Parameters	Evaluation
1. Packaging condition	
Presence of defects such as improper sealing of laminated foil bags	None
2. Chemical quality	
Aflatoxin content (ppb) [a]	0
3. Acceptability of the product [b]	Mean ratings
3.1 Odor	6.7
3.2 Texture (crunchiness)	5.8
3.3 Overall acceptability	6.3
3.4 Color	6.7
3.5 Appearance	6.8
3.6 Flavor	6.8
4. Sensory characteristics of the product [c]	Mean intensity ratings
4.1 Texture	
Hardness on first bite	122
Fracturability on first bite	77
Hardness on first chew	114
Fracturability on first chew	72
4.2 Appearance	
Color	52
4.3 Aromatics	
Roasted peanutty aroma	55
Caramel aroma	10
Rancid aroma	0
4.4 Tastes	
Sweet taste	53
Salty taste	27
Bitter taste	0

[a] Limit of Detection (LOD) = 5 ppb.

[b] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability mean ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely).

[c] Means are from ratings of 8 panelists in two replications. The test was conducted using unstructured line scales with anchors 12.5 mm from each end for the attributes of (4.1) texture: hardness on first bite (12.5 = very soft, 137.5 = very hard); fracturability on first bite (12.5 = crumbly, 137.5 = brittle); hardness on first chew (12.5 = very soft, 137.5 = very hard); fracturability on first chew (12.5 = crumbly, 137.5 = brittle); (4.2) appearance: color (12.5 = off-white, 137.5 = brown) ; (4.3) aromatics: perceptible (=12.5) and strong (= 137.5) for roasted peanutty and caramel aroma; and (4.4) taste: perceptible (=12.5) and strong (=137.5) for sweet, salty and bitter tastes.

Results of Tests for Product Quality During Storage

Tables 6.9 and 6.10 show the mean ratings for acceptability, and the number of responses for mean consumer ratings obtained from the consumer tests.

Table 6.9 Mean consumer ratings for acceptability of peanut brittle in laminated foil during storage at 35, 37.5, and 40°C

Storage temperature (°C)	Storage time (days)	Mean ratings [a]					
		Odor	Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/taste
	0 (initial)	6.7	5.8	6.3	6.7	6.8	6.8
35	22	6.5	6.4	6.8	6.7	6.7	6.7
37.5	20	7.2	6.9	6.9	6.7	7.1	7.0
40	15	6.9	6.5	6.8	6.8	6.8	6.9

[a] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability with mean ratings where 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

Table 6.10 Frequency of responses for mean consumer ratings 6 and above, 5, and 4 and below for acceptability of peanut brittle in laminated foil and stored at 35, 37.5, and 40°C

Storage temperature (°C)	Storage time (days)	Rating [a]	Number of Responses					
			Odor	Texture/ crunchiness	Overall liking	Color	Appearance	Flavor/ taste
	0 (initial)	6 and above	26	20	23	27	28	24
		5	0	0	1	1	0	1
		4 and below	4	10	6	3	2	4
35	22	6 and above	25	25	25	27	25	25
		5	1	2	2	1	2	1
		4 and below	4	3	3	2	3	4
37.5	20	6 and above	27	28	27	27	28	28
		5	1	0	1	1	2	0
		4 and below	2	2	2	2	0	2
40	15	6 and above	28	23	24	27	27	26
		5	0	1	4	0	0	1
		4 and below	2	6	2	3	3	3

[a] The sample was evaluated by 30 consumers. A 9-point hedonic scale was used for acceptability ratings (1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely)

The results in Tables 6.9 and 6.10 showed the following: (1) after storage for almost one month, the product was acceptable to the consumer panel; and (2) the study will continue until end of shelf life at accelerated temperatures is reached to be able to predict the shelf life at 30°C and to determine the actual Q_{10} of the product.

CONCLUSIONS

The continued and increasing orders by the distributors all over Region 8 especially at the Tacloban Airport and at Baybay, Leyte indicate that consumers outside of Buray, Paranas, Samar are purchasing peanut brittle even when it is more expensive than the traditional product. The ability of WPPA to supply these outlets in addition to supplying the local markets is an indication of the sustainability of the association even with only very minimal involvement of the project team. The involvement of other stakeholders, especially of DOLE and DTI, indicate that the project could now move out with an assurance of sustainability of WPPA and its business.

Although the economic impact on the lives of WPPA's members and their households might not be that spectacular, the knowledge they gained especially on aflatoxin eradication and the availability of products especially at the Tacloban City airport and other "pasalubong" centers are enough for now to say that PCRSP Project has made a difference in the lives of the peanut product customers in Region 8 and consequently WPPA members.

Through more aggressive marketing strategies with efficient backward linkage with the peanut farmers, WPPA can increase profit and increase income since increased capacity of the group to process especially if all slicing and other processing aides and building will be available and become more competitive and will eventually become a leader in Region 8 in terms of peanut products. Furthermore, their adoption of natural peanut butter and peanut-flavored polvoron have added employment opportunities among members and consequently increase their family income. Above all, WPPA hopes to contribute to still better quality piniato for Buray. However, WPPA has still to improve recording to give the true picture of the effect of technology transfer.

After almost a month of storage at accelerated temperatures, samples of peanut brittle in laminated foil were acceptable to the consumer panel. Since the study has just started, it is not yet feasible to predict the product shelf life. The study will continue until the product becomes unacceptable at 35, 37.5 and 40°C to be able to predict shelf life at 30°C and calculate the Q_{10} value.

REFERENCES

AOAC (Association of Official Analytical Chemists). 2005. Official Methods of Analysis of AOAC International. 18th Ed. AOAC International. Gaithersburg, MD. USA.

Labuza, T.P. 2002. Determination of Shelf Life of Foods. Downloaded from http://www/courses.che.umn.edu/00fscn8334_1f/Pdf.Folder/General20%Shelf20%LifeReview.pdf on July 27, 2002.

Labuza, T.P. and Schmidl, M.K. 1985. Accelerated shelf life testing of foods. Food Technol. 39:57.

Lustre, A. O., A. O. Cariso, G. M. Agustin and R. L. Moxsley. 2004. Impact Assessment of the Vitamin A fortification of Peanut Butter on an Industry Innovator: A Final Report of a Peanut Collaborative Research Support Program Funded Project.

Lustre, A. O., F.C. F. Galvez, L. S. Palomar and A. V. A. Resurrccion. 2002. Report on an Industry Workshop and Government Seminar. Chapter 4. USAID-PCRSP Monograph Series No.1. 143pp.

Meilgaard, M., Civille, G. V. and Carr, B. T. 1991. Sensory Evaluation Techniques. 2nd Ed. CRC Press, Inc., Boca Raton, Florida.

Palomar, L. S., I. A. Licayan, L. A. Galvez, L. B. Paloma, R. S. Gravoso, F.C. F. Galvez, A. O. Lustre, and A.V.A. Resurreccion, 2000. Consumer-Based Optimization and Sensory Profiling Of Peanut Brittle In The Visayas**.** Peanut Collaborative Research Support Program. Leyte State University, Department of Food Science and Technology, Visca, Baybay, Leyte.

Palomar, L. S., L. A. Galvez, L. B. Paloma, R. S. Gravoso, A. O. Lustre, and A.V.A. Resurrección. 2007. Development and Evaluation of Peanut Products for Industry Association/Cooperative and Private Companies and Processors in Eastern Visayas. A Report presented during the 2007 LSU In-House Review.

PCRSP (Peanut Collaborative Research Support Program). 2007. Consumer Acceptance, Sensory Profiling, Technology Transfer and Shelf Life of Peanut Brittle for the Manila Market. Chapter 5. Monograph Series No. 7. Peanut Confections and Snacks. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

PCRSP (Peanut Collaborative Research Support Program). 2007. Note on Consumer – Based Optimization and Sensory Profiling of Peanut Brittle in the Visayas. Monograph Series No. 7. Peanut Confections and Snacks. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).

Roa, J. R. and L.A. Galvez. 2006. Impact Assessment Using Quick Response Appraisal (QRA.). Buray, Paranas, Samar. A Report

Taoukis, P. S., Labuza, T. P. and Saguy, S. 1997. Kinetics of food deterioration and shelf-life prediction. Chapter 12 in Handbook of Food Engineering Practice, Valentas, K., J. Rotstein, E and P.R. Singh (Ed.), pp.361-403, CRC Press.

USFDA (United States Food and Drug Administration). 2001. Examination of Containers for Integrity. Chapter 22c in Bacteriological Analytical Manual (BAM) Online. Downloaded from http://www.cfsan.fda.giv/~ebam-22c.html on May 23, 2005.

APPENDIX A

LETTER FROM THE DEPARTMENT OF LABOR AND EMPLOYMENT

LETTER FROM THE DEPARTMENT OF LABOR AND EMPLOYMENT

Republic of the Philippines
DEPARTMENT OF LABOR AND EHPLOYMENT
, Regional Office No.8
Tacloban City

May 4, 2004
Date

ROSEMARIE G. BASILAN
President – Weight Peanut
Processors Association (WWPA)
Brgy. Paranas, Samar

Sir/Madam:

Enclosed herewith is the Registration Certificate No. R0800-04-04-RW-825 issued in flavor of the

WRIGHT PEANUT PROCESSORS ASSOCIATION (WWPA)
Brgy. Paranas, Paranas, Samar

The fiscal period of that RWA ends on December 31 of each year. Accordingly, its verified financial report covering the period from January 1 to December 31, of each year should be submitted to us within (30) days of the latter date.

Please be guided accordingly.

Very truly yours,

(SGD)
CRISTINA TABAO-LONGJAS

OIC- Chief, Labor Relations Division

APPENDIX B

REGISTRATION CERTIFICATE

REGISTRATION CERTIFICATE

Republic of the Philippines
DEPARTMENT OF LABOR AND EMPLOYMENT
Regional Office No. VIII Tacloban City

Registration Certificate No. RO800-04-04-RW A-825

KNOW ALL MEN BY THESE PRESENTS:

BY VIRTUE of the provisions of the Labor Code, as amended, and its implementing rules

WRIGHT PEANUT PROCESSORS ASSOCIATION (WPPA)
BRGY. PARANAS, PARANAS, SAMAR

has this day been Registered as and conferred with all the rights and privileges of a legitimate workers' association established for the MUTUAL AID and PROTECTION of its members. It shall promote the moral, social and economic wellbeing of its members and shall have the right to represent them in accordance with its constitution and by-laws and for purposes not contrary to law.

This certificate of registration shall. subsist unless cancelled in the manner provided for by the Labor Code and its implementing rules and at all times shall be subject to compliance by said workers' association with all applicable laws and regulations relating to workers' association.

IN WITNESS WHEREOF, we hereunto affixed our signatures with the seal of Regional Office No. VIII, Tacloban City, Philippines, this 29th day of April 2004.

RECOMMENDING APPROVAL:

(SGD)
CRISTINA TABAO-LONGJAS
OIC-Labor Relations Division

Approved:

(SGD)
FORTER G. PUGUON
Regional Director

APPENDIX C

RESOLUTION NO. 1

RESOLUTION NO.1

Republic of the Philippines
Province of Samar
Municipality of Paranas
Buray Paranas, Samar

Resolution No.1 made during the board meeting last June, 2004, the board discuss the matter to the body / member and explain to them what necessary documents to be accomplish to availed assistance from DOLE Integrated Livelihood Program.

Where as, the body / member agree to made this resolution applying for accreditation with DOLE, and authorizing the President of Wright Peanut Processor's Association (WPPA) of Rosemarie G. Basilan, to represent in behalf of the association.

Where as, the officers of the Association agree also to attach our signature over printed name below.

BOARD OF DIRECTORS

ROSEMARIE G. BASILAN **PAZ D. GABON**

ROWENA G. ABANTAO **EMILIA D. BASAS**

CONRADO D. BASAS **GLENDA G. BABALCON**

ROSEMARIE S. INDICO

Republic of the Philippines
Province of Samar
Municipality of Paranas
Buray Paranas, Samar

APPENDIX D

Focus Group Discussions Employing Quick Response Appraisal (Roa and Galvez, 2006)

FOCUS GROUP DISCUSSIONS EMPLOYING QUICK RESPONSE APPRAISAL (ROA AND GALVEZ, 2006)

The ratings and qualifications given by the members are given in Table 6.3. On the average, the members rated the linkages to input supply and the piniato technology relatively higher than the other enterprise areas. The processing system was rated lowest and this was obvious as the processing shed, equipment and tools were still inadequate. Commerciability was also rated low because of the inadequate markets and the lack of negotiating skills to develop, have a better deal and sustain the market. The overall commerciability of the *piniato* product largely hinged on the effect the introduced technologies have on quality, price, market negotiation, market positions and promotion. That the input supplies are sourced from an LGU-connected wholesaler is an area that needs to be assessed in terms of costing and overall efficiency, competitiveness, and the effect on product price. This is in addition to the pressing need to really have a respectable processing area and system.

The most significant stories were:

- The knowledge learned especially on the aflatoxin-reduction was important as it is critical to the distinction of their product quality vis-à-vis the others. Preference of native and newly harvested peanuts for optimum quality and higher processing recovery
- The group members also benefited in terms of better social status, and have gained confidence that they are able to get support from various agencies.
- They also feel "good" with visitors getting interested in their business, and their own contribution to the improvement of the *piniato* micro-industry, of which Buray is known for a long time.
- The processing group is an avenue to earn in addition to some of the members' own "punto" in *piniato* processing.
- The piniato processing is a household-based micro-enterprise that has helped women mostly to earn additional income for their household expense as well as for children's school allowance and food.
- *Piniato* is produced by about 70 percent of households in Buray (ca. 300 households).

Ratings and explanations given by selected WPPA members during the Focus group discussion/ Quick Response Appraisal

Category	Range	Average	Explanations
R & D (technology)	3 – 4.5	3.8	Participants said that the product technology needs improvement especially in slicing, which until now is done manually. This is laborious especially with increased production. Other improvements are in wrapping, packaging, sorting and roasting (some members need additional training)

Category	**Range**	**Average**	**Explanations**
Potential for marketing	2.5 – 4	3.4	Established but needs additional markets. Market promotion needs to be improved – price versus quality. The local market considers price as the major buying factor, not so much for quality. Needs a strategy to segment market as to price and quality, and with the related improvements in packaging and presentation- =**Outside Markets** Current market outlets are on consignment basis, and yet their retail prices are high. This causes slow sales turnover. Lacks skills to negotiate with retailers.
Processing system	3 – 3.5	3.1	Processing facilities, tools need improvement especially the slicing tool. The processing shed is critical but the LGU in-charge of the work plan seems to be slow. This was started in June this year, but to date has not been done yet. The group needs an operation capital for the processing set-up. The offer of the governor to provide funding has not been attractive to the groups because of its seemingly political color. He requires that the project be solely funded by his support, and that the group reorganize.
Organization	3 - 4	3.6	Members on the whole are cooperative. But some members are not active as needed, and some do not respond promptly to calls for meetings. This is due to the pressing need of members to spend time for other earning activities. While this is understood by the other members, they were apprehensive if this could constrain their peanut processing enterprise especially when bigger orders come. **Solution:** Team-ups among members with similar time availability.
Management	3 - 4	3.2	Members, especially those with managerial tasks, need further skills training like in bookkeeping, marketing/promotions, production management, leadership skills, etc.
Linkages to input supply	3 - 5	3.9	Native peanuts are preferred than the imported one because the former has better yield after aflatoxin sorting. But the local supply of native peanuts is limited. Recent discussion among neighboring local governments identified Gandara, Samar as the source of native peanuts.

APPENDIX E

BALLOT FOR THE CONSUMER TEST OF PEANUT BRITTLE

BALLOT FOR THE CONSUMER TEST OF PEANUT BRITTLE

CENTRAL LOCATION TEST: _____ (date)

Panelist # _____ Sample # _____

Instruction: Please answer the following questions by putting a check mark in the square that best reflects your feelings about this sample.
Please bite half of the sample and answer the first 2 questions; then look at the sample and answer questions 3 and 4; lastly, eat the rest of the sample and answer question 5.

1. How would you rate the TEXTURE of the sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

2. How would you rate the COLOR of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

3. How would you rate the APPEARANCE of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

4. How would you rate the FLAVOR/TASTE of this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
❑	❑	❑	❑	❑	❑	❑	❑	❑

5. OVERALL, how would you rate this sample?

Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely
	❑	❑	❑	❑	❑	❑		❑

Thank you !

APPENDIX F

BALLOT FOR THE DESCRIPTIVE TEST OF PEANUT BRITTLE

NAME:_______________________ CODE:______________
Date: _______________________

Please put a vertical mark through the line scale to indicate the amount of each attribute (the scale is from 0 to150mm)

Texture

First Bite

0 150
|____

Definition:
First Bite: Bite through a pre-determined size of sample with incisors
Hardness- the force to bite through the incisors
Reference/ Intensity Rating: Planter's Peanut= 95; Carrots= 110; Life Savers= 150; Warm-up= 122

0 150
|____

Definition:
First Bite: Bite through a pre-determined size of sample with incisors
Fracturability- the force with which the sample breaks
Reference/ Intensity Rating: Graham crackers= 42; Corn chips= 55; Chichacorn= 65; Warm-up= 77

First Chew

0 150
|____

Definition:
First Chew: Bite through a pre-determined size of sample with molars
Hardness- the force with which the sample breaks
Reference/ Intensity Rating: Planter's Peanut= 90; Carrots= 100; Life Savers= 145; Warm-up= 114

0 150
|____

Definition:
First Chew: Bite through a pre-determined size of sample with molars
Fracturability- the force with which the sample breaks
Reference/ Intensity Rating: Graham crackers= 35; Corn chips= 45; Chichacorn= 60; Warm-up= 72

Appearance

Color

0 150
|____

Definition:
Off-white- the color associated with plain popcorn
Brown- the color associated with powdered cocoa
Reference/ Intensity Rating: Washed sugar= 20; Ludy's Peanut Butter= 90; Warm up= 52

Aromatics

Roasted Peanutty

0 150

|____

Definition:

Roasted Peanutty aroma- the aroma associated with medium roasted peanuts
Reference/ Intensity Rating- Raw Peanut- 0; Planter's Peanut = 70; Warm-up = 55

Caramel aroma

0 150

|____

Definition:

Caramel-like aroma – the aroma associated with caramelized sugar
Reference/Intensity Rating: 2% sucrose solution = 20; 5% sucrose solution = 50; 10% sucrose solution = 100;
16% sucrose solution = 150; Warm up= 10

Tastes

Sweet

0 150

|____

Definition:

Sweet taste – the taste stimulated by sucrose
References/Intensity Rating: 2% sucrose solution= 20; 5% sucrose solution = 50;
10% sucrose solution = 100; 16% sucrose solution = 150; Warm-up = 53

Salty

0 150

|____

Definition:

Salty taste – the taste stimulated by sodium chloride
Reference/Intensity Rating: 0.2% sodium chloride solution = 25; 0.35% sodium chloride solution = 50;
0.5% sodium chloride solution = 85; Warm-up= 27

Bitter

0 150

|____

Definition:

Bitter taste- the taste stimulated by caffeine
Reference/ Intensity Rating: 0.05% caffeine solution= 20; 0.08% caffeine solution= 50;
0.15% caffeine solution= 100; Warm- up= 0

Thank you!

CHAPTER 7

IMPACT ASSESSMENT OF A STABILIZED PEANUT CHOCOLATE SPREAD

Alberto R. Cariso [1]

[1] Division Chief, Food Development Center 1632, Philippines

ABSTRACT

The technology for a peanut chocolate spread was transferred to EDJE's only in April 2007, a processor of peanut butter who supplies the product to several bakeries in Laguna and Manila. The collaborator was optimistic that the new product will be a success in the market.

Information about the status of the transferred technology to the Food Development Center revealed that the technology must be modified to address the problem of unavailability of a big chiller which will be used in conditioning the product after addition of a stabilizer. Modification will be done through removal of the processing steps on addition of a stabilizer and conditioning at 2 to 10°C after addition of a stabilizer. Due to this modification, the product will be a flowing-type peanut chocolate spread.

Deleted:

INTRODUCTION

The technology for the manufacture of a stabilized peanut chocolate spread, published in Chapter 3 of Peanut CRSP USA-Philippines Monograph Series No. 6 on Peanut Butter and Spreads (PCRSP, 2006), was offered to a medium scale peanut industry, EDJE's, located in Sta. Rosa, Laguna. The collaborator was identified by the Food Development Center.

Prior to transfer of the technology for a stabilized peanut chocolate spread, the collaborator is a peanut butter manufacturer and supplies the product to bakeries in Laguna and to AAA, a 50-store bread chain in Metro Manila, and has secured a contract to supply all 500 branches of the BBB bakeshop across the country by next year. The technology transfer was completed in April 2007 at the collaborator's plant.

OBJECTIVE

The objective of this chapter is to report on the status of the transfer of technology for stabilized peanut chocolate spread to the collaborator.

METHODS

One week after the transfer of technology, telephone calls were made to inquire from the collaborator about the status of the transferred technology for stabilized peanut chocolate spread.

RESULTS

According to the collaborator, the technology for a stabilized peanut chocolate spread cannot be adopted yet. The process requires conditioning of the product in a big chiller, and based on their daily production volume for plain flowing-type peanut butter of about 8 tons per month, they do not have the capacity to condition the daily production volume requirement.

Due to the unavailability of a big chiller, the collaborator will instead produce the flowing-type peanut chocolate spread, because the product, according to them has a good marketing potential. The collaborator also said that they will produce the stabilized peanut chocolate spread as soon as they are able to buy a big chiller.

CONCLUSIONS

The transferred technology for a stabilized peanut chocolate spread will be modified by the collaborator. The processing step requiring addition of a stabilizer will be removed to address the problem of the need of a big chiller to condition the product after addition of a stabilizer. The product will be a flowing-type peanut chocolate spread which will not require conditioning of the product.

REFERENCE

PCRSP (Peanut Collaborative Research Support Program). 2006. Development, Optimization, Sensory Profiling and Technology Transfer of a Chocolate-Peanut Spread. Chapter 3. Monograph Series No. 6 Peanut Butter and Spreads. United States Agency for International Development – PCRSP. Project 04 (USA-Philippines).