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No. 8

IMPACT ASSESSMENT OF PEANUT-CRSP PROJECTS IN THE PHILIPPINES - PART 1

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IMPACT ASSESSMENT OF PEANUT-CRSP PROJECTS IN THE PHILIPPINES
Part 1

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CHAPTER 1

MONITORING IMPACT OF COMPLETED PROJECTS

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ABSTRACT

Impacts of two technologies developed in the project are discussed. The impact of the vitamin A fortification of peanut butter and of the sorting technology for aflatoxin control on the sales performance, production volumes and socio-economic benefits was determined through interviews with the collaborating company's representatives and monitoring of the vitamin A and aflatoxin content of peanut butter in the market.

The collaborator promoted the vitamin A fortified peanut butter through: (1) a sticker on the label panel which bears the information "Fortified with Vitamin A" and the percentage vitamin A content on the Nutrition Facts Panel, (2) advertisements aired over the radio in January 2000 and on television in February 2000, and (3) nationwide distribution of 2,500 posters of the product.

Production volume was affected by the sales performance of the vitamin A fortified peanut butter. The volume decreased when sales were down, especially during the first few months after launch of the labeled vitamin A fortified peanut butter in December 1999 to March 2000. The volume was increased by the company in anticipation of the peak months of sales. Data shows that the sales performance dictates the production volume for succeeding months except when sales for the succeeding months are anticipated to increase. The adoption of the fortification technology necessitated the hiring of additional personnel, three women who were assigned to the Research and Development, Quality Control and Production Sections. In addition, two men from the Production Section were assigned full-time to the mixing step to ensure that recommended procedures for addition and mixing of the fortificant and premix were followed.

Samples of vitamin A fortified peanut butter from area supermarkets were analyzed for vitamin A content to evaluate the efficacy of the premix technology. The data showed that the vitamin A in 10 of 22 samples, vitamin A content met the target RENI of 4.38 μg retinol/g peanut butter. Verification of the possible causes of low vitamin A contents in the product was conducted. Results showed that the production personnel followed the recommended procedure in the addition and mixing of the fortificant. A storage study of the fortificant was conducted and showed that the initial content of the fortificant was found to be only 33% of the declared value and further decreased after one week of storage at refrigeration temperatures. This showed that a rate of loss after one week in storage was 2.49%. The low vitamin A content in fortified peanut butter samples was attributed to the low concentration of vitamin A in the batch of fortificant used. These findings were used as basis for advising the collaborator to discontinue the use of that particular batch of fortificant until a new supplier of the fortificant was available.

Adoption of the sorting technology for removal of aflatoxin contaminated peanut kernels enabled the collaborating company to export Kare-kare mix with peanuts in the US, Middle East and Hong Kong, whereas sales performance of the Kare-kare mix with peanuts, before the introduction of the sorting technology, was zero. The addition of peanuts to Kare-kare sauce mix with peanuts not only improved the product but also contributed to an increase in sales. After adoption of the sorting technology, the collaborating company experienced increase in sales and production volume, and sometimes could not fill some orders, for both domestic and export markets as a result of the high demand and limited production situation. The adoption of the two technologies created confidence in the collaborating companies regarding the superiority of their products over their competitors, giving them a competitive advantage.

INTRODUCTION

The project aims to evaluate the sustainability of Peanut-CRSP completed projects by monitoring perceptible social and economic benefits experienced by industry collaborators resulting in the adoption of the new technologies developed. Two completed projects namely: (1) Technology for Vitamin A Fortification of Peanut Butter, and (2) Sorting Technology for Aflatoxin Control, were monitored to assess the impact of the projects after adoption of the technology by the industry partners collaborating on the project.

The formal turnover of above technologies to their respective collaborators took place in a signing ceremony held in June 1999. Present were industry collaborators from Newborn Food Products Corporation headed by Mr. Ramon Pua and Marigold Commodities Corporation headed by Mr. Kim Lapuz and Peanut-CRSP Principal Investigators headed by Dr. Anna V.A. Resurreccion of the University of Georgia, Dr. Alicia O. Lustre of the Food Development Center, Dean Angelita Dizon and Dr. Flor Crisanta F. Galvez of the University of the Philippines in Diliman.

In July 1999, samples of Vitamin A Fortified Peanut Butter and of aflatoxin-free Kare-kare Mix, were part of a food exhibit which was showcased during the Launching of Proper Food Handling Program "*Epektibo at Responsableng Asal sa Pagkain*" held at the Food Development Center. This event marked the first introduction of vitamin A fortified peanut butter and aflatoxin-free Kare-kare Mix in the local market as the two industry collaborators joined other food companies in participating in the food tasting and product selling activities.

OBJECTIVES

Our objective was to monitor perceptible social and economic benefits of completed projects and to evaluate their sustainability. Specifically, we evaluated the impact of aflatoxin control technology on the acceptance/expansion of export shipments for "Kare-kare" mix to the U.S., of vitamin A fortification of peanut butter and of aflatoxin control on the sales of relevant products by Marigold and Newborn, of technology adoption by both industry collaborators on product quality at the market and other socio-economic benefits provided by the technologies transferred.

METHODS

Preparation of a Checklist for Use in the Measurement of the Sales Performance, Production and Socio-Economic Impact

A questionnaire was prepared and was used as guide in gathering data on the sales performance of the product, monthly changes in the production volumes, employment opportunities and promotion of women welfare. The questionnaire was initially provided to the collaborators who took them several months to complete and return the accomplished forms. The first questionnaire was personally handed to

the collaborators in February 2000 but the completed forms were received by the Food Development Center (FDC) only in June 2000.

Collection and Verification of Data

Quarterly interviews with the collaborators were conducted at least once for the period to gather and/or verify information supplied on production volume, sales volume, promotional activities and number of additional hired labor.

Collection and Analysis of Samples

Samples of Kare-kare mix and fortified peanut butter were obtained from Metro Manila stores and/or supermarkets on a monthly basis for aflatoxin and vitamin A analysis, respectively. Samples collected came from production batches with the highest production for the month, which were supplied by the industry collaborator. Thirteen packs of Kare-kare mix and two bottles of fortified peanut butter were either purchased in supermarkets and public markets or taken directly from the industry collaborator's plant. In addition to the above, six shipments of Kare-kare mix (with peanuts added) intended for the U.S. market were analyzed prior to shipment to ensure that the product will not encounter any detention due to presence of aflatoxin. Samples obtained were submitted to the FDC, Chemistry Section for analysis.

RESULTS

Monitoring the Impact of Project 3.2.7A Technology for Vitamin A Fortification of Peanut Butter

Monitoring the Production Volume, Sales Performance and Socio-Economic Benefits as a Measure of Impact

Production Volume. Table 1.1 shows the production volume of vitamin A fortified peanut butter before and after technology adoption. The technology was actually adopted by the collaborator in July 1999 but the market launch of the labeled vitamin A fortified peanut butter did not occur until December 1999. The production volume gathered in 1999 represents the pre-technology adoption period, whereas the production volume gathered in 2000 represents the post technology adoption period.

The total production for year 1999 was 507 metric tons while for year 2000, it was 534 metric tons or a production increase of 5.3%. There was an increase in production every quarter in 2000 compared to 1999 except in the third quarter (July – September) of 2000. This decrease in production in the 3rd quarter of 2000 was purposely implemented by the collaborating company's management, in anticipation of decreasing sales after the beginning of the school year in June. Conversely, when sales were anticipated to increase in the 4th quarter (September - December) production volume was increased.

The first quarter of the year showed the lowest levels of production. This was expected as this period was just after the Christmas season when the purchasing activities of the Filipinos were also lowest. In year 2000, the highest production volumes achieved by the collaborator were in the 2nd and 4th quarters of the year. The specific months of highest production were in June and December. June is the start of school year and December is the start of Christmas season.

Although the total increase in production volume in year 2000, after technology adoption, was relatively small compared to year 1999, before technology adoption, this was considered by the collaborator as a positive event in sustaining their competitiveness during these difficult economic periods in the Philippines. During these years, the Philippines experienced the devaluation of peso and many factories closed down. This was particularly a difficult time for peanut processors as peanuts raw materials were imported, and thus the cost was high but could not increase the price of the finished product as consumers might not buy it.

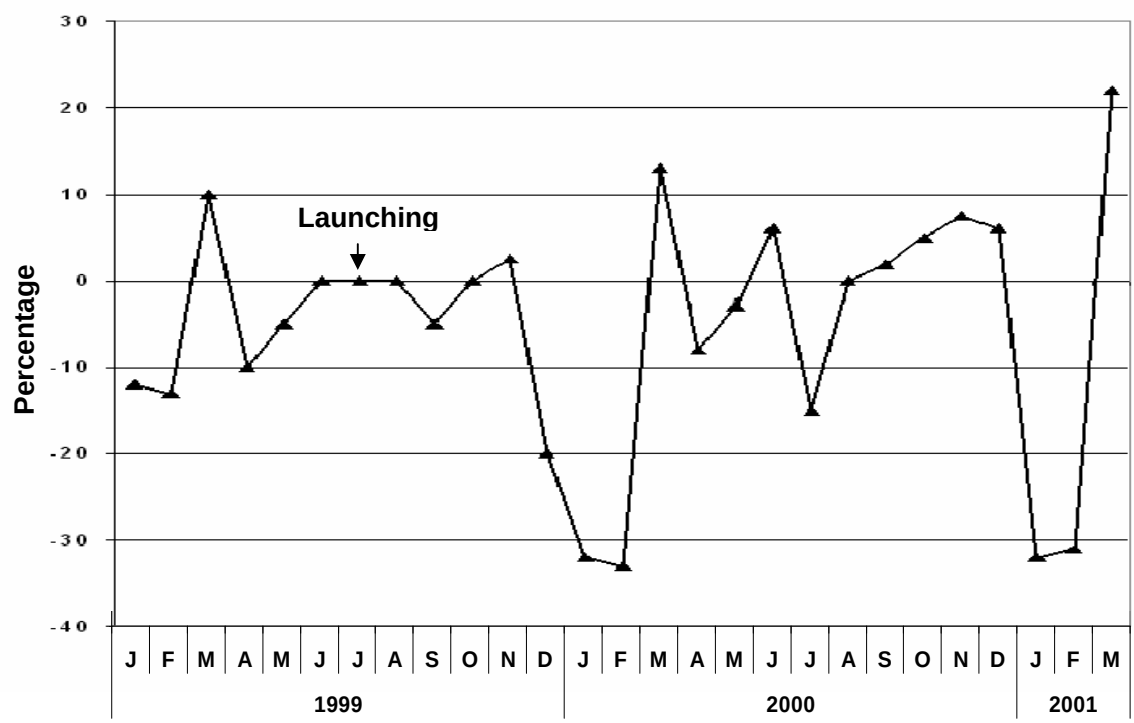

Fig. 1.1 Monthly sales comparison of vitamin A fortified peanut butter in 1999, 2000 & 2001.

Sales Performance. The sales performance (Fig. 1.1) for vitamin A fortified peanut butter was monitored from December 1999 to April 2001 after the collaborating company introduced the labeled Vitamin A fortified peanut butter product in the market in December 1999. According to the industry collaborator, one of the causes for the delay in market launch was because it took the company several months (~4 months) to obtain the Bureau of Food and Drug's (BFAD) approval for the product registration of its fortified peanut butter, which was considered a new product. There was also a need to prepare for technology adoption, by hiring and training additional workforce, purchasing and installation of equipment, which took approximately four months to complete.

One of the first promotional strategies undertaken by the collaborator was to place a sticker bearing the information "Fortified with Vitamin A" and % vitamin A content on the Nutrition Facts Panel, declaring that the peanut butter has been fortified with vitamin A. This was followed with advertisements about the product, aired over the radio in January 2000 and on television in February 2000. Finally, 2,500 posters of the vitamin A fortified peanut butter were distributed nationwide.

Table 1.1 also shows the percentage increase/decrease in sales volume of vitamin A fortified peanut butter before and after technology adoption. The basis of percentage computation in increase/decrease in sales was the comparison of the sales of the particular month to the same month of the previous year. Eight of twelve months in 2000, after technology adoption, showed an increase or equivalent sales was realized compared to 1999. However, there were only six of twelve months of increased or equal sales in 1999, before technology adoption compared to the previous year (1998). The first quarter of 2001 also showed sales increases in two of three months. In addition, Fig 1.1 shows that when the decreased sales observed yearly, in January and February, after the Christmas season, there were only three months of ten in 2002 that sales were lower compared to the same period in 1999. The increasing sales in 2000 and 2001, demonstrated above, helped the collaborating company to survive the otherwise catastrophic effect of the economic downturn experienced by the country in 1999 and early 2000 as discussed previously.

Socio-economic Impact. According to the collaborator, the adoption of the fortification technology in their peanut butter necessitated the hiring of three women workers and the reassignment of two males to the production section. The newly hired workers were assigned to the Research and Development and Quality Control and Production functions. A female full-time R&D/QC Head, was hired to oversee the research and development as well as quality control operations of the company. Two other females were hired, one as a Quality Control worker and the other as production head. Preparation of the fortificant, i.e. weighing of fortificant during the weekly transfer to smaller containers and its addition during premix preparation, was closely supervised by the R&D Head together with the QC worker who was tasked to supervise the preparation of the premix and fortified peanut butter. The female hired as production head supervised the company's production operations. In addition to the above, the two males in the Production Section were assigned full-time to the mixing step to ensure that recommended procedures for addition and mixing of the fortificant and premix were followed.

Monitoring the Vitamin A Content in Fortified Peanut Butter

The effectiveness of the premix technology for the vitamin A fortification of peanut butter developed for Newborn Food Products Corporation was evaluated by collecting market samples of fortified peanut butter from local supermarkets and the industry collaborator's plant. The information on the highest production codes produced during the month was taken from the industry collaborator to serve as basis for sample collection. In some instances, samples were obtained directly from the industry collaborator's plant, particularly during the time when an FDC personnel conducted an observation of the addition and mixing process during a commercial production run to verify possible causes of low vitamin A content in fortified peanut butter. Samples from supermarkets consisted of two jars of fortified peanut butter while samples taken from the industry collaborator's plant, consisted of three samples taken at the start, middle and end of the filling line. Samples collected were then analyzed compositely.

Table 1.1 Production volume and percent increase/decrease in sales volume of fortified peanut butter before and after technology adoption.

Month	Production Volume (Kg)[1]			Sales Percentage Increase/Decrease[2]		
	1999	2000	2001	1999	2000	2001
1st Q (Before Technology Adoption)						
Jan	32,000	33,760	32,000	Decreased (-12.0)	Decreased (-20.0)	Equal to 2000 sales
Feb	38,000	41,800	45,000	Decreased (-13.0)	Decreased (-20.0)	Increased (+2.0)
Mar	49,000	46,158	46,000	Increased (+10.0)	Decreased (-3.0)	Increased (+9.0)
Sub-Total	**119,000**	**121,718**	**123,000**	**Decreased (-15.0)**	**Decreased (-43.0)**	**Increased (+11.0)**
2nd Q (After Technology Adoption)						
Apr	46,000	47,794	-	Decreased (-10.0)	Increased (+2.0)	-
May	37,000	38,998	-	Decreased (-5.0)	Increased (+2.0)	-
Jun	46,000	58,420	-	Equal to 1998 sales	Increased (+6.0)	-
Sub-Total	**129,000**	**145,212**		**Decreased (-15.0)**	**Increased (+10.0)**	**-**
3rd Q						
Jul	46,000	39,100	-	Equal to 1998 sales	Decreased (-15.0)	-
Aug	46,000	44,128	-	Equal to 1998 sales	Equal to 1999 sales	-
Sep	40,000	41,000	-	Decreased (-5.0)	Increased (+6.9)	-
Sub-Total	**132,000**	**124,228**		**Decreased (-5.0)**	**Decreased (-8.1)**	**-**
4th Q						
Oct	40,000	46,000	-	Equal to 1998	Increased (+5.0)	-
Nov	41,000	48,000	-	Increased (+2.5)	Increased (+5.0)	-
Dec	46,000	49,000	-	Decreased (-20.0)	Increased (+26.0)	-
Sub-Total	**127,000**	**143,000**	-	**Decreased (-17.5)**	**Increased (+36.0)**	-
TOTAL	**507,000**	**534,158**	-	**Decreased (-52.5)**	**Decreased (-5.1)**	-

[1]1999 was used as baseline production volume before the product launch in December 1999; production figures are contained in a report submitted to FDC by Ms. Arlene Hilao dated October 11, 2000.

[2]Basis of percentage computation is sales volume compared to the same month of the previous year.

Note: Technology adoption started in July 1999 but 100% of peanut butter in the market was fortified in December 1999

The collection and analysis of samples of fortified peanut butter from supermarkets and industry collaborator's plant started in July 1999 immediately after the signing ceremony in June 1999 which marked the formal turn-over of the premix technology for the vitamin A fortification of Lily's brand peanut butter. Commercial production of vitamin A fortified peanut butter did not occur until December 1999.

Table 1.2 shows the level of vitamin A content in samples of fortified peanut butter obtained in supermarkets and industry collaborator's plant covering production dates from March 1999 to February 2001. A graphical presentation of the above data is presented in Fig. 1.3. Serving as benchmark data was a sample of unfortified peanut butter purchased in Sorsogon, which was produced in March 1999. As expected, the vitamin A content of the peanut butter from Sorsogon had zero mcg retinol/g peanut butter.

The vitamin A content in fortified peanut butter (Fig. 1.3) from various sources indicated varying levels of vitamin A which ranged from 2.23 - 11.51 μg retinol/g peanut butter. The data showed that the vitamin A in 10 of 22 samples, vitamin A content met the target RENI of 4.38 μg retinol/g. An initial verification of the possible cause of low vitamin A contents in fortified peanut butter was conducted in December 1999 by validating the fortification procedure recommended to the industry collaborator. The process was evaluated by observing plant personnel involved in the actual addition and mixing of the fortificant and/or premix during a commercial production of the premix and of the final fortified product. Result of actual observation indicated that the FDC recommended procedure for vitamin A fortification was not strictly followed by plant personnel. In two instances, e.g. in the months of January 2000 and May 2000, were highest (10.79 – 11.51 μg retinol/g) The high levels of vitamin A in the January 2000 production date were attributed to an FDC staff members being physically present to observe the actual addition and mixing of the fortificant, thus the proper addition of the fortificant was implemented. The sample processed in May 2000 did not have an FDC staff members present. Based on the above findings, the industry collaborator was advised to strictly follow the FDC recommended procedure for the addition and mixing of the fortificant, to achieve the target level of fortification of 1/3 RENI.

Since the fortificant used by the industry collaborator takes about 2 - 3 months to consume, evaluation of results was made on a quarterly basis. From July - December 1999, relatively low vitamin A content was observed in the fortified peanut butter, which ranged from 2.23 - 4.01 μg retinol/g peanut butter. The samples obtained in July to December 1999 had vitamin A when launching was only in December 1999 because the collaborator started to adopt the fortification technology as early as July 1999 but it was only in December 19999 that the collaborator started to label their product with vitamin A. A validation of the procedure was conducted by FDC to verify the possible cause of the low levels of vitamin A in the final product. Results of the verification study showed that the recommended procedure for the addition and mixing of the fortificant was not strictly followed by plant personnel in-charge. Based on the above findings, the industry collaborator was advised to strictly follow the FDC recommended procedure for the addition and mixing of the fortificant, to achieve the target level of fortification of 1/3 RENI.

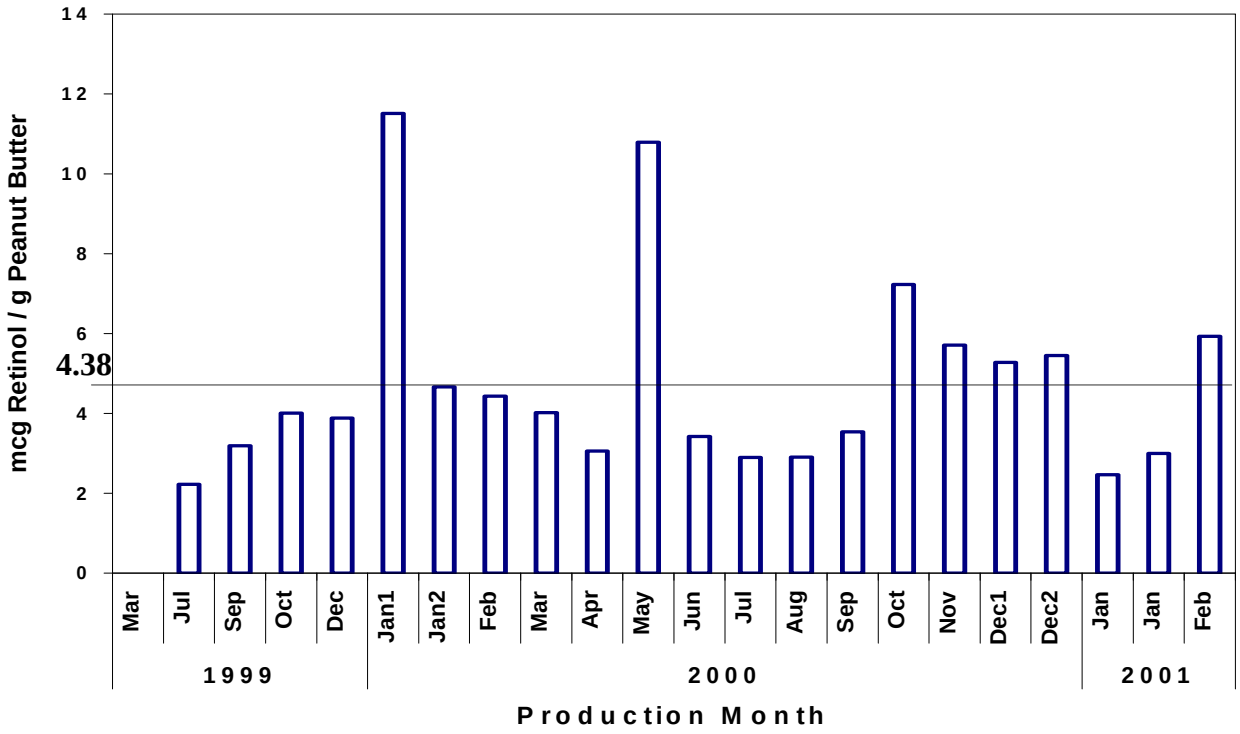

Fig. 1.2 Monthly levels of vitamin A (Retinol) in fortified peanut butter, CY 1999-2000.

Table 1.2 Vitamin A content in samples of fortified peanut butter for the period covering March 1999 to February 2001.

Production Date	Collection Site	Date Analyzed	Vitamin A content (μg/g)	Remarks
1999				
Mar '99	Sorsogon Public Market	September 1, 1999	0.00	Sample not fortified.
Jul	Newborn Plant	September 1, 1999	2.23	
Sep	Newborn Plant	September 14, 1999	3.19	
Oct	SM Megamall	October 27, 1999	4.01	
Dec	Newborn Plant	December 23, 1999	3.88	
2000				
Jan'00	Newborn Plant	January 14, 2000	11.51	
Jan	Alabang Public Market	April 3, 2000	4.67	
Feb	Alabang Public Market	April 4, 2000	4.43	
Mar	SM Makati, Makati City	May 12, 2000	4.02	
Apr	7-11 Alabang	July 25, 2000	3.06	
May	SM Makati, Makati City	August 2, 2000	10.79	
Jun	Ever Gotesco, Quezon City	July 25, 2000	3.42	
Jul	SM Megamall, Mandaluyong City	October 17,2000	2.90	
Aug	SM Megamall, Mandaluyong City	October 18, 2000	2.91	
Sep	SM Megamall, Mandaluyong City	October 4, 2000	3.54	
Oct	SM Makati, Makati City	December 5, 2000	7.23	
Nov	Landmark Supermarket, Makati City	December 7, 2000	5.71	
Dec	Newborn Plant	December 12, 2000	5.28	
Dec	Newborn Plant	December 12, 2000	5.45	Sample obtained during the 1st verification study.
Dec'00	Zamboanga City	March 2, 2001	5.93	Provincial sample
2001				
Jan'01	Newborn Plant	January 30, 2001	2.47	Sample obtained during the 2nd verification study
Feb	SM Makati	February 28, 2001	3.00	

After market launch in December 1999, in January - April 2000, the vitamin A content of fortified peanut butter was relatively higher (3.06 – 11.51 μg retinol/g peanut butter) than those obtained before launch in July - December 1999. The values obtained except for the March and April, 2000 samples were found to be within the target fortification level of 1/3 RENI, which corresponds to 4.38 μg retinol/g peanut butter. Over the four-month monitoring period, a decreasing level of vitamin A was likewise observed which resulted in an increase in the rates of vitamin A loss. The lowest reported level of 3.06 μg retinol/g peanut butter was noted to have been produced in April 2000 while the highest reported level of 4.67 μg retinol/g peanut butter was produced in January 2000. The monthly rates of vitamin A loss during the period covered was an increasing 5.13%, 9.26% and 23.88%. One of the possible reasons for the low levels of vitamin A in the fortified product was the use of a fortificant, which had an initial assay lower than the declared concentration of 1 Million IU/g. It is important that the fortificant used provides the stated concentration on its label, as this would affect the level of vitamin A in the final product if it does not. The decreasing level of vitamin A over the four-month monitoring period, may be attributed to the possible degradation of the opened fortificant during its shelf-life, until it was used up. Since the 5 Kg fortificant used by the industry collaborator takes about 2 - 3 months to consume, the weekly transfer of the fortificant into smaller containers may have caused the degradation of vitamin A. Weekly transfer of the fortificant to smaller containers, needed for one day's production was necessary to prevent the entire 5 Kg of fortificant from being exposed daily to light and oxygen, with each production run. However, as vitamin A is sensitive to light and oxygen, it is possible that the weekly transfer of the fortificant to smaller containers has affected the efficacy of the vitamin A palmitate.

From June - September 2000, the vitamin A content of product samples during the period covered, were very low ranging from 2.90 - 3.54 μg retinol/g peanut butter. The values obtained did not meet both the results of pilot trials as well as the target fortification level of 4.38 μg retinol/g peanut butter. From October - December 2000, the vitamin A content in samples of fortified peanut butter were found to be relatively higher than previous months, as it ranged from 5.28 - 7.23 μg retinol/g peanut butter.

Vitamin A contents were high on the months of January 2000, May to June 2000, and on October 2000. The high amount of vitamin A in the products could be due to high levels of vitamin A in the newly opened 5 Kg containers of the fortificant. According to the collaborator, a 5 Kg container of the fortificant is consumed within 2 to 3 months of production. However, decreases in Vitamin A followed a four month cycle. If one assumes that high levels of vitamin A on the months of May and October could be due to newly opened containers of the fortificant. The above findings showed that vitamin A inproduct samples decreased with longer time of storage or the vitamin A concentration of the fortificant decreased with longer time of use during this monitoring period.

Verification of the Possible Cause of Low Vitamin A Contents in Fortified Peanut Butter

As a result of the low vitamin A content in fortified peanut butter obtained in supermarkets in Metro Manila, a verification of its possible cause was conducted in December 2000 – January 2001. For every verification tests, an actual observation of the addition and mixing process by plant personnel was made after which samples of fortified peanut butter were taken for analysis of vitamin A content. The following were the results of the verification conducted.

1st verification

In December 2000, an announced inspection of an actual commercial production was conducted by FDC to determine the cause of the low vitamin A contents in samples of fortified peanut butter taken in supermarkets. Two sets of product samples were taken and submitted at the FDC Chemistry

Laboratory for vitamin A analysis, i.e. samples taken in a production batch where FDC personnel observed the actual mixing of the premix to plain peanut butter and in a production batch where no FDC personnel was present during production. Production of the premix was not observed at this time because the premix was already prepared when the team arrived.

Result of observation of the mixing process showed that the personnel in charge of mixing followed the recommended procedure in the addition and mixing of the fortificant. This is probably the reason why the level of vitamin A in samples taken in the presence and absence of FDC personnel did not show any significant difference, as shown in the results of analysis which indicated a vitamin A content of 5.28 and 5.45 μg retinol/g peanut butter, respectively. The values obtained were 20 - 23% higher than the declared value of 1/3 RENI which corresponds to 4.4 mcg retinol/g peanut butter because an overage was added. The low vitamin A content in fortified peanut butter was attributed to the low concentration of vitamin A palmitate used in fortifying which according to the industry collaborator had been opened more than a month ago.

Considering the above finding, a second verification was recommended wherein actual observation of the premix preparation and weighing of fortificant was conducted.

2nd verification

In January 2001, a second verification was conducted. Production was observed starting from the weighing of the fortificant to the production of the premix to the production of fortified peanut butter. Samples of the fortificant, premix and fortified peanut butter were taken from the production line for vitamin A analysis.

According to the industry collaborator, the fortificant used was manufactured by Roche and was purchased from Vitachem, a local distributor of Roche products. At the time the 2nd verification was made, the fortificant had been opened and stored at refrigerated temperature for about two weeks.

Result of actual observation showed that the recommended procedures for the addition and mixing of the fortificant during the production of premix and fortified peanut butter were strictly followed by the industry collaborator. Despite this observation, it was noted that low levels of vitamin A content in both the premix and fortified peanut butter were obtained (Table 1.3). Following are the results of vitamin A analysis versus target levels:

Table 1.3 Comparison of levels of vitamin A in fortified peanut butter, peanut butter premix, and vitamin A palmitate using the recommended procedures in adding and mixing of the fortificant

Product Analyzed	Vitamin A content Obtained (μg Retinol/g)	Vitamin A content expected (μg Retinol/g)
Fortified Peanut Butter	2.47	4.38 (1/3 of RENI)
Peanut Butter Premix	159.68	252.68 - 282.42
Vitamin A palmitate	64,033.00	300,000 - 333,333

The low vitamin A content in the peanut butter premix and fortified peanut butter were attributed to the low content of the vitamin A palmitate used to fortify the peanut butter as this was found to be only 21% of the declared value of 1 Million I.U. (or 300,000 μg Retinol/g). This confirms earlier hypothesis made in the 2nd verification that the possible cause of low vitamin A content in the final product was probably due to the low content of vitamin A in the fortificant used.

Considering the above findings, the industry collaborator was advised to inform its supplier about the low assay of the vitamin A palmitate and to request for a certificate of product analysis every delivery to ensure that the fortificant delivered meets the specifications. Information was likewise requested from Roche on studies undertaken by their company on the shelf life of vitamin A palmitate in both open and unopened conditions. The shelf life of vitamin A palmitate in the opened condition was deemed necessary because the smallest packaging available for a vitamin A palmitate is 5 Kg, which takes about 2.5 months for Newborn to consume. According to Ms. Corazon Garalde of Roche, they do not have any data on the stability of vitamin A palmitate after it has been opened.

Since no information on the stability of vitamin A palmitate after opening the container provided by Roche, it was recommended that a study to determine the stability of the fortificant at the target shelf life of 2.3 months be conducted. This is to ensure that the concentration of the fortificant is still within acceptable levels at the end of the target shelf life. A proposal to determine the stability of vitamin A palmitate at the target shelf life was prepared, with the fortificant being subjected to the existing handling and storage conditions practiced by the collaborator.

Stability of Vitamin A Palmitate During Storage

A study to determine the stability of vitamin A palmitate under existing conditions of handling and storage practiced by Newborn Food Products was conducted. The study involved the collection of vitamin A palmitate from Newborn Food Products, for the conduct of assay on the fortificant. Collection of samples was done immediately upon opening of the 5-Kg container then weekly thereafter until all of the contents are fully used up. Throughout the study, the fortificant simulated the existing handling and storage conditions practiced by the industry collaborator as follows: Initially, the 5 Kg vitamin A palmitate packed in aluminum container was divided into two separate containers of 5 Kg capacity. One of the containers was immediately stored at refrigerated temperatures for use after contents of the other container has been fully used up. Fortificant intended for one-week production was then taken from the other container by transferring ~ 85 g of vitamin A palmitate in five 100 ml capacity aluminum containers. After every transfer in smaller containers, the fortificant was stored at refrigerated temperatures (2-8°C) until its intended use. Above procedure was to be repeated until the contents of both containers were used up. For this study, a 5-Kg container of vitamin A palmitate obtained by Newborn Food Products, Inc. from Vitachem, a local distributor of Roche products, was used.

Result of initial assay after opening indicate that the fortificant had a low vitamin A content of 99,758.95 μg retinol/g (or 332,529.83 IU/g) as this was found to be only 33% of the declared value of 300,000 μg retinol/g (or 1 Million I.U./g). After one week of storage at refrigerated temperature (2-8°C), the assay of the vitamin A palmitate dropped to 97,277.78 μg retinol/g peanut butter (or 324.259.27 IU/g). The rate of loss after one week in storage was 2.49% which is considered low. Above findings confirm previous hypothesis that the cause of the low vitamin A content in the fortified peanut butter was due to the low concentration of vitamin A in the fortificant used after opening.

Considering however, the low assay of the fortificant, it was recommended that the on-going stability study of the vitamin A palmitate from Roche, be discontinued. The need to continue the study was found unnecessary because the vitamin A content of the fortificant did not meet the declared value of

1M IU/g, which was the concentration, needed to arrive at the target fortification level of 1/3 RENI. The collaborator was likewise advised to discontinue use of the entire container unless the amount of fortificant added is increased to meet the target level of fortification. As of this writing, a new supplier was being tapped by the R&D Head to supply the company with vitamin A palmitate. The study on the stability of the fortificant will resume soon as the new supplier delivers the fortificant. The need to conduct a study on the stability of the vitamin A palmitate with an assay of 1 Million IU/g at the target shelf life of 2.5 months was deemed necessary to determine the rate of vitamin A loss in the fortificant at the existing handling and storage conditions practiced by the collaborator. Knowledge of the level of vitamin A in the fortificant during the target storage period will be useful in establishing recommendations as to the amount of fortificant to be added after prolonged storage.

Monitoring the Impact of Project 3.2.8A Sorting Technology for Aflatoxin Control

Monitoring the Aflatoxin Content in Kare-kare Mix

For the period March 1999 to January 2001, a total of 21 samples were obtained from the supermarkets and the collaborator's plant. All samples tested negative for aflatoxin content (Table 1.4). Likewise, samples taken from six shipments to the U.S. tested negative of aflatoxin contamination. According to the industry collaborator, it has not received any reports of detention due to aflatoxin contamination. The above findings indicate the effectiveness of the sorting technology in controlling aflatoxin in Kare-kare Mix.

Monitoring the Sales Performance, Production and Socio-Economic Benefits

A total of five quarterly interviews were conducted and in attendance were, Mr. Kim Lapus, General Manager, Mr. Juan Bernad, the Management Trainee for Domestic Sales, Mr. Frank Aguba, Deputy Director for Sales and Marketing, Ms. Oteyza Peñero, R & D Head and Ms. Evangeline Tayag, Production Supervisor. The following information was gathered during the meeting:

Sales Performance. Before the introduction of the sorting technology for aflatoxin control, the product sold by the industry collaborator to the U.S. market was a type of Kare-kare mix without peanuts, to prevent the product from being detained at the port of entry to the U.S. due to aflatoxin contamination. Consumers using the product were required to add peanuts or peanut butter during the preparation of the sauce for Kare-kare to enhance its peanut flavor, which is a characteristic of the product. After the collaborator adopted the technology, they tried shipping Kare-kare mix with peanuts to the U.S. initially in small quantities starting in June 1999. Since no reports of detention problems were received from its distributor in the United States, the industry collaborator after building confidence started accepting orders. The biggest shipment of the product made to the U.S. was reported in January 2001 at 1,040 Kg. (Table 1.5).

During the monitoring period covered, the collaborator did not provide any figures of their sales. Only production volumes were provided. Since the collaborator claimed that all products produced for export are based on orders they received, it was then assumed that volume of sales for export are the volume produced for the given period. In an interview conducted last December 6, 2000, Mr. Frank Aguba, Deputy Director for Sales and Marketing, mentioned that the company sometimes had to deny some orders both in the domestic and export market because of the high demand and limited production situation.

Promotional activities were reportedly conducted by the collaborator in the U.S. in November 2000 in the Los Angeles, California area where Filipino population is high. Almost at the same time, an intensified promotion of aflatoxin-free Kare-kare mix with peanuts was conducted in the local market

through the "*Pistang Mama Sita*". The *Pistang Mama Sita* is a promotional activity where cooking demonstrations and free tasting activities were held in supermarkets and groceries.

Production Volume. The collaborator claimed that they have no production data for the period April 1999 to June 2000 except for the volume shipped to the U.S. market during the period June-October 1999 where they claimed to have produced and exported a total of 246.24 kg. of the product (Fig. 1.4). The collaborator however, cannot identify how much was produced and exported on a monthly basis.

A comparison of production for the period January to March 2001 showed an increase of more than 30.0% from the total production of the same months in 1999 (Table 1.4). Table 1.4 shows that the total production for the export market was 246.24 Kg, however, the total production for the US Market was only 82.08 Kg. Almost two-thirds of the production volume went to other markets such as the Middle East and Hongkong, according to the collaborator. A total of 1,766.24 kg of Mama Sita's Kare Kare Mix was exported during the first three months of year 2001 comprising 12.1% of total production while the volume produced for the U.S. market comprised 7.7% of total production and 63.5% of the total export. All exports to the U.S. market have not been tested by the U.S. Food and Drug (USFDA). This mean that the aflatoxin content of the product is acceptable.

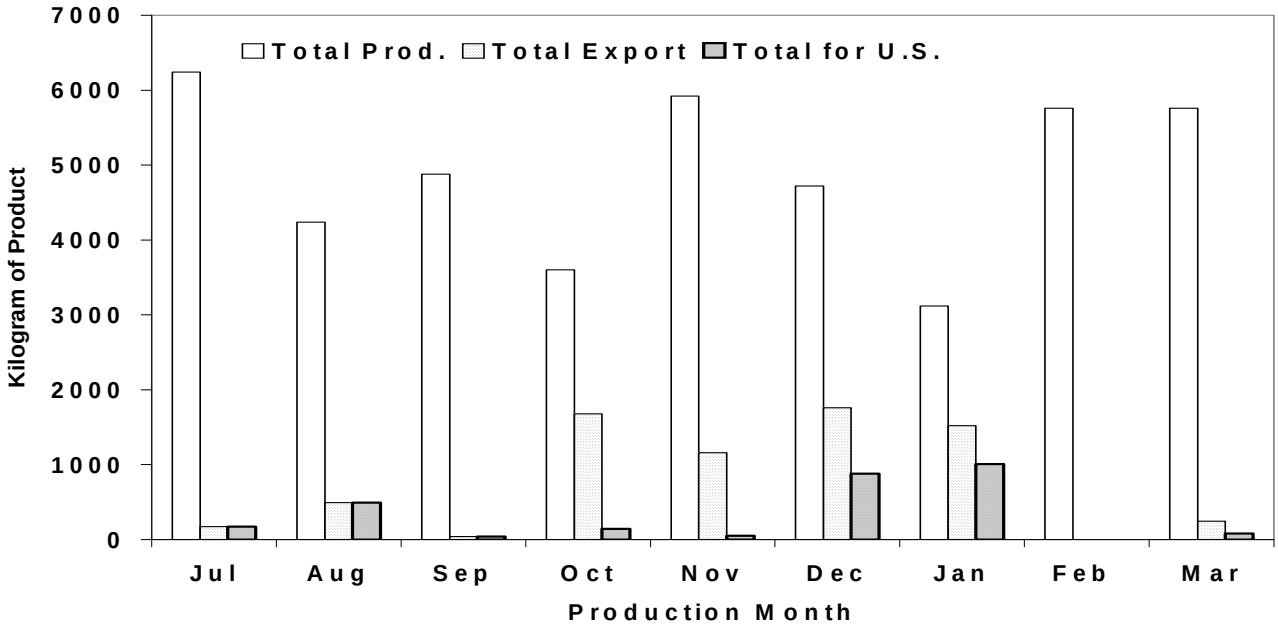

Fig. 1.3 Selected monthly total production volume, total volume for export and total for U.S. market, July-December 2000 & January-March 2001.

The fluctuations in the total monthly production levels from July 2000 to March 2001 is not based on sales forecasts but on the availability of the supply of good quality shelled peanuts.

Socio-economic Benefits. With the adoption of the sorting technology for aflatoxin control, the collaborator reportedly hired five additional male workers to perform the sorting operation. The male workers were preferred because unlike its female counterparts, the male workers are able to carry the sack-loads of peanuts to the sorting table without any help.

CONCLUSIONS

Initial Impact

Vitamin A Fortified Peanut Butter

The collaborator, Newborn Foods Corp., is the first peanut butter processor in the Philippines to market vitamin A fortified peanut butter. The vitamin A fortification technology for peanut butter is often referred to by the industry collaborator as the main reason for their increased sales.

Sorting Technology for Aflatoxin Control

The adoption of the sorting technology enabled the collaborator, Marigold Commodities Corp., to export their Kare-kare mix with peanuts not only to the U.S. but also to Middle East and Hong Kong. Before the adoption of the technology, Kare-kare mix with peanuts could not be exported to these countries. The aflatoxin content of 0 ppb constantly obtained in samples of products obtained during the monitoring period, has built a high degree of confidence on the part of the collaborator, resulting in the development of additional peanut products including "Java" sauce, which incorporates the sorting technology as a major step in its production. The improved product i.e. with added peanuts, has contributed to the increase in sales.

Continuing Impact

The continuing impact created by the two technologies to their respective collaborators is the increased confidence in the superiority of their products over their competitors. The projects also achieved the objective of increase peanut consumption in the country.

Table 1.4 Total production volume of kare-kare mix (with peanuts added), volume for export and volume produced for the U.S. market.

Production Date (Month)	Total Production (Kg)			Total Production For the Export Market (Kg)			Total Production for the U.S. Market (Kg)		
	1999	2000	2001	1999	2000	2001	1999	2000	2001
January	3,920.00	-	3,120.00	-	-	1,520.00	-	-	1,040.00
February	3,880.00	-	5,760.00	-	-	-	-	-	-
March	3,440.00	-	5,760.00	-	-	246.24	-	-	82.08
April	-	-	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-	-	-
June	-	-	-	-	-	-	-	-	-
July	-	6,240.00	-	-	171.36	-	-	171.36	-
August	-	4,240.00	-	-	492.48	-	-	492.48	-
September	-	4,880.00	-	-	41.04	-	-	41.04	-
October	246.24	3,600.00	-	246.24	1,680.00	-	246.24[1]	143.64	-
November	-	5,920.00	-	-	1,160.00	-	-	53.35	-
December	-	4,720.00	-	-	1,760.00	-	-	880.00	-
Total	11,486.24	29,600.00	14,640.00	246.24	5,304.88	1,766.24	246.24	1,781.87	1,122.08

Source: Monthly Report submitted to FDC by Marigold Commodities Corp.
[1]The amount represents all shipments made to the U.S. from June to October 1999.

Table 1.5 Aflatoxin content in samples of kare-kare mix (with peanuts added) taken from supermarkets in Metro Manila, provinces and Marigold Plant.

Production Date	Place Bought	Date Analyzed	Aflatoxin content (ppb)	Remarks
Feb. 1999	EDSA Central Public Market	Aug. 31, 1999	0	Initial sample before sorting was introduced.
Jul. 1999	Rustan's Supermarket, Mandaluyong	Aug.31, 1999	0	3 months after introduction of the sorting process.
Sept. 1999	SM Megamall	Oct. 26, 1999	0	
Oct. 1999	Marigold plant	Dec. 29, 1999	0	1st shipment to the U.S.
January	Marigold Plant	January 9, 2000	0	2nd shipment to the U.S.
January	Rustan's Mandaluyong	May 11, 2000	0	Shipping to the US & Middle East at 300 cases/month average.
February	Marigold Plant	February 28, 2000	0	3rd shipment to the U.S.
February	SM Makati City	May 11, 2000	0	Experienced no detention problems in the U. S.
March	Rustan's Mandaluyong	May 11, 2000	0	
April	Sunshine Mall Taguig	July 13, 2000	0	
May	Sunshine Mall Taguig	July 13, 2000	0	
June	SM Megamall	August 8, 2000	0	
July	Makro, Sucat	August 4, 2000	0	
August	Rustan's Mandaluyong	May 22, 2000	0	
September	Rustan's Supermarket	November 20, 2000	0	
October	Landmark Supermarket, Makati City	December 5, 2000	0	
November	Landmark Supermarket, Makati City	December 5, 2000	0	
December	Agoo Supermarket, Agoo, La Union	December 12, 2000	0	Provincial sample.
	Marigold Plant	December 12, 2000	0	Produced for the U.S. market. 4th monitoring batch
Jan. 2001	Marigold Plant	January 18, 2001	0	Produced for the U.S. market. 5th monitoring batch
	Marigold Plant	January 28, 2001	0	Produced for the U.S. market. 6th monitoring batch

CHAPTER 2

IMPACT ASSESSMENT ON THE USE OF SORTING IN THE PRODUCTION OF PEANUT-BASED PRODUCTS

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ABSTRACT

While aflatoxins are known to be carcinogens, they also have additional toxic effects. A previous research and development project resulted in a procedure designed to eliminate aflatoxin-contaminated kernels in raw peanuts through a new treatment and sorting process. The collaborative project was carried out by the University of Georgia, the Food Development Center/National Food Authority, and the University of the Philippines at Diliman and was funded by the Peanut Collaborative Research Support Program (supported by U.S. Agency for International Development). A private company agreed to adopt the procedure for the peanut content in one of its products. This is a report on the process of technology transfer and assessment of the socioeconomic impacts of this new aflatoxin elimination process on that company.

Among other impacts, it was found that despite some increase in costs and labor (positive impacts on the Philippine economy) the adoption of the sorting technology enabled the company to significantly improve the quality of their production and subsequently their sales. For example, this process helped account for an increase in the total export market for all countries for Kare-Kare mixes (with peanuts) and 100% of the increase in these exports to the United States. Also, new products have since been developed with other peanut-based products for export mostly due to aflatoxin reduction. Another major impact is that this company is now providing the Philippine consumer with the aflatoxin-free product. The company also indicates that their adoption of the sorting process led to an improvement in product quality in other ways, such as increased shelf life.

A survey of consumers included questions concerning awareness and knowledge about aflatoxin among Filipino consumer and suggests very low familiarity with issues concerning food safety and hazards, especially aflatoxin. The indicated support of consumers (in the survey) in buying aflatoxin-free peanut products should encourage the collaborating company and others to look into the possibility of adding an “aflatoxin-free” statement on their labels of aflatoxin-free peanut-based products such as their Kare-Kare mix and Java sauce and adding aflatoxin-free messages to their advertising. This study also suggests that, while the sorting technology is labor intensive, it is feasible under the appropriate conditions and should be considered by other companies.

INTRODUCTION

Mycotoxins, such as aflatoxin, are chemical substances produced as secondary metabolites by fungi, especially molds. It is commonly produced by particular strains of *Aspergillus flavus* and *Aspergillus parasiticus* and is widely found in many agricultural products. These mycotoxins are widely studied due to their biological effect to animals and humans as well as their economic implications. Examples of agricultural commodities implicated with aflatoxin are groundnuts, corn, barley, beans, cottonseed, rice, wheat, copra, cassava and peas.

The first aflatoxins identified were designated as aflatoxin B1, B2, G1 and G2 on the basis of their color, either blue (B) or green (G), at which they fluoresce under ultraviolet (UV) light. Aflatoxin B1 is the most potent carcinogen among all natural compounds and is also acutely toxic at high levels of contamination (IARC, 1993). Even at low concentration, aflatoxin is believed to pose a risk to human health due to its extreme toxicity. Furthermore, since they are considered 'unavoidable contaminants' of major plant commodities, aflatoxin is considered a consumer food safety issue. Because of its carcinogenic properties, high levels of aflatoxin in agricultural products are not permitted by government food agencies such as the Bureau of Food and Drug in the Philippines and U.S. Food and Drug Administration in the USA. The maximum allowable level of total aflatoxin for commodities for human and animal consumption in different countries is shown in Table 2.1. However, aflatoxin exposure in many high mortality developing countries makes it probable that such exposure negatively influences many health factors (including HIV) that account for 40% of the burden of diseases in these countries (Williams et al, 2004).

Table 2.1. Maximum allowable level of total aflatoxin (ppb) for commodities for human and animal consumption.

U.S. FDA	20 ppb[1]
United Kingdom	4 ppb[2]
Asia[3]	20-30 ppb[1]
Philippines	15 ppb

[1]Flach, 1987, [2]MAFF, 1996, [3]China, India, Malaysia and Thailand

The presence of aflatoxin in agricultural products can be detoxified in various ways. Physical destruction such as treating with heat and irradiation has been used but none of which was entirely effective. Chemical degradation of aflatoxins can be carried out by adding various chlorinating, oxidizing and hydrolytic agents. The use of bacteria, fungi and algae can remove or degrade aflatoxin in foods and feeds. And last, infected kernels or grains can be physically removed using the electronic color sorting equipment, water-flotation method, hydrogen peroxide blanching process and manually sorting for damaged kernels or grains.

One of the problems of the peanut industry in the Philippines is aflatoxin contamination of raw and processed peanuts due to difficulty in controlling the temperature and relative humidity during storage. Norhayati, *et. al*. (1999) reported that in the Philippines, roasted shelled peanuts and fried peanuts had aflatoxin content of 117 and 375 ppb, respectively. Peanut products exported from the Philippines have suffered detention problems because of high levels of aflatoxin. Consumer demand and the world export market for commodities susceptible to aflatoxin contamination are even pushing towards zero tolerance for aflatoxin. From the methods mentioned on aflatoxin detoxification, peanut manufacturers in the Philippines can use manual sorting of raw peanuts to separate kernels that are not fit for human consumption. A manual sorting procedure to eliminate aflatoxin-contaminated kernels in raw peanuts has been developed through a tripartite collaboration between the University of Georgia, the Food

Development Center under the National Food Authority and the College of Home Economics of the University of the Philippines (Galvez, Francisco, Lustre and Resurreccion, 2002). From the methods mentioned on aflatoxin detoxification, peanut manufacturers in the Philippines can use the manual sorting of raw peanuts to separate out kernels that are not fit for human consumption. The research and development was funded by the Peanut Collaborative Research Support Program (Peanut-CRSP) of the United States Agency for International Development (USAID). The technology involves a dry blanching procedure where raw peanuts are roasted for 45 to 55 minutes and then aflatoxin-contaminated peanuts are manually sorted out from the batch of peanuts (Fig. 2.1).

The newly developed procedure for sorting peanuts at commercial scale is as follows:

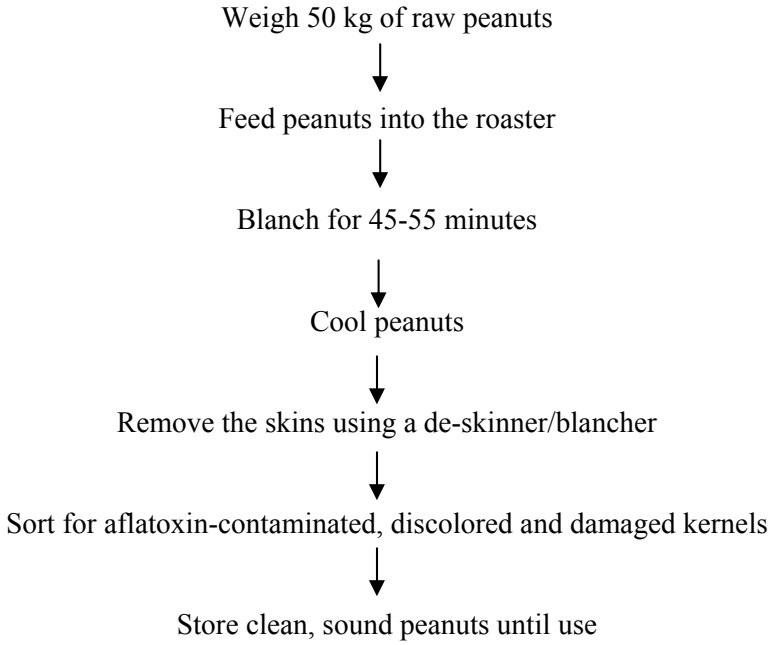

Fig. 2.1 Flow diagram of the developed manual sorting procedure for raw peanut.

The manual containing guidelines for sorting aflatoxin-contaminated, discolored and damaged kernels were introduced to a peanut product manufacturer. The sorting procedure resulted in a number of changes in the previous procedure that was being followed by the collaborator on roasting of raw peanuts prior to production of peanut-based products. The company now has to follow a 2-stage roasting process, the first stage of which is the blanching process to facilitate sorting of the aflatoxin-contaminated peanut kernels. The assessment of the process of transferring the technology and the factors affecting it are important for assessing the value of the technology transfer. In this study, the impact of the addition of the sorting procedure in the production of peanut-based products was assessed in terms of such factors as the quality of the product, sales and marketing, and changes in employment. This knowledge can inform and enhance the transfer of similar technology to other food industries engaged in producing peanut products.

OBJECTIVES

This study was undertaken to assess the overall impacts of sorting of peanuts in the production of peanut-based products specifically Kare-Kare mix. As there will be multiple impacts, the study expressly seeks to (1) assess the impact of sorting technology on the business and socio-economic status of the collaborating agency; (2) assess the impact of sorting technology on the employees directly affected by the technology and (3) assess consumer awareness of the negative effects of aflatoxin in peanuts.

METHODS

Chronology of Technology Transfer and Production Impacts

The sorting technology was developed by the research team from the University of Georgia, University of the Philippines and the Food Development Center (FDC) (Galvez *et al*, 2002). Activities related to the transfer, adoption and commercialization of the sorting technology are given in Table 2.2.

In January of 1998, the research team became a technology transfer team. For example, management had to be satisfied with regard to potential changes and costs of adoption of the technology, and middle managers directly responsible for production had to be trained on the steps of the sorting technology. Finally, new workspace had to be allocated and remodeled and workers trained to do the sorting.

The company does not process peanuts regularly. The normal practice is for the company to blanch peanuts in bulk, and then store them until orders for Kare-Kare mix have been made. Once the orders have been placed, blanched peanuts are processed into Kare-Kare mix. The company also has a marketing distribution group, separate from the company that handles shipment of Kare-Kare mix outside the Metro Manila area. All of the above, plus the company's concern for privacy and subsequent reluctance for revealing the monetary value of data reported, made the impact assessment less quantitative and precise.

However, one basis of comparison is the data supplied by the company for Table 2.2. The January through March 1999 total production of Kare-Kare mix with peanuts (11,486.24 kg and 14,640 kg for the same period in 2001) shows an increase of 3,154 kg (about 28%). The total amount produced for the U.S. export market between July 2000 and March 2001 is 15,762 kg. The total amount of Kare-Kare mix with peanuts produced during this period is 44,240 kg, making the U.S. 35.6% of the market for this product during this period. Later figures in this report on the analysis of impacts on business give greater detail on the comparison of the domestic and export market. It is important to recognize that none of the Kare-Kare mix with peanuts could have been exported to the U.S. before the adoption of the sorting technology.

After a number of qualitative open-ended interviews with the company owner and personnel in charge of the peanut sorting process, a set of questionnaires were prepared to be used as interview guides in gathering data on the impact of sorting technology. The questionnaires were designed to incorporate relevant questions regarding business and socio-economic status of the company. A questionnaire was submitted to the General Manager of the company. Interviews with the General Manager and the Production Manager were likewise conducted for gathering further data and verification of information.

Table 2.2. Calendar of events on collaboration with a peanut manufacturing company on the adoption of sorting technology (Galvez et al, 2002).

Date	Activities
January 1998	Start of collaboration with peanut processors
December 1998	Use of technology in production line of the collaborating company
April 1999	Trial shipment of aflatoxin-free Kare-Kare mix to the USA
June 1999	Formal turn-over of sorting technology to industry collaborator Signing ceremony 1st shipment of aflatoxin-free Kare-Kare mix to the USA
January – March 1999, October 1999	Total production of Kare-Kare mix with peanuts, 11,486.24 kg Total production produced for the US market, 264.24 kg
July – December 2000	Total production of Kare-Kare mix with peanuts, 29,600.00 kg Total production produced for the US market, 14,640.00 kg
January – March 2001	Total production of Kare-Kare mix with peanuts, 14,640.00 kg Total production produced for the US market, 1,122.08 kg

To assess the aflatoxin awareness of consumers, interviews were conducted with 361 household respondents in 10 areas of Manila and communities North and South of Manila and in Visayas Islands of the Philippines using a structured questionnaire (Appendix A). The *barangays* (communities) in these areas were randomly selected from a list of 127 stores selling vitamin A fortified peanut butter. The survey was part of an impact assessment of a vitamin A fortification technology transfer project to a peanut butter manufacturer (Galvez et al, 2003). Respondents were chosen based on the following criteria: (1) respondent is the one who determines what foods will be bought for the household; (2) respondent's household has children and; (3) respondent's family eats peanut and/or peanut-based products.

RESULTS

Negative Impacts Encountered Upon Initial Adoption

The sorting procedure, which involves at least six steps, was added to the production flow diagram of the company. The initial problems perceived by the company were the following:

1. Inavailability of space to accommodate manual sorting of peanuts.
2. Additional personnel to manually sort the blanched peanuts.
3. Training of personnel for proper sorting of damaged peanuts.
4. Increase in production cost due to an additional processing step.
5. Increase in time needed to prepare the peanuts for processing.

Impact on Employment, Facilities and Raw Material

Manufacturing Facilities

The manufacture of the Kare-Kare mix is maintained in one of the company's food plants and the design of the food plant was modified to allow flexibility and continuity in the production. A total of 25 square meter area was provided as an additional area for the manual sorting of peanuts. Additional utensils and/or equipment were purchased such as stainless tabletop trays and scoops to be used for sorting. The company has recently transferred to a bigger manufacturing facility. Operations for peanut-based products started during the first quarter of 2003. A sorting area was included in the new plant, and the company also purchased a new, larger, continuous roaster to be used for blanching and roasting the peanuts. The Research and Development (R&D) Group of the company had to modify the sorting procedure that was originally given to them as a result of using the new roaster for their peanuts. New parameters, temperature and blanching time were established to conduct proper sorting of peanuts.

Employment

During bulk processing of peanuts, at least four to eight employees are assigned to conduct the sorting. The company hired two additional personnel to join the production team. The company assigns two regular employees as part of the team while the rest are temporary casual employees (employed for five months only). The sorting of kernels requires a high degree of familiarization of aflatoxin-contaminated kernels. A total of 30 hours of training and orientation was given by the R&D group to production personnel involved in sorting. The Production Manager and two other assistants closely monitor the sorting of peanuts during the day. A few regular employees are included in the team, to serve as 'leaders' of the group. In this way, these regular employees are being asked to carry the responsibilities of the management. When an order must be filled, the workers always extend the normal 8-hr workday by two to five hours to finish the processing of peanuts. This results in additional overtime pay.

Employees

The sorting of peanuts for aflatoxin-contaminated and damaged kernels is not an easy task. The Production Manager indicated that they try to minimize the number of employees in the production. Therefore, workers have many tasks assigned to them such as sorting, weighing, and packing, among others. A maximum of eight employees have been identified to do the sorting of peanuts. The usual complaints by the sorters are eyestrain and also, extension of working hours due to sorting. As a response, the management decided to rotate the sorters in the production area to reduce eyestrain. At the conclusion of four hours of sorting, workers are transferred to do another task to rest their eyes. And after a few hours, they are rotated back and resume sorting.

Raw Material

Since the company had not previously sorted for damaged nuts, an increase in raw material loss was noted, between 15 to 25%. This figure was found to be quite high. This reflects either raw peanuts being used are not of good quality or sorting for aflatoxin-contaminated peanuts is being overly done. When asked to verify this figure, the Production Manager said that sorters do not only look for aflatoxin-contaminated and damaged nuts, but also, they have included off-colored peanuts in their sorting. The discoloration of peanuts was later found to be due to uncontrolled heating of peanuts while blanching. The fabricated roaster that the company is using does not have adequate temperature controls, and so, the roasting of peanuts was likely overdone, causing the discoloration of some peanuts. When the study by the research team on the development of the blanching procedure began, it was found that overheating

results in the development of more intense color on peanuts, which might be mistaken for damaged or aflatoxin-contaminated. This can, therefore, increase raw material loss in the batch of peanuts. As the company has already built a new plant and acquired new equipment including a better roaster, the problem of overheating was solved. As a result, raw material loss dramatically decreased from 15-25% to 1-3%.

Impact on Business

Production Impacts of Kare-Kare with Peanuts

Production data from 1999 up to 2002 was obtained from the company for their Kare-Kare mix with peanuts. The data included yearly production reports for domestic, export and U.S. markets, where values are in unspecified "weight units" to maintain the company's privacy. A summary of the total production volume of Kare-Kare mix with peanuts from January to October is shown in Fig. 2.2.

The company indicated a growth of 30% in volume of domestic and exports sales after the sorting technology was adopted. Total production increased from 1999 to 2002 except for year 2001 where there was a drop in production volume both for domestic and export. Sourcing of raw materials and price of peanuts in the market contributed to the slight drop in production.

A comparison of the total production for the period of January to October from 1999 to 2002 revealed an increase of almost 60% from the total production of the same months in 1999. Covering the same period, the domestic market increased by 48%, while the export market increased (in gross weight units) from 3,100 to 6,900 which would not have been possible without aflatoxin-free peanut.

As shown in Fig. 2.3, the majority of the Kare-Kare mix sales are for domestic consumption, with an average of 83.74%, while Kare-Kare mix for export sales is an average of 16.26%. The export market share sales gradually increased from 1999 to 2002 (a 39% increase).

Looking at the production data for export (Fig. 2.4), an increase in export production volume from 1999 to 2002 can be seen. None of this production could have gone to the U.S. without the aflatoxin elimination technology, and the market share increased even after the first year of exports. The average U.S. market share for the next three years (2000 to 2002) increased an average of 26.7 % over 1999. The average U.S. market share of 45.37% was obtained in 2001.

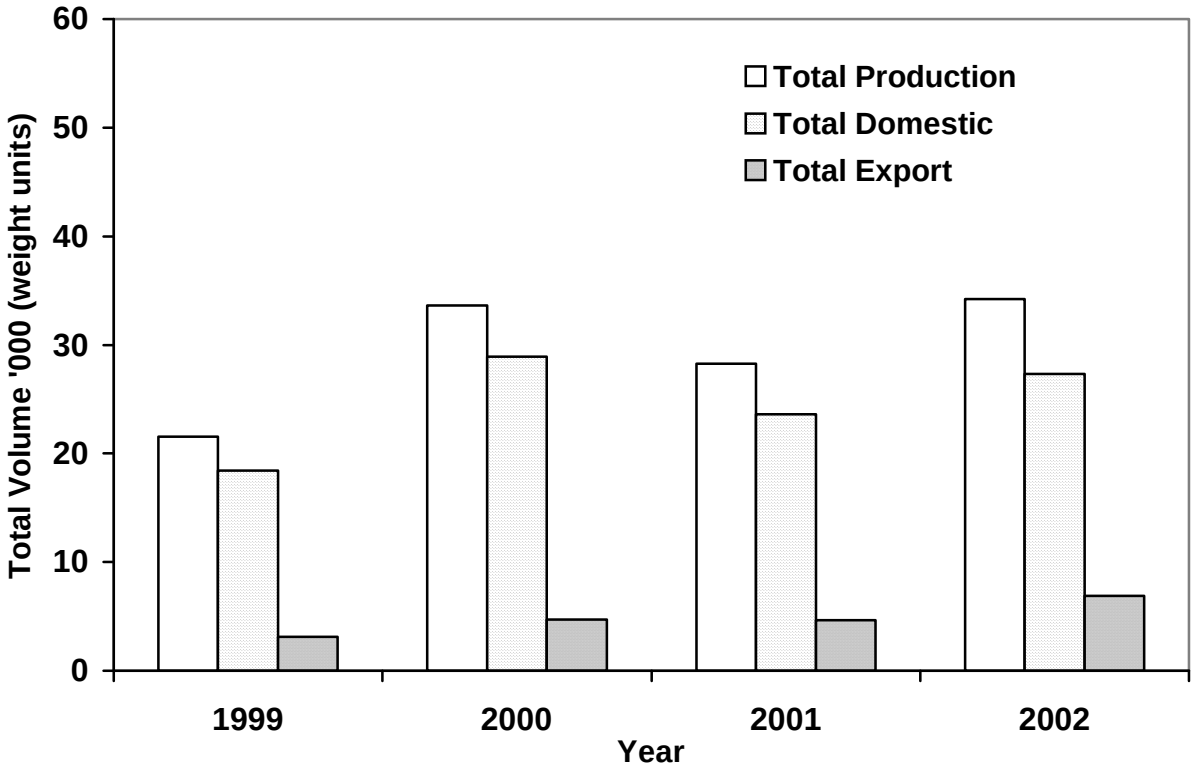

Fig. 2.2 Total production volume of Kare-Kare mix with peanuts, volume for domestic and volume for export from January to October.

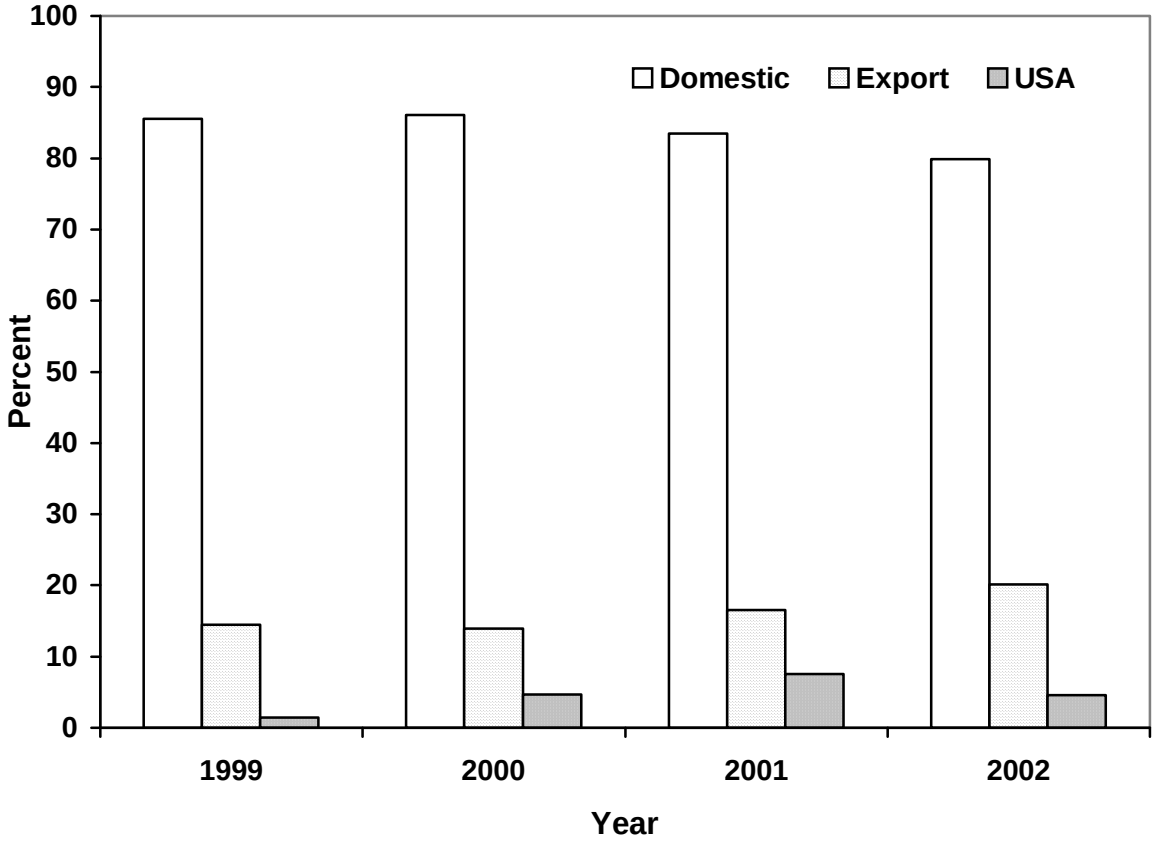

Fig. 2.3 Percent market share of domestic, export and US sales of Kare-Kare mix with peanuts from January to October.

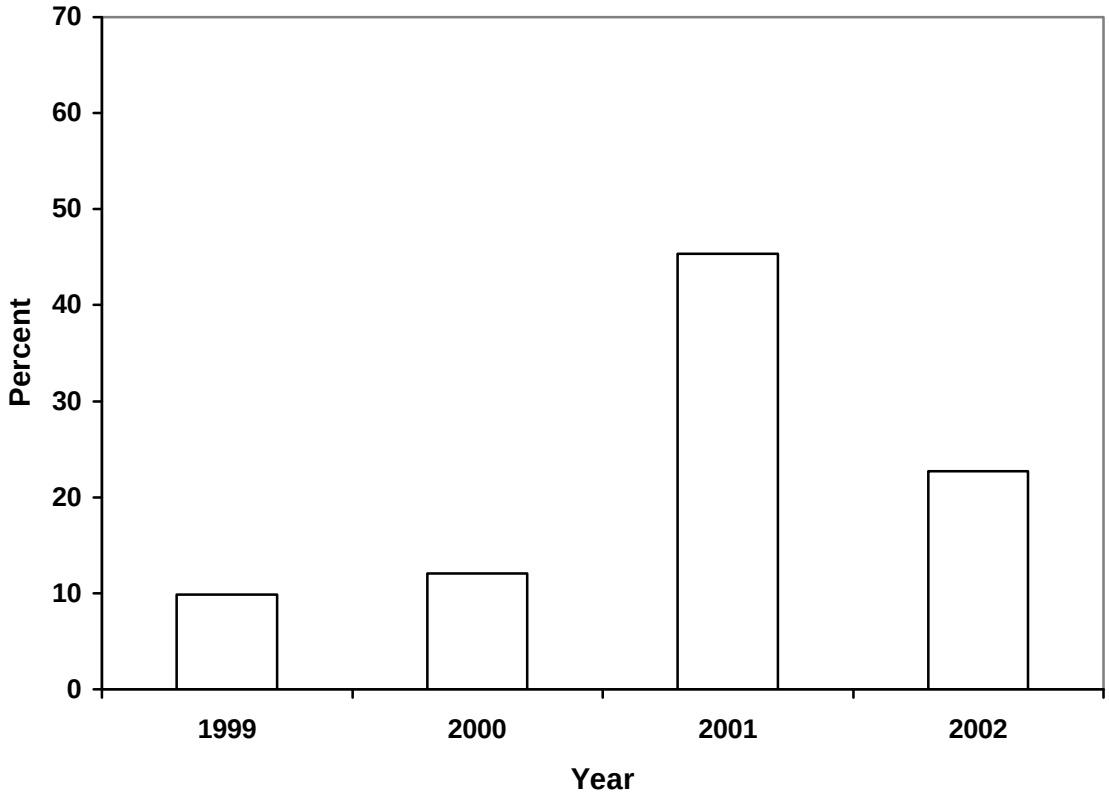

Fig. 2.4 Percent USA market share of Kare-Kare mix with peanuts from January to October.

An updated sales report was provided to the research team showing worldwide volume sales from 2000 to 2004 (Fig. 2.5). The figures were reported in terms of number of cases sold for two sizes of Kare-Kare mix, the 57 g and 100 g sizes. Total sales volume increased from 2000 to 2004 for both sizes of Kare-Kare sauce mix. Highest percentage increase of 39.7% and 9.4% was obtained from 2002 to 2003 for the 57 g and 100 g variants, respectively. Increases in dollar amounts were again not made available for both variants.

Production Impacts of Kare-Kare Mix without Peanuts

Despite the increase in total exports of Kare-kare sauce mix with peanuts, this has not diminished total exports of Kare-kare mix without peanuts to the US. Production data for the Kare-Kare mix without peanuts were also obtained from 1999 to 2002. Total production of the mix without peanuts increased from 1999 to 2002 by 8% as shown in Fig. 2.6, while a decrease was noted for the years 2000 and 2001. Sourcing of raw materials and price of peanuts in the market contributed to the slight drop in production as claimed by the company. Total export increased by 7% from 1999 to 2002.

Almost 60% of the Kare-Kare mix without peanuts was produced for export as shown in Fig. 2.7. The percent market share for export, including the U.S., remained stable, even with the introduction of Kare-Kare mix with peanuts. The biggest export market is still the U.S., with at least one-third of the total volume for export produced. This is remarkable in that it suggests that all the Kare-Kare mix with peanuts exported to the U.S. resulted in new additional sales with introduction of the new product.

International Marketing

Table 2.7 shows the countries where Kare-Kare mix is currently being exported. New markets established for the Kare-Kare mix with aflatoxin-free peanuts include the U.S., Hong Kong and Middle East. The company indicated that the U.S. and the Middle East are their biggest exporting countries for the Kare-Kare mix with peanuts. The inclusion of these countries in their market list improved positive growth and expansion for their Kare-Kare mix with peanuts. Although there was growth in the production of Kare-Kare mix with peanuts, the management indicated that their sales for Kare-Kare mix without peanuts remained unaffected by these improvements.

Marketing activities conducted by the company included advertisements in the newspapers, consumer tasting in supermarkets and participation in trade fairs. Accompanying the display of their different products is a note that highlights the zero-aflatoxin content of their peanut-based products. The advantage that their product is the first peanut-based mix in the country to be proven aflatoxin-free was highlighted in their official website and product brochures.

Table 2.3. Countries where peanut-based products are currently being Exported (Kare-Kare mix and Java sauce).

USA	Belgium
Canada	Germany
Hong Kong	Kuwait
Singapore	United Arab Emirates
France	Commonwealth of Northern Marianas Islands
Spain	Japan
Italy	Oman
Qatar	Bahrain

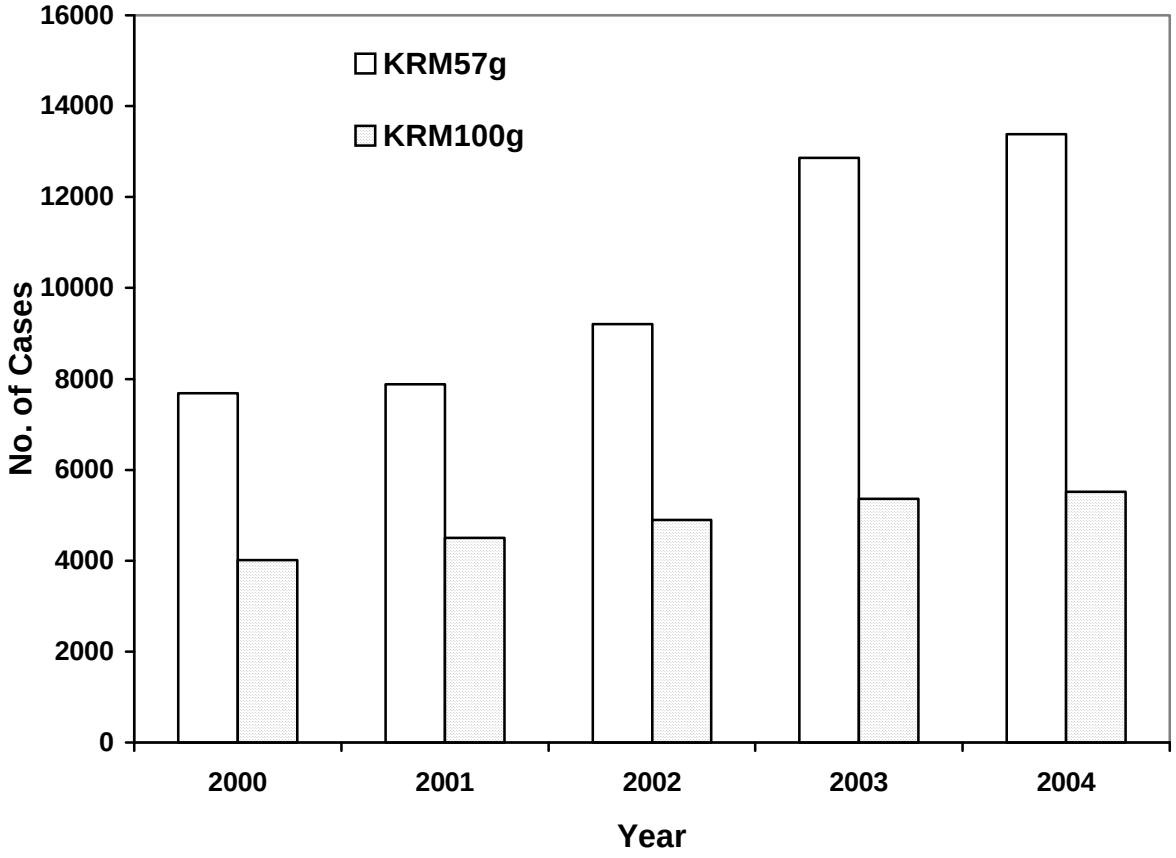

Fig. 2.5 Total volume sales (as number of cases) of Kare-Kare mix with peanuts. (KRM57g = Kare-Kare Mix, 57 g variant; KRM100g = Kare-Kare Mix, 100 g variant.)

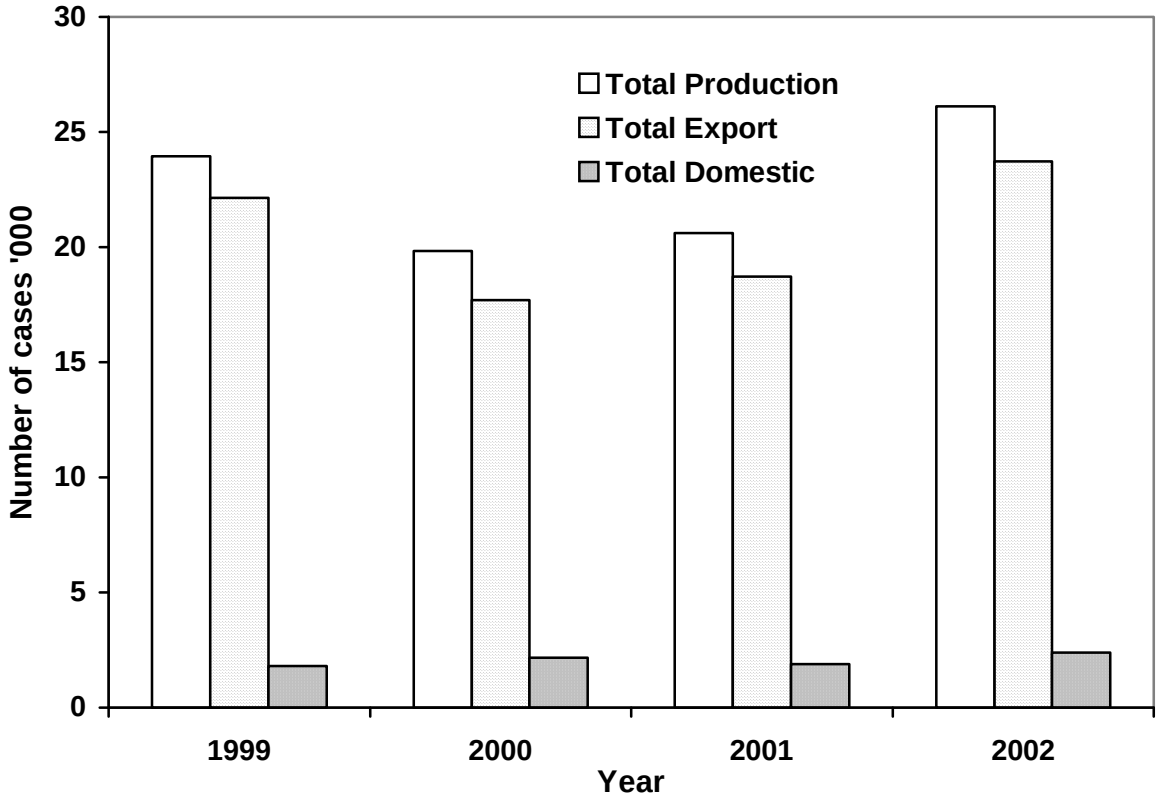

Fig. 2.6 Total production volume of Kare-Kare mix without peanuts, volume for domestic and volume for export from January to December.

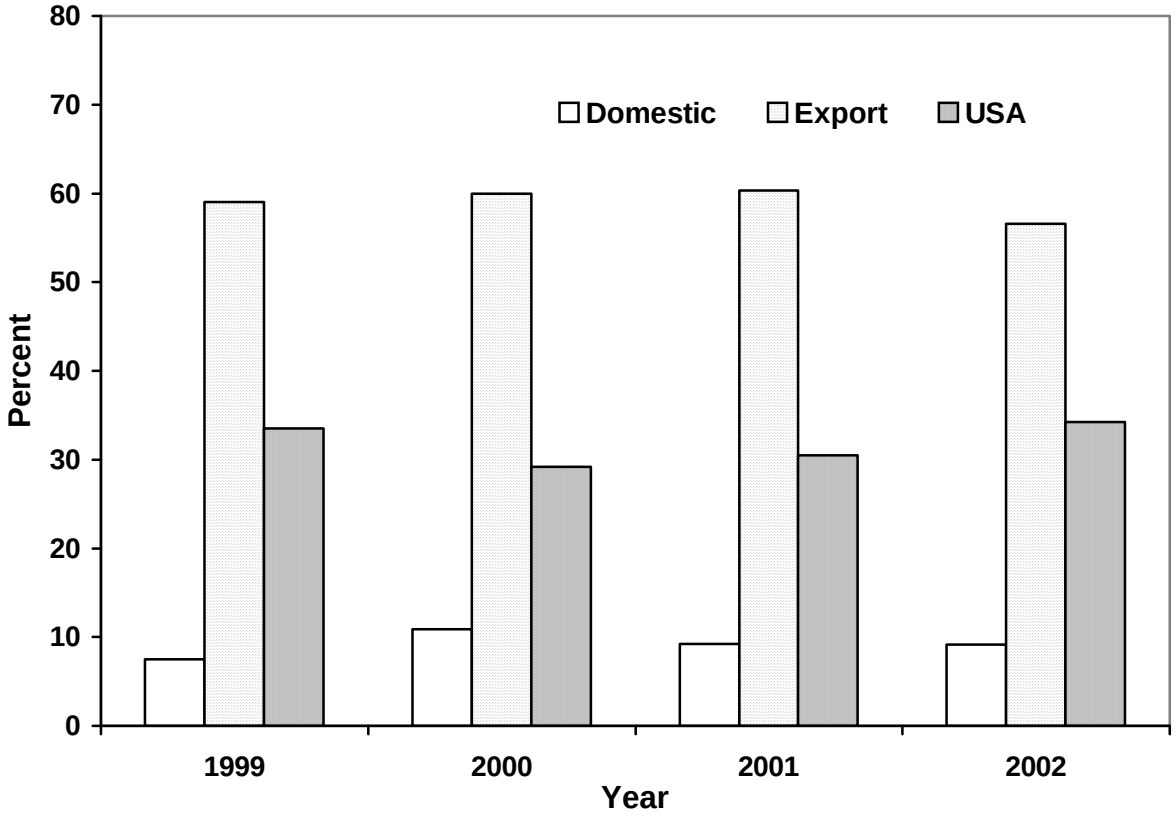

Fig 2.7 Percent market share of domestic, export and US sales on Kare-Kare mix without peanuts from January to December.

Research and Development of Peanut-Based Products

The assurance that peanut-based products will pass the aflatoxin requirement encouraged the company to export Kare-Kare mix with added peanuts to the U.S. market. The success of the product in penetrating the U.S. market gave them the company confidence to develop other peanut-based products. The newest product that has been released and exported in other countries, including the U.S. is the Java sauce, which was released during the last quarter of year 2001. As shown in Table 2.8, the company started exporting Java sauce to the U.S. only in 2002 and almost 50% of the total export was targeted for the U.S. market. The collaborator also indicated that they have two additional peanut-based products currently under development.

Table 2.4. Total production volume of Java sauce, volume for domestic and volume for export.

Year	Total Production (weight units)	Total Domestic (weight units)	Total Export (weight units)	Total U.S. (weight units)
2001[1]	101.44	87.38	14.06	0.00
2002[2]	296.46	216.26	57.16	23.04

[1]From October to December
[2]From January to December

Impact on Product Quality

Upon the adoption of the technology and subsequently exporting Kare-Kare mix with peanuts to the U.S., the Food Development Center (FDC) monitored the aflatoxin contents of shipments made to the U.S. from October 1999 to January 2001. A total of six analyses were done, each of which resulted in zero level of aflatoxin. As for its shipments made to other countries, the company indicates that they have not received any product detentions from its distributors outside the Philippines.

Management indicated that the inclusion of peanut sorting and aflatoxin testing increased production cost by 30%. This increase affected the price of Kare-Kare mix in the market. The company used to test their products for aflatoxin every month. At present, the company tests their products for aflatoxin every quarter, indicating great confidence that peanut sorting is successful in eliminating aflatoxin for their products.

When the company adopted the sorting procedure, several product improvements were observed. The company claimed that Kare-Kare mix increased its shelf life from the normal six months to one year. They claim to have products that lasted for two years, without turning rancid. The research and development and production groups of the company regularly conduct sensory tasting of their products, and they noted that Kare-Kare mix had a better taste profile and acceptability. Since peanuts are rigorously sorted for aflatoxin-contaminated, as well as, damaged and discolored peanuts before processing, the Kare-Kare mix was improved in several ways.

Products returns reported were 1.2%, mainly due to macro contamination rather than product deterioration. The exact figures cannot be quantified since the common practice is that the distributor accumulates all rejects for a certain period of time, before traveling to Manila to save on cost. These rejects are normally found to occur in small groceries or ‘sari-sari’ stores in the provinces.

Impact on Consumers

A total of 361 households were interviewed in the Luzon and the Visayas Islands. Respondents were chosen based on three criteria: (1) respondents are the ones who decide what food to buy; (2) respondents and their families eat peanut-based products and; (3) the household has children.

Of the 361 households, 176 respondents belong to the middle-income group (with monthly income >PhP10,000.00) while 185 respondents belong to the low-income group (with monthly income <PhP10,000.00). The survey was conducted in conjunction with the survey on the Impact of Vitamin A Fortification on Consumers.

When consumers were asked what peanut-based products they buy, 17.61% of the middle income and 18.92% of the low-income groups buy Kare-Kare mix. Based on the frequency of consumption (Fig. 2.8), most consuin mers consume the product once a month, because it is readily available at restaurants. Kare-kare is usually prepared in the home during special occasions. As for the basis of choice, both income groups regard taste as the most important factor in choosing the Kare-Kare mix, followed by brand name and then price. Availability and color of Kare-Kare mix were found not to be relevant in their choice (Fig. 2.9). A majority of the respondents in both income groups consumes Kare-Kare mix that includes peanuts (Fig. 2.10). When asked what brand of Kare-Kare mix they usually buy, both income groups responded that they use the Mama Sita brand more than the other brands available in the market (Fig. 2.11).

Of the 361 respondents, only 7.95% of the middle-income group and 4.86% of the low-income group are aware of aflatoxin as shown in Fig. 2.12. When asked what foods are susceptible to aflatoxin contamination, the respondents have very little knowledge (middle-income=6.8; low-income=1.6).

The respondents were then told that aflatoxin is a carcinogen and that the usual foods contaminated are peanuts and corn. Having been thus informed, when asked if they will buy peanut-based products with aflatoxin-free peanuts, 85% of middle-income group and 81% of low-income group said “yes” (Fig. 2.13). When asked if they have seen peanut products with aflatoxin-free labels, more than 98% of the respondents said that they have not seen peanut-based products with aflatoxin-free labels.

Comparing the level of awareness of consumers on vitamin A and aflatoxin, as seen in Chapter 4 of this monograph on impact assessment of vitamin A fortification of peanut butter on families and consumers, consumers were more knowledgeable about vitamin A than aflatoxin. This was expected since many institutions advertise the importance of vitamin A in the diet whereas efforts from the government or any other institutions to disseminate information on the role of aflatoxin in foods are nil. In fact, this is probably the first time that awareness on aflatoxin is being communicated. The fact that peanuts are popular in the Philippines and that aflatoxin contamination is prevalent; a tripartite effort from the government, academe and industry to reduce or eliminate the problem should be encouraged.

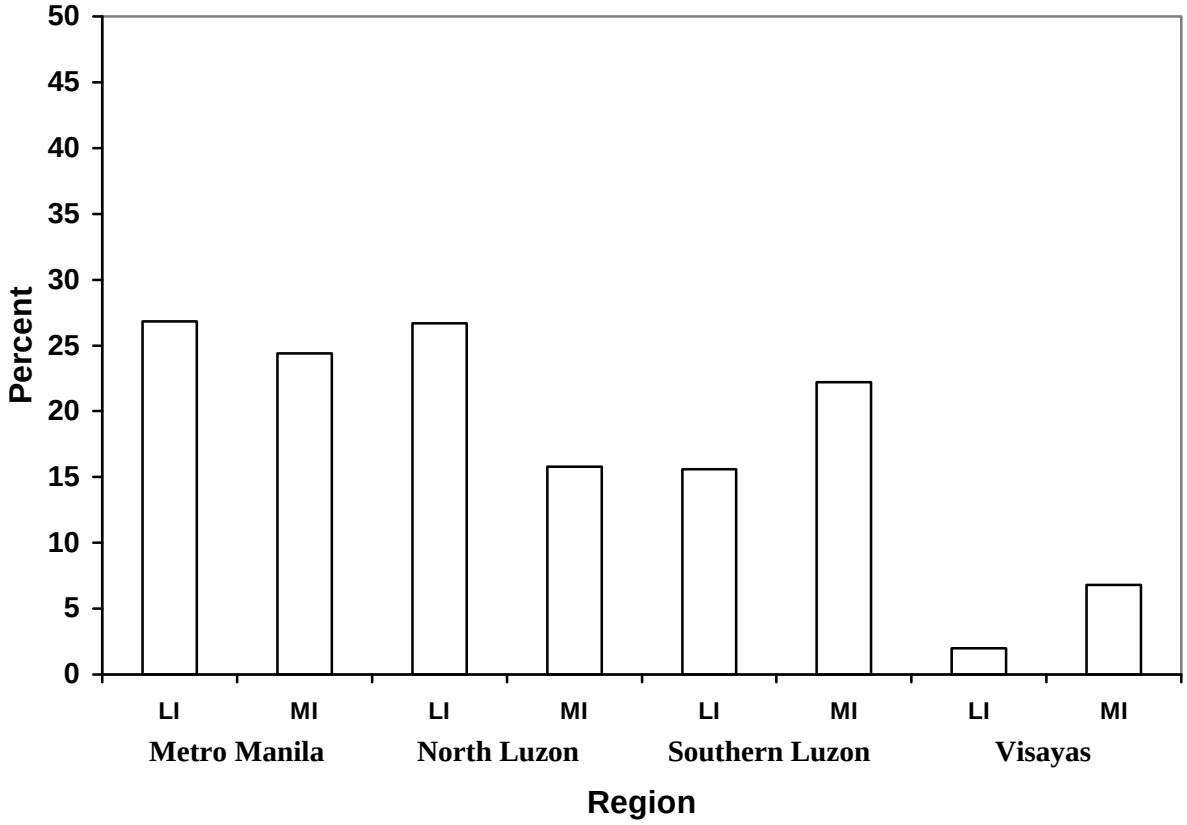

Fig. 2.8 Number of respondents in different regions who buy Kare-Kare mix (LI stands for low income and MI stands for middle income).

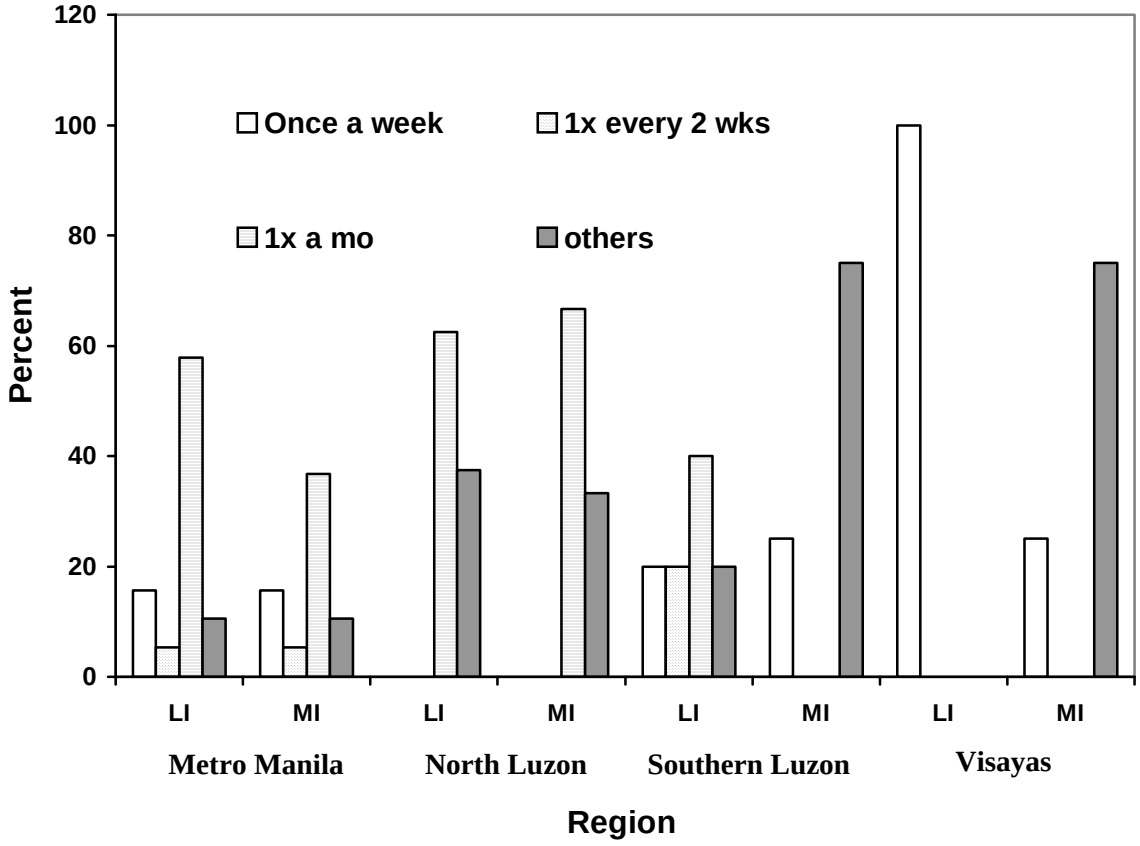

Fig. 2.9 Frequency of Kare-Kare mix purchase by Filipino consumers in different regions (LI stands for low income and MI stands for middle income).

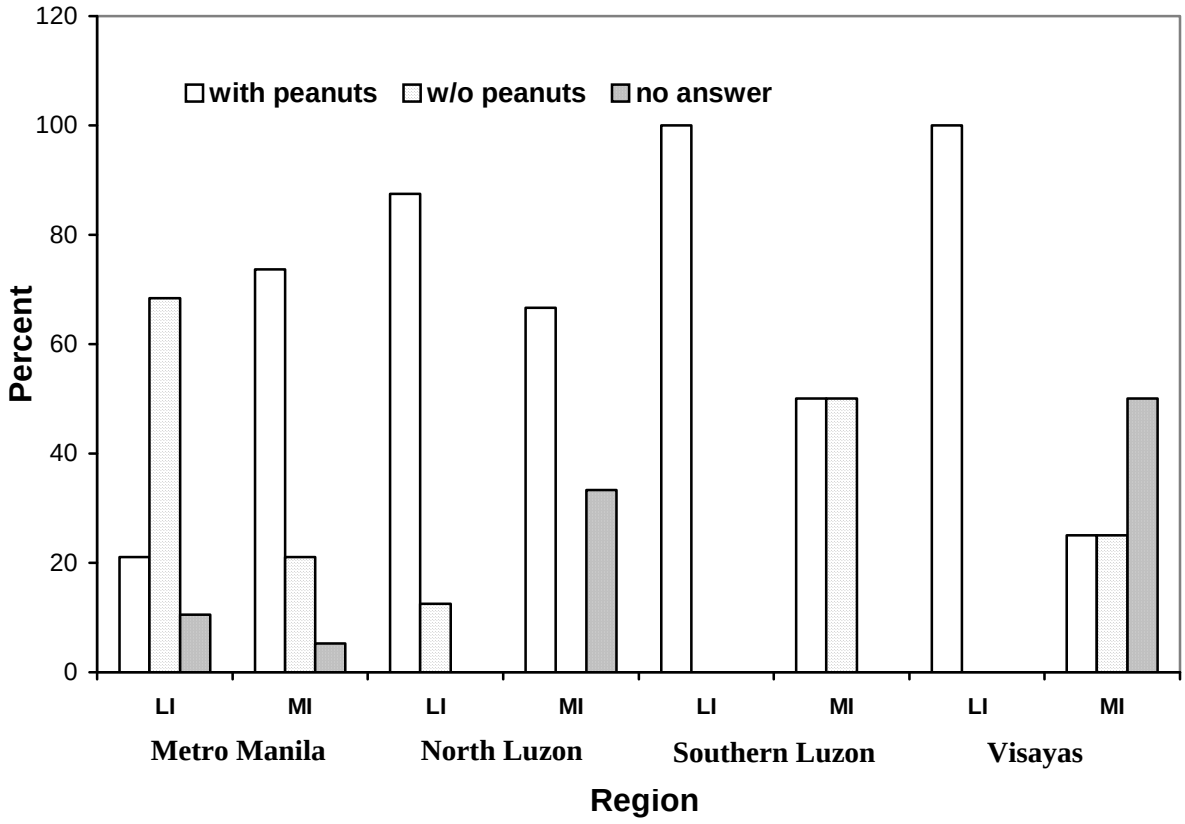

Fig. 2.10 Type of Kare-Kare mix usually purchased by Filipino consumers in different regions (LI stands for low income and MI stands for middle income).

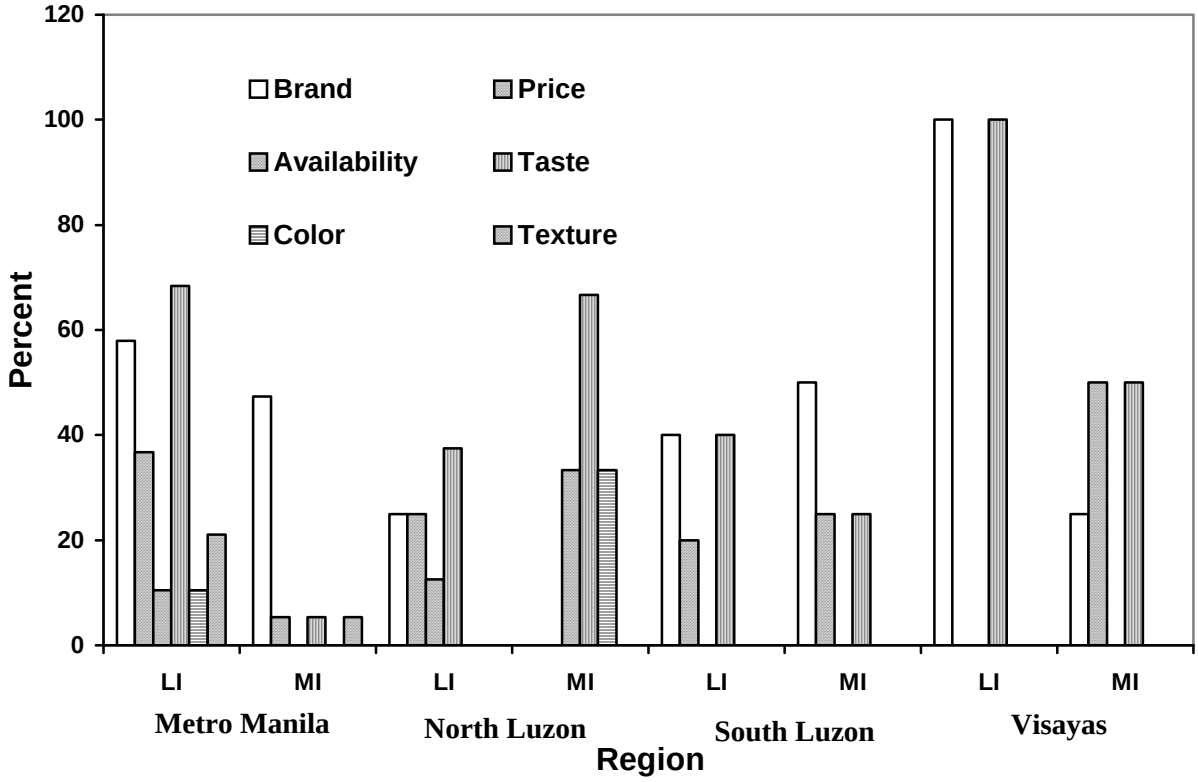

Fig. 2.11 Basis of choice for Kare-Kare mix purchase of Filipino consumers in different regions (LI stands for low income and MI stands for middle income).

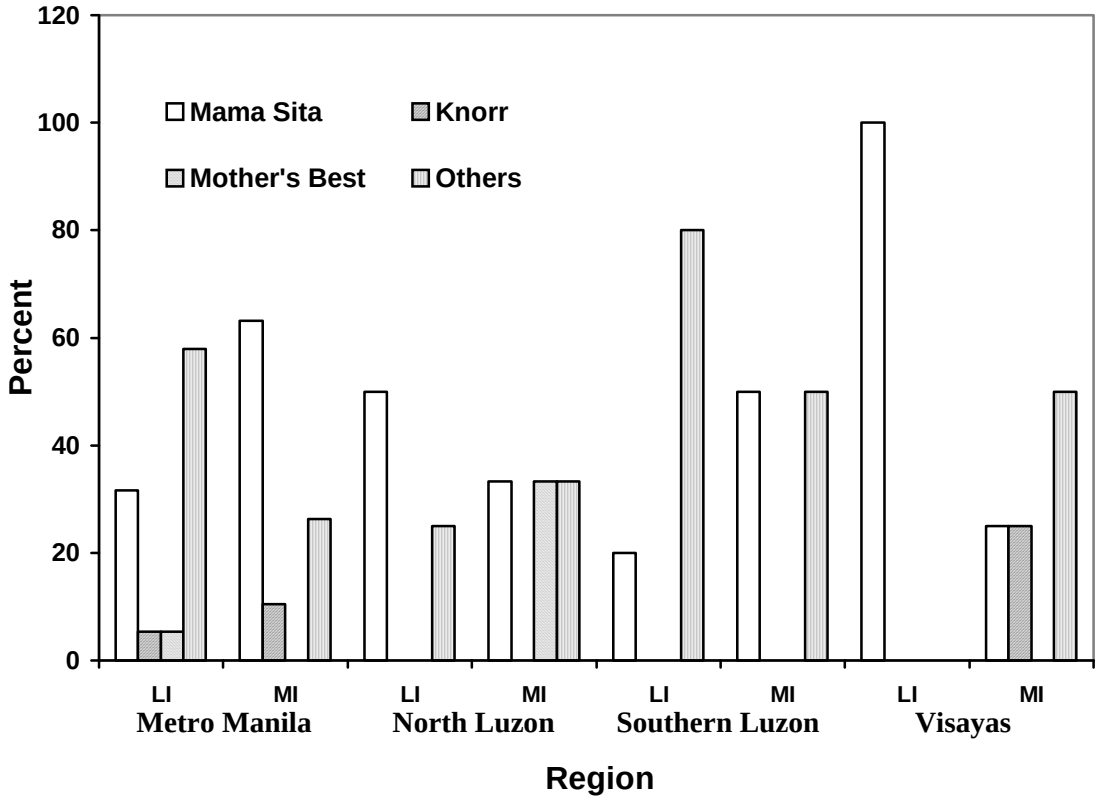

Fig. 2.12 Brand of Kare-Kare mix usually purchased by Filipino consumers in different regions (LI stands for low income and MI stands for middle income).

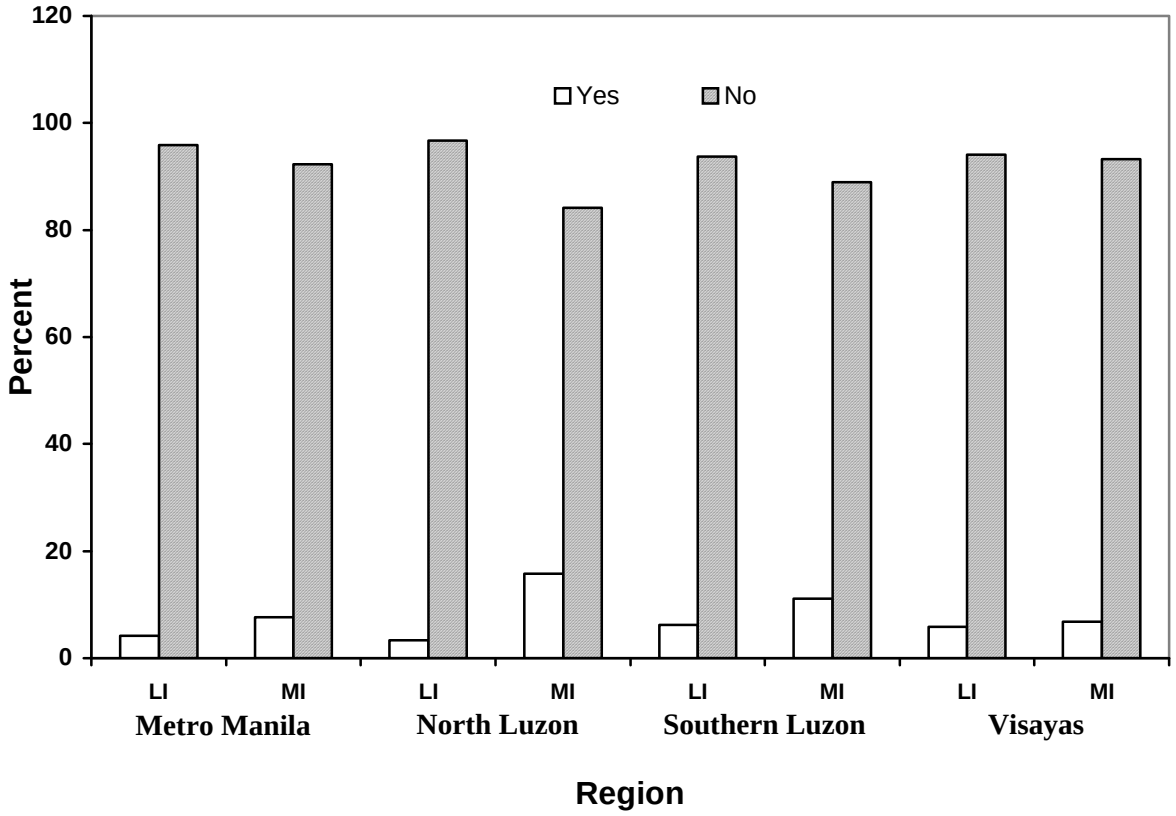

Fig. 2.13 Response of Filipino consumers in different regions regarding their knowledge on aflatoxin (LI stands for low income and MI stands for middle income).

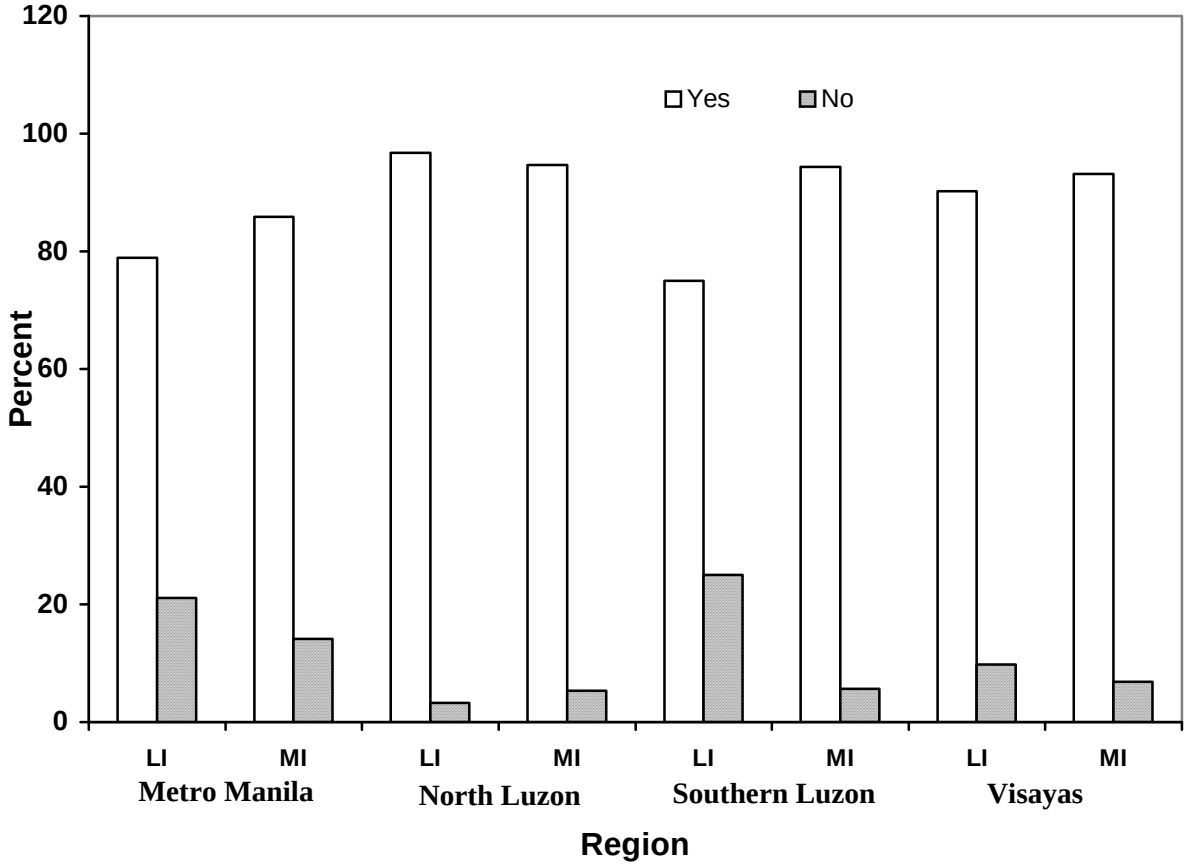

Fig. 2.14 Percentage of Filipino consumers in different regions who will buy aflatoxin-free Kare-Kare mix (LI stands for low income and MI stands for middle income).

CONCLUSIONS

The initial perceived problems encountered by the peanut processing company upon adoption of the sorting technology to eliminate aflatoxin were: inavailability of space, hiring and training of additional personnel, and an increase in production cost and time needed to prepare the peanuts for processing. A sorting area was incorporated into the company's production plant to accommodate the sorting of peanuts and the production team was reorganized to include the additional task. Fatigue and boredom were major problems for the trained "sorters". Employment practices such as job assignment rotation were also modified to reduce fatigue and facilitate efficient sorting of peanuts. The hiring of new employees are positive impacts from the point of view of the Philippine economy.

The company was able to improve their sales and production, especially in widening their export market for Kare-Kare mixes with peanuts (to the U.S., Hong Kong and the Middle East). Their export market sales increased from 14 to 20% (1999 – 2002) due mainly to new access to the U.S. market with aflatoxin-free peanuts. The U.S. share of the export market production for this product went from zero in 1998 to 45% in 2001. This was completely due to having aflatoxin-free peanuts. Since then, no shipments made to countries such as the United States have been reported to contain aflatoxin. Other peanut-based products like Java sauce were developed due to the aflatoxin elimination process leading to expanded product lines.

A consumer survey, which included questions on awareness and knowledge about aflatoxin among Filipino consumers, suggests very low familiarity with issues concerning food safety and food hazards including that of aflatoxin. The respondents however were willing to buy aflatoxin-free peanut products (over 80%). This should encourage the collaborating agency to look into the possibility of adding an "aflatoxin-free" declaration prominently displayed on their labels of peanut-based products such as Kare-Kare mix and Java sauce and to more aggressively advertise this advantage.

The export of Kare-Kare sauce with peanuts to the U.S. by this company did not exist before the transfer of the aflatoxin control technology to the company. Although the peanut-free mix was exported, this required peanuts to be added. The amount of product exported more than doubled from 1999 to 2001. In addition, the health and well-being of Philippine consumers is enhanced by aflatoxin-free products. These substantial positive impacts result from the aflatoxin sorting research and development. The technology has been transferred to peanut processors in the Philippines.

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APPENDIX A

QUESTIONNAIRE USED IN THE CONSUMER SURVEY

UNIVERSITY OF THE PHILIPPINES CONSUMER STUDY

Code No. _____ Interviewer:_____

Area: _____ Date: _____

Case No._____ Sex: Male (*Lalaki*) : _____ Female (*Babae*) : _____

Address (*Tirahan*)

_____

Good Afternoon/Morning,

Hello, my name is_____

I am working with the University of the Philippines to do a study of consumers and their opinions. The study is especially to find out about nutrition opinions, people who eat peanut products and their family characteristics. The Philippines has problems of vitamin deficiencies. Therefore, it is important to do this study to find out why and what can be done to improve the situation.

(Ako po ay si _____, estudiante sa U. P. May pag-aaral po kaming ginagawa sa U.P. tungkol sa mga opinion ng mga mamimimili, lalong-lalo na tungkol sa kalusugan at sa mga namimili at kumakain ng mga pagkaing may mani. Malaki po ang problema ng Pilipinas tungkol sa kakulangan ng bitamina sa kanilang kinakain. Kaya po namin ginagawa ang pag-aaral na ito.)

Let me ask you a few questions to see if you qualify to be in the survey:

1. Are you the person who determines what foods will be bought for this household?
   _____Yes _____ No

(If "Yes", describe relationship of respondent to household: _____)

(If "No," ask:)

May I speak with the person who determines what foods will be bought for this household?_____

(Describe relationship of respondent to household: _____)

2. Are there children living in the home now? _____ Yes _____ No

3. Do you or members of your family eat peanut products? _____ Yes _____ No

(If "No" to any of the above – stop interview and go to the next house.)
(If "Yes" to all the above, proceed.)

I need to ask you a few questions about you and your family as I said before. You can be sure that your name and your answers to my questions will not be revealed to anyone. Your answers will only be reported as numbers and percentages like in an opinion poll. This will only take a few minutes, so may I continue? _____ Yes _____ No

(If "No")

Why? _____

(If "Yes", proceed with the questionnaire.)

I would like to ask some general questions about you and your family.

1. How old are you? (*Ilang taon ka na*?):……_____

2. What is your marital status? (*Ikaw ba ay*?)
   - Single (*Binata/Dalaga*)…… _____
   - Married (*May Asawa*)…….…… _____
     - **(If "Married")**
     - How old is your spouse?…….……. _____
     - How many years ago did you first get married?…….. _____
     - How many years have you been living together with your current spouse?…….……... _____
   - Separated (*Hiwalay*)……... _____
   - Widowed (*Biyudo/Biyuda*)……. _____

3. Who are the people that live in this household? (*Sinu-sino ang nakatira sa bahay na ito? Isama ang inyong sarili.)*

Household Member	Age	Gender	Own Children? (Yes / No)
Adults **(M = 21; F = 18)**: **(Encircle Respondent)**			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Household Member	Age	Gender	Own Children? (Yes / No)
Children in the Household:			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Household Member	Age	Gender	Own Children? (Yes / No)
Other Adults:			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(If "Single", skip to 4.)

How many of your children are living outside the house? _____
How old is your oldest child? _____ years old
How old is your youngest child? _____ years old

4. What was the highest grade level in school that you completed? (*Antas ng pag-aaral na natapos mo*). ……. _____

Elementary	High school	College/Vocational	Graduate school
[1 2 3 4 5 6]	[7 8 9 10]	[11 12 13 14]	[15 16 17 18 19]

(Note: Record the exact number of years.)

(If there is a "Spouse")

5. What was the highest grade level in school that your spouse completed? (*Antas ng pag-aaral na natapos ng asawa mo*). …….. _____

Elementary	High school	College/Vocational	Graduate school
[1 2 3 4 5 6]	[7 8 9 10]	[11 12 13 14]	[15 16 17 18 19]

(Note: Record the exact number of years.)

Now, I would like to ask you about your employment.

6. Which one of the following best applies to you and your spouse: (*Alin ang pinaka-angkop sa iyo*?)

	Respondent	Spouse
Homemaker (*Maybahay*)	_____	_____
Self-employed	_____	_____
Full-time employee (*May pirmihang trabaho*)	_____	_____
Part-time employee (*Hindi pirmihan*)	_____	_____
Student (*Estudyante*)	_____	_____
Unemployed (*Walang trabaho*)	_____	_____
Retired (*Retiro*)	_____	_____

Now, I would like to ask you about the people that contribute to the total monthly household income.

7. How many people in your household contribute to the household's monthly income? Include yourself if you are employed. (*Ilang miyembro ng pamilya ang may suweldo? Isama ang inyong sarili sa bilang*) _____

8. What is the total gross annual income of your household? What is the total gross income of your household last month? *(Gaano ang kinikita ng inyong pamahayan sa isang taon? Gaano ang kinita ng inyong pamahayan nitong nakaraang buwan?)*

		Annual		Last Month
Is it:	Under P 9,999	_____	Under P 1,000	_____
	P 10,000 – P 49,999	_____	P 1,000 – P 4,999	_____
	P 50,000 – P 99,999	_____	P 5,000 – P 9,999	_____
	P 100,000 – P 149,999	_____	P 10,000 – P 14,999	_____
	P 150,000 – P 199,999	_____	P 15,000 – P 19,999	_____
	P 200,000 – P 249,999	_____	P 20,000 – P 24,999	_____
	P 250,000 – P 299,999	_____	P 25,000 – P 39,999	_____
	P 300,000 – P 349,999	_____	P 40,000 – P 49,999	_____
	P 350,000 – P 399,999	_____	P 50,000 or over	_____
	P 400,000 or over	_____		

Now I would like to ask you about food purchases. Please do not include non-food costs.

9. How much does your household spend for food "per week", not including money spent for meals eaten away from home? This will include money spent on meats, fish, etc. (*Magkano ang ginagastos ninyo sa pagkain para sa isang linggong konsumo, hindi kasali sa gastos kung kumakain sa labas?)*
P _____

10. How many persons eat their meals regularly in your home, not including visitors? (*Ilang tao ang pirmihang kumakain sa bahay ninyo? Huwag ibilang ang bisita*.) _____ persons

11. Who is the person who cooks the food most of the time?
(*Kung hindi, ang laging nagluluto ng pagkain ay* -)

Wife (*Ina*)	_____	Helper (*Katulong*)	_____
Husband (*Ama*)	_____	Others, specify (*Iba*)	_____
Child (*Anak*)	_____		

Now, I would like to ask you about the health effects that food have.

12. Are the following foods nutritious (good for the body) or not? (*Ang mga sumusunod na pagkain na aking babanggitin ay masustansiya ba o hindi?)*

a. Fruits (*prutas)*	_____Yes	_____No	_____Don't know
b. Vegetables (*gulay)*	_____Yes	_____No	_____Don't know
c. Meat & Poultry	_____Yes	_____No	_____Don't know
d. Candies	_____Yes	_____No	_____Don't know
e. Snack chips (*chichirya*)	_____Yes	_____No	_____Don't know
f. Crackers	_____Yes	_____No	_____Don't know
g. Softdrinks	_____Yes	_____No	_____Don't know
h. Fruit-flavored drinks	_____Yes	_____No	_____Don't know
i. Milk and milk products	_____Yes	_____No	_____Don't know
j. Seafoods (*laman-dagat*)	_____Yes	_____No	_____Don't know
k. Eggs	_____Yes	_____No	_____Don't know
l. Nuts	_____Yes	_____No	_____Don't know
m. Bread (*tinapay)*	_____Yes	_____No	_____Don't know

13. What are the effects of good nutrition? (*Anu-ano po ang epekto sa tao kung ito ay sapat sa nutrisyon?)*

_____ healthy body	_____ strong muscles	_____ good eyesight
_____ obesity	_____ healthy skin	_____ grow taller
_____ stronger bones	_____ don't kow	_____ others
_____ resistance to disease		

14. What are the effects of poor nutrition? (*Anu-ano po ang epekto sa tao kung ito ay kulang sa nutrisyon?)*

_____ weak	_____ malnourished	_____ don't know
_____ sickly	_____ high blood pressure	_____ others
_____ diabetic	_____ poor school performance	
_____ not within ideal weight		

Now I would like to ask you about what you consider important in buying foods. I am going to ask you how important you consider the following in buying foods: nutrients (*sustansya*), price (*presyo*), convenience (*madaling gamitin*), packaging (*pinaglalagyan*), quality *(kalidad*), and brand names (*tatak*) but I will you about them one by one.

15. How important do you consider the following in buying food*? (Gaano kaimportante sa iyo ang mga sumusunod sa pagbili mo ng pagkain?)*

How important are:

Nutrients *(sustansya)?*
Very important____ Moderately important_____ Not important____ [No response____]

Price *(presyo)?*
Very important____ Moderately important_____ Not important____ [No response____]

Convenience/ease of use *(madaling gamitin)?*
Very important____ Moderately important_____ Not important____ [No response____]

Packaging *(pinaglalagyan)?*
Very important____ Moderately important_____ Not important____ [No response____]

Quality/taste *(kalidad)?*
Very important____ Moderately important_____ Not important____ [No response____]

Brand names *(tatak)?*
Very important____ Moderately important_____ Not important____ [No response____]

Are there other things that you consider important in buying foods? **(specify)**
_____

Is it:
Very important____ Moderately important_____ Not important____ [No response____]

Now I would like to ask you questions about peanut-based products.

16. Which of these peanut-based products do you buy? *(Alin sa mga sumusunod ang binibili mong pagakain na may mani?)*

Kare-kare mix	_____	Adobo Peanuts	_____
Flavored peanuts	_____	Peanut Cookies	_____
Peanut Candies	_____	Java sauce	_____
Boiled peanuts	_____	Peanut butter	_____
		Others **(Specify)**	_____

(If "Yes" to peanut butter, proceed to 17.)
(If "No" to peanut butter, skip to 22.)

17. How often do you buy peanut butter? **(Pause.)**
(Gaano ka kadalas bumili ng peanut butter?)
_____ Once a week
_____ Once every two weeks
_____ Once a month
_____ Others (please, specify)

18. What do you consider important in your choice of peanut butter?
(Ano ang basehan mo sa pagpili ng peanut butter?)
Is it:

_____ brand	_____ taste	_____ texture
_____ price	_____ color	_____ others
_____ availability		_____ none of the above

19. What brand do you usually buy? (*Anong klase at tatak ang binibili mo*?) _____
If that brand is not available, do you buy another brand?
Yes **(specify)** _____ No _____

20. Who among the members of the household eat peanut butter? How many times a week does each member eat peanut butter? (Please estimate)

Household member		Times/week	Amount Each time (in tbsp)	Total amount
Adults:	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
Children: **(M /F)**				
Child 1	_____		_____	_____
Child 2	_____		_____	_____
Child 3	_____		_____	_____
Child 4	_____		_____	_____
Child 5	_____		_____	_____
Child 6	_____		_____	_____
Child 7	_____		_____	_____
Child 8	_____		_____	_____
Child 9	_____		_____	_____
Child 10	_____		_____	_____

Other Adults:				
_____	_____	_____		_____
_____	_____	_____		_____
_____	_____	_____		_____
_____	_____	_____		_____

(Total Amount = Times/week X Amount each Time)

21. How do members of the household eat peanut butter? **(Check all that applies.)**
    _____ by itself or
    _____ with something **(Specify)**
        _____ bread
        _____ crackers
        _____ rootcrops
        _____ bananas
        _____ with jelly or other spread **(Specify)** _____
        _____ others **(Specify**) _____

    Do you have any peanut butter in your house now? _____Yes _____No]

(If "Yes", proceed. If "No", skip to 22.)

May I see what type of peanut butter you have and how much is left in the jar?
    _____ Actually had peanut butter
    _____ peanut butter with Vitamin A
    _____ peanut butter with no Vitamin A
    _____ No peanut butter with Vitamin A

Now I would like to ask you about vitamins.

22. Have you ever heard about Vitamin A? (*Nakadinig ka na ba ng tungkol sa Vitamin A?)* ____Yes _____No

(If "Yes", proceed. If "No", skip to 26.)

23. What do you know about Vitamin A? *(Ano ang inyong kaalaman tungkol dito?)*
    _____

    _____

(If health benefits are mentioned, skip to 26.)

24. Does Vitamin A affect health? _____Yes _____No

(If "Yes", proceed. If "No", skip to 26.)

25. How does it affect health?_____

26. Would you buy Vit. A-fortified peanut butter if you knew that it improves eyesight? _____Yes _____No

27. Would you still buy peanut butter with no Vit. A? _____ Yes _____ No
Why_____

_____

28. Are you aware of the Vit. A-fortified foods in the market like noodles and Star margarine? (*Alam ba ninyo na marami nang pagkain ang dinagdagan ng Vit. A tulad ng instant noodles at Star margarine*?) _____ Yes _____ No

29. Have you ever heard of or seen Vit. A-fortified **(added with Vitamin A)** peanut butter?
_____ Yes **(Specify brands.)** _____ _____ No (**Skip to 33.)**

30. Have you bought Vit. A-fortified **(added with Vitamin A)** peanut butter? _____Yes
_____No

(If "Yes", proceed. If "No" skip to 33.)

31. Why did you buy Vit.A-fortified peanut butter?

_____

_____

32. Have you eaten peanut butter with Vit. A?
_____Yes _____No _____ Don't know

Now I would like to ask you about other peanut-based products.

(If kare-kare was checked in 16, proceed. If not, skip to 37.)

33. How often do you buy kare-kare sauce? (*Gaano ka kadalas bumili ng kare-kare sauce*?)
_____ Once a week
_____ Once every two weeks
_____ Once a month
_____ Others **(Specify)** _____
_____ Never

(If "Never", skip to 37 . If respondent buys, proceed.)

34. Do you buy kare-kare sauce with _____ or without _____ peanuts?

35. What do you consider important in your choice of kare-kare sauce? Is it:
(*Ano ang basehan mo sa pagpili ng kare-kare sauce*?)

_____ brand	_____ taste	_____ texture
_____ price	_____ color	_____ others
_____ availability		_____ none of the above

36. What brand do you usually buy? (*Anong klase at tatak ang binibili mo*?) _____
If that brand is not available, do you buy another brand?
Yes **(Specify)** _____ No, why_____

Now I would like to ask you about aflatoxins. Aflatoxins are toxins produced by molds (*amag*) on foods.

37. Have you heard about aflatoxin? (*Narinig mo na ba ang tungkol sa aflatoxin*?) _____
Yes _____ No

(If "Yes", proceed. If "No", skip to 40.)

38. What do you know about aflatoxin? (*Ano ang inyong kaalaman tungkol dito*?)

_____

_____

_____

39. Are you aware which foods are susceptible to aflatoxin contamination? (*Alam mo ba ang mga pagkain na pwedeng magkaroon ng aflatoxin*?)
_____ Yes **(Specify)** _____ _____ No

Aflatoxins cause cancer.

40. Will you buy peanut-based products that say on the label that they don't have aflatoxin? (*Bibili ka ba ng mga pagkaing may mani na walang aflatoxin*?) _____Yes _____ No

41. Have you seen peanut-based products that are labeled aflatoxin-free?
_____Yes **(Specify)**_____ _____ No

Now, I would like to ask you some questions about family activities.

42. Do you or your spouse actively participate in religious activities once a month or more (for example, attend church or mosque services, meetings of other religious associations etc)?

Respondent	_____Yes	_____No
Spouse	_____Yes	_____No

(If Yes, proceed. If No, skip to question # 44.)

43. What kind of religious activities are these? (e.g. activities related to Church, Mosque, Synagogue)_____

44. Are you or your spouse a member of any civic clubs?

Respondent	_____Yes	_____No
Spouse	_____Yes	_____No

(If Yes, proceed. If No, skip to question # 46.)

45. Which clubs are these? Respondent_____
Spouse_____

46. To what other community club(s) and organizations do you or your spouse belong?
Respondent_____
Spouse _____

47. Do you or your spouse participate in school activities?
    Respondent _____Yes _____No
    Spouse _____Yes _____No

(If Yes, proceed. If No, skip to question # 49.)

48. What school activities have you participated in?
    Respondent_____
    Spouse _____

49. How many heads of the households on your street do you know by last and first name?_____

(If none, go to question #51. Otherwise, proceed.)

50. Could you tell me their first and last names? **(Stop at 20)**
    1_____2_____3_____4_____
    5_____6_____Total_____

51. How many heads of the households on other streets of your neighborhood do you know by first and last name?_____

(If none, go to question #53. Otherwise, proceed.)

52. Could you tell me their first and last names? **(Stop at 20)**
    1_____2_____3_____4_____
    5_____6_____Total_____

53. How often have you had dinner or a party at your neighbors' places in the last six months? **(circle one)**

    Never, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

54. How often have you invited your neighbors for dinner or a party at your place in the last six months? **(circle one)**

    Never, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

55. How often have you loaned things (tools, kitchenware etc) to your neighbors in the last six months? **(circle one)**

    Never, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

56. How often have you borrowed things (tools, kitchenware etc) from your neighbors in the last six months? **(circle one)**

    Never, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

57. In the last six months, how many times have you loaned money to your neighbors? **(circle one)**

    Never, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

58. In the last six months, how many times have you borrowed money from your neighbors? **(circle one)**

Never, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more

Now, I would like to ask you questions about your sources of information.

59. Do you subscribe to a daily paper? _____Yes _____No

60. Do you read at least the first page of a newspaper almost every day?
_____Yes _____No

61. Do you have a TV set? _____Yes _____No

62. Do you watch TV news almost every day? _____Yes _____No

63. Do you listen to news on the radio almost every day?
_____Yes _____No

Now, I would like to ask you questions on family decision-making.

64. Who decides most often what to eat for dinner?
    1. You
    2. Your Spouse
    3. Children
    4. Other_____

65. Who decides most often on what groceries to buy for your family?
    1. You
    2. Your Spouse
    3. Children
    4. Other_____

66. Who makes most decisions about going to movies?
    1. You
    2. Your Spouse
    3. Children
    4. Other _____
    5. Never go to movies

67. Who decides most often about whether to go to religious events?
    1. You
    2. Your Spouse
    3. Children
    4. Other_____
    5. Never go to religious events

68. Who in your family most often decides whom to invite for dinner?
    1. You
    2. Your Spouse
    3. Children
    4. Other_____
    5. Never invite people to dinner

69. What kinds of things does your family do together?
    1. Eat dinner together? Yes ___No____
    2. Go to religious services? Yes___No___
    3. Have birthday parties for the children? Yes__No____
    4. Have birthday parties for the parents? Yes___No____
    5. Go to movies? Yes__No__
    6. Go on picnics? Yes___No____
    7. What other things does your family do together?
    1_____2_____3_____4_____

Maraming Salamat po sa inyong pahintulot na makausap ko kayo ngayon. Malaking tulong po ito sa amin.

CHAPTER 3

IMPACT ASSESSMENT ON THE TECHNOLOGY OF VITAMIN A FORTIFIED PEANUT BUTTER TO AN INDUSTRY COLLABORATOR

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ABSTRACT

The impact of the vitamin A fortification of peanut butter was evaluated on an industry collaborator who had produced the product for three years through face-to-face interviews with collaborator's representatives. The study focused on the economic aspects, such as product sales, marketing system and volume, product quality and production cost; and on social impact such as effect on employment and workers' morale. A questionnaire was used as guide during the interviews.

The collaborator, in spite of the presence in the market and increase in sales as well as increase in the number of distributors of the product, viewed the technology as having no impact on sales. After the technology adoption the production volume increased by 37% in 2002 compared with their production in 1999. The vitamin A fortification did not change the color and typical peanut butter aroma of the product or the "all natural" image of the product. The fortification technology, however, reduced the estimated shelf life of the product which caused the company to change their delivery patterns to ensure that the product contained the required vitamin A content.

The production cost increased by 10% as a result of the adoption of the technology because of the additional steps and manpower. Six personnel were hired which is viewed as a positive impact for the Philippine economy. The only impact accepted by the collaborator on the adoption of technology was the strengthening of their technical group and positive changes in workers' attitude. It created awareness in workers to consistently maintain the quality of their product and a big challenge in surviving the competition in the market.

INTRODUCTION

In December 1997, the Food Development Center (FDC) invited possible industry collaborators, who were willing to participate in a research collaboration for the vitamin A fortification of peanut butter, to a conference. An existing Food Development Center client responded positively to serve as the industry collaborator for the research. The research had two phases. The first phase involved laboratory scale studies on how to incorporate the vitamin A into the product to achieve uniform dispersion without loss of the added fortificant. This took one year and four months to complete (Galvez et al., 1999). The second phase of the research involved a technology transfer stage providing the collaborator with the capability to incorporate the fortification step in its plant process and to sell a product that met the required standards. This included the establishment of Sanitation/Standard Operating Procedure (SSOP) and the development of a Hazard Analysis Critical Control Point (HACCP) plan for vitamin A fortified peanut butter. This took two years for the company to implement.

According to a Memorandum of Agreement between the investigators and the industry collaborator, the cost of the research and technology transfer was shared under the following provisions: (a) cost of 50% peanuts during the first phase of the study, (b) cost of the fortificant during the first and second phases of the study, and (c) equipment, facilities, cost of peanuts, and cost of vitamin A analysis during the second phase of the study was to be provided by the industry. The collaborator was granted exclusive use of the technology for a period of one year. However, the collaborator had exclusive use of the technology for three years because they encountered unexpected problems in the launching and performance of the product in the market. The product was introduced in December 1999.

OBJECTIVES

The objective of the study was to evaluate the impact of the development, technology transfer, adoption and commercialization of vitamin A fortified of peanut butter specifically on sales, markets, product quality, employment and workers' attitude. The hypothesis for the impact study was that the fortification of peanut butter would increase sales, expand markets adequately to counter increased production costs, improve product quality, and increase employment.

METHODS

Vitamin A deficiency is a major problem among pre-school Filipino children, with extreme deficiency often resulting in blindness. Research and development was previously conducted to develop a process to reliably fortify peanut butter with vitamin A (Galvez et al. 1999). This is a critical innovation, since peanut butter serves as a major food commodity purchased by household consumers in the Philippines.

The present study involves an evaluation of the impact of the technology developed for the Vitamin A fortification f peanut butter on an industry collaborator. The collaborator is currently producing and selling a vitamin A fortified peanut butter brand and has done so for the last three years

(1999-2001). The major objectives of this report are to evaluate the impacts of vitamin A fortification of peanut butter on the industry collaborator, with specific focus placed on sales, markets, product quality, employment and workers' morale.

This study focused on an assessment of specific economic and social effects on the collaborator. Economic impact was assessed by determining the effect of selling vitamin A fortified peanut butter on (a) product sales, (b) marketing system and volume, (c) product quality, and (d) production cost. Social impact was assessed by determining the effect on employment and workers' morale.

Preparation of Questionnaire

A questionnaire was prepared as a guide for gathering data on the impact of the technology developed for vitamin A fortification of peanut butter on the industry collaborator. Impact refers to the broad, long term economic and social effects resulting from the research and technology transfer. Such effects maybe anticipated or unanticipated, and positive or negative, at the level of individual or the organization. Such effects generally involve changes in both cognition and behavior (Impact Assessment and /evaluation Group, 2002).

Collection of Data

Face-to-face interviews were conducted with the relevant personnel to obtain data from the collaborator on sales figures, additional markets/distributors, additional employees hired due to the technology, increased sales personnel, new product lines developed and promotional activities. All data gathered were identified based on whether it occurred before or after technology adoption.

The first individuals interviewed were from the management representatives. They were the Executive Assistant to the President and the Industrial Engineer Consultant. The second group of people interviewed was from the research and development (R&D)/quality control (QC) representatives and production personnel namely: R&D and QC Head and their staff, Lead Person assigned at roasting and sorting of peanuts, Lead Person assigned at production area, Lead Person assigned at warehousing area.

RESULTS

Responses to Questionnaires and Evaluation of Data

Effect on Product Sales

Table 3.1 shows the responses of management, R&D/QC representatives and production personnel on the effect of vitamin A fortification of peanut butter on product sales. The management indicated that vitamin A fortification did not have any impact on sales. Whatever increase in company sales was attributed to the additional distributors of the company rather than on the fortification of the product. The manger also stated that they did not encounter problems in selling vitamin A fortified peanut butter in the market. The R&D/QC personnel also indicated that adding vitamin A to the peanut butter did not affect their claim that their product is an "all natural" peanut butter as their volume of sales has been maintained.

Table 3.1 Questions and responses relevant to the effect on product sales.

	Question	Response
Question 1	What are the impacts of vitamin A fortification of peanut butter in terms of domestic sales? □ Increased □ Decreased □ No change	No change [1]
Question 2	What were the problems encountered by the company in selling vitamin A fortified peanut butter?	None [1]
Question 3	What is the effect of adding vitamin A to the company's claim that their product is an all-natural peanut butter?	No effect as they still maintain their volume of sales [2]
Question 4	What are the impacts of vitamin A fortification of peanut butter in terms of the volume of raw peanuts that you use per day/month? □ Increased □ Decreased □ No change	No change [3]
Question 5	Did you engage in advertising the product as vitamin A fortified until now? □ Yes □ No	Yes [1]
Question 6	Please specify the medium used: □ Radio □ Print □ T.V.	Radio. Print, small scale. (They are disappointed on the lack of government support on the promotion of vitamin A fortified products. They believe that this is one of the reasons why their sales did not increase) [1]

Respondent: [1] Management representative
[2] R&D/QC representative
[3] Production personnel

The above responses claiming that no change in sales occurred appears to agree with the information provided by the production personnel that the amount of peanuts used by the company before and after technology adoption remained the same. However, comparing the calculated production volume (693,000 kg) produced by the company in year 2002 and the reported volume (507,000 kg) produced in year 1999 prior to technology adoption (Table 3.2), indicates that the company increased its production volume by 186,000 kg or 37% after technology adoption. The management representative, however, refused to acknowledge any increase in production volume by the company due to vitamin A fortification of peanut butter. This is a typical response in a company operating in a very competitive environment. It is expected that companies would not reveal their production or sales volume, which might be useful to competitors, especially if this encouraged them to add vitamin A to their product.

Table 3.2 Volume of production of fortified peanut butter and raw material usage before (Year 1999) and after (Years 2000 and 2002) technology adoption.

Item	Year 1999	Year 2000	Year 2002
Volume of production of fortified peanut butter in kg	507,000 [1]	534,158 [1]	693,000 [3]
Volume of raw material usage in kg	405,600 [2] ≈ 31 sacks of 50 kg/day)	427,326 [1] ≈ 32 sacks of 50 kg/day	554,400 [3] ≈ 42 sacks of 50 kg/day)

[1]Reported in the Final Report on Project 3.2.17/Impact Monitoring of Completed Projects. Peanut Collaborative Research Support Program. University of Georgia, April 15, 2001.
[2]Calculated value based on reported total production volume (80% of the reported total production volume).
[3]Calculated value based on reported volume of raw materials being used everyday on an interview with RD/QC representative.
[4]Calculated value based on reported volume of raw materials being used everyday in an interview with RD/QC representative. (2,100 kg per day x 22 days x 12 months).

Although the company engaged in limited advertising of the product in radio and print media, the management representative complained about the lack of government support in the promotion of vitamin A fortified products as one of the reasons for not realizing the anticipated increase in company sales. Despite the perceived low impact of vitamin A fortification on product sales, the management representative expressed that the company sees vitamin A addition as something that maybe useful to the company in the future.

Effect on the Marketing System and Volume

Table 3.3 shows the responses of the management representative on the effect on the marketing system and volume. He stated that vitamin A fortification did not contribute to opening additional markets or to the hiring of additional salesmen. However, he indicated that they increased their number of distributors by 5%. Distributors are carriers of product in various parts of the country. He stated that the increase in numbers of distributors was responsible for the increase in company sales. Although the management representative claimed that vitamin A fortification did not contribute to opening additional markets, the increase in number of distributors indicated additional volume of the product in the market.

Table 3.3 Questions and responses relevant to the effect on the marketing system and volume.

	Question	Response [1]
Question 1	Did you have additional outlets because of having a vitamin A fortified product? □ Yes □ No If yes, by how many? _____	No
Question 2	Did you increase the number of salesmen because of having a vitamin A fortified product? □ Yes □ No How many? _____	No
Question 3	Did you increase the number of distributors because of having a Vitamin A fortified product? □ Yes □ No How many? _____	Yes 5%
Question 4	Did you have new products developed because of technology adoption? □ Yes □ No Please specify _____	Yes, variations of peanut butter

Respondent: [1] Management representative

Effect on Product Quality

Table 3.4 shows the responses of the R&D/QC and management representatives on the effect of vitamin A fortification on product quality. The management representative stated that vitamin A fortification did not change the sensory quality of their product in the market in terms of color and typical peanut aroma. The R&D/QC representative had the same assessment. This is a positive effect, as the company wanted to maintain the "original" quality of the product, as they perceived was desired by their market. The addition of vitamin A had not affected the "all natural" image of the product as it was reported that the volume of the sales was maintained.

Table 3.4 Questions and responses relevant to the effect on product quality.

	Question	Response [1, 2]
Question 1	Did fortification improve color of your products in the market? □Darker □Lighter □No change	No change
Question 2	Did fortification change the typical peanut butter odor of your products in the market? □ Lesser □ Stronger □No change	No change
Question 3	Did fortification result in presence of off odor in your products in the market? □ Present □None	None
Question 4	Did fortification result in presence of off flavor in your products in the market? □ Present □ None	None
Question 5	What are the impacts of the technology on the quality of your products in terms of shelf life? □ Increased □ Decreased	Decreased from 9-12 months to 6 months
Question 6	What are the impacts of vitamin A fortification of peanut butter on unsold volume of products? □ Increased □ Decreased □No change	No change

Respondent: [1] Management representative
[2] R&D / QC representative

Effect on Production Cost

Table 3.5 shows the responses of management on the effect on production cost. The management representative asserted that, in terms of production cost, the fortification of the product only resulted in added cost and time delay in processing because of the need to cool down the product prior to the addition of vitamin A. He also indicated that, while the cost of the fortificant was minimal, the additional step of fortification increased production time and financial cost by 10% because of the hiring of additional personnel and longer production time. The company claimed that the increased cost was not added to the price of the product. This increased cost may have been absorbed by the reported increase in company sales due to the expanded distribution network.

Table 3.5 Questions and responses relevant to the effect on production cost.

	Question	Response [1]
Question 1	What are the impacts of vitamin A fortification of peanut butter on the business of your company in terms of production cost? □ Increased □ Decreased □ No change	Increased
Question 2	If yes, by how much?	10%
Question 3	Why was the production cost increased?	Because of hiring of additional personnel and longer production time
Question 4	Did you increase selling price of the product because of vitamin A fortification? □ Yes □ No If yes, by how much _____	No

Respondent: [1] Management representative

Effect on Employment and Workers' Attitude

Table 3.6 shows the responses of the management and R&D/QC representatives on the effect on the employment and workers attitude. The management representative indicated that they increased their personnel by six: two in R&D, one in QC, one in Production and two in Management.

Table 3.6 Questions and responses relevant to the effect on employment and workers' attitude.

	Question	Response
Question 1	What are the impacts of vitamin A fortification of peanut butter on employment generation? □ Increased □ Decreased □ No change	Increased [1]
Question 2	In what area did you increase personnel? □ Production □ Sales □ Others. Please specify	Production. Technical (QC and R&D) Management [1]

Table 3.6 *continued . . . .*

	Question	Response
Question 3	How much was the increase? □ Production □ Sales □ Other(s)	1 production staff 2 R&D staff 1 QC staff 2 management staff [1]
Question 4	Did the company undergo re-organization of production staff due to fortification i.e., on number of employees? □ Yes □ No	Yes [1]
Question 5	Did the company undergo re-organization of production staff due to fortification i.e., on gender issues; do you consider sex of applicant in hiring? □ Yes □ No	No [1]
Question 6	Did the company undergo re-organization of production staff due to fortification i.e., on number of working hours? □ Yes □ No	No [1]
Question 6.7	Did the company undergo re-organization of production staff due to fortification i.e., on training on production? □ Yes □ No	Yes [1]
Question 6.8	What are the impacts of vitamin A fortification on attitudes of personnel?	This created awareness among personnel to be quality conscious on maintaining the level of vitamin A in the product. It is also easier now to introduce new changes in the production and quality control system than before. There is less resistance in personnel to follow improvements on production and quality control system. [2]

Respondent: [1] Management representative
[2] R&D/QC representative

The management representative was appreciative of the fact that fortification of their product paved the way for the company to become more quality conscious resulting in the strengthening of the company's technical group and changes in workers' attitude. The above view was shared by R&D/QC personnel who indicated that vitamin A fortification created awareness among production personnel to be quality conscious in maintaining the level of vitamin A in the product. The R&D/QC personnel also said that it was also easier now to introduce new changes in the production and quality control system than before. There is now less resistance in personnel to follow improvements on the production and quality control system.

CONCLUSIONS

The continued presence, and increase in sales, of the vitamin A fortified peanut butter in the marketplace indicates that consumers are purchasing the product. Yet, the collaborator viewed the vitamin A fortification of peanut butter as having no impact on sales. It is logical that a company operating in a very competitive environment would not want to reveal information on sales. In fact, it was noted that a leading competitor brand of peanut butter fortified their product not with one vitamin but with four namely, vitamin A, B, D and E. This occurred about six months after the collaborator's vitamin A fortified peanut butter was launched in the market.

Although the collaborator stated that there was no improvement in sales due to the fortification, the company increased the number of distributors. This indicated additional volume of the product in the marketplace. This become evident when one considers the calculated volume of the product produced by the collaborator before and after the technology adoption. They increased their production volume by 186,000 kg or 37% in year 2002 compared with their production in year 1999. It is, of course, difficult to separate out the causes of the increase.

Company officials were relieved that vitamin A fortification did not change the color and typical peanut butter aroma. This is a positive outcome as the collaborator wanted to maintain the original quality of their product, which they perceived as desirable to their consumers. The addition of vitamin A did not affect the "all natural" image of the product. The vitamin A fortification however was perceived to reduce the calculated shelf life of the product. This caused the company to change their delivery patterns to ensure that the product contained the level of vitamin A on the market shelves as required by local regulations. The reduction in product shelf life did not affect product returns as the product was a fast moving item.

The vitamin A fortification increased production cost by 10% because of the additional steps and manpower requirement. Six additional personnel were added. While this is viewed as a "cost" to the company, the increase in employment is a positive impact for the Philippine economy. The continued adoption of the technology by the collaborator indicated that this additional cost may have been absorbed by some increase in company sales. However, the only impact of vitamin A fortification of peanut butter that was accepted by the collaborator was the strengthening of their technical group and positive changes in workers' attitude. The adoption of this technology created awareness in workers to consistently maintain the quality of their product. This consciousness of maintaining a certain level of quality in the product paved the way for the employees to be quality conscious and strengthened the technical capability of the collaborator. The management viewed this change in worker attitude as very useful to them for the purpose of surviving the competition in the present time and in the future.

While the collaborating company does not admit positive influences on sales after introducing vitamin A fortification, it does point to other positive outcomes both currently and potentially for the future. As awareness of the importance of vitamin A increases among consumers, this should benefit companies advertising fortification. Since the costs are negligible and the health benefits for consumers are substantial, other companies should be encouraged to adopt the technology. At the very least, better health for the children of the Philippines should be a strong motivation.

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CHAPTER 4

IMPACT ASSESSMENT OF VITAMIN A FORTIFICATION OF PEANUT BUTTER ON FILIPINO FAMILIES AND CONSUMERS

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ABSTRACT

Research and development funded by the Peanut Collaborative Research Support Program was previously conducted to develop a process to reliably fortify peanut butter with vitamin A (Galvez *et al.*, 1999). In 1999, the first industry collaborator agreed to adopt the technology and subsequently began marketing it throughout the stores carrying the firm's peanut butter. The product was labeled "vitamin A fortified".

The research examines the impact of the vitamin A fortification of peanut butter on middle-income and low-income consumers and their family characteristics. It involves the analysis of a stratified random sample survey of households in Cebu, Laguna, Tarlac, and 10 Metro Manila urban *barangays* (communities). A total of 176 middle-income households and 185 low-income households participated in the survey for a total of 361 households. Only households that purchase peanut products and have children were included. Over 90 percent of the households consume peanut butter, by far the most commonly consumed peanut product.

Highlights of the 2002 household survey include the following: Over 40% of households buy peanut butter at least once a month. Lily's Peanut Butter is purchased by about 20% of households (16.5% of middle-income households and 22.7% of lower-income households), making it the second largest selling peanut butter. Among persons 2 to 20 years of age, 76% eat at least one serving of peanut butter per week. About 15% of children in the sample are estimated to be consuming at least one serving per week of Lily's vitamin A fortified peanut butter. There are 127 locations in the places mentioned above that contain stores selling this fortified peanut butter. In addition (and independently) an industry competitor, Lady's Choice, the number one peanut butter choice in this survey, has recently started advertising "Vitamin A Fortified" on its label. It is the choice of about 29% of households. None of these consumers had access to vitamin A fortified peanut butter before the fortification of Lily's Peanut Butter in 1999.

INTRODUCTION

Consumer Research

Consumers play a vital role in the success of products and new technologies in the market. Manufacturers and producers develop products that cater to the needs and wants of consumers. Therefore, it is important in understanding consumers to avoid judgment, accept their behavior, and present realistic choices through the products and services offered to them.

The factors influencing consumer knowledge, attitudes and behaviors can be measured qualitatively and quantitatively through the conduct of an organized and unbiased investigation such as a consumer survey (Galvez *et al*., 2002). Consumer surveys lead the researcher to a better understanding of what consumers eat, and why and how they buy certain food products. This, in turn, helps decision-makers, producers and manufacturers.

New products should undergo research and development at the laboratory level. Products should also be tested for acceptability and market viability in the actual market for which it was intended. One specific tool typically used in this endeavor is the consumer survey. Aside from the above-mentioned application, consumer surveys are also designed to assess the current performance of products, impact on the target market and possibly the society as a whole from the vantage point of consumers.

Food Preferences

A variety of factors influence people in regards to their choice of what to eat, how it is eaten and why. According to Lyman (1989), among these are food characteristics, body weight, age, sex, race, self-concept, socioeconomic status, peer or other role models, parental attitude, family relations, nutrition knowledge, television viewing, familiarity, context, geography, culture and food meanings.

Aroma, taste and appearance are significant sensory properties of food that influence preference (Galvez *et al*, 2002). The pleasantness of aroma significantly affects the willingness to try foods (Raudenbush, 1995). On the basis of taste, both children and adults generally prefer sweet foods while aversion to sour and bitter tastes seems to be an innate reaction in most humans. Lyman (1989) reasoned that the latter could have been acquired as a form of adaptation because bitter taste is largely associated with poisonous substances. In terms of eye-appeal, the more attractive the packaging and the appearance of the food prepared, the more likely it will be purchased (Baron and Mueller, 1995).

One of the factors that is said to largely influence food preference of young children is the family. Long-term food preferences could be acquired from family behavior towards food. However, research evidence is mixed. A previous study (Birch, 1992) showed that children tend to acquire the preference for fatty foods when they are exposed to adults who are fond of these types of foods. This is in contrast to a meta-analysis of the parent-child relationship which concluded that only a small, albeit significant, relationship exists in the similarity of parents' and children's food preferences (Borah-Giddens and Faciglia, 1993).

Outside influences come into play as the child grows. Peer choices and the media can influence their food preferences. As young people enter adulthood, behavior towards food is affected by their individual lifestyle and social circumstances. This would include household composition, household employment, family relationships, eating location, extracurricular activities, and decision-making practices (Galvez *et al*., 2002).

Nutrition knowledge is another factor influencing food preference. In a society that is now more aware of the positive association between good nutrition and healthy living and a prolonged and productive life, people are now looking for preservative-free, fresh and organic foods, supplements, and fortified foods. Nutrition knowledge, although not a guarantee of good eating habits, is often considered a significant supporting factor towards good eating habits and is supported by a number of research publications (Moxley, 1981). The cultural and geographic aspects of food preferences are also a consideration. An example of this is Australians who have an aversion to strong sour flavors, while the Japanese have a strong preference for this taste (Tacey, 1992). Lyman (1989) explained that the context of food preference includes the manner in which food is served and other components of the actual service and setting. This also includes the traditional pairing of food such as bacon and eggs, cookies and milk, and peaches and cream.

Peanut and Peanut Products

Peanut (*Arachis hypogaea*) is one of the most widely used and studied groundnuts. From its humble beginnings as farm feed for fowl and domestic animals in the U.S. during the early 1800's (Woodroof, 1983), it has become a popular component of alternative food products such as beverages (Rubico *et. al.*, 1987; Garcia et al*.,* 1990), coffee whitener (Abdullah *et al*., 1990), buttermilk substitute (Lee, 1990), imitation cheese spreads (Santos *et al*.*,* 1989), and peanut paste (Muego-Gnanasekharan and Resurreccion, 1993).

Aside from these alternative products are other more common peanut products such as peanut butter. According to a study by Garcia *et al.* (1990), peanut butter was the most preferred peanut product among consumers in the Philippines (Galvez *et al*., 2002). Various modifications and additions have been made to peanut butter to make it more appealing to consumers. After the previous flowing-type of peanut butter came other variations such as stabilized peanut butter, peanut butter-jelly stripes, and now the vitamin A fortified peanut butter. These value-adding features of peanut butter have been intended not only to increase the number of peanut butter offerings in the market but also to address certain health issues such as malnutrition.

The Need for Vitamin A Fortification

Vitamin A deficiency is one of the leading causes of blindness among Filipino children. In fact, vitamin A deficiency (VAD) is still considered a public health problem among pre-schoolers and pregnant and lactating women (Villavieja *et al*., 2001). The Philippine government through its Department of Health has come up with programs to alleviate, if not totally eradicate this problem. Collectively, these were commonly referred to as the "*Sangkap Pinoy"* program during the early 1990's, which was carried out in local health centers and other volunteer private food establishments. These so called "*Patak* Centers" gave capsulated vitamin A supplements to pre-school children and infants twice a year. Aside from the doses of vitamin A, the government has promoted the "*Sangkap Pinoy* Seal" (SPS) that encourages the usage of fortified food products.

Motivated by these government efforts, food manufacturing companies have come out with the vitamin A fortified product lines such as instant noodles, margarines and other spreads, bread, milk and other milk products that add value to their commodities. The results of the survey conducted by Villavieja *et al.* (2001) revealed low levels of awareness among Filipinos of both food products with SPS (16.7%) and other fortified foods in general (11.6%). However, they found that despite the low level of awareness, there was a high percentage of usage of food products with SPS. Among the top five frequently used food products with SPS were "Star" margarine (61.1%), "Payless" instant noodles, "Lucky Me" instant noodles, "555" sardines, and "Tang" powdered juice drink (Villavieja *et al.,* 2001). A consumer survey conducted in 2002 among Filipino households by Galvez and colleagues (2002)

showed that Filipinos (90% of respondents) would be willing to purchase vitamin A fortified peanut butter, if this was made available to them. At that time, none was available on the market.

OBJECTIVES

Peanut-CRSP has conducted previous studies designed to develop various peanut products, one of which is vitamin A fortified peanut butter. After a presentation of the new technology to invited peanut manufacturers at the facilities of NFA/FDC, only one company indicated interest. With the technical assistance of the vitamin A research and development team from the University of the Philippines and Food Development Center, the industry collaborator adopted this technology and the resulting product was subsequently introduced in the market in 1999. With this event, there was a need to assess the impact of the introduction of vitamin A fortified peanut butter on consumers. It is envisioned that the information gathered will help in guiding future research and making policy decisions and marketing strategies in the development and distribution of fortified foods. The specific objectives of the study were to: (1) estimate the current impacts of fortified peanut butter on the consumers in the relevant market areas; (2) compare the knowledge, purchase, and use of vitamin A fortified peanut butter in low and middle income groups for enhancing planning for future impacts; (3) estimate the consumption of peanut butter with vitamin A among children to asses current impacts on the most vulnerable age groups; and (4) examine family patterns of consumption of vitamin A fortified peanut butter to assess general impacts on the family and learn more about household and family members in relation to children's consumption.

METHODS

Questionnaire Development

A survey instrument was developed to be administered in personal interviews. The final version of this questionnaire consisted of several parts. Topics included: (1) demographic and socio-economic questions including the name, address, age, sex, civil status, status of households, educational attainment, occupation, household income and food expenditures; (2) marketing and eating habits; (3) nutrition knowledge; (4) peanut product consumption of households; (5) peanut butter preferences; and (6) knowledge, attitude, behaviors towards vitamin A fortification. The questionnaire was written in English with Filipino translations in *Tagalog* (see Chapter 2, Appendix A).

Data Collection and Processing

An intensive three-day training workshop was held to train interviewers. In the summer of 2002, one-on-one interviews were conducted in some of the major areas of the Philippines where vitamin A fortified peanut butter was distributed in Metro Manila, South Luzon, North Luzon, and Cebu. A list of supermarkets and grocery stores where vitamin A fortified peanut butter were sold was obtained from the collaborating company. Manila, Cebu and *barangays* (communities) just outside Manila to the North and South were purposely chosen, because these are the areas where most of the stores were located. Also, these different geographical areas were selected to attempt to maximize family and consumer variability within travel and budget constraints of the research project. Random sampling was done to determine which of the 127 stores located in Metro Manila would be chosen. Ten sampling sites were randomly

chosen for Metro Manila, while in South Luzon and North Luzon, two sampling sites were taken. In the Visayas region, eight sampling sites in Cebu were selected. The minimum target number of respondents for Metro Manila was 150, 100 for North and South Luzon and 100 for Cebu, which provided a total of 350. Over-sampling was planned, however, to make up for rejections and, therefore, the actual sample is 361.

Only respondents who answered "Yes" to the three qualifying questions were considered for the survey namely: (1) if the respondent is the one who decides on food purchases; (2) if they had children living at home and; (3) if they eat peanut and peanut products. Both low-income families (with family income less than PhP 10,000 and middle-income families (with family income between PhP 10,000 and PhP 500,000) were represented in the total number of respondents.

RESULTS

Demographic Findings

Table 4.1 shows the distribution of respondents among the different major sites where the survey was conducted. From the 394 households surveyed, 361 respondents (92%) passed the screening test. The other 33 respondents either (a) failed the screening test (4%); (b) passed the screening test but did not want to be interviewed (3%) or; (c) did not want to be interviewed at all (1%). The distribution of respondents per survey area is: Greater Manila Area = 151; South Luzon = 50; North Luzon = 50; and Cebu = 110. Incomes of Php 10,000 or less were determined to be the low income group. A total of 176 respondents (48% of the sample population) are in the middle income (MI) group and 185 (51.2%) from the low income (LI) level. The geographic breakdown in Table 4.1 shows that Metro Manila has the largest population in the sample (N=151 or 41.8%). This is appropriate since Manila has the greatest population concentration.

The majority of respondents for both LI (91.9%) and MI (90.3%) households were female. Many of these were mothers, accounting for 73.9% and 78.4% of MI and LI respondents, respectively. The total number of non-adult members/children (male is considered adult if above 21, female is considered adult if above 18) in LI households was 468 while MI had 432 persons. The average number of children per household is 2.45 for MI and 2.53 for LI. About 65% of MI respondents and 34.1% of LI respondents had some education beyond high school.

The survey results also show that more MI respondents were able to reach tertiary education than the LI group. The mother's and father's education are both important for nutrition knowledge, as evidenced by the findings of Moxley (1981). This in turn could have an effect on the intentions to purchase and consume vitamin A fortified peanut butter among respondents.

Table 4.1 Sample Distribution: Major sampling area and gross monthly income for families with children living at home (N = 361).

Major sampling area	Middle income (>PhP[1] 10,000.00)		Low income (<PhP[1] 10,000.00)	
	Frequency	%	Frequency	%
Metro Manila	80	45.4	71	38.4
North Luzon	18	10.2	32	17.3
South Luzon	19	10.8	31	16.8
Visayas	59	33.5	51	27.6
Total	176	100.0	185	100.0

[1] PhP=Philippine peso

Socio-Economic Information

MI households had a larger number of residents per household than the LI group, but as the survey results show, nearly 79% of both have 4 to 9 residents. The majority of both income groups have 2 or fewer wage earners, but the percentage is higher for LI groups (76.7% for MI and 91.4% LI). Although 91.1% of respondents are females, 64.8% of MI and 61.1% of LI are employed (either self-employed, full-time or part-time). The LI household income of Php 9,999 per month is equivalent to PhP 119,988 per year.

In terms of weekly expenditures for food, the highest percentage of expenses ranged from PhP 1,001 to PhP 1,500 (34.7%) for MI and PhP 501 to PhP 1,000 (38.4%) for LI families (Fig. 4.1). Even this level of expenses would appear to be a hardship for many, since 27.5% make PhP 4,999 or less per month. Also, most families have four or more persons living in the household (only about 14% have less). Such relatively low incomes may be important in explaining why peanut butter, a relatively inexpensive food, is so popular.

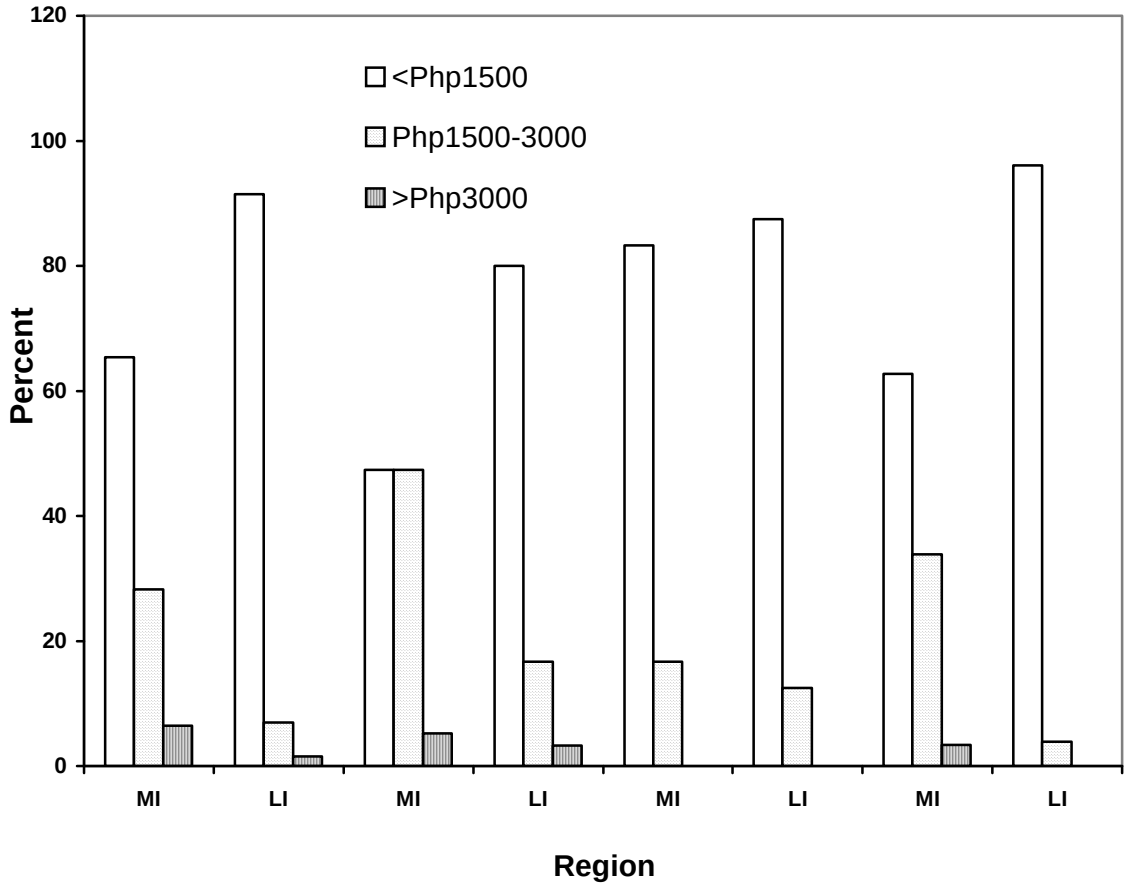

Fig. 4.1 Amount in Philippine peso (PhP) spent by Filipino consumers in different regions on food per week (MI and LI stands for middle income and low income, respectively).

Consumer Attitudes, Knowledge and Behavior

Family Activities

Based on Lyman's (1989) statement that family influences food preference, there was a need to establish a clear picture of how strongly the parents and other family members influence the food preferences of the children. This can be achieved by finding out the activities the family do together most often. Results of the survey showed that the most common activity done together by family members was eating dinner (80% for both middle and low-income groups), followed by birthday parties for children (70% for MI and 52% for LI), birthday for parents (60% for MI and 36% for LI) and going on picnics (56% for MI and 47% for LI). Further analysis revealed that these activities have one thing in common – these all involve food purchase and consumption. This gives evidence that family indeed would have a substantial influence on children's food preferences. These family members may not necessarily be the parents but other adult members of the household as well.

Family Decision-Making

Family decision-making was included in this study to determine the dynamics of decision-making in a typical Filipino household and whether this would have a significant influence on the decision to purchase and consume vitamin A fortified peanut butter. Previously, it was found that the women in the household were often the ones responsible for deciding on food purchases. The answers to these set of questions further strengthened the idea that women in the family were in fact responsible for decisions based on food consumption and purchases. More than 90% of respondents for both income groups were female and mostly the mothers and/or wives. Thus, it would be safe to infer that the main decision-makers regarding what food to eat for dinner and what groceries to buy were the mothers and/or wives.

It can also be seen that there was a very few percentage of children who were part of the decision-making activities. Furthermore, most of these activities were related to going out to movies and inviting people to dinner. The adults in the family, as expected, had the final say with respect to what food to eat and what groceries to purchase. This suggests that adult decisions prevail and so information dissemination with regard to nutrition should target the adult members of the family. They are the ones who would eventually have to make an evaluation of the nutritional value of foods and its importance on the children or the younger members of the family.

Nutrition Knowledge

The variable, nutrition knowledge, was measured by first asking the respondents whether the 13 food items enumerated in the survey had some nutritive value or none. Based on the total correct answers the level of knowledge was divided into three categories: level 1 (scores equal to or below 7 points), level 2 (scores of 8-10) and level 3 (scores of 11-13). Seventy-seven percent of MI and 68.7% of LI are in level 3.

Knowledge of the respondents on the nutritive values of certain foods shows that both groups are able to correctly identify from the given list what foods are nutritious. Respondents from both MI and LI are also correct in saying what effects good and poor nutrition have on the body. Based on the results, it seems that both groups are about equal in level of knowledge capabilities. The nutrition questions included in the survey may not be sufficient to accurately gauge the extent of knowledge each group possesses especially, more complex health implications. For example, it is notable that the lowest correct response on the effects of good nutrition was the effect on good eyesight (MI = 22.2%; LI = 15.7%). Since this would include vitamin A's positive contribution, additional nutrition education is, apparently, still needed.

Moxley (1981) cites numerous studies that provide evidence for a relationship between nutrition knowledge and a number of appropriate food and vitamin choices. Analyzing a U.S. sample (North Carolina families) he also found that family income and mother's education were related to "mother's nutrition knowledge".

Consumption of Peanut Butter

Among the peanut products available in the market, peanut butter got the highest percentage (91.5% for MI and 93% for LI). It shows that it is still the most popular peanut product among Filipinos and an excellent medium through which to get vitamin A into the diet of the Philippine population. Fig. 4.2 shows the number of respondents in the different regions who buys peanut butter.

Peanut butter consumption patterns of Filipino families vary in terms of frequency of purchase, basis of choice and in the way it is eaten. This is not surprising because most of the respondents' (both middle and low income groups) top three bases of choice for peanut butter were taste, brand, and price across all regions visited (Fig. 4.3). The survey revealed that the most common period of purchase is once a month. It would be difficult to judge, however, from the frequency of purchase alone to compare amounts of household consumption because the packaging size that each household buys varies. Comparison of peanut butter purchases between income groups showed that MI families (23.9% once a week) buy peanut butter more frequently than LI households (17.8% once a week). Only about 8% of households never buy peanut butter.

A certain sense of brand loyalty is evident but this could perhaps be attributed to the taste of peanut butter the respondents were used to. Filipinos are known to have a liking for sweet taste as evidenced by the products catering to the so-called Filipino palate such as the sweet-blend catsup, Filipino-style spaghetti sauce (which is also slightly sweet) and sweet chili sauces. This could partly be the reason why there was a high percentage of respondents who bought Lily's and Lady's Choice peanut butter. Filipino households seem to also be price-conscious as supported by the relatively high percentage of respondents who answered price (74% for MI and 65% for LI) as determinant of peanut butter choice.

When asked if they are willing to buy another brand, if the particular brand they like is not available, 51.1% of MI and 51.9% of LI families said "no". This shows that the respondents have brand loyalty. This could be attributed to the taste respondents are used to having. Lily's and Lady's Choice are the most popular alternative brands. Among MI households 11.4% choose Lady's Choice and 8.5% choose Lily's, whenever the preferred brand is unavailable. For LI households, 10.3% choose Lady's Choice and 9.2% choose Lily's as an alternative. Until all peanut butter is fortified with vitamin A, brand loyalty is a problem, if it prevents consumers from switching to vitamin A fortified peanut butter.

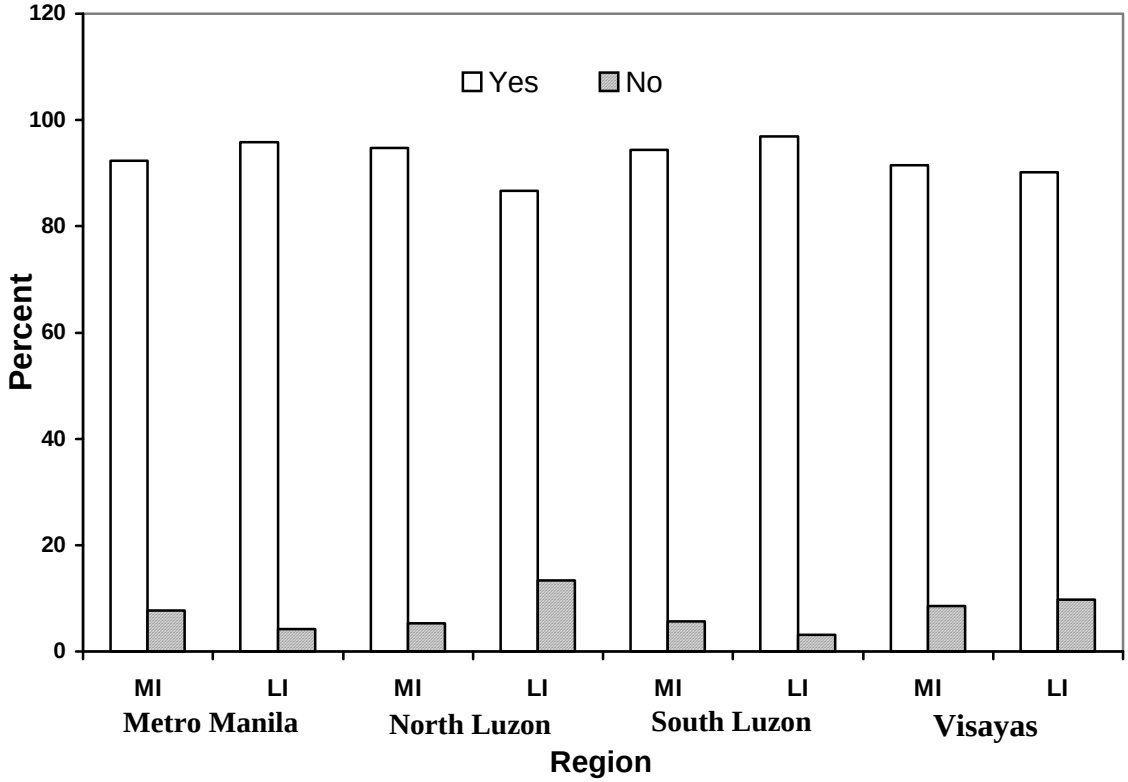

Fig. 4.2 Number of Filipino respondents in different regions who buys peanut butter (MI and LI stands for middle income and low income, respectively).

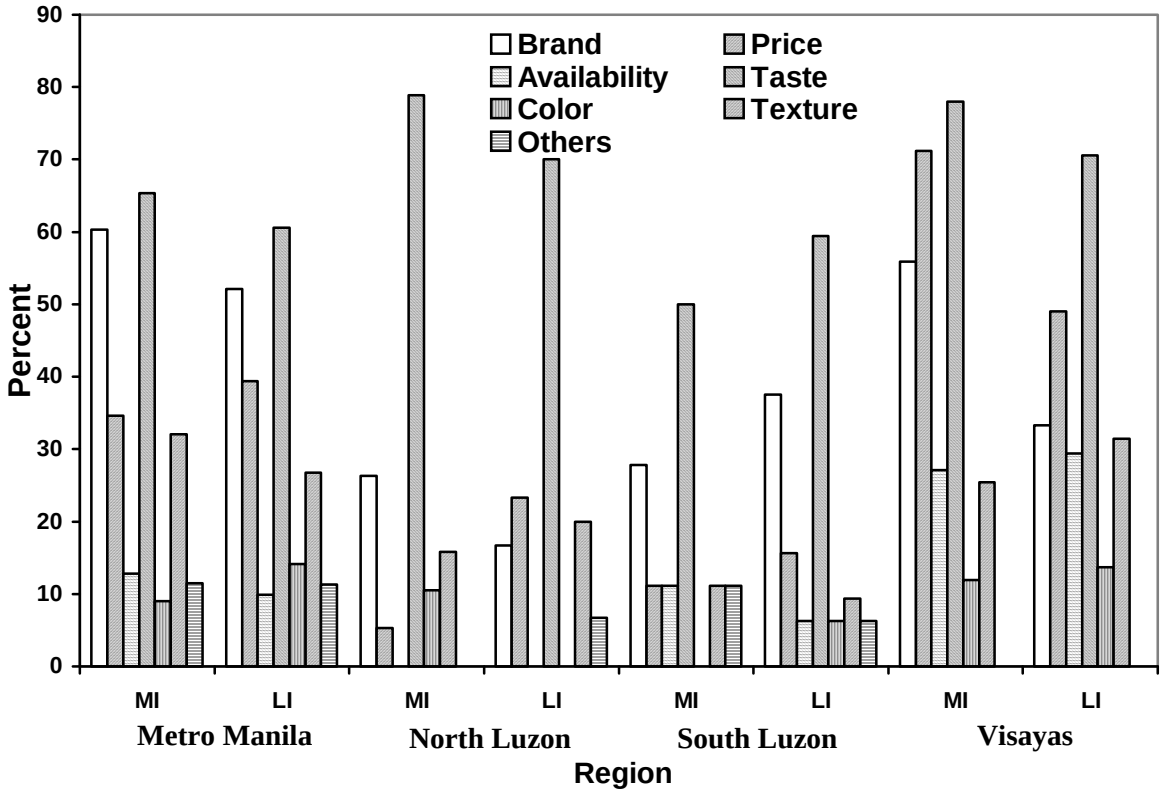

Fig. 4.3 Basis of choice for peanut butter purchase of Filipino consumers in different regions (MI and LI stands for middle income and low income, respectively).

Consumption of Vitamin A Fortified Peanut Butter

Results reveal that a large percentage of respondents (71.0% for MI and 84.3% for LI) say they do not consume vitamin A fortified peanut butter. However, when asked if they were willing to purchase vitamin A fortified peanut butter, 96.0% of MI and 94.6% of LI respondents responded positively.

Only 26.1% of MI families and 15.7% of LI families conveyed that they have eaten vitamin A fortified peanut butter (Fig. 4.4). Just 34.7% of MI and 26.0% of LI respondents have heard of or seen vitamin A fortified peanut butter (Fig. 4.5). Willingness to buy vitamin A peanut butter is supported by previous studies by Galvez *et al.* (2002) on Filipino consumer preferences for peanut butter. The results indicated that 98% of MI respondents and 96% of LI respondents were willing to purchase vitamin A fortified peanut butter. However, if the price was higher, they might not buy it.

Lady's Choice and Lily's are the most frequently purchased peanut butter brands. Therefore, nearly half of households (51.1% of MI and 47.0% of LI) purchase and eat peanut brands that are labeled "fortified with vitamin A" (Lady's Choice and Lily's). These are the only brands labeled "fortified with vitamin A." However, Lady's Choice was not so labeled when Lily's first sold fortified peanut butter and unlike Lily's, the technology transfer team did not test Lady's Choice for amounts of vitamin A content.

Actual peanut butter consumption (by number of servings) of children in LI and MI households shows that the age range with the highest amount of servings consumed per week (31-40 tablespoons) was 13-20 years old for LI and 7-12 years old for MI. Across all age ranges above 2 yrs for both income groups, the most frequent amount of servings consumed per week is 0.5-10 tablespoons. The highest is 63.6% for LI children 7 to 12 (Fig. 4.6 and 4.7).

According to the United States National Institute of Health (US/NIH), the daily recommended intake (RDI) of vitamin A for children ages 2-6 is approximately 350 mcg (micrograms), equivalent to that contained in two tablespoons of Lily's vitamin A fortified peanut butter. For children ages 7-12, the recommended daily intake (RDI) is roughly 550 mcg (just over three tablespoons of Lily's vitamin A fortified peanut butter). For persons ages 13-20, this number is 900 mcg (between five and five and a half tablespoons). The United States Institute of Health's recommended daily intake numbers for vitamin A are provided here since the Philippine RENI's are only available for adults.

Vitamin A deficiency (VAD) at present is most prevalent among children age 6 months to 6 years old. The responses in this study were obtained from children ages 2 to 6, which is the most vulnerable age group among these categories. Even if all peanut butter were as fortified as Lily's, 11.4% of LI and 6.8% of MI children ages 2 to 6 would certainly be consuming enough to receive the RDI. Some LI and MI in the categories of 11-20 servings per week would as well. The results show the highest consumption is among older children 7 to 12 years of age (about 64% of LI and about 58% MI eat 0.5 to 10 servings per week). However, since only those consuming 3 tablespoons per day of vitamin A fortified peanut butter (according to US/NIH) get the full RDI, most of the children do not consume sufficient quantities to get the full RDI.

If all peanut butters were fortified, a large percentage of the vulnerable groups' age 2 to 6 would be able to obtain a higher percent of the target RENI for fortified foods with vitamin A. Additional variants of peanut butter (e. g. chocolate-flavored or strawberry-flavored peanut butter) could also be fortified with vitamin A. Consumer research should be carried out to see what would most effectively increase consumption of vitamin A by younger children.

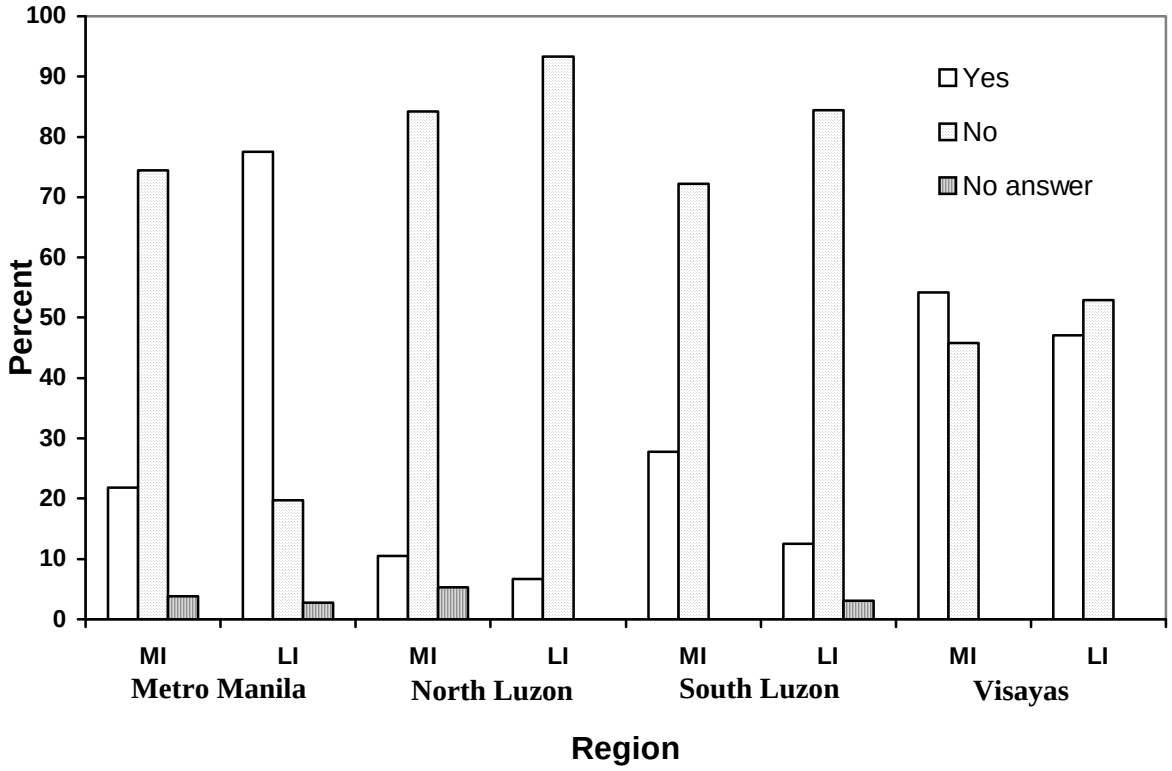

Fig. 4.4 Response of Filipino consumers in different regions on their awareness regarding vitamin A fortified peanut butter available in the market (MI and LI stands for middle income and low income, respectively).

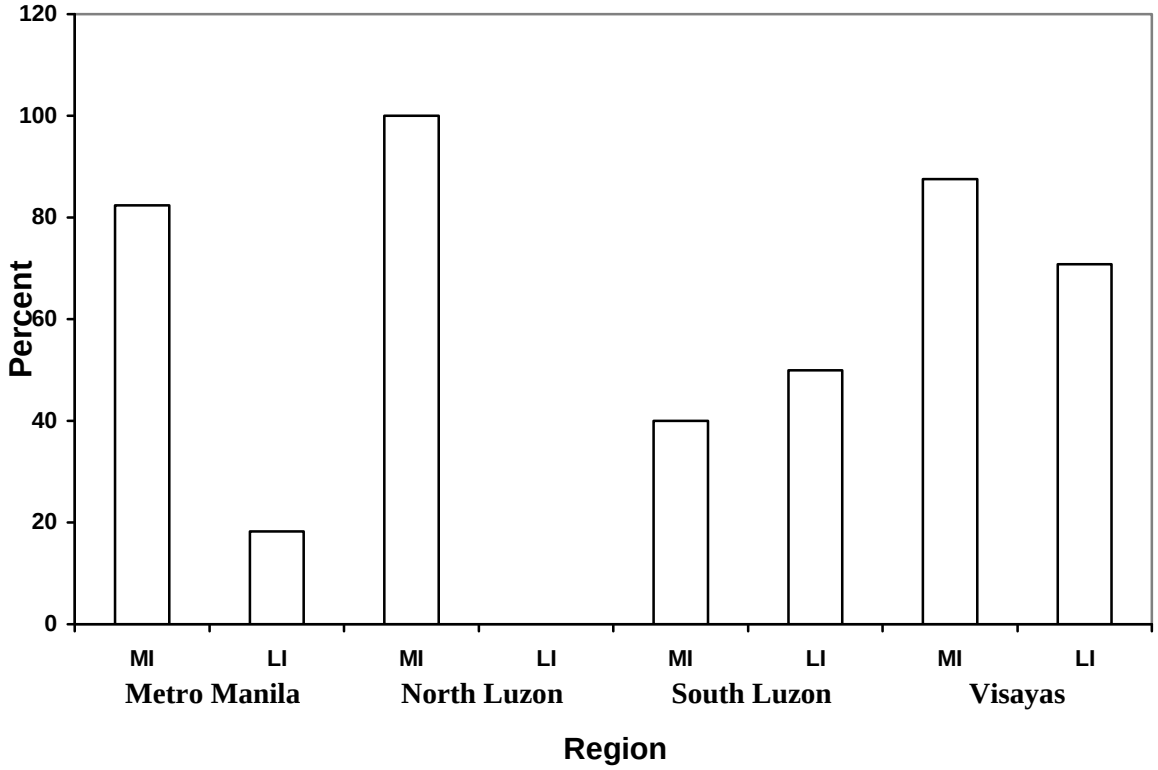

Fig. 4.5 Number of Filipino consumers in different regions who bought vitamin A fortified peanut butter (MI and LI stands for middle income and low income, respectively).

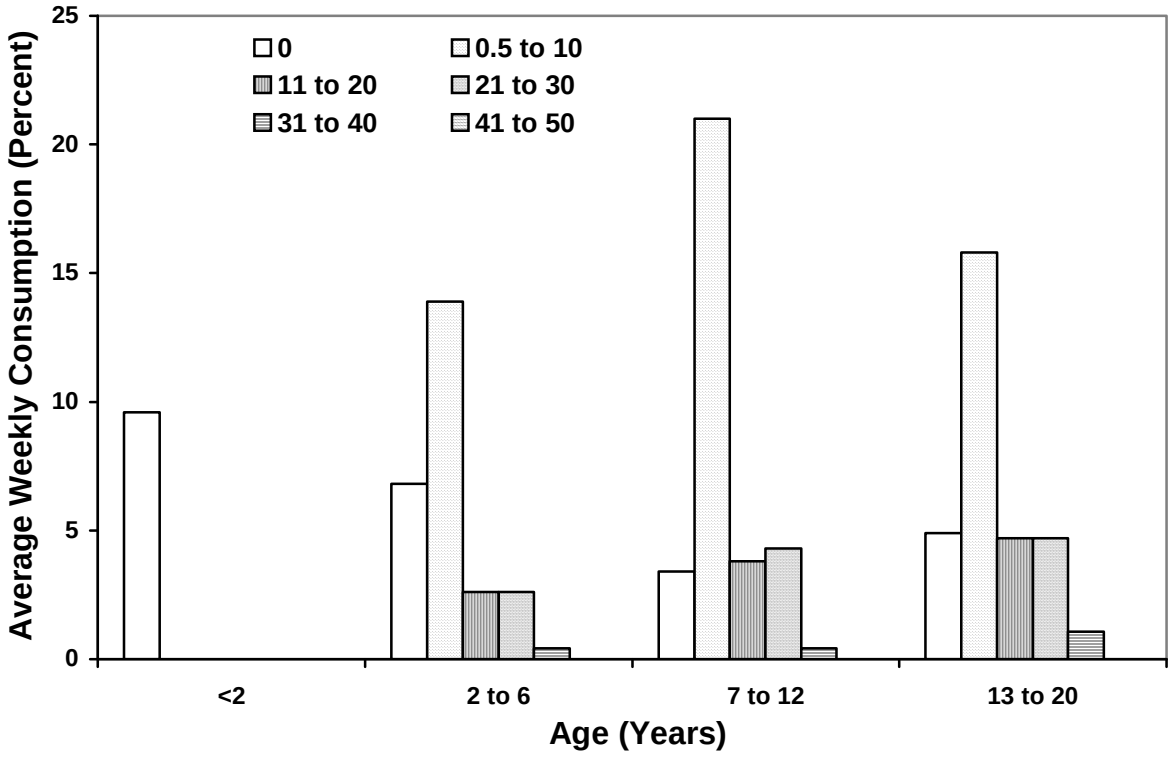

Fig. 4.6 Peanut butter consumption of children in low income households per week (Male < 21, Female < 18; 1 serving = 1 tablespoon).

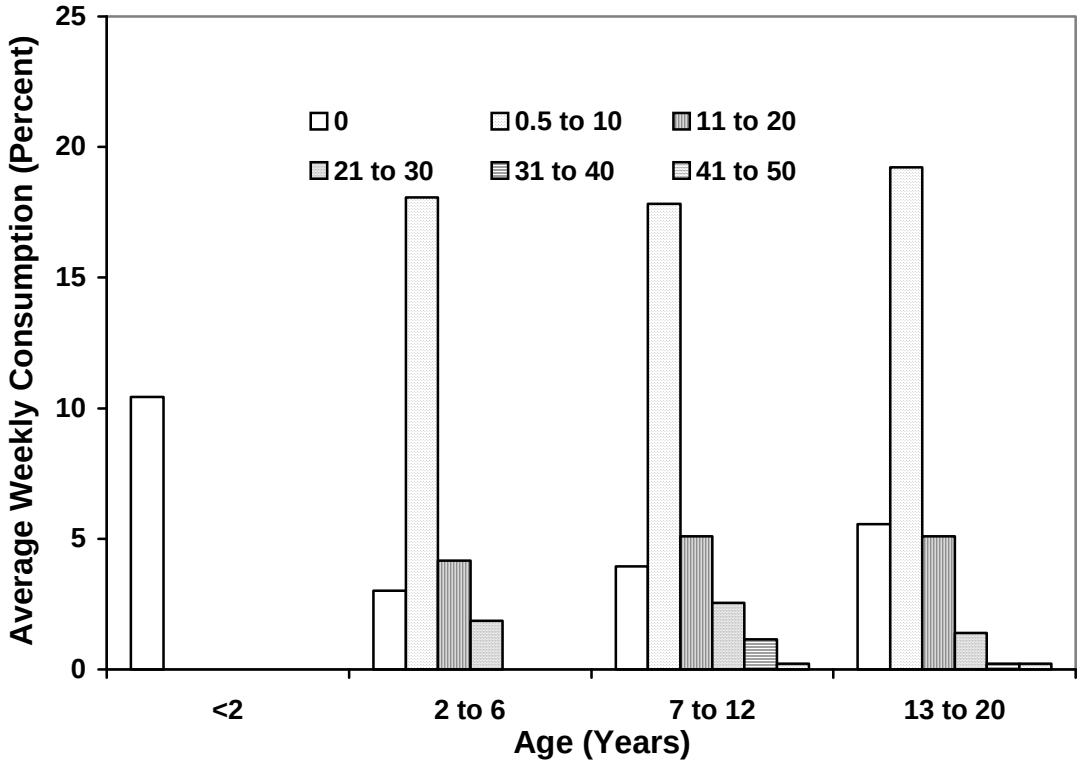

Fig. 4.7 Peanut butter consumption of children (in tablespoon) in middle income households per week (Male < 21, Female < 18, 1 serving = 1 tablespoon).

CONCLUSIONS

This study of the impacts of vitamin A fortification of Lily's Peanut Butter on consumers is based on a sample of 361 households with 150 distributed in 10 *barangays* (communities) in Metro Manila, 50 each from Northern Luzon and Southern Luzon and 110 from Cebu, the second largest City in the Philippines.

There are 900 children in these households, 468 in lower-income (LI) households and 432 in middle-income (MI) households. On average, there are 2.49 children in each household. Of the 361 households, 71 indicate Lily's is the brand they buy (the second most purchased peanut butter in the Philippines). At 2.49 children per household the estimate would be that 177 (19.7%) are living in households with Lily's vitamin A fortified peanut butter available. However, since response patterns indicate that 76 percent of children eat peanut butter weekly, the number actually consuming Lily's peanut butter on a regular basis would be closer to 135 (15.0%).

There are 185 LI households in this sample. Of these, 42 indicate regularly purchasing Lily's Peanut Butter. LI households have an average of 2.53 children per household, which means about 106 (22.6%) of LI children live in households with Lily's vitamin A fortified peanut butter available. Of the 176 MI households in the sample, 29 purchase Lilly's Peanut Butter. MI households average 2.45 children per household, which means about 71 (16.4%) of MI children live in households with Lily's vitamin A fortified peanut butter available.

While the samples in this study are not large enough to be scientifically representative and, therefore, we cannot provide statistical probabilities of accuracy, we are able to obtain some basic demographic data for the 10 sample *barangays* (communities) where stores selling the Lily's product in the Metro Manila area are located (Appendix A). These 10 store locations (in 10 *barangays*) range from 999 to 11,016 households for a total of 33,673 households. If one assumes that, as in the study sample, 92% of households would meet the screening criteria, the total would be 30,979 households (with children) in which peanut butter is consumed. If, as in the sample, 20% of these purchase the Lily's product, this would be about 6,196 households using the vitamin A fortified Lily's brand. While population estimates for them are not available, there are 127 locations in and around the Metro Manila area containing stores selling Lily's vitamin A fortified Peanut butter (Appendix B). Also, the *barangay* level population data are not available for the areas sampled in Northern Luzon, Southern Luzon and Cebu. The cities in which these stores are located have a total of 280,645 households (see Appendix C for details).

The potential for increasing the intake of vitamin A through peanut butter fortification appears substantial. Peanut butter is by far the number one choice among peanut products (92.2% of respondents). Only 30.2% of respondents have seen or even heard of vitamin A fortified peanut butter. However, after being informed of its importance, 95.3% indicate they will buy vitamin A fortified peanut butter in the future. This suggests that considerable gains could be made through effective education and advertising. Since 90% of respondents were female and about 74% of them are mothers who make the decisions on what foods to buy, women are the logical target audience.

Another avenue to increase vitamin A intake is to convince the other peanut butter producers to add vitamin A. One competitor has recently done so (Lady's Choice) and is the first choice of survey participants among all brands (34.7% of MI and 24.3% of LI). Together, vitamin A fortified labeled peanut butter brands (Lily's and Lady's Choice) are purchased by 47.0% of LI and 51.1% of MI households. (Lady's Choice was not tested for actual vitamin A content.)

If 57.1% of MI and 47.0% of LI households in the survey areas are consuming vitamin A fortified brands, this amounts to a substantial contribution. Providing thousands of Filipinos with this additional source of vitamin A will help augment total vitamin A and diminish deficiencies and its debilitating effects.

The sample population on which this study is based is mainly urban and suburban (72.3% from Manila and Cebu, the second largest city). Forty-nine percent of respondents had obtained some education or skill training beyond high school. Over 60% of the mostly female respondents are employed at least part-time. While all LI families made less than PhP 10,000 per month, 45% spent more than PhP 1,000 per week (PhP 4,000 per month) on food. By comparison MI families make more than PhP 10,000 per month and 70% spend more than PhP 1,000 per week on food. The findings regarding peanut butter consumption and vitamin A in this study are more likely to apply to other urban and suburban populations of the Philippines with the characteristics described here.

Even with a relatively urban and educated population, like the one represented in this study, the knowledge of vitamin A and food sources containing it are not very well known. Four years after the industry collaborators' launch of vitamin A fortified peanut butter in the market, there still seems to be a lack of awareness about this product. The lowest percent correct response on the nutrition knowledge test in this survey was the detrimental effect of vitamin A deficiency on eyesight. Consumers need to be made more aware of the importance of obtaining the required vitamin A from their diet and the severity of the adverse effects from its deficiency. The results point to a need for more aggressive marketing of the fortified peanut butter by the company and a more extensive vitamin A information dissemination campaign on the part of the government.

NOTES

1. The research and development technology being assessed here resulted in a serving of vitamin A fortified peanut butter that is 65 percent of the Philippine Recommended Daily Allowance (RENI) for an adult male and is equivalent to 525 mcg RE. The actual vitamin A content was 8.50 to 8.60 mcg retinol per gram peanut butter. The serving size was 2 tablespoons (or 40g)

2. The U.S. RENI for vitamin A is 1,000 retinol equivalents per day for adults and children over 4 yrs. A good food source of vitamin A contains at least 10 percent of U.S. RENI "in a selected serving size or a unit of measure considered easy for the consumer to use" (Hopkins Technology, 2003).

3. At the end of the data collection day, each questionnaire was reviewed to assure completeness and accuracy. The actual interview period was from June to October 2002. Three types of interviews were conducted to pre-test the questionnaire: (1) actual interview practice with project staff members; (2) actual interview with households in nearby residential area and (3) actual interview on one of the sampling sites. Interviewers were asked to read the questions verbatim. For every actual survey conducted, interviewers were asked for feedback on their experiences and problems encountered. Necessary revisions were done on the questionnaire based on the results of the pre-test. Upon completion of the survey, questionnaires were coded and data were entered in the database. Data entry was 100% verified. Statistical Analysis System v.8 (SAS Inc., 2001) was used for all statistical analyses.

4. Random sampling of households began in the city blocks surrounding each store and continued in the next until the target N was reached. Proximity to stores which sold Lily's peanut butter was considered important to insure that households had a reasonable opportunity to have access to it. Zero purchases would eliminate the dependent variable.

5. A serving is one tablespoon, which is 32.5% of the Philippine Recommended Daily Allowance for an adult male (see note number one).

6. The latest recommendations for the daily intake for vitamin A (updated October 6, 2003) provided in the Dietary Reference Intakes developed by the Institute of Medicine are: 300 mcg for children ages 1-3, 400 mcg for children ages 4-8, 600 mcg for children 9-13, 900 mcg and 750 mcg for males and females ages 14-18, respectively, and 900 mcg and 770 mcg for males and females over the age of 19, respectively (Clinical Nutrition Service, Warren Grant Magnuson Clinical Center, 2003)

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APPENDIX A

TOTAL POPULATION, HOUSEHOLD POPULATION AND NUMBER OF HOUSEHOLDS IN THE BARANGAY AREA SURVEYED IN METRO MANILA

TOTAL POPULATION, HOUSEHOLD POPULATION AND NUMBER OF HOUSEHOLDS[1] IN THE BARANGAY AREA SURVEYED IN METRO MANILA

Store	Location	Total Population	Household Population	Number of Households
Glorimart	San Francisco del Monte, Q.C.	35,923	35,782	8,300
Welcome	Rotonda, Q.C.	4,292	4,292	1,011
New Life	Delta, Q.C.	12,600	12,505	3,236
EPC	Munoz, Q.C.	9,265	9,254	2,131
TDC	Novaliches, Q.C.	12,078	12,038	2,731
Value Point	Binondo, Manila	5,384	5,373	1,121
Admiral	Blumentritt, Manila	8,038	8,030	1,664
Trident	Paco, Manila	5,395	5,381	999
All Nation	Las Pinas City	6,377	6,377	1,464
Big C	Bicutan, Taguig	48,865	48,689	11,016

[1] as of May 1, 2000

Sources (Personal Communication):
Mr. Ramon Dolor, Sec 1, NSO, Household Statistics Department
Ms. Gloria Barcebal, Community Office, Manila City Hall
Ms. Nimfa Maranan, Community Affairs Officer V, Manila Barangay Bureau

APPENDIX B

LIST OF AREAS AND OUTLETS SELLING LILY'S PEANUT BUTTER

LIST OF METRO MANILA AREAS AND OUTLETS SELLING LILY'S PEANUT BUTTER

Quezon City

Store	**Location**
Eunilane Supermarket	Visayas Ave.
Eunilane Supermarket	Kalayaan
G.L. Delmonte	Del Monte
Glorimart	Tandang Sora
Glorimart	Del Monte
Glorimart	Kamias
Glorimart	Project 8
Glorimart	Project 4
Glorimart	Visayas Ave.
Parco Supermarket	Quezon Ave.
Parco Supermarket	EDSA
ALW Quirino	Quirino
Fernando's Supermarket	Sta. Mesa
Daily Supermarket	Cubao
Anson	Aurora
UC Plaza	Kamuning
Purity Supermarket	Cordillera
Shopper's Delight	Project 8
Welcome Supermarket	Rotonda
UP Cooperative	UP Diliman
Home Sweet Home	Roosevelt, SFDM
New Life	Delta
Tropical	Panay
EPC Munoz	Munoz
Imart	Kamuning
Imart	QC
Imart	Banawe
Imart	Katipunan
Imart	Dahlia
Imart	Vicas
Imart	Shorthorn
Imart	Mayon
Liana's Supermarket	Rotonda
Plaza Fair	Cubao
Grocer's Foodarama	Cubao
Cesar's Balintawak	A. Bonifacio, Balintawak

Manila

Store	**Location**
Glorimart	Laon-laan
Intermassive Paco	Paco
Manel's Mart	Singalong, Malate
SSG Sta. Ana	Sta. Ana
SK Port Area	Port Area
Corona Foodmart	Binondo
Masagana Supermarket	Kalaw
Manel's Mart	Malate
Value Point	Binondo
Fairmart	Sta. Cruz
Trident	Paco
Masangkay	Sta. Cruz
Subway	Sta. Cruz
Admiral Grocery	Blumentrit
Phil. Commercial	San Andres
St. Joseph Supermarket	Gagalangin
Imart	Sampaloc
Imart	Paco
Imart	Sta. Mesa
Imart	Tayuman
Imart	Vito G. Cruz
Imart	V. Mapa
Imart	P. Campa
Imart	Onyx
Imart	Hidalgo
Hope Well Foundation	Sta. Cruz
Kings Foodmart	Sta. Cruz
Fargo	Quiapo
Shoppersmart	Sta. Cruz
Plaza Fair	Manila
Kids & Mom	Pandacan
Kids & Mom	Faura
Kids & Mom	Maypajo
Western Supermarket	Escolta
Remson	Carriedo

List of Metro Manila Areas and Outlets Selling Lily's Peanut Butter (continued)

Quezon City

Store	Location
Super Nova	Novaliches
TDC	Bayan, Novaliches
Glorimart	Novaliches
Edd Tess	Novaliches
Nova Gold	Bayan, Novaliches
EPC Novaliches	Novaliches
San Roque Supermarket	Novaliches
Nova Deal	Novaliches
Imart	Novaliches
Plaza Claire	Sauyo
Imart	Lagro
Gracewill	Lagro
Meadows	Regalado
Shortstop	B.F. Fairview

Mandaluyong

Store	Location
EPC Kalentong	Kalentong
Richmarsh	Kalentong
Imart	Kalentong
Imart	Parklea

Rizal

Store	Location
Imart	Taytay
Tropical	Taytay
Tropical	Cainta
CVC Supermarket	Cainta
Home Sweet Home	Masinag, Rizal
Rempson Taytay	Taytay
Imart	San Mateo
Imart	Antipolo 2
Imart	Antipolo
Imart	Parang

Paranaque

Store	Location
Sucat Foodmart	Sucat
Better Living	Paranaque
Chessy	Sucat
V.M.	Baclaran
Big C	Bicutan
Mega Mart	Bicutan
Tropical	Bicutan
Imart	Paranaque
Imart	Baclaran I
Imart	Baclaran II

Valenzuela

Store	Location
CVC Supermarket	Malinta
Home Sweet Home	Dalandanan
Royal Mall	Malinta Exit
Fast n' Shop	Valenzuela

Pasay

Store	Location
Masagana	Pasay
Alphabeta	Taft Avenue
Imart	Taft
Publix Mart	Taft

Antipolo

Store	Location
Rempson	Masinag
Gems Supermarket	Antipolo
Eastmart	Antipolo
Rejoice	Antipolo
Super Palengke	Antipolo
Ultramega	Antipolo

APPENDIX C

TOTAL POPULATION, HOUSEHOLD POPULATION AND NUMBER OF HOUSEHOLDS IN THE CITY/TOWN AREA SURVEYED OUTSIDE METRO MANILA

TOTAL POPULATION, HOUSEHOLD POPULATION AND NUMBER OF HOUSEHOLDS[1] IN THE CITY/TOWN AREA SURVEYED OUTSIDE METRO MANILA

Province	City/Town	Total Population	Household Population	Number of Households
Laguna	Calamba City	281,146	280,529	58,466
	Los Banos	82,027	80,830	17,030
Tarlac	Tarlac City	262,481	262,015	51,703
Cebu	Cebu City	718,821	714,388	147,600

Source: [1] www.census.gov.ph/census, 2000,