CORNELL
AGRICULTURAL ECONOMICS
STAFF PAPER

AN ECONOMIC ANALYSIS OF A FOOD SUPPLEMENT FOR MANILA SCHOOL CHILDREN

By

June Wolgemuth

February 1976 No. 76-10

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York, 14853

TABLE OF CONTENTS

AN ECONOMIC ANALYSIS OF A FOOD SUPPLEMENT FOR MANILA SCHOOL CHILDREN*

By June Wolgemuth

I. Introduction

The presence of human malnutrition in its varying degrees of severity has been reported in most countries. The Philippines is one example although the reading public is probably less aware of malnutrition in the South Pacific. Since the early 1970s the hidden hunger of many developing countries has been overshadowed by the frank and devastating starvation encompassing many millions of people reported both from Bangladesh and The Sahel. In these two areas the wasted bodies and protruding eyes of those affected permit even the untrained observer to readily identify those who require help. However in the Philippines it is less easy to locate those who need food aid. Certainly, one also can find children in the hospitals showing similar symptoms to those in the most food depleted areas of the world but the malnutrition which is thought to have existed in the Philippines for decades is the chronic, less easily identifiable kind. It is the kind of malnutrition in which the adult or child shows very few of the symptoms normally associated with undernutrition except for the physiological adaptation to less food accomplished by expending less energy for activity or growth. Even the family does not recognize that slow starvation exists in its victim until food becomes in shorter supply and then the often fatal results take their toll much more quickly than if the individual had had an adequate diet. The debilitating effects of malnutrition may also be suspected when serious infection sets in, permitting symptoms much more severe than found in the well-nourished individual. Thus hidden malnutrition is just as alarming as overt malnutrition because these people often go unnoticed, fail to receive aid of any kind, and succumb quietly to its effects.

Many programs have been devised and implemented to alleviate malnutrition. These range from giving food away (dole-out), to encouraging families to grow their own food, or to using food as a wage in exchange for some type of work (Food-for-Work). However not all of these programs reach those most in need of food for as long as they need it. The most malnourished often are too young or weak to maneuver themselves to a food distribution center and once there, the "dole-out" can strip the recipients of their self-respect and motivation to produce their own food. The humiliating effects on the individual are matched by the negative effects that free food has on the local and national economy of the recipient country.

---

* In slightly modified form this paper was first submitted as part of the requirements for Agricultural Economics 660: Food, Population, and Employment, Fall Term, 1975/76.

One food program which does endeavor to distribute food to the hungry and at the same time corrects for the dole-out effect is the Philippines School Feeding Program. Although feeding is based on the use of a food supplement, known as the "Nutribun", constructed from imported PL 480 commodities, it cannot be considered the only solution, but does offer a temporary answer to a chronic problem until that time when the Philippine economy can produce and distribute food in adequate quantities to its people. Since it is not unusual for a so-called "temporary approach" to be employed for 5, 10, or 15 years if economic growth lags behind what is desirable, it is wise to closely examine both the costs of the program and several alternative approaches. These concerns have given rise to the questions to be examined in this paper: (1) Is the food supplement being used to feed the children more expensive than the accepted rice diet? and (2) Is it possible to substitute domestically produced foods for the ingredients of the supplement? In short, we want to investigate whether a supplement for school children is the most efficient route and then look more closely at the supplement with the idea of improving it.

Since its implementation in 1971, the Philippine School Feeding Program has been expanded from seven schools in Manila to 2890 schools throughout the country. However consideration of all of these schools and their communities would require a careful recognition of cross-cultural differences present in the Philippines as well as the cost effects of delivering the product to regions of varying distances from the major center of trade--Manila. Thus the discussion will focus only on Manila school children.

Manila schools were chosen for consideration for several reasons. First, its longevity is unmatched by any other community. Secondly, its inhabitants represent a mix of both long-term and recently migrated cultural backgrounds so that acceptance here suggests potential acceptance in other areas. Thirdly, more public schools are participating in the program than in any other area. In fact, all but two of the schools in Manila use the Nutribun. Fourth, Manila also represents a range of the lower socioeconomic classes (SEC) among whom one would expect to find malnourished children. For example, in Manila and its suburbs one may find squatter settlements as well as legally housed ghetto poor of the Tondo district. Finally, the population of Manila school-aged children is high, over 195,000 (15 percent of the total population in Manila) (9, p. 2), permitting an examination of the effects of the feeding program on a large sample.

Before the program is described in more detail, it is in order to note the nature of criticism directed toward most school feeding programs. The argument presented is that the poorest and most malnourished school-aged children never go to school or are the first to drop out, so that, in effect, a school feeding program does not reach those most in need. While this may be true, it cannot be said that those who do go to school are not also hungry. While they do have the advantage of attending a school, a responsible community cannot deny food to a malnourished child because he is relatively less malnourished than another. Instead, the

needs of all hungry children should be met. The error lies not in the feeding of school children but in failing to also feed those who do not attend school. Perhaps those who do attend school will be less likely to drop out if they are well-nourished.

II. Description of the School Feeding Program

The purpose of the School Feeding Program is "to reach 2.7 million underweight or malnourished children with supplemental food and with food and nutrition education" over a period of four years (18, p. 4). The program was initiated in 1971 (18, p. 14) under the combined efforts of Department of Education and Culture of the Philippines, CARE, and the United States Agency for International Development (USAID). Supplemental food is delivered via the Nutribun which is a hamburger-shaped roll. The source of nutrition education is channelled through two routes. First, it is a part of the health and physical education curriculum of the public school system. Secondly, during a break period when the children are eating the Nutribun, the teacher and school nurse are encouraged to explain both why the Nutribun is a good food and how it helps the child to grow.

Growth is assessed by weighing the child. Before a child can participate in the school feeding program, it must be determined whether or not he/she is malnourished. This assessment is made at the start of the academic year when all the children in the school are weighed. If a child's weight is 75 percent or less of standard weight for age[1/], he may be enrolled in the program. Once the child begins to receive the food supplement, he is weighed periodically to follow his progress or lack of it. The weighing experience itself is thought to be a period of health education demonstrating that good food can improve growth and development.

The length of time a child remains in the program depends on both his age and weight at the start of his participation. For example, a 6-11 year old child who is less than 60 percent of expected weight-age is given three years for recovery. A child 6-12 years whose weight is 60-75 percent expected weight may be enrolled in the program for two years. If a child does not grow, the school officials are to investigate possible causes such as prolonged illness, parasitic infestation, or a change in the home diet. It is not unlikely that a family on a severely limited budget may shift food from the participating school child to another family member whose diet is marginal.

The composition of the Nutribun was based on donated wheat flour (Table 1) which was later changed to soy-fortified wheat flour. To the flour is added dried milk powder, oil, water, yeast, salt and sugar. Since all but the last three ingredients are donated, the ingredient cost comes to only ₱ 0.0227 ($0.003)[2/] per roll (30, p. 1). The child

1/ The weight standard is based on the American growth studies reported in W. Nelson's Textbook of Pediatrics.

2/ (US) $1 = ₱ 6.7

TABLE 1. NUTRIBUN NUTRIENT COMPOSITION*

(per bun)

Commodity	Grams	Calories	Protein (g.)	Calcium (mg.)	Iron (mg.)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)
Wheat Flour	100	364	11.6	16	2.90	.44	0.26	3.5
Milk Powder	14	51	5.0	183	.08	.05	(0.25)	0.1
Oil	5	44	-	-	-	-	-	-
Sugar	2	46	-	-	-	-	-	-
Yeast		6	(0.7)a/	(0.9)	0.3	(0.11)	(0.7)	Trace
TOTAL	133	511	17.3	199.9	3.28	.62	4.3	4.0

a/ Numbers in parentheses denote values imputed from another form of food or from a similar food.

* Table taken from: "Cost Composition of Nutribun Production for USAID/FFP Tondo Feeding," Arturo Palmez, mimeo., 1972-73.

receives over 17 grams of protein and 500 Kcal. of energy and significant quantities of calcium, iron, thiamine, riboflavin, and niacin. Vitamin A and ascorbic acid must be provided by some other means. If this roll is used as a dietary supplement and not a replacement, it would be expected that the gap between the recommended requirements and intake of the average 7-12 year old school child will be closed or almost so for seven major nutrients (Figure 1). How closely the RDA is met depends on the age of the child.

The child receives the Nutribun during the entire 140 days of the school year. For each Nutribun, he is asked to pay ₱ 0.10 ($0.015), which in effect removes the dole-out aspect, and renders to the food a sense of value. Only about ₱ 0.04 is required for actual processing of the supplement. The return on the Nutribun also provides some funds for supplies needed by the schools to operate the program such as weighing scales, growth charts, and other educational supplies. Theoretically, if the child cannot afford the ten centavos, a sponsor from the community is sought. However, most children are able to afford the roll as was surmised in the initial stages of the planning of the program. At this time it was recognized that the school canteen which sells cookies, crackers, candy and fruit to the children does a brisk business.

The school may bake the Nutribun on the premises or contract with a local bakery to bake and deliver it each day. The latter is the most commonly used system in Manila. One criticism of donated food programs is that the food often enters the black market through mysterious means. Since no preservative is added to the finished roll which in effect lowers shelf-life, the Nutribun must be eaten within a short time after it is baked and is not easily marketed to the public.

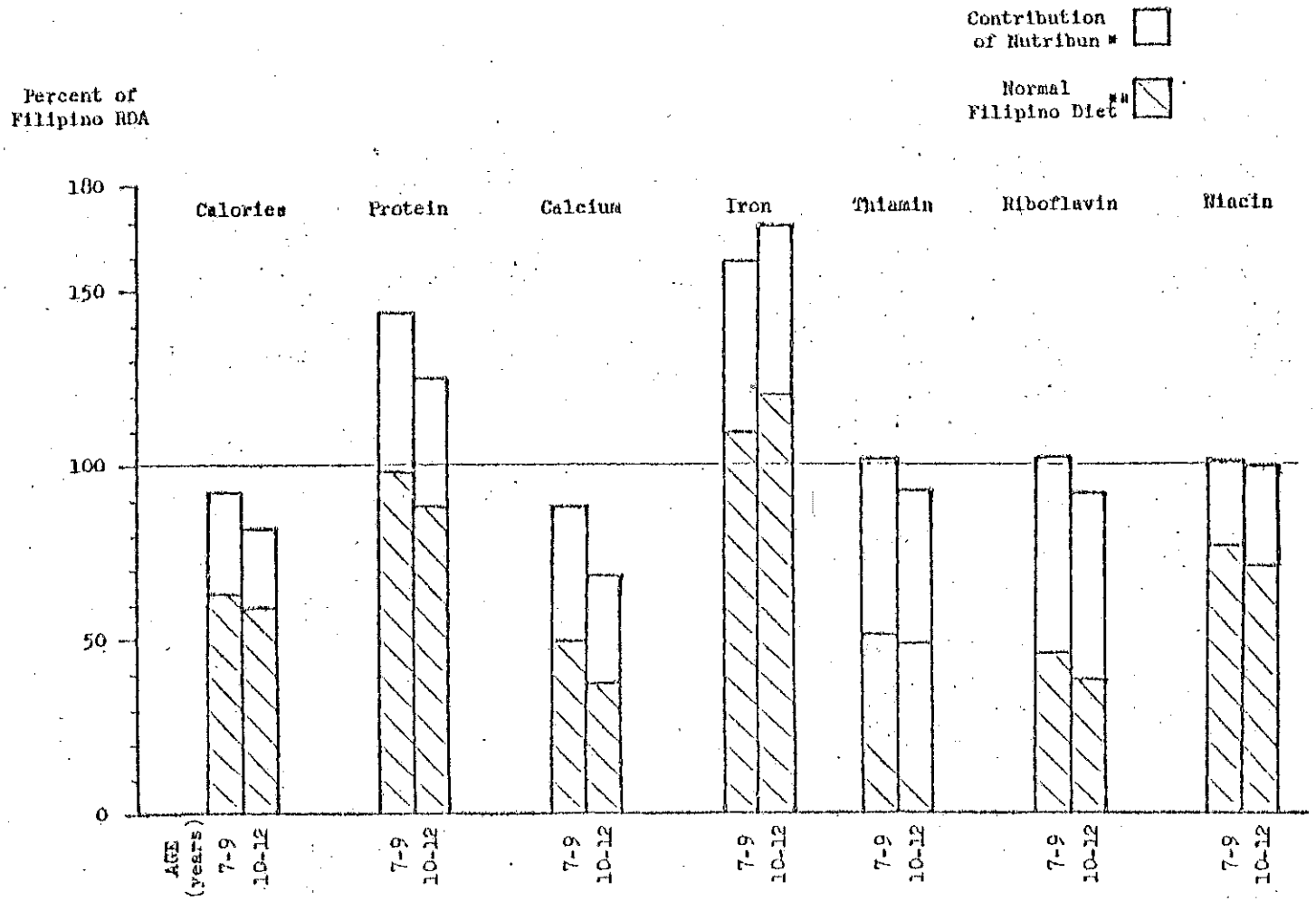
The feeding program has been found to be a success in increasing growth. In an evaluative study of participating Manila school children, most malnourished children were reported to increase in weight above that expected for their age. This rate of weight gain also permits some catch-up growth to the child's expected weight for age (42, p. xxix).

III. Is There a Need for a Nutrition Program?

Obtaining accurate health and vital statistics is difficult if not impossible in most developing countries. The data which are collected often are limited to certain subpopulations within the country and are based on estimates and "expert" judgment. Thus information from these countries should be viewed with caution. By piecing together reports from many sources and by cutting across several scientific disciplines, a somewhat consistent picture does ermege as to the nature of malnutrition in the Philippines although its extent and underlying causes may require conjecture.

The rationale for the school feeding program is based on the conviction that caloric intake of Filipinos falls short of recommended levels by 15 percent (300 Kcal.) and that protein intake is deficient by 6 percent (3 grams) (18, p. 1). Vulnerable groups such as infants, preschool children, school age children, and pregnant and lactating women are felt to be at an even greater risk. For example, school children between the ages of 7-9 years and 10-12 years of age show an apparent deficit of 32 percent and 37 percent in calories, respectively, and

FIGURE 1. CONTRIBUTION OF NUTRIBUN TO DIET OF FILIPINO SCHOOL CHILD



* Data from "Cost Composition of Nutribun Production for USAID FFP Tondo Feeding," Arturo Palmez, mimeo.

** Data from C. D. Intengan, Philippine J. Nutr. XXIII, April-June 1970.

7 and 6 percent in protein (18, p. 10). In each age group, the gap between intake and recommended levels is much more serious for calories than it is for protein. These data have contributed to the increasing recognition that much of the malnutrition, not only in the Philippines but also in other areas of the world, is a caloric malnutrition and not protein malnutrition.

Most assessments of nutritional adequacy are based on comparisons to recommended intake. Just how closely recommended intakes or RDAs describe dietary adequacy warrants close examination.

A. Recommended Dietary Allowances (RDA)

Individual food needs are determined by age, sex, body composition, level of activity, climate, and state of health. RDAs serve as guideposts only for groups of people and are not meant to delineate precise individual requirements for which they are mistakenly used.

Protein RDAs are a function of daily nitrogen loss, protein quality of the diet, age and sex. Pregnancy and lactation increase the body's need for all nutrients (16, p. 22). Often overlooked is importance of the quality of the protein used in the diet. Protein quality varies among food staples for some foods are composed of a poorer quality protein as determined by its amino acid pattern. The amino acid pattern of egg is considered to be of the highest quality and all other food proteins are compared to it. Since a rice based diet contains a poorer quality protein than the egg, rice is given a value of only 60 percent, which means that protein recommendations for each age group must be adjusted upward by a factor of 1.67.

The recommendations for protein are most likely still too high even though they have been consistently adjusted downward as knowledge concerning individual requirements has expanded. This is so stated because of the way recommended intakes are determined. First, the physiological requirement of protein is assessed and then raised by 30 percent to set a "safe level" of intake.

Detailed consideration was given by FAO/UN (Food and Agriculture Organization of the United Nations) to each factor which is believed to affect energy needs. However, body size is determined by recording existing weights of the population such that weights are expressed in terms of what is rather than what they should be, which of itself is a question that is difficult to answer. Physical activity classifications suggested by FAO range from "light activity" to exceptionally active. Just how much time an individual actually spends within each classification can be assessed closely only under the artificial conditions of the laboratory. A satisfactory method for assessing energy expenditure in a normal living stiuation is still being sought. Variations between sexes begin at puberty, but to what extent is still unknown, as is the variation due to age.

In each of the above cases, recommendations are set by informed opinion supported unfortunately by too little documented evidence of

human need under varying circumstances. What we have then is a set of guidelines with a stated safety margin to cover most of the population. Actually we do not know precisely what the people need. FAO feels that the likelihood of consuming an adequate diet decreases progressively as the individual's intake recedes from the recommended levels. If this is so, would it not be better for RDAs to be stated as ranges rather than misleading and misused solitary figures for various nutrients?

B. Filipino RDA

The 1970 Filipino RDA is the last of several modifications of those first formulated in 1941 by the National Research Council of the Philippines. The final revision was deemed necessary as studies among Filipinos showed that energy expenditures were overestimated particularly for women (25, p. 5). The new RDAs are based on 1) studies among Filipinos for various nutrients; 2) nutrition surveys by the Food and Nutrition Research Council in eight out of ten regions in the Philippines which provide data on food consumption and incidence of nutritional deficiencies; 3) anthropometric data among children and youths; 4) recommendations of FAO and WHO. Dr. C. Intengan expressed the desire ". . . that better estimates not only tech ical but also economical, would be arrived at. Since the country has been perenially confronted with food shortages, the standards have to be realistic and practical, with improvements in health being the primary concern."(26, p. 2).

As a result, the RDA for calories was decreased from 2600 Kcal. to 2500 Kcal. for men and from 2500 Kcal. to 1900 Kcal. for women. Protein intake recommendations were computed considering the requirements for the reference protein, i.e. rice. They were set at 56 grams for men and 49 grams for women.

C. Recommendations for School Age Children

Since school age children are the target group of this discussion, the RDAs for 7-12 year olds is of particular interest. In 1956 Leitch and Widdowson recommended allowances for children to the age of ten, which are determined by using consumption data of healthy children in the USA and United Kingdom and later confirmed by surveys in other European communities (16, p. 33). It is important to note here that allowances are based on consumption of what children are eating now rather than an accurate determination of need. These recommendations are open to question in light of the obesity in young children in the developed world.

FAO recommends that its reference child be used as a standard for children in all countries even though their average weights may differ from that of the reference children. The rationale presented is that groups of children who do deviate from the reference child may be malnourished as a result of previously poor diets. The effect of an allowance thus based on age and greater than that for observed weight is a provision for catch-up growth required for rehabilitation of an undernourished child. Since we know very little about what normal children require and much less about what a malnourished child needs for rehabi-

litation, this recommendation is often accepted for "safety's sake." The Filipino RDA for energy and protein shows a downward adjustment from the FAO recommendation for children between 7-12 years of age (Table 2).

In summary, it is unfortunate that dietary recommendations are not more accurately known. For lack of a better tool and for universal comparison, the Filipino RDA will be used to assess dietary adequacy but caution in interpretation is suggested.

D. Nutrition Surveys

Dietary Results

There are two reports of particular relevance to the Manila school child (Table 3). First, the Nutrition Survey of Metropolitan Manila by the Food and Nutrition Research Council (FNRC), which does not of itself list age-specific food intake but provides the basis for a later analysis in which the original data are used to provide figures concerning protein and calorie intakes of various age groups (26, p. 10).

The second study in Table 3 is of some magnitude and comprehension in its reporting of both dietary intake and nutritional health of the participating children in the Bayambang Applied Nutrition Programs sponsored by UNICEF. These children attended public schools in the Central Luzon area.

Both the FNRC figures and the Bayambang Survey show that caloric intake is apparently deficient for both the 7-9 and 10-12 year old children. These values range from a low of 59 percent to a high of only 65 percent of recommended levels. Protein deficits do not appear to be as seriously low as caloric levels for the lowest percentage intake is only 88 percent while all other children receive over 90 percent of recommended levels. Only in the Bayambang study were intakes of the remaining five nutrients reported by age. Iron3/ was more than adequately met (110-120 percent) while calcium, thiamin and niacin were found at levels of 52 percent or less of recommended levels. The very low levels of thiamin would suggest a need for returning to fortification of rice in the Philippines.

Biochemical Results

School children (7-12 years of age) in the baseline Bayambang Survey show mean total protein levels of 7.6 ± 0.04, serum albumin 4.64 ± 0.03, and serum globulin levels of 2.93 ± 0.04.4/ Each is within acceptable ranges. Serum carotene and vitamin A levels were low, 63.8 ± 3.80 mcg/100 ml. indicate liver stores do exist while values below 20 mcg/100 ml. usually indicate little liver storage.

3/ Recent reports suggest this dietary iron may be largely unavailable for absorption.

4/ Acceptable serum values are listed below:

Total serum protein: 6.5-7.5 g/100 ml	Serum Albumin: 3.5-5.09 g/100 ml
Serum Globulin: 2.0-2.99 g/100 ml	Serum Carotene: 125-199 mcg/100 ml
Serum Vitamin A: 34-49 mcg/100 ml	

TABLE 2. COMPARISON OF RECOMMENDED DAILY ALLOWANCES OF THE PHILIPPINES* and FAO† FOR CALORIES AND PROTEIN

	Philippines				FAO			
	Weight (kg.)	Age 7-9 (years)	Weight (kg.)	Age 10-12 (years)	Weight (kg.)	Age 7-9 (years)	Weight (kg.)	Age 10-12 (years)
Calories	25	1900	33	2300	28.1	2190	36.9	2475
Protein (gm.)[a]	25	38	33	45	28.1	41	36.9	49

* Data from C. L. Intengan, "What is the Protein Gap?" Phil. J. Nutr., XXV, 10, January-March 1972.

† Data from Joint FAO/WHO Expert Committee, Energy and Protein Requirements (Rome 1973), p. 35, 38.

a/ Net Protein Utilization (NPU) of 60

TABLE 3. NUTRITION SURVEYS OF LUZON SCHOOL CHILDREN

	Survey	Date	Population	Type of Data
1.	Nutrition Survey[a/] of Metropolitan Manila	1958	2,967 persons	Food consumption Nutrient intake by age Nutrition status
2.	Bayambang Applied Nutrition Program[c/]	1964 and 1968	Families of 25 pupils in 4 schools (695 persons)	Food consumption Nutrient intake Nutrition status Mortality data Anthropometric parameters

Data Sources: a/ E. S. Quogue, Nutrition Survey of Metropolitan Manila, (Manila, FNRC), 1962; and Carmen D. Intengan, Phil. J. Nutr. XXV, Jan.-March 1972.

b/ J. Bulatao-Jayme, Phil. J. Nutr. XXIII, July-Sept. 1970.

Some of the FNRC biochemical data are also categorized according to age. Of interest are the hemoglobin values which were deficient among slightly over 5 percent of female and male school children; 52 percent to 44 percent were low. This suggests the presence of iron-deficiency anemia among these children. Serum protein was deficient in 4 percent of the males and 2 percent of the females and low in 11 percent of the males and 1 percent of the females. Serum Vitamin C levels were also low in 6 percent of the girls and 4 percent of the boys and deficient in 19 percent of the girls and 9 percent of the males. Deficient serum A levels were reported in 11 percent of the boys and 9 percent of the girls and were low in 17 and 20 percent, respectively.

Clinical Results

Clinical signs were reported only in the FNRC study. Most commonly found were eye changes such as dry conjunctiva, conjunctiva, infection, and Bitot's spots in 176 out of 485 children who were examined between 7-12 years. One symptom of scurvy and low Vitamin C intake is bleeding gums; 100 children were reported with these gum changes. Other clinical signs of nutrition deficiencies are goiter (4 cases), nasolabial seborrhea (1 case), angular scars and angular stomatosis (7 cases), tongue changes (43 cases), marginal gingivitis (5 cases) and hyperkeratosis and xerosis (16 cases).

Anthropometric Results

Although the studies report height, weight and triceps skinfold measurements, only weight data will be discussed. Weight gain or the

failure to do so is one of the earliest indicators of a change in the health status of the child and is also one of the more easily recorded field measurements. Once the weights are taken they are compared to either the Filipino or United States (US) weight standards (5, p. 49; 38, p. 47).

Each study shows that no matter which weight standard is used, the school children fail to reach acceptable levels of growth. In the Bayambang study, the mean weight of 7-9 year old children is about 20 kilograms and 25 kilograms for the 10-12 year olds. Thus, these children have reached only 80 percent of the weight of the 7-9 year old Filipino reference child and 76 percent of the weight of the 10-12 year old reference child.

In a feeding study of 3,960 children in eight elementary schools in the province of Bulacan (Figure 2) the recorded mean weights of the children in each grade are no more than 73 percent of the US standard. Over 35 percent of the children in all grades were about 60 percent of their expected weight which is an indication of severe malnutrition and growth stunting (6, p. 18).

A later study of 1,119 children in five elementary schools in Manila indicates the presence of malnutrition. Almost 20 percent were 60 percent or less of expected weight-age and 70 percent were between 60-75 percent (43, p. 23).

A report by USAID/Manila estimates that of the approximately 8.8 million school aged children between 6-13 years of age, 3 million are seriously malnourished. Of these, 2 million may be reached through schools while one million are "out of school." An estimated 80-90 percent are underweight for age (less than 75 percent standard weight) according to surveys of the schools (18, p. 25).

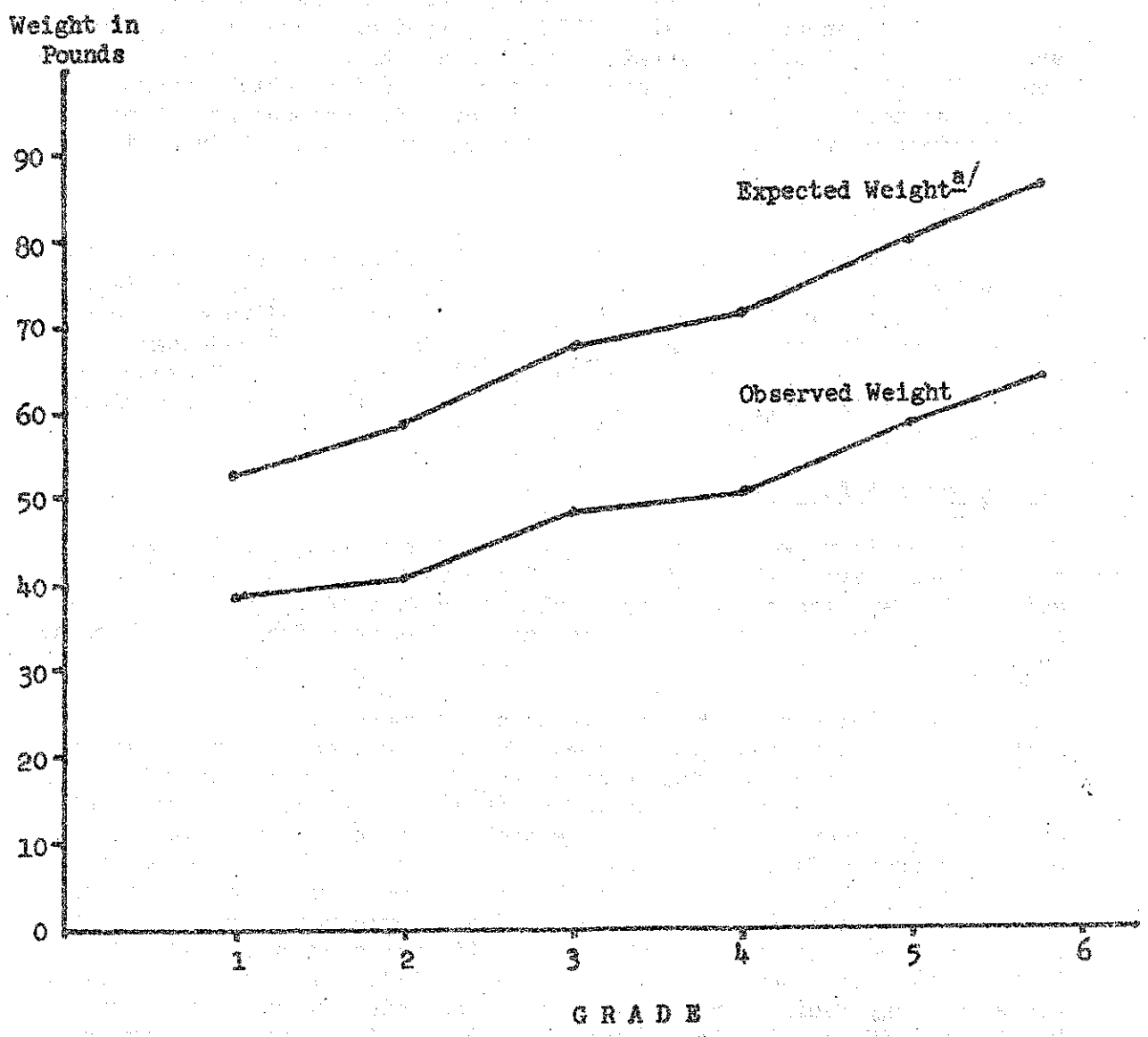
The weight data do in fact support the dietary findings. If protein were more inadequate in their diets, it would be expected to find children who not only failed to grow but who also showed frank signs of marasmus. If the children received very little protein and a high intake of calories, kwashiorkor would be expected. But what is found is almost adequate protein and some calories which apparently maintains life but does not permit optimum growth and weight gain.

A Note on Weight Standards

Considerable debate has been heard over the question of using American growth standards for Filipino children. The argument presented is that the American child is genetically taller than the Filipino child and that by using these standards, malnutrition is overestimated.

This line of reasoning cannot be completely accepted in light of several studies. First, a growth study of the children of the upper socioeconomic families of Manila residents who were thought to have access to an adequate diet and excellent medical care were found to have approached similar weights and heights of their American counterparts

FIGURE 2. WEIGHT SURVEY OF ELEMENTARY SCHOOL CHILDREN IN BULACAN PROVINCE*



a/ United States Growth Standard from H. C. Stuart and S. S. Stevenson, Textbook of Pediatrics, W. Nelson (ed.), 7th Ed., (Philadelphia: W. B. Saunders Co.), 1959, p. 47.

* Data source: Appendix Table 1.

(17, p. 11). Similar results were reported in African populations (19, p. 47; 27, p. 17).

Secondly, it now is well recognized that the previously thought to be small Japanese have, since WWII--a period of increasing economic and social opportunities--attained weights and heights to equal American youth (39, p. 1). Thus, use of a growth standard which lowers weight and height expectations would, in effect, have the result of underestimating the malnutrition problem rather than identifying it.

Other Health Indicators

Infant mortality rates (IMR) are reported as a general parameter of the level of health of the population. The figure falls with improvements in the quality of health care, in the dietary, and in other environmental conditions. IMR rises when these factors are inadequate. Compared to other Asian countries (Table 4), the IMR of 73.8 deaths per 1000 live births reported for the Philippines is the highest and almost three times that of the United States.

E. Income and Food Expenditure

Income is viewed as one of the major factors restricting adequate food intake. Even with complete knowledge in the area of nutrition science by families of the third world, insufficient incomes will prohibit the procurement of the desired diet. The data from the Philippines suggest that many families cannot purchase an adequate diet.

To determine what the cost is of an adequate family diet, the cost of the protein and caloric needs for a reference family of six was assessed. The reference family consists of six members: one male adult, one lactating woman, one infant (9 kg.), one child 1-3 years old, one child 7-9 years old,and one male adolescent 16-20 years old. Cook estimates that a family requires ₱ 1860 per year ($228) to provide its dietary needs (11, p. 13). A calculation was made by the author of the cost of a rice diet which meets all of the caloric needs and, for most family members, all of the protein needs (in terms of quantity). The cost of this rice diet is ₱ 1550 per year ($231). Figures 3 and 4 illustrate how many families may not receive even this low income. In the Philippines (Figure 3) almost 60 percent of the families are reported to earn even less than ₱ 1999 per year which is the income range in which the two least cost diets fall.

These families would be in serious jeopardy if they needed to rely solely on their ability to buy their own food. It should be noted that many rural families in the Philippines do grow their own food, fish or trade for food, therefore income levels would not accurately reflect their ability to provide food for the table.

However, in Manila (Figure 4) where it is more difficult to grow the family diet and where most food must be bought, almost 18 percent of the families just meet or fall below the least cost diets. Thus, if a family cannot buy, it is less likely to be able to supplement the diet by some other means.

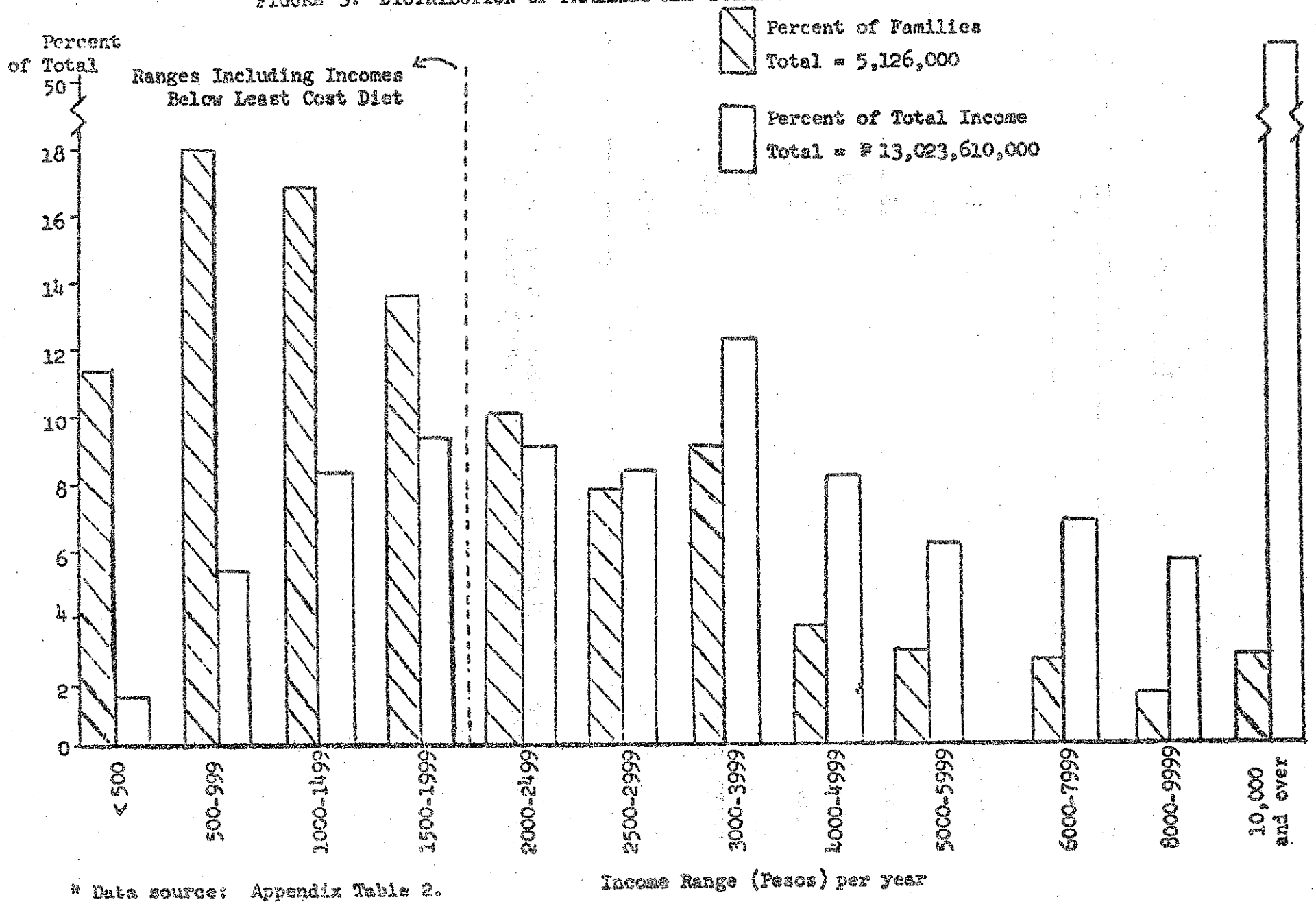
TABLE 4. SELECTED INFANT MORTALITY RATES (IMR)*

(Deaths per 1000 live births)

Country	IMR
Japan	18.7
Australia	19.1
Hong Kong	26.4
Taiwan	26.4
Sri Lanka	52.8
Malaysia	53.2
Korea	58.2
Philippines	73.8
United States	25.2

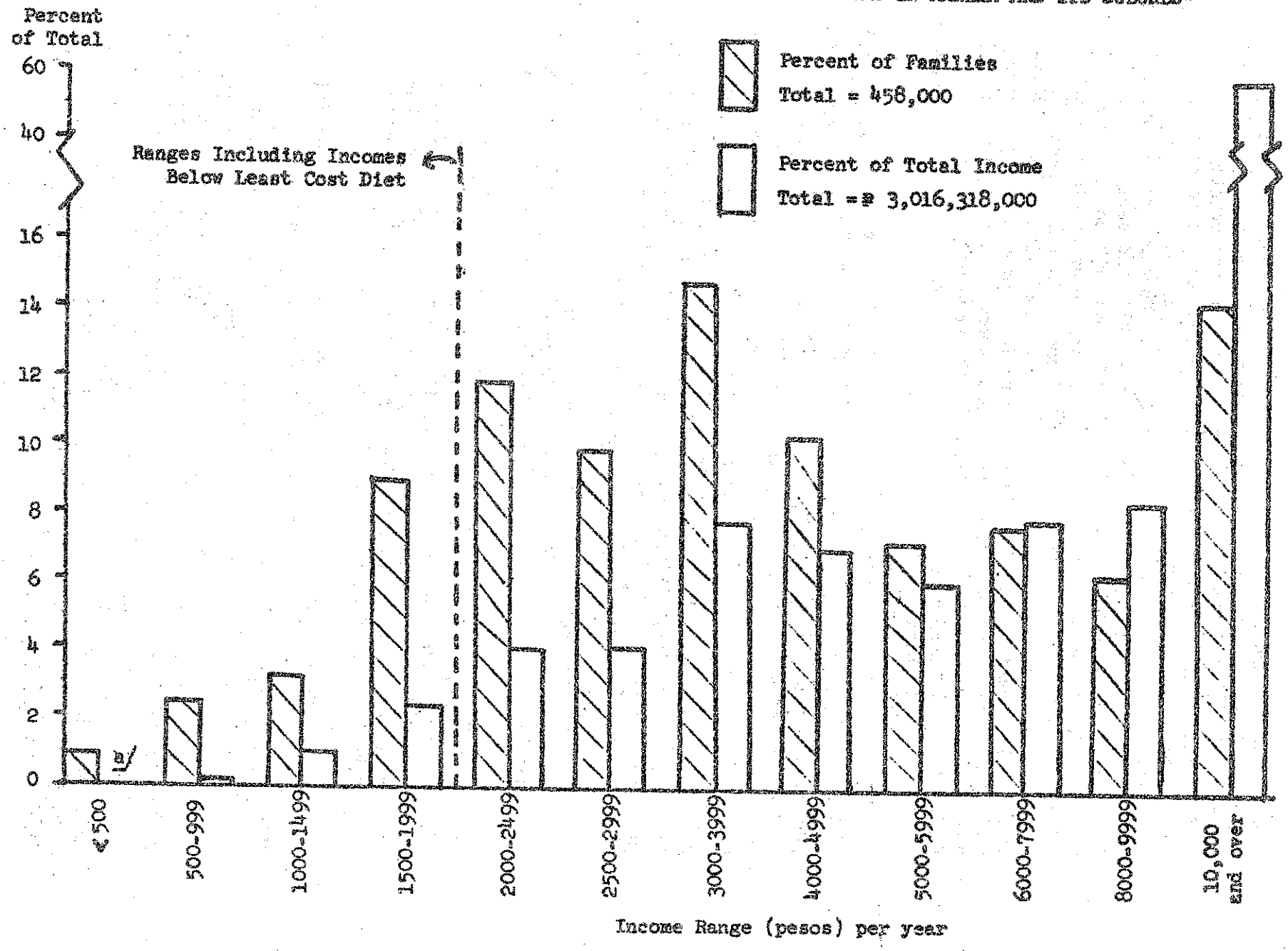
* Data from Catholic Relief Services-USCC, "An Evaluation of Nutrition Education Program," (Incentive Grant AID/CED-2462) March 1972.

FIGURE 3. DISTRIBUTION OF FAMILIES AND TOTAL FAMILY INCOME IN THE PHILIPPINES*



* Data source: Appendix Table 2.

FIGURE 4. DISTRIBUTION OF FAMILIES AND TOTAL FAMILY INCOME IN MANILA AND ITS SUBURBS*



a/ Less than 0.05 percent.

* Data source: Appendix Table 2.

Figures 3 and 4 illustrate another important fact. Income distribution is severely skewed toward the wealthy and many Filipinos have not participated equally in the economic growth of the country. In Manila (Figure 4) only 14 percent hold 51 percent of the total value of the incomes earned. On a national basis (Figure 3) 23 percent of the families receive 59 percent of the income. Furthermore, an analysis of the growth of real personal income in the 1960s and early '70s indicates that this difference in income distribution will not be corrected for some time to come. Although the lowest income group did increase personal income by 58 percent between 1965 and 1971, the highest income group shown in Table 5 also shows a rise in personal income by a similar amount (51 percent) during the same time period. Growth is a positive event but it must be noted that the lowest income groups started in 1965 from a lower base (index of 108) than did the more wealthy (index of 146). Thus, the poor require a much more rapid rate of growth to equalize income distribution.

Filipino food expenditures closely follow Engel's Law, which states that as incomes rise, the proportion spent on the dietary falls. At the lowest income decile (Figure 5), almost all (80 percent) of the income is spent on food. It is not until the sixth decile that over one-half of the income is freed for purchasing other items. The highest income group spends only 32 percent on food; however among the very wealthy, this percentage would be expected to fall to much lower levels. Figure 5 also suggests that these families whose income falls below the least cost diet, spend 75-80 percent on food. That not all is spent on food indicates that 1) the diet may be supplemented by other means, 2) food in adequate quantities for all family members is not provided, and/or 3) other consumer goods have a higher priority to food.

We now have some idea who can or cannot purchase an adequate diet. It is now of interest to look at what it is that families can buy with their limited incomes and how this may change with increasing incomes.

A summary of three nationwide surveys conducted between 1970 and 1972 conveniently expresses food consumption by per capita income. Each survey includes just slightly over 1000 families whose income is classified into four major categories shown in Figures 6 and 7. During the survey period shortages of certain food items were noted due to the disruptive effects of climatic and political upheavals.

The first item purchased by all four income groups is rice (Figure 6). Rice is the staple of the diet but the amount consumed at any income level varies only by 127 calories. The quantity of starchy staples also does not change. Purchases of other food items do change with income. Maize which is not a preferred product is replaced with other foods, such as wheat, as incomes rise. Sugar, vegetable oil and pulses are purchased in large quantities as are all of the high protein foods and fruits and vegetables. While the substitutions made within income groups are interesting to note, the fact that is most important is that each income group appears to provide itself with close to adequate caloric intake. The highest income group may be in danger of obesity if they actually do consume 2800 Kcal. and do not lead an active

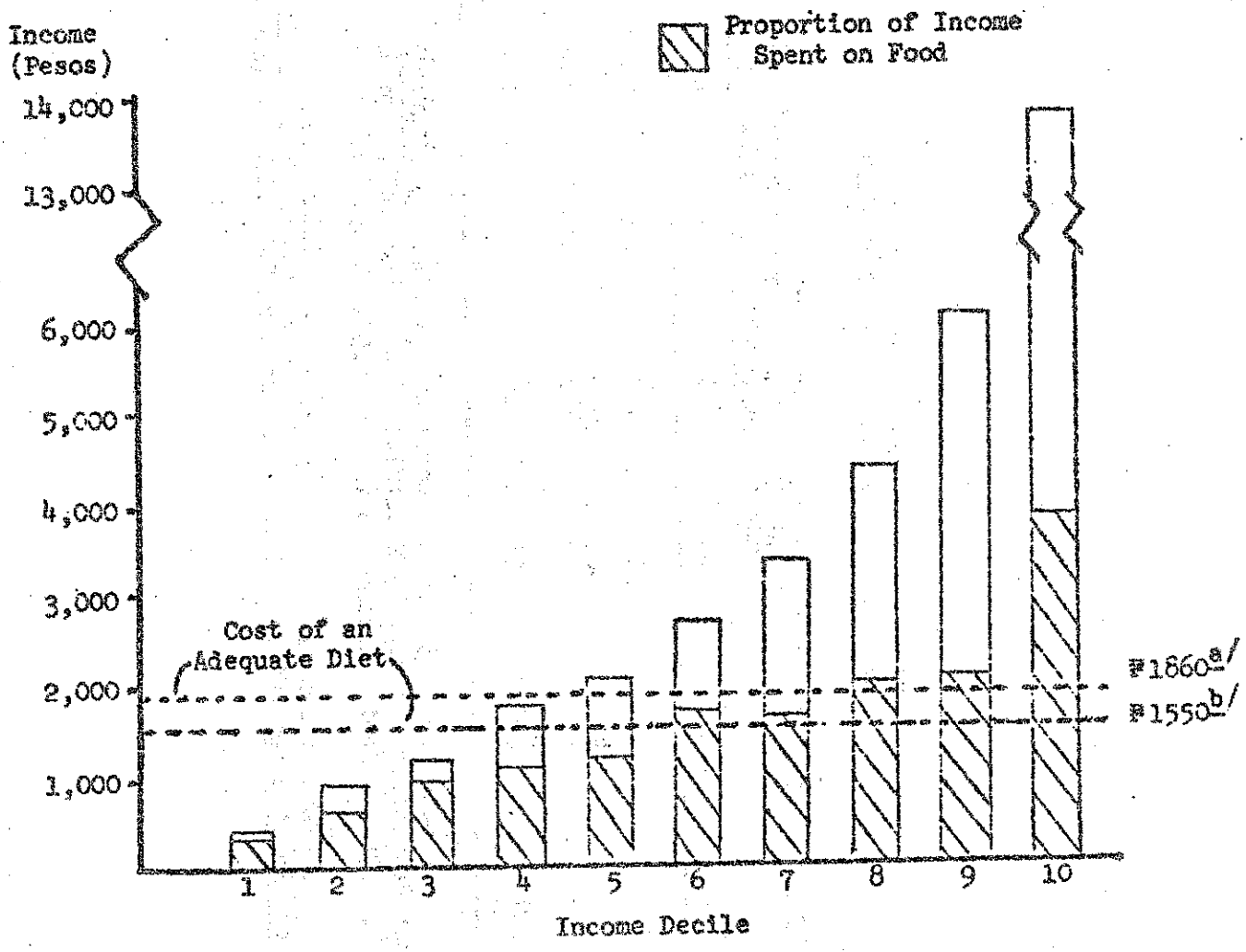
TABLE 5. REAL PERSONAL INCOME GROWTH*+

Year	Total	Index of Personal Income, Lowest Percentiles				
		1st	2nd	3rd	4th	5th
1961	100	100	100	100	100	100
1965	140	108	123	143	142	146
1971	207	171	186	215	212	220

* Data from: Bureau of Census and Statistics, BCS Monthly Bulletin of Statistics, October 1972; Office of Director, BCS, "Special Release" No. 139-C, "Family Income Distribution 1971, 1965, 1961."

+ Table taken from: T. Cook, An Overview of the Nutrition System of the Philippines (Office Bureau of Nutrition, TAB, AID), August 1973.

FIGURE 5. FAMILY INCOME AND FOODS COST FOR MINIMUM ADEQUATE DATA*

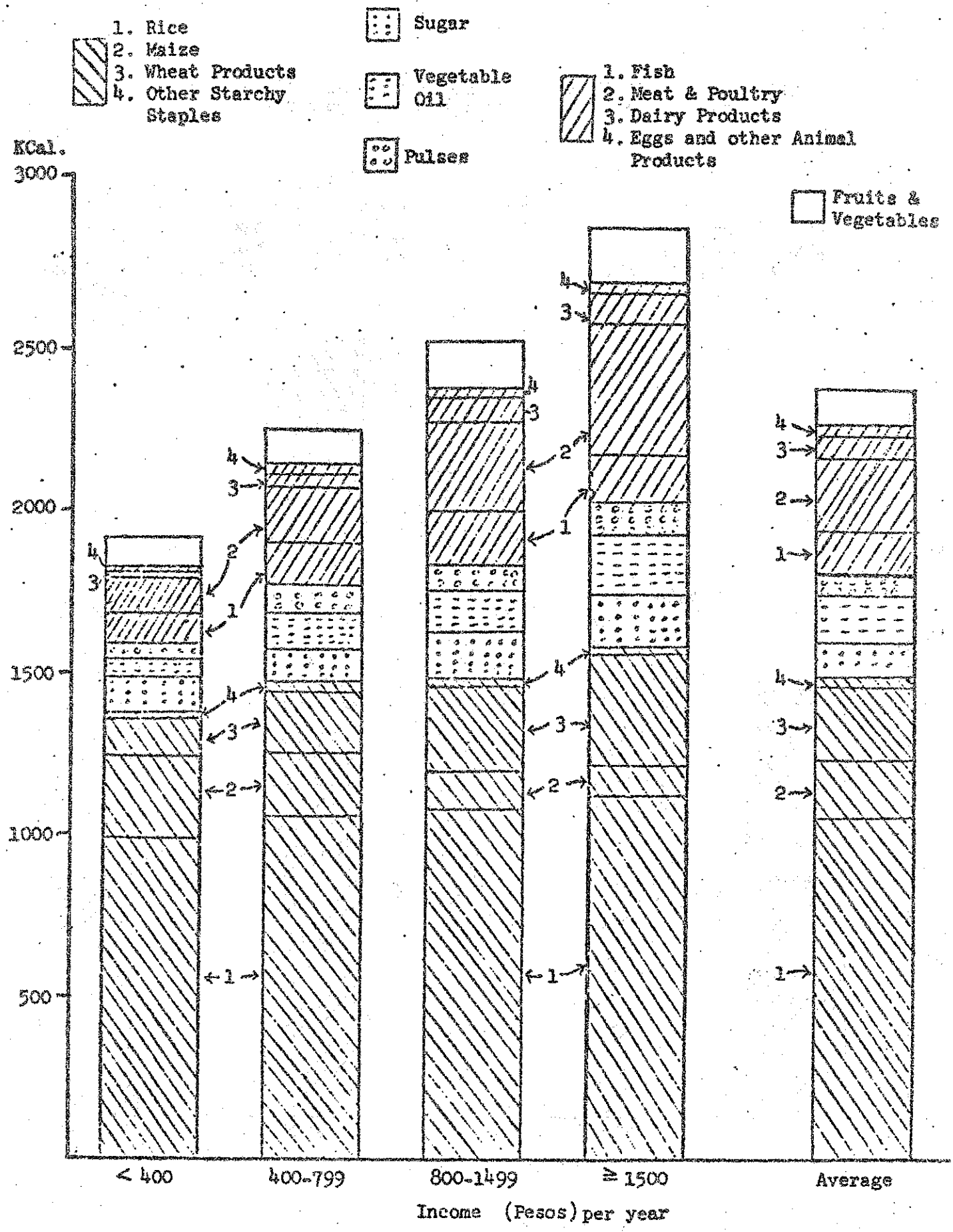


a/ Data from: T. Cook, An Overview of the Nutrition System of the Philippines (Office Bureau of Nutrition, TAB, AID), Aug. 1973.

b/ Rice Diet. Calculated by using price ceilings set by the National Economic and Development Authority, March 1973.

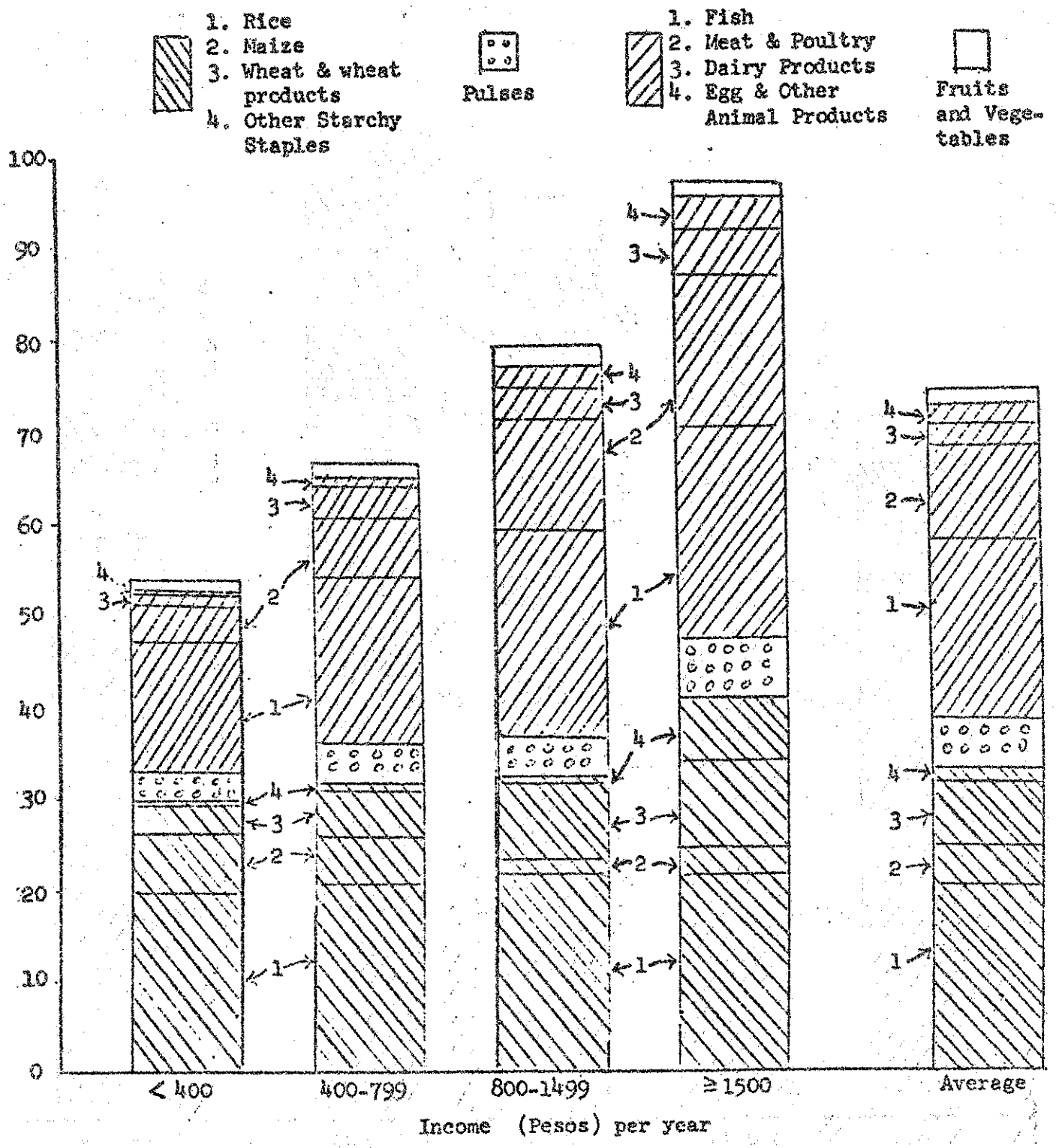
* Data Source: Appendix Table 3.

FIGURE 6. APPARENT PER CAPITA DAILY CALORIC DISAPPEARANCE BY FOOD GROUPS AND FOUR INCOME CLASSES, 1970-72*



* Data source: Appendix Table 4.

FIGURE 7. APPARENT PER CAPITA DAILY PROTEIN DISAPPEARANCE BY FOOD GROUPS AND FOUR INCOME GROUPS, 1970-72*



* Data source: Appendix Table 4.

life. Their high caloric intake may also reflect a high level of waste in preparing food, unreported family members, or frequent entertaining of friends. Finally, the difference between the first and second income groups may be a factor of the downward pull on intake of extreme poverty of those in the first income group.

In the protein group of foods (Figure 7) rice provides the highest proportion of protein of any food item except for the highest income in which fish provides slightly more. Again protein intake meets protein need in all income groups. The lowest income group receives 55 grams and the highest receives much more than needed--97 grams of protein.

Fish is the source of animal protein of the lowest income group, but it is also highly valued by the wealthy Filipino families. Seventy percent of all animal protein is obtained by the lowest income group through fish while the wealthier use only 78 percent. The wealthier Filipino family is thought to purchase the more expensive varieties of fish along with their obvious preference for meat and poultry, dairy products and eggs.

The price of animal protein foods varies a great deal. A very inexpensive fish is galunggong which sold for ₱ 1.88 in the retail markets of Greater Manila on July 1, 1972 (2, p. 2).5/ Compare this to the price of beef at ₱ 8 per kilogram for lean meat and ₱ 6.90 per kilogram for a pork shoulder (28, p. 2).

It appears that the Filipino family provides for their protein needs at the expense of their energy needs. This pattern was also noted in the dietary surveys reviewed. Perhaps the answer is one of personal choice rather than efficient economic decisionmaking. In the lowest income group, 54 percent of the protein comes from one of the cheapest food groups--the starchy staples. The remaining intake comes from the more expensive foods such as meat, poultry, fish and dairy products. It appears that even at the lowest income levels, the consumer purchases sufficient carbohydrate foods, perhaps not only to give him a sense of satiety, but also to add variety to the diet through animal and fish products. This trade-off sacrifices adequate calories for additional adequate protein from a source of higher nutritional quality. It is not known whether this choice is made purely on the basis of availability, a desire for variety in the diet, for social prestige, or in some way an acknowledgement that animal protein is nutritionally desirable in the diet.

The data presented for each of these income groups represent averages. The families that fall at the highest and lowest ends of the range are not well represented by these graphs. It is the latter group for which we would like to know just how closely intake is described. Unfortunately the data do not lend themselves to this kind of examination.

5/ Prices rose by 38 percent within 17 days following severe flooding in the Manila area.

In conclusion then, the dietary data suggest low calorie intake among school children. Protein intake is not as seriously deficient and if the Filipino RDA includes a margin of safety in its recommendation, it is likely that many school children are getting enough protein. The disappearance data by income group contradicts the above but again these data are averages and do not reflect food distribution within the family. In traditional peasant families, the adult males receive the better portion of the meal both in terms of quality and quantity and the younger family members and the women must be satisfied with what remains.

Unequal family food distribution also may explain the clinical, biochemical and anthropometric data, all of which indicate nutrient deficiencies and poor growth. On the basis of these last three data groups, a feeding program is warranted for the elementary school age child.

Finally, while the disappearance data by income group suggests adequate diets, the comparison between income and the price of the least cost diet again casts doubt on dietary adequacy, and credence to some form of family income supplementation.

IV. Brief History of Food For Peace (FFP) in the Philippines

At the end of World War II and until 1950, US economic assistance to the Philippines took the form of postwar rehabilitation (3, p. 2). After the passage of the Food For Peace Act in 1954, known also as Public Law 480, food aid to the Philippines was delivered using its authority. When PL 480 was originally placed under the administrative control of the Agency for International Development (AID), the sale (Title I) and/or the donation (Title II) of US surplus commodities was approved with little consideration to the impact of the commodities on the economy of the recipient country. About 1961, the focus of food aid was altered to permit the promotion of developmental projects as identified by the recipients' national planning councils.

In 1973, the commodity distribution program was curtailed as the stock piles of US grains diminished. Worldwide poor harvests and unfavorable weather conditions increased the demand for US commodities at a time when she also experienced poor harvest. In 1973, the total value of PL 480 distribution fell by 30 percent ($750 million) compared to 1972 ($1107 million). Total Title II assistance fell from 34 percent in 1972 to 28 percent in 1973 (3, p. 1).

The Philippines has received a total value of $237.9 million of agricultural exports from the United States during the 17 year period from fiscal year 1954-55 to 1971-72. The exports took the following forms (Figure 9): 1) Sales for foreign currency, $50.5 million; 2) long-term dollars credit sales, $76.8 million; 3) government donations for disaster relief and economic development, $10.4 million; 4) $84.4 million, donations through voluntary relief agencies; and 5) barter, $15.8 million (2, p.66). For the fiscal year 1973, the Philippines was programmed to receive $146.5 million of Title I commodities. It is interesting to note that only 26 percent is in the form of a food commodity, while 49 percent is

cotton, textiles, and yarn (3, p. 78). This is contrary to the assumptions of many observers who view PL 480 as only a food distribution program.

Until Title II, the Philippines received $14.5 million[6/] worth of commodities channeled either through voluntary agencies or government to government exchange. These commodities included wheat flour, bulgar, corn-soya-milk (CSM), rolled oats, and nonfat dry milk (NFDM) and some corn, sorghum, vegetable oil, and others (3, p. 99). The voluntary agencies received 40,000 tons worth $7.5 million in 1953 (2, p. 53) to be used for the feeding of over 1.97 million children and pregnant and lactating women (3, p. 90). Most of the remaining allotment went to either the World Food Program (WFP) of the United Nations in Manila or to the Philippines Government (3, p. 99).

The voluntary agencies have used the commodities in a number of ways to feed preschool children, their pregnant and lactating mothers, school age children, unemployed families and others requiring food aid. Over the years food aid programs have been modified as understanding of the needs of the poor has expanded. One example is a program which at one time gave food away to deserving families and has now been modified to distributing food as a wage for work on community development projects such as digging wells or repair and building of roads and bridges.

V. Production and Value of The Nutribun

The Nutribun is composed primarily of the donated FFP commodities, wheat flour [7/] and milk powder (Table 6). Over time the market values of these commodities fluctuate sharply with supply (Figure 8). During the 1970-73 period, the prices of both have been increasing as world supplies have declined. A third ingredient, oil, is donated from another source. The last three ingredients--yeast, salt, and sugar--are not donated and must be purchased at market prices. The cost of these three ingredients is ₱ 0.023 per bun as estimated by USAID in Manila in the early 1970s (30, p. 1).

The remaining production costs are nonfood costs such as utilities, manual labor, and delivery. The figures used in Table 6 for these items are again those determined in a cost analysis by USAID for a Nutribun Feeding Program in the Tondo Area of Manila. Nonfood costs (₱ 0.020 per bun) make up about one-half of the cost of the donated product (Figure 9), which is ₱ 0.043 per bun. In short, to feed a child for one school year of 140 days, almost ₱ 6 (₱ 5.978) is needed which is less than one US dollar. Furthermore, to meet the stated goal of the Philippine Government to feed 2.7 million children, over ₱ 16 million or $2.4 million is needed. Sixteen million pesos is a large sum for any third world country's educational or health budget which normally operates under limitations of resources rather than abundance.

6/ This figure includes commodity market value and value of ocean freight.

7/ A recent formulation of Nutribun contains soy-fortified wheat flour and no milk powder. Eliminating the milk powder can be expected to reduce the market value. The analysis in this discussion considers the more expensive product.

TABLE 6. COST COMPARISON AMONG SEVERAL INGREDIENT SOURCES USED IN THE FORMULATION OF THE NUTRIBUN

	Weight (g.) a/	Commodities	Market Value of Commodities	Coconut Flour i/	Coconut Skim Milk	Coconut Milk and Flour
Wheat Flour	98	d/	.0410 c/ .0712 d/	.0420 j/ .0675 j/	.0410 c/ .0712 d/	.0420 .0695
Milk Powder	14	d/	.0334 a/ .0635 f/	.0334 e/ .0635 f/	.0351 k/ .0805 k/	.0351 .0805
Oil	5	d/	0.0134 h/	0.0134	0.0134	0.0134
Water	56	-	-	-	-	-
Yeast	2	0.0120 b/	0.0120	0.0120	0.0120	0.0120
Salt	1.5	0.0002 b/	0.0002	0.0002	0.0002	0.0002
Sugar	12	0.0105 b/	0.0105	0.0105	0.0105	0.0105
Total Cost of Ingredients (Pesos) g/		0.0227	.1105 - .1708	.1115 - .1691	.1122 - .1878	.1132 - .1861
Labor b/		0.01	0.01	0.01	0.01	0.01
Utility b/		0.003	0.003	0.003	0.003	0.003
Delivery b/		0.007	0.007	0.007	0.007	0.007
Total Nonfood (Pesos)		0.020	0.020	0.020	0.020	0.020
TOTAL COST OF NUTRIBUN (Pesos)		0.0427	0.1305 - 0.1908	0.1315 - 0.1891	.1322 - .2078	.1332 - .2061
Cost per Child per School Year (Pesos)		5.978	18.27 - 26.71	18.41 - 26.47	18.51 - 29.09	18.65 - 28.85
Cost to Feed 2.7 million Children (Million Pesos) j/		16.14	49.33 - 72.12	49.71 - 71.48	49.97 - 78.55	50.35 - 77.91

a/ Formulation from A. Palmez, "Cost Computation on Nutribun Production for USAID, FFP Tondo Feeding.

b/ Based on A. Palmez, Ibid.

c/ Source: Trade Yearbook, 27, 150, Rome: FAO/UN, 1973 Average price of imported wheat flour for 1968-69 when commodity is abundant and sold at relatively lower prices

d/ Source: Trade Yearbook, Ibid., Average price of imported wheat flour for 1972-73 when commodity is in short supply and valued at relatively higher prices

TABLE 6 . (continued)

e/ Source: Trade Yearbook, op.cit.p. 87; lower price period 1968-69.

f/ Source: _____ Ibid.; higher price period 1972-73.

g/ $1.00 = ₱ 6.70

h/ Price ceiling of edible cooking oil set by Price Control Council, NEDA, The Times Journal, March 23, 1973.

i/ Coconut flour may be successfully substituted for wheat flour in a leavened bread product at a level of 5 percent.

j/ Determined by using 95% of values "C" and "D" and a 5% substitution with Copra Flour (₱0.44/kg; Hogenmaier, R., et al., "Coconut Protein Technology," PAG, II, #4, 29, 1972).

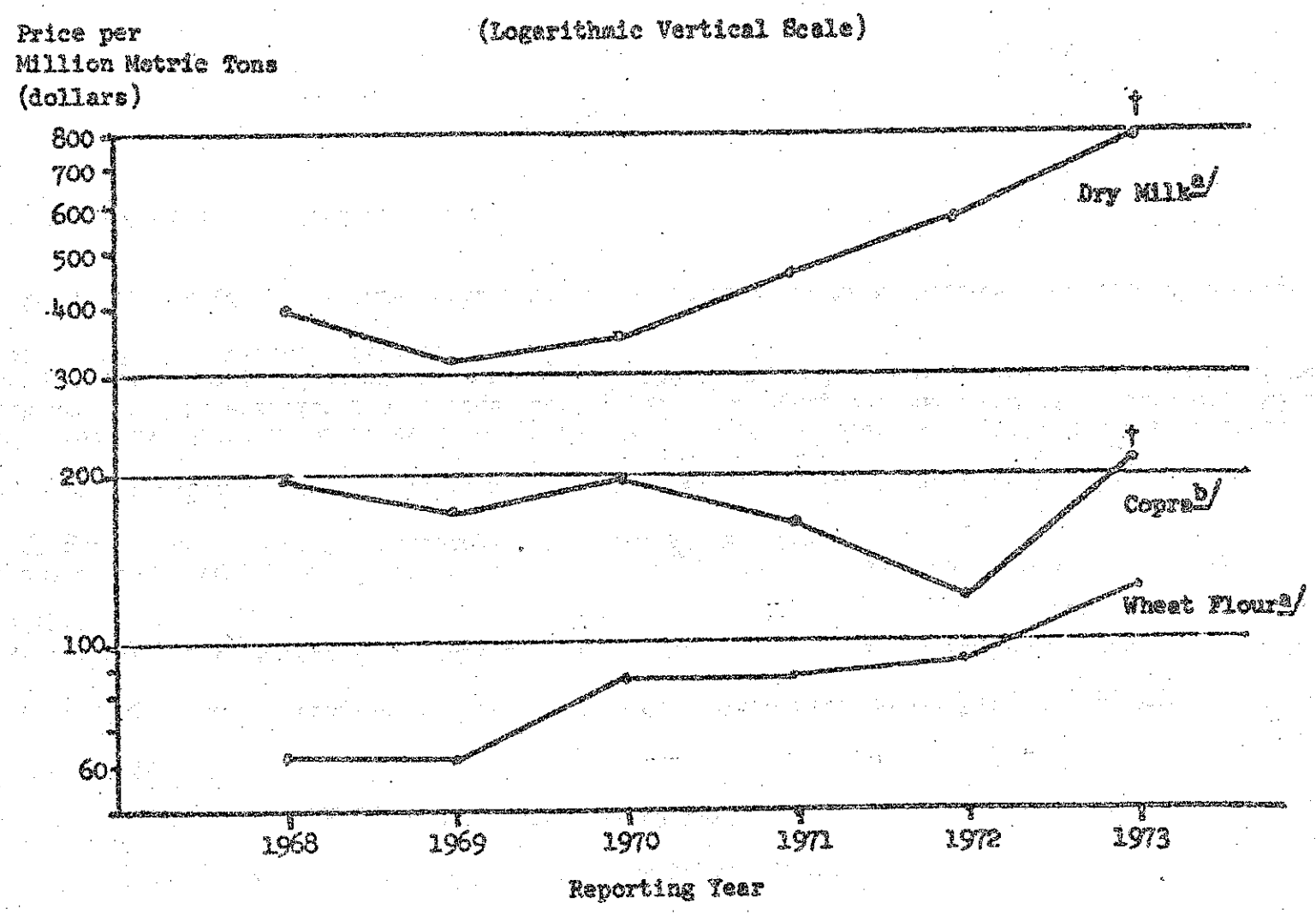
k/ Low price: ₱ 2.51/kg coconut skim milk. High price: ₱ 5.75/kg coconut skim milk

Actual cost is dependent on 1) price of extracted oil sold to cover part of the processing costs of the skim milk product; 2) efficiency of extraction; 3) costs of equipment and level of automation; 4) sale of other coconut byproducts; 5) production capacity of the plant; 6) cost of coconuts; 7) degree of refinement of the oil; and 8) unforeseen expenses.

Conditions discussed in "Recommendations to USAID for Prov. of Tech. Support to a Coconut Processing Pilot Plant . . ."

l/ Projected number of children to be fed.

FIGURE 8. VALUE OF WHEAT FLOUR, DRY MILK AND COPRA IN THE PHILIPPINES, 1968-1973*



* Data from: Trade Yearbook, FAO/UN, 27, 1973.

† Provisional a/ Import Value b/ Export Value

It is not unreasonable to expect that at some time in the future, the wheat flour and milk powder that are imported by the Philippines will no longer be free should US foreign policy change. In light of this possibility, would it be wise in terms of cost for the Philippines to continue with the Nutribun or would it be too expensive? These questions could be most adequately answered if the market prices of wheat flour and milk powder were known for the future. Since it is impossible to know precisely what future prices will be, the next best approach is to assess the past trends of prices of these commodities in order to arrive at some type of range of prices.

Between 1968-69 wheat flour and milk powder were in abundant supply (Figure 8) and prices for these commodities were at the lowest level for the six year period of 1968 through 1973. Import prices between 1972-73 were very high (Figure 8) reflecting scarcity of supply. In order to determine the market value of the Nutribun, the lowest figure of the range will be the average price for the 1968-69 period and the highest figure will be taken from the average price during the 1972-73 period. We find that the cost of wheat flour ranges from ₱ 0.04-₱ 0.07 per bun while the price of m lk powder doubles between the two time periods rising from ₱ 0.03 to ₱ 0.96 per bun. When these figures are added to those of the other ingredients and nonfood costs (Table 6), the value of the Nutribun increases from the donated price of ₱ 0.04 per bun to ₱ 0.13-₱ 0.19 per bun or three to five times the donated cost. Thus, to feed 2.7 million children, the Philippine Government will need to allocate an additional ₱ 49-72 million should donated commodities be eliminated.

VI. Commodity Substitutions

At the prospect of having the cost of the Philippine School Program skyrocket in the future, it is not surprising that the Philippine Government has begun searching for alternate ingredient substitutes, preferably from domestic sources, to replace the imported ingredients. Of the various substitutes considered, coconut products appear to be the most favored for several reasons. First, projected figures show a decrease in exports of dessicated coconut from 1972 to 1973 (80,410 metric tons to 78,049 metric tons) (41, p. 12). Second, the export price of coconut has dropped by not quite one-half from 1968 to 1972 (Figure 8: ₱ 1.66/kg. to ₱ 0.87/kg.) (32, p. 334). A price drop of another important coconut product, oil, has fallen since 1968 from ₱ 1.30/kg. to ₱ 1.20/kg (32, p. 309). These changes have encouraged the coconut industry to seek additional markets for its product.

Thirdly, coconuts are found in abundant supply in the Philippines--6,954 million nuts produced annually between 1960-66 (1, p. 103). The people are accustomed to its use and taste which is often preferred over other flavors in similar products. And finally, coconut is a source of good protein. Not only does it have a good PER[8]/ of 2.2-2.5 (29, p. 59), a protein balance study among college age women showed that nitrogen balance was not altered in those subjects fed a Nutribun diet containing a coconut substitute (20, p. 1). The amino acid pattern is also acceptable

8/ PER refers to protein efficiency ratio.

although tryptophan is limiting (13 p. 29).

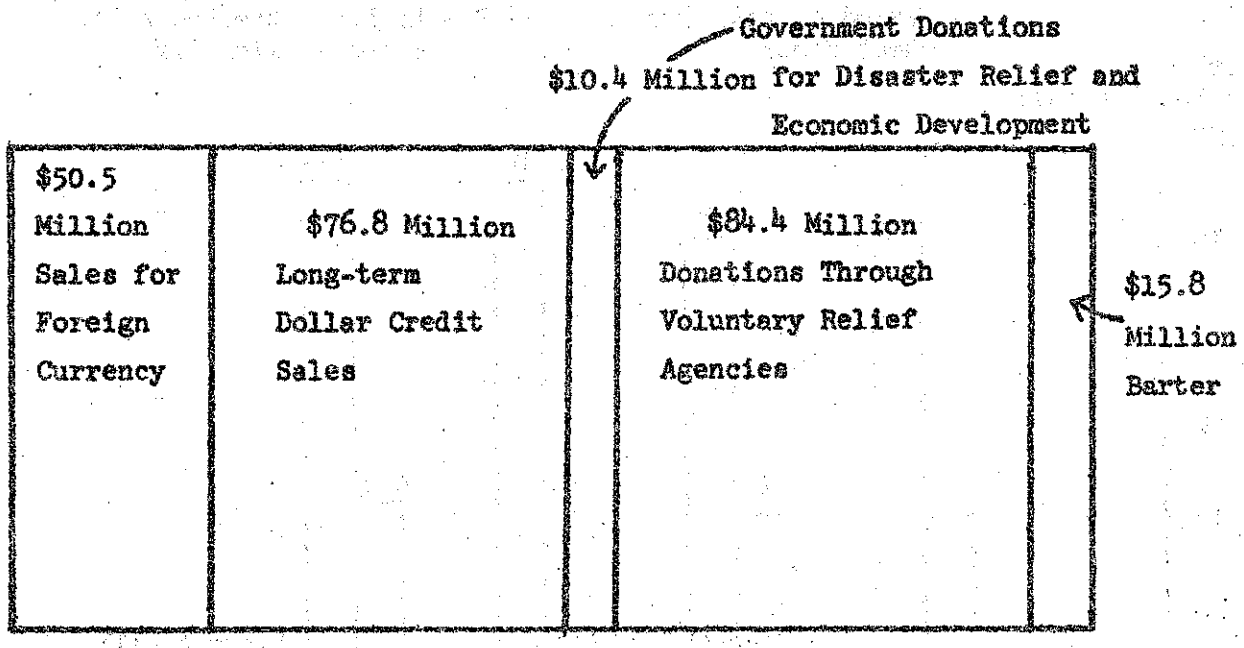
The coconut subsitute used in the balance study is coconut flour which may replace wheat flour at a level of 5-11 percent. Several "dry processes" exist for refining the raw coconut to produce the flour. Each relies on the basic steps of drying the coconut, extracting the oil and using the resulting product to produce the coconut flour (24, p. 28). The least expensive product is made from the whole coconut including the coconut parings. To produce this product, first the coconut is husked and then the whole nut including the outer brown layer is ground into flour and the oil is extracted. The final product is light brown in color and has a coconut flavor (13, p. 29). In 1972 the price per pound of coconut parings flour was estimated at 3 cents (24, p. 29). An alternative which is priced at 7 cents per pound extends the processing to removal of all outer layers of the coconut leaving only the white meat. The white maat is the desiccated coconut which we recognize as the form of coconut used in the coconut sweets, cakes and pies. Flour made from desiccated coconut is a finer, whiter flour than that made from the coconut parings. A third more complex process produces a protein isolate from the desiccated coconut which is priced at 50 cents per pound (24, p. 29). In each of the above three estimates, it is assumed that the oil is sold to cover some of the manufacturing costs of the flour product. As a result, the actual price of the flour would vary according to the current world market price of oil.

A range of costs is calculated once again to ascertain the cost effects of substituting 5 percent of the wheat flour with coconut flour. An entire coconut flour replacement cannot be made because the glutenizing quality of wheat flour which gives bread its texture is not found in coconut flour. The lowest price is found by reducing the lowest price recorded for wheat flour by 5 percent (or 4.9 grams by weight) and replacing it with the price of the coconut parings flour. The same procedure was followed for the highest price of wheat flour. Thus, the substituted flour product could cost anywhere from ₱ 0.420 to ₱ 0.068 per bun (Table 6). If the least expensive whole coconut flour product is used in the Nutribun, the coconut flour substitution is more economical only when the price of wheat is high. It could save the feeding program ₱ 0.34 per child or ₱ 0.64 million to feed 2.7 million children. However, when the price of wheat is low, the substitution is more expensive and would cost ₱ 0.14 more per child (see also Figure 10). With the bumper harvests experienced by US farmers this year, the price of wheat can be expected to fall from its previously high levels. When this does happen, the use of coconut flour will not be more economical. Thus, for dependability of supply the substitution may be recommended but not for the purpose of reducing the cost of the Nutribun.

The most expensive item in the Nutribun is the milk powder. Over the past five years, the cost of milk powder has more than doubled (Figure 8) and would appear to be a likely candidate for replacement by a less expensive product. Once again a coconut product has been formulated to replace entirely the cow's milk powder. Although it has a good quality protein, the nutrient profile does differ from the dried cow's milk most notably in its calcium content. The coconut skim

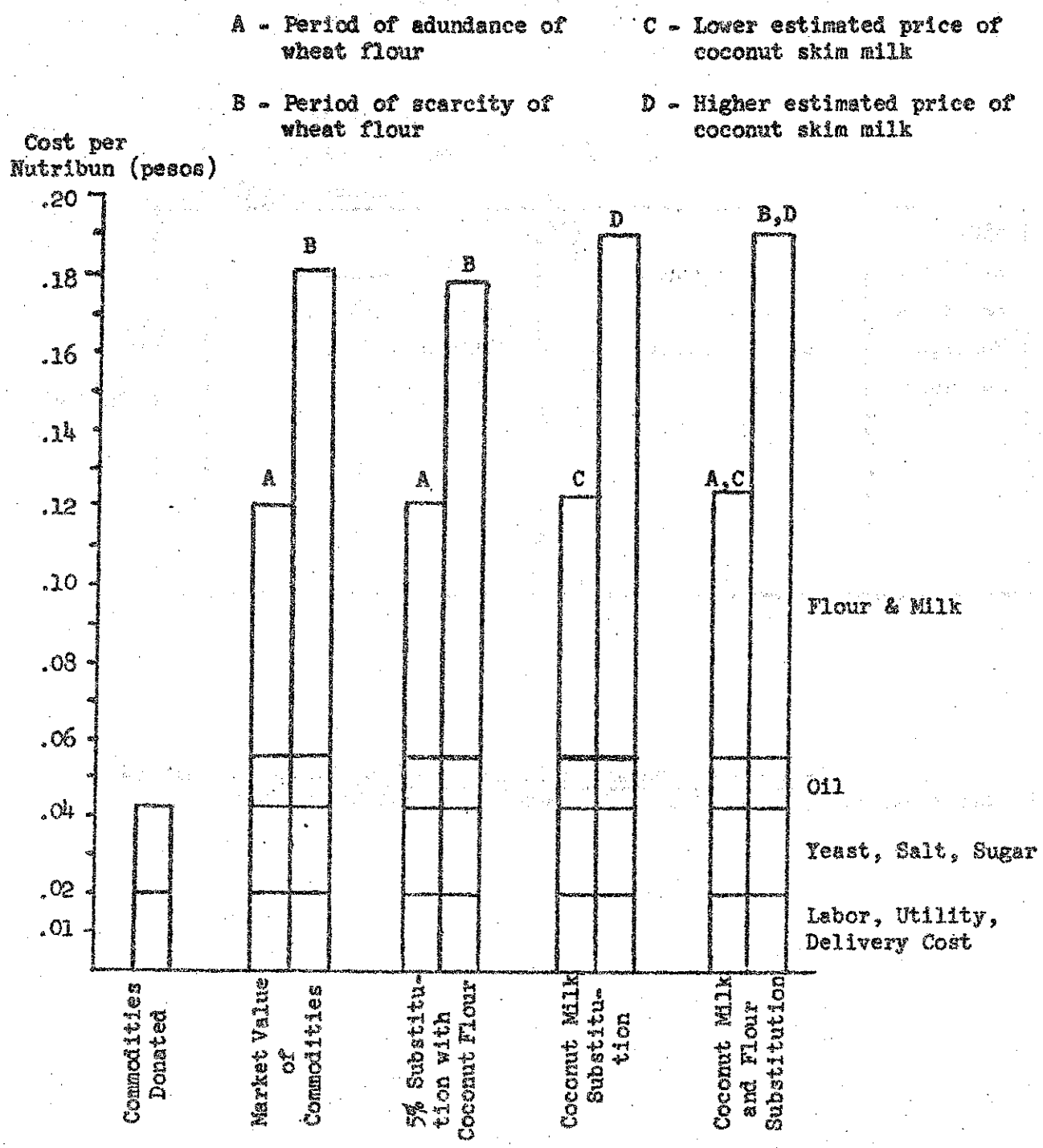
FIGURE 9. TOTAL VALUE OF UNITED STATES' PL-480 EXPORTS TO THE PHILIPPINES*

(FY 1954-55 to FY 1971-72)



* Source: 1973 Annual Report on Public Law 480, Period January 1-December 31, 1973, Washington, D.C., House Document No. 93-362.

FIGURE 10. COST COMPARISON AMONG SEVERAL INGREDIENT SOURCES USED IN FORMULATION OF THE NUTRIBUN*



* Data source: see Table 4.

milk product is made by a "wet process" in which " . . . the coconuts are ground fresh, extracted with water, the fibrous solids removed from the resulting slurry, and then the liquid centrifuged to produce oil and a low-fiber protein product" (24, p. 28).

Price estimates of wet processing quoted in the literature has risen from 16 cents per pound (24, p. 30) to 22 cents per pound (36, Annex 1, p. 9; 23, p. 5). These two estimates will be used as the end points in the cost calculation range. Milk powder is completely replaced by the coconut skim milk. Once more, the coconut product is more expensive (Table 6 and Figure 10). It increases the cost of Nutribun feeding anywhere from ₱ 0.24 to ₱ 2.38 per child or ₱ 0.64 million to ₱ 6.43 million for the program. Consequently, the use of coconut skim milk is recommended only for possible dependability of a domestic supply unaffected by foreign production.

A final look was taken at the cost of the program if the two coconut products were combined (Table 6). As expected, their use increases the price of the program from ₱ 1.02 million to ₱ 5.79 million.

The original question posed asked whether the Nutribun is the most economic means of alleviating hunger among Manila school children. To examine this question it is necessary to compare the costs of the various Nutribun formulation with the cost of the rice diet (Table 7). First, a range of costs (Figure 11) for the rice diet was determined using the price of rice at its least import price (40, p. 123; 41, p. 129) as the low value and a retail price listed in March 1973 (28, p. 1) for the high value.

During the process of reviewing rice values, it was noted that the value of Philippine rice responds closely to domestic production. Unfortunately the country does not always produce all that it needs as indicated by the need for importation of rice (Figure 12) which has the effect of increasing prices. Between 1961-73, the Philippines imported anywhere from 3 to 9 percent of that amount of rice produced in the country--an average production of 4.5 million metric tons. In 1965, the Philippines required 14 percent of its productive capacity to be imported. Very little rice is even exported--usually less than 100 metric tons. A few exceptions are noted: in 1970 and 1972 over 1000 metric tons were exported and in 1968 close to 36,600 metric tons were exported indicating that the Philippines does have the potential to more than supply her own needs but is rarely able to do so. Her failure to reach self-sufficiency is a factor of 1) the shortage of capital for small land-holding farmers, particularly those located outside central Luzon, 2) lack of access to primary markets due to poor roads, and 3) frequent disastrous climatic conditions which curtail potential production (34, pp. 6-9). Nonetheless, the Philippines has increased total rice production between 1961 and 1974 by 70 percent. She has been able to do this by utilizing the high-yielding rice varieties developed at the International Rice Research Institute in Los Banos.

TABLE 7. NUTRIENT ANALYSIS AND COST OF THE NUTRIBUN USING THREE FORMULATIONS COMPARED TO THAT OF A RICE DIET FOR A 7-9 YEAR OLD FILIPINO CHILD

	Rice Diet		Nutribun	
	528 gm.	Percent RDA*	One	Percent RDA
Protein (gm.)	39	103	17	46
Kcal	1900	100	511	27
Calcium (mg.)	111	22	200	40
Iron (mg.)	18	38	3.28	47
Thiamine (mg.)	1.58	158	0.54	54
Riboflavin (mg.)	0.63	63	0.62	62
Niacin (mg.)	0.63	5	7.3	33
Cost/day	₱ 0.69		₱ 0.0427[A)] 0.1305[B1)] - 0.1908[B2)] 0.1315[C1)] - 0.1891[C2)] 0.1322[D1)] - 0.2078[D2)] 0.1332[E1)] - 0.2061[E2)]	
Cost/gram protein per day	₱ 0.018		₱ 0.0025[A)] 0.0077[B1)] - 0.0112[B2)] 0.0074[C1)] - 0.0111[C2)] 0.0078[D1)] - 0.0122[D2)] 0.0078[E1)] - 0.0121[E2)]	
Cost/100 Kcal/day	₱ 0.036		₱ 0.0084[A)] 0.0255[B1)] - 0.0373[B2)] 0.0257[C1)] - 0.0370[C2)] 0.0258[D1)] - 0.0407[D2)] 0.0261[E1)] - 0.0403[E2)]	

A: Donated commodities: wheat flour, dry milk, oil

B_1 & B_2: Purchased commodities at low and high price estimates

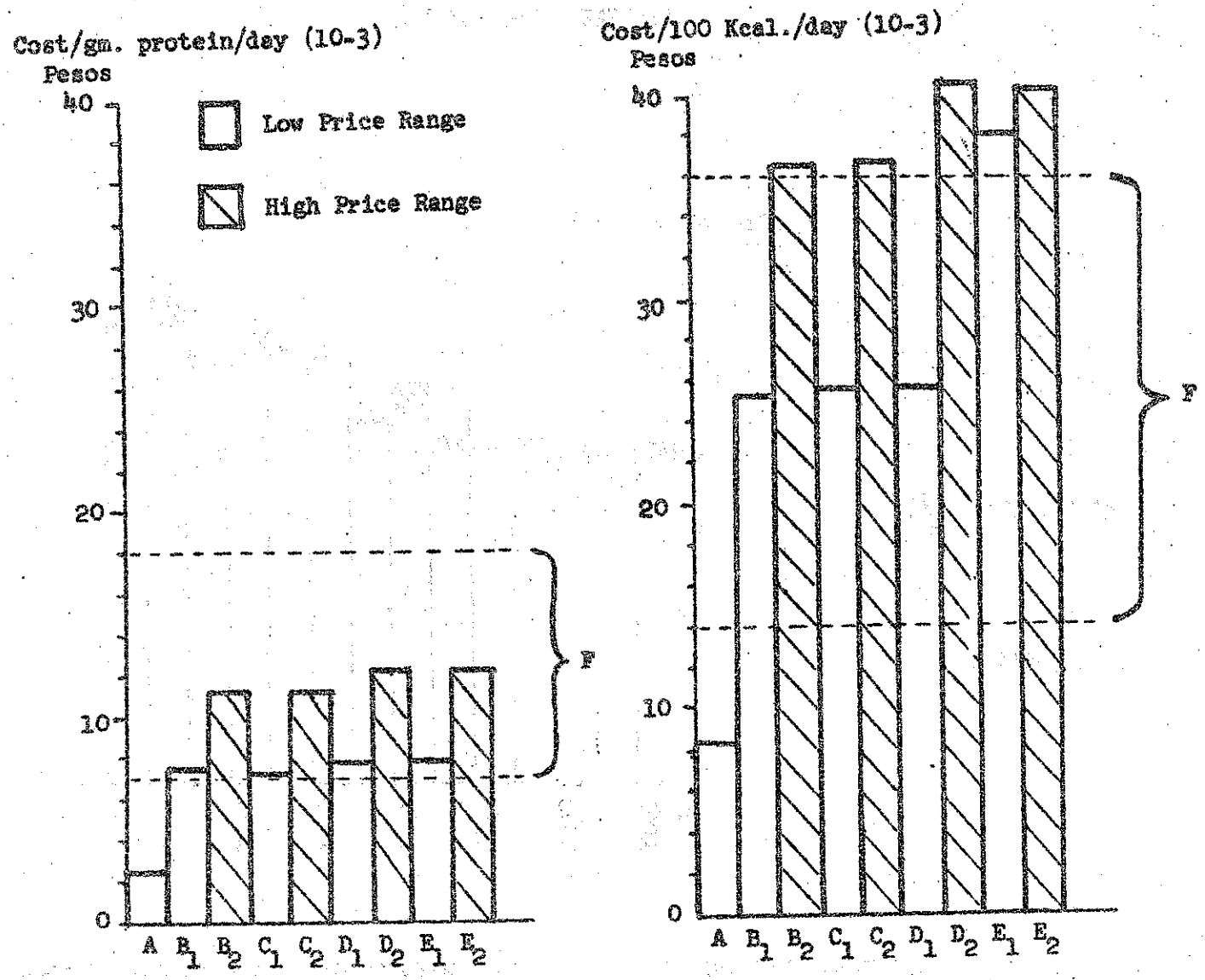
C_1 & C_2: 5 percent coconut flour substitution at low and high price estimates

D_1 & D_2: coconut skim milk substitution at low and high price estimates 5 percent coconut flour and skim milk

E_1 & E_2: 5 percent coconut flour and coconut skim milk substitution at low and high price estimates

* Data source: See Table 6.

FIGURE 11. RANGE OF COST ESTIMATES FOR NUTRIBUN COMPARED WITH RICE DIET OF A 7-9 YEAR-OLD CHILD*



A: Donated commodities: wheat flour, dry milk, oil

B_1 & B_2: Purchased commodities at low and high price estimates

C_1 & C_2: 5% coconut flour substitution at low and high price estimates

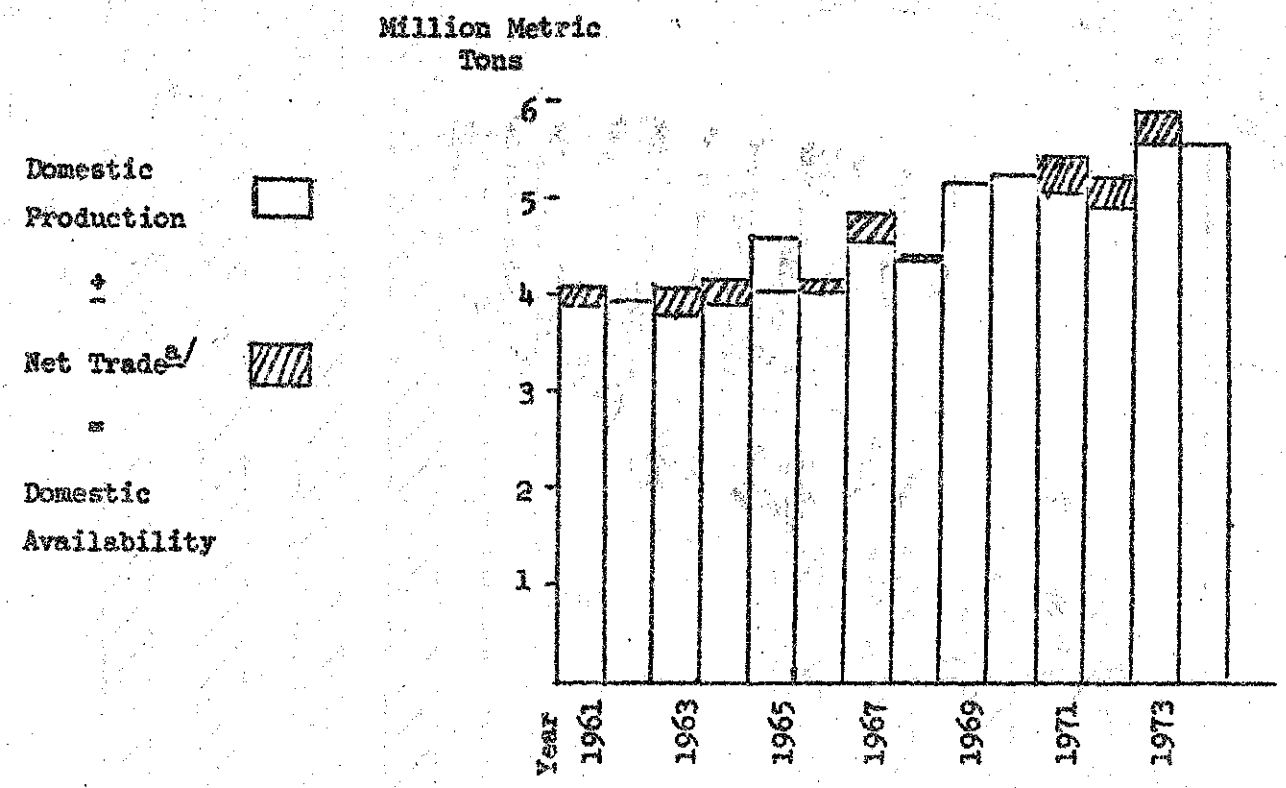
D_1 & D_2: Coconut skim milk substitution at low and high price estimates

E_1 & E_2: 5% coconut flour and skim milk substitutions at low and high price estimates

F: Range of costs of rice diet

* Data source: FAO/UN, Trade Yearbook: 1973, 27, Rome; and The Times Journal, March 23, 1973.

FIGURE 12. DOMESTIC AVAILABILITY OF RICE IN THE PHILIPPINES, 1961-1974*



a/ Net trade primarily represents imports. Exports of rice were significant only in 1968 when over 36,600 million tons were sold.

Data sources: Production Yearbook, 26, Rome, FAO/UN, p. 61
Production Yearbook, 28.1, FAO/UN, p. 47
Trade Yearbook, 25, Rome, FAO/UN, p. 123.
Trade Yearbook, 27, Rome, FAO/UN, pp. 129-31, 145, 148, 150-2.

The rice diet of Table 7 provides 39 grams of protein and 1900 Kcal. in addition to calcium, iron and Vitamin B. These intakes of protein and calories provide an adequate vegetable protein intake but should also include small amounts of an animal protein or of a legume to insure the amino acid pattern required by growing children. The rice diet costs ₱ 0.69 per day. Each gram of protein costs ₱ 0.018 per day while 100 Kcal. costs ₱ 0.036 per day.

On the other hand, the Nutribun does not deliver as much protein, calories or iron although some of the protein, i.e., from the milk pow-powder, is of a higher quality protein and provides a better amino acid pattern. It also provides twice the calcium of the rice diet which is important for an area where most sources of calcium are in short supply and very expensive. Niacin intake is also enhanced by consuming the Nutribun. Its cost varies according to the formulation used (Table 7) from ₱ 0.043 per day using donated ingredients to ₱ 0.21 per day when the coconut milk powder is used. The cost per gram of protein for the seven prices derived from the various ingredient formulations is less in each case than the rice protein. Nutribun protein costs anywhere from ₱ 0.003 to ₱ 0.012 per day. Nutribun calories are also less expensive than rice calories except at the higher price ranges (B_2, C_2, D_2 and E_2) of the Nutribun formulations.

It is clear that the donated product is usually less expensive than the rice diet. The purchased product (B_1 and B_2 of Table 7) competes with the rice diet for protein when rice is expensive and also competes rather well when rice is least expensive except in the case where wheat flour is expensive. Since rice is a much more concentrated source of calories than is the Nutribun, it is not surprising that rice calories at the low price of rice are less expensive than wheat flour calories at the lower price of wheat flour. The relationship holds true for the higher prices of both food staples, but here the Nutribun is much more competitive.

Per gram of protein, the coconut substitution presents a more expensive product but less expensive than rice when the price is high. The coconut products compete less well than wheat flour with the rice diet for calories.

VII. Uses and Limitations of the Nutribun

In the analysis above, the cost of producing the Nutribun is shown to be less expensive, in most cases, than the rice diet. Only in those years when rice prices and the surplus commodity prices were high is there competition between the two. Historically, rice prices rarely fall below the price of wheat during the same year. This means that the Nutribun made from either donated or purchased surplus commodities usually will be less expensive than a rice diet. However, using surplus US commodities to feed school children requires a heavy reliance on international trade to supply the feeding program. It can be argued that this reliance may discourage domestic production of rice. Again, it should be remembered that up to the present, Philippine rice production has rarely met domestic need and that many families are not able to afford the traditional rice diet. Until the Philippines is consis-

tently able to produce the rice needed by its population at a price commensurate with the income of the lowest income groups, supplemental feeding programs such as the Nutribun program will be needed. Once rice production has increased and stabilized, this feeding program will have outlived its usefulness and should be abandoned or redesigned to utilize domestic foods. Imported foods should be used as a "stop-gap" measure only during that time when domestic production of a local staple does not meet the need of the local population.

The expense of the coconut substitutions requires a very careful consideration of their use. It appears that they are not more economical than an imported flour product. However, their use may be justified in other terms. Once the means for their production are established, the coconut products would provide a domestic and dependable food product unaffected by the policies and production of other countries. The demand for production of coconut products could provide additional sources of employment in a country where unemployment is high. Finally, in the event that the ingredients would need to be purchased, domestic substitution of a coconut product would provide a means of saving valuable foreign exchange.

REFERENCES

1 Isabel C. Abdon, "Coconut as a Source of Protein," Phil. J. Nutrition, April-June 1969.

2 Agricultural Economics, Statistical and Market News, August 2, 1972.

3 1973 Annual Report on Public Law 480, Period January 1-December 31, 1973 (House Document No. 93-362, Washington, D.C.).

4 M. Bohdal and W. K. Simmons, "A Comparison of the Nutritional Indices in Healthy African, Asian and European Children," Bulletin World Health Organization, Vol. 40, No. 1, 1964.

5 J. Bulatao-Jayme, et al., "The Nutritional Reevaluation of the Bayambang Applied Nutrition Program," Phil. J. Nutrition, Vol. XXIII, No. 3, 1970.

6 M. M. Caedo, "Nutrition Programs, Province of Bulacan" (USAID/Nutrition/Philippines, draft manuscript, 1973).

7 G. A. Camcam, "The Heights and Weights of School Children in Relation to Economic Status," Phil. J. Nutrition, Vol. XX, No. 1.

8 Catholic Relief Services-USCC, "An Evaluation of Nutrition Education Programs," (Incentive Grant AID/CED-2462, March 1972).

9 Manila, National Census and Statistic Office of the Philippines, National Economic and Development Authority, Census of Population and Housing, 1970 Census.

10 F. H. Chaffee, et al., Area Handbook for the Philippines (Washington, D.C.: Superintendent of Documents, US Government Printing Office, 1969).

11 Thomas M. Cook, An Overview of the Nutrition System of the Philippines (Office of Nutrition, Bureau for Technical Assistance, Agency for International Development, August 1973).

12 L. B. Darrah and F. A. Tongson, Agricultural Marketing in the Philippines (Laguna, University of the Philippines, College of Agriculture, 1969).

13 R. W. Engel, "Coconut Flour as a Food Resource in the Philippines," PAG Bulletin, 1974.

14 R. W. Engel and A. S. Fraleigh, "The Nutribun: A Ready-To-Eat Complete Meal," LIFE, March 1972.

15 J. E. Eusebio, "Factors Affecting Food Consumption" (Paper presented at the Workshop on Training of Community Workers, East-West Food Institute, University of Hawaii, Honolulu, Hawaii, February 10-21, 1975).

16 Joint FAO/WHO Expert Committee, Energy and Protein Requirements, (Rome, 1973).

17 Food for Peace in the Philippines (Washington, D.C., Cheechi and Company, draft manuscript).

18 Food and Nutrition Prop. (Proj. No. 492-69-560-252, USAID/HPA/Philippines, September 1, 1973, mimeo.).

19 F. J. Ford, "Can an International Standard for Malnutrition be Devised?" J. Tropical Pediatrics, Vol. 10, 1964.

20 C. S. Formacion, "Wheat and Coconut Flour Utilization by Six College Women," (M.S. degree thesis, VPI/SU, Blacksburg, Va., 1972).

21 F. D. Goldfield, Pocket Data Book, USA 1967 (US Department of Commerce, Washington, D.C.: US Government Printing Office, 1966).

22 V. Gorospe and R. L. Deatz, The Filipino in the Seventies (Quezon City, 1973).

23 R. D. Hagenmaier, C. M. Cater and K. F. Mattel, "Aqueous Processing of Coconuts: Economic Analysis," J. American Oil Chem. Soc., Vol. 52, No. 1, 1975.

24 R. D. Hagenmaier, P. Quinitio, and K. F. Mattel, "Coconut Protein Technology," PAG Bulletin, Vol. 2, No. 4, 1972.

25 C. Ll. Intengan, "Recommended Dietary Allowances for Filipinos--1970 Revision," Phil. J. Nutrition, Vol. XXIII, No. 2, 1970.

26 C. Ll. Intengan, "What is the Protein Gap?", Phil. J. Nutrition, Vol. XXVI, No. 1, 1972.

27 R. L. Jackson, "Effect of Malnutrition on Growth of the Pre-School Child," in Pre-School Child Malnutrition - Primary Deterrent to Progress (Publication 1282, Washington, D.C., Food and Nutrition Board, NAS-NRC, 1966).

28 "New Price Ceilings Set," The Times Journal, March 23, 1973.

29 C. L. Miranda, et al., "A Biological Evaluation of Coconut Flour," Phil. J. Nutrition, Vol. XXI, No. 2, 1968.

30 A. Palmez, "Cost Computation on Nutribun Production for USAID FFP Tondo Feeding," (mimeo.).

31 "The Philippine School Nutrition Program," (Food for Peace/ USAID, mimeo.).

32 FAO, Stat. Div., Production Yearbook, 1973 , Vol. 18, Rome.

33 FAO, Stat. Div., Production Yearbook, 1974, Vol. 28.1, Rome.

34 Quarterly Economic Review, Philippines, Taiwan (Annual Supplement 1975, London, The Economist Intelligence Unit).

35 E. S. Quiogue, et al., Nutrition Survey of Metropolitan Manila, (FNRC, NSDB, 1962).

36 "Recommendations to the US Agency for International Development for Provision of Technical Support to a Coconut Development Pilot Plant to be Constructed and Operated by the Government of the Philippines," (Food Protein Research and Development Center, Texas A and M University, July 1973, Annex 1, mimeo.).

37 E. L. Santos, et al., Income and Food Consumption, Philippines, (National Food and Agricultural Council, Marketing Research Unit, No. 73-8, May 1973).

38 H. C. Stuart and S. S. Stevenson, "Physical Growth and Development," in Textbook of Pediatrics, Waldo E. Nelson, ed., 7th ed., (Philadelphia, 1959).

39 T. Tezuka, "Annual Changes and Differences in Status of Nutritional Intake and Physical Parameters Among the Japanese," The Annual Report of the National Institute of Nutrition (Tokyo, 1969).

40 FAO, Stat. Div., Trade Yearbook, 1971, Vol. 25, Rome.

41 FAO, Stat. Div., Trade Yearbook, 1973, Vol. 27, Rome.

42 J. C. Waterlow and P. R. Payne, "The Protein Gap," Nature, Vol. 258, November 13, 1975.

43 J. C. Wolgemuth and L. Manlulu, "Weight Response of Filipino Elementary School Children," J. of Nutrition, Vol. 103, No. 7, 1973.

44 J. C. Wolgemuth, "Evaluation of a School Feeding Program in Manila," (draft manuscript, 1973).

APPENDIX

TABLE 1. WEIGHT SURVEY OF ELEMENTARY SCHOOL CHILDREN IN BULACAN*

(weight in pounds)

Grade	Number of Children	Average Weight	Percent of Standard a/
I	777	39.3	72.9
II	757	43.4	72.5
III	673	48.1	71.7
IV	629	52.8	71.9
V	625	58.0	72.2
VI	499	64.8	74.9
TOTAL/Average	3960	49.5	72.5

* Data from M. M. Caedo, "Nutrition Program, Province of Bulacan" (USAID/Nutrition, Philippines, draft manuscript, 1973).

APPENDIX

TABLE 2. DISTRIBUTION OF FAMILIES AND TOTAL FAMILY INCOME IN THE PHILIPPINES AND IN MANILA AND ITS SUBURBS, 1965*†

Income Class	Philippines		Manila and Suburbs	
	Families	Income	Families	Income
(Pesos)				
TOTAL (thousands)	5,126	₱ 13,023,610	458	₱ 3,016,318
Percent	100.0	100.0	100.0	100.0
< 500	11.6	1.4	0.8	(0)a/
500 - 999	17.7	5.3	2.4	0.3
1,000 - 1,499	16.7	8.1	5.3	1.0
1,500 - 1,999	13.5	9.2	9.0	2.4
2,000 - 2,499	9.9	8.8	11.9	4.1
2,500 - 2,999	7.6	8.1	9.9	4.1
3,000 - 3,999	8.9	12.1	14.8	7.8
4,000 - 4,999	4.6	8.0	10.3	7.0
5,000 - 5,999	2.8	6.0	7.3	6.0
6,000 - 7,999	2.5	6.8	7.7	7.9
8,000 - 9,999	1.5	5.4	6.3	8.5
10,000 & over	2.6	20.8	14.3	50.9

* Table from: V. R. Gorospe and R. L. Deats, The Filipino in the Seventies (Quezon City, 1973).

† Data from: "Family Income and Expenditures 1965," Series No. 22, The BCS Survey of Households Bulletin.

a/ Less than 0.05 percent.

APPENDIX

TABLE 3. FAMILY INCOME AND FOODS COST FOR MINIMUM ADEQUATE DIET*
(cost in Pesos)

Income Decile	Average Annual Family Income a/	Percent Income Spent on Food b/	Annual Adequate Diet Cost c/	Difference d/
1st	466	80	1860	1,488
2nd	909	75	1860	1,198
3rd	1,318	75	1860	876
4th	1,728	75	1860	564
5th	2,191	62	1860	502
6th	2,748	62	1860	157
7th	3,416	45	1860	0
8th	4,432	45	1860	0
9th	6,307	32	1860	0
10th	13,850	32	1860	0

* Table from T. Cook, An Overview of the Nutrition System of the Philippines (Office of Nutrition, Bureau for Technical Assistance, AID, August 1973).

a/ Data from Office of the Director, Bureau of the Census and Statistics, Special Release No. 139-L, February 1973, "Family Income Distribut on 1971, 1965, and 1961.

b/ Estimates based on Family Income and Expenditure Survey, 1965, Survey Division, Bureau of Census and Statistics.

c/ The diet was taken from a USAID study. Cost information was updated. Between this study and the previous 1970 study, the low income consumer has gained almost no real buying power.

d/ The deficit between income available for food expenditure and costs of an adequate diet based on local food habits can be reduced somewhat for lower income groups by purchasing corn instead of rice, increasing purchases of beans, replacing some of the dried fish, and growing food in backyard gardens.

APPENDIX

TABLE 4. APPARENT PER CAPITA DAILY CALORIC AND PROTEIN DISAPPEARANCE BY FOOD GROUPS AND FOUR INCOME CLASSES, 1970-72*

Food Group / Income Class →	Calories (KCal.)					Protein (gm.)				
	400	400-799	800-1499	1500	Ave.	400	400-799	800-1499	1500	Ave.
Rice	990	1062	1087	1117	1064	19.3	20.7	21.1	21.7	20.7
Maize	255	180	105	90	167	6.7	4.7	2.7	2.4	4.1
Wheat & Wheat Prod.	119	191	256	343	227	3.6	5.8	7.8	10.5	6.9
Other	15	17	17	18	17	0.6	0.7	0.6	6.6	2.1
Starchy Staples TOTAL	1379	1450	1464	1568	1465	30.2	31.9	32.2	41.2	33.8
Sugar	96	129	148	159	133	-	-	-	-	-
Vegetable Oil	62	106	133	184	121	-	-	-	-	-
Pulses	49	61	82	97	72	3.3	4.1	5.5	6.6	4.9
Fish	96	130	152	161	135	13.7	18.4	21.6	22.9	19.2
Meat & Poultry	90	175	275	389	232	3.9	7.4	11.8	17.2	10.1
Dairy Products	25	44	70	83	56	1.3	2.2	3.6	4.2	2.8
Eggs & Other Animal Products TOTAL	222	369	528	673	448	19.7	29.5	39.3	47.3	34
Fruits & Vegetables	92	98	147	158	124	1.3	1.0	2.0	2.1	1.6
GRAND TOTAL	1900	2213	2500	2839	2363	54.5	66.5	79.0	97.2	74.3

*Sources: Santos, et al., Income and Food Consumption, Philippines, Dept. of Agric. 1973.