

I. SUMMARY

It is estimated that two thirds of Brazil's 95 million inhabitants are malnourished due to poverty and to poor dietary habits. These factors are discussed below and in subsequent sections.

Statements about the extent of the malnutrition problem in Brazil are based partly on observation and partly on limited, incomplete studies conducted in certain areas of the country. Yet, both visual evidence and the limited studies conducted support the conclusion that malnutrition is a widespread problem in Brazil. It is seen in every state, in every city and in every municipality of the country. About one area, in the State of Rio de Janeiro, for instance, Brazil's National Food Commission reports:

"The average intake of protein is low in quality as well as in quantity, with daily consumption of 49.5 grams of which only 36 percent are of animal origin. The diet of the population studied is inadequate, for in addition to its low purchasing power, the agricultural and animal production is not sufficient to permit an adequate food balance. As a consequence, the average levels of per capita consumption of calories and other nutrients are below the daily requirements recommended." (See Tables ~~II~~ and ~~III~~ for recommended dietary allowances and the results of the Northeast nutrition survey of May 1963)".

The problem of protein deficiency has been recognized by both the government and the private sector, and a wide range of activities are already under way towards meeting this need. Within the Brazilian Government, the National Food Commission (CNA) was established in the Ministry of Health in 1945, to coordinate and stimulate Brazilian efforts to improve all aspects of nutrition, including food fortification. Although it has never been a strong and dynamic entity, its role is recognized and its legal attributes have been well defined. Academic institutions and research centers at Ribeirão Preto, Recife, Campinas, São Paulo and Rio de Janeiro are already contributing, with a broad spectrum of activities, to nutrition improvement and food fortification. Furthermore, Brazil differs from most other developing countries in that it already has a high degree of sophisticated technical know-how in its food industry. Thus, with a relatively limited input in technical assistance and financial support for experimental and pilot plant equipment, Brazil could increase significantly its availability of high-protein foods and fortify some of its food staples.

Consideration must be given to the premise, however, that solving nutritional deficiencies requires a different approach than, for example, building a hydro-electric plant. There is no one way to do it. Various foods must be produced, processed, and presented to consumers for acceptability. Various possibilities of food fortification, both as to the vehicle and the additive, must be experimented - and many will be rejected. A systems approach to the problem is required and cost/benefit studies will have to be made to evaluate the alternatives. But, in combatting malnutrition, many approaches can and should be used. This project is

designed to explore those that X at the outset appear most feasible, and as a result of such preliminary efforts, to develop additional ways of attacking the problem.

The goals of this activity are: (1) to raise the level of protein consumption of target groups to within the range of recommended daily dietary allowances by ~~XXXXX~~ making available high-protein foods at low cost or fortifying basic commodities; (2) to strengthen the official coordinating entity, the National Food Commission (CNA) so that it will have a stronger voice in formulation of national ~~XXXXX~~ policies regarding food and nutrition, acting as a catalyst in stimulating public and private initiatives geared to solve Brazil's malnutrition problems; and (3) to strengthen the food research and technology institutes' capability to develop and process the required foods.

As can be noted, the minimum Brazilian outputs necessary to make effective use of the U.S. assistance to be provided herein, are already existing. CNA is an on-going institution and the food research and technology research institutes have been in operation for some time. Our assistance will greatly accelerate attainment of the ultimate goal of increasing protein intake of affected population groups.

Project activities to be coordinated by CNA, will be divided in two groups:

1- Experiments to fortify and then programs to introduce the two fortified basic commodities: mandioca flour and bread. These are shown by surveys to be the most widely consumed foods in the low-cost range, especially in the RE, but also in urban areas throughout Brazil.

2- Gaining wider use in maternal/child health and in school lunch programs of several protein foods or protein additives which, for a variety of reasons, have been unable to reach the take-off point, and introducing these into the commercial market.

There are a number of specific fortification agents that will be tested. These include: Fish protein concentrate; a soy-milk product (Solein); torula yeast; soy protein isolate; lysine, and possibly others.

The tests of the economic and technical feasibility of various fortification additives will be carried out in conjunction with a number of universities, government research or food technology centers as well as with the industrial enterprises which produce the foods or food-fortificants described above. The major consumers, during both the experimental phase of the activities and subsequently, will be such government feeding programs as the National School Lunch Program (CNAE), National Department of the Child (recently renamed the Coordination of Maternal/Child Protection) and other welfare or institutional feeding organizations. When the products reach commercial production, the consumers and beneficiaries will also be the public at large.

The project is consistent with GOB and USAID goals in Health and nutrition. The GOB has demonstrated its concern through the creation and budget support of CNA and DNCR. The USAID in its FY 71 CFS states: "We want to encourage the GOB to extend maternal and child health and nutrition facilities much more widely..." (See the FY 71 Country Field Submission, page 17).

This project is expected to run for five years. The total financial Brazilian inputs are estimated at Cr\$24,002,000 or the equivalent of US\$5,298,454. The total estimated life of the project cost to USAID is \$569,240. The dollar equivalent of \$53,700 in Trust Funds will also be required.

II. SETTING OR ENVIRONMENT

It is estimated that the problem of malnutrition in Brazil affects over 60 million people. Its effects are observed most acutely in the NE and North, in the shanty-towns of large cities and in rural areas throughout the nation. The people who live on the periphery of São Paulo and in the "Favelas" of Rio de Janeiro, for instance, present the same degree of malnutrition as those of the Northeast and in the Amazon region. In the state of São Paulo (the most highly developed area of Brazil) of the 19-year old boys recently called up for military service, 60 percent were rejected, mainly because of insufficient height and weight, indicating chronic malnutrition since early childhood.

The poorer classes suffer the effects of these deficits most severely as shown in the high infant mortality rates and widespread incidence of endemic diseases, low scholastic results and indisposition towards physical effort. More than one-half (51%) of all children born in Brazil die before 5 years of age. The root causes of this problem are the prevalence of communicable diseases, poor environmental sanitation and malnutrition (See Non-Capital Project Paper (PROP), National Public Health Planning and Coordination, September 12, 1969, Tables 2 and 3). In addition, the growing trend from rural to urban living results, in many instances, in a deterioration of nutritional status. When the poor farmer migrates to the city, he leaves the "soil-to-mouth" maintenance of his family (with perhaps some exchange of food with his neighbors) and enters an economic structure where all his family's food requirements must be purchased for cash. He is usually ill-prepared for employment and can earn only a minimum wage, which does not permit the purchase of adequate foods for himself and his family. He is thus even worse off than before. Moreover, due to ignorance, the family is usually unable to select proper foods even if the money should be available. But malnutrition in Brazil is not only due to low income; it is also due to the non-availability of high-protein or properly fortified foods that fall within the basic dietary patterns as well as within the food budget.

In addition, it is becoming more widely recognized that malnutrition is a preponderant factor not only in retarded mental development of infants and pre-school children but also in poor educational achievement of school children. Recent research shows that malnutrition during formation of the fetus and in the first years of life provokes retardation of cerebral development which may lead to irreversible deficiency in mental capacity. In addition, malnutrition results in low productivity of labor which limits social and economic development in general.

The maternal/child health program, a high priority of the Ministry of Health, can be assisted considerably if production of high-protein foods is stimulated and made available at low cost to mothers and pre-school children as well as through the national school lunch program. Fortification of school lunch commodities will provide extra protein to this vulnerable segment of the population over 11 million of whom receive school feeding; for some their only meal of the day. Other institutional consumers, such as those assisted by welfare programs, the armed forces, the hospitalized etc. will also benefit from the improved diet not to mention the general public when these new or enriched foods become increasingly available.

There exist in Brazil today several governmental and non-governmental agencies, such as the National Food Commission, the Brazilian Association of Food Industries, the Marine Research Institute, the Food Technology Institute at Campinas, and others already undertaking a number of self-contained projects as described briefly in this PROP, but there is great need for additional technical and financial assistance. Since this subject must be approached with considerable caution to assure that alternative ways of achieving the goals are considered and measured, this project, therefore, is also designed to bring together and examine a number of separate initiatives and attempt to systematically and intelligently support those that appear to have the greatest merit, i.e. chance of succeeding.

III. GOALS AND STRATEGY

One of the principal goals of this project as already stated, is to raise the levels of protein consumption of target groups of the population. How? (Through the production and marketing of new low-cost protein foods and the fortification of basic food commodities.)

By how much? Enough data do not exist at the present time to base an intelligent forecast of protein consumption increments that would result from this project. Yet, it is hoped that during its life, the participating Brazilian agencies will conduct the necessary research in selected areas to determine project impact as judged by the new and additional enriched foods that will reach the vulnerable population sectors as a result of this project.

However, it can be stated now that providing extra protein to mothers and pre-school children will upgrade their nutritional status, improve maternal and child health, and tend to diminish infant mortality; that fortification of school-lunch commodities will provide extra protein to some 11 million children who are benefitted by school feeding; and that - based on results of international research in many countries, gathered and published by FAO-increased consumption of protein will help increase the productivity of the workers who eat the protein-rich foods, thus contributing to the socio-economic development of the nation.

At the same time, it is also a principal goal to strengthen the coordinating nutrition entity, CNA and to strengthen the various academic and research centers collaborating with private industry groups involved in this effort.

CNA is recognized as having primary responsibility in this field. However, as CNA is not today a sufficiently strong or effective organization to carry out without support a systematically planned food fortification program, a basic objective of this project is also to build into CNA an institutional capacity to administer and coordinate the program set out here.

Diagrammatically, the strategy follows the pattern shown below:

FORTIFICATION OR PROTEIN FOODS (Production and/or Commercialization)	RESEARCH AND/OR PILOT TEST CENTERS	USERS	TARGET
Fortify Mandioca " Bread	Universities and Nutrition Institutes	School Lunch (CNAE)	Higher Protein Consumption
Produce FFC	Food Technology and Food Research Centers	Maternal/Child Health (CPMI)	
" Solein	Marine Research Inst.	Public Welfare Programs	
" Torula " Others	Food Industry	Military Commercial Market	

These activities will be coordinated and supported by CNA.

Initially, efforts will be concentrated on:

a) Mandioca fortification:

This is a long-range activity, with technical support by AID/W Technical Assistance Bureau, which is considering it partially as a regional project because of its world-wide implications. Although AID/W will provide technical support, the responsibility and greater part of the work will be carried out by Brazilians with USAID assistance. The fortification of mandioca will be undertaken initially with soy protein isolate, the only protein additive currently being produced commercially in Brazil. As other products for fortification reach the point of production, their use in fortifying mandioca will also be investigated.

The project includes clinical work with laboratory animals and children, ^{Experiments are already} under way at the British-American Hospital in Lima, Peru, ~~and will be~~ performed at the Medical School (metabolism center) at Ribeirão Preto, São Paulo, as well as at the Institute of Nutrition of the Federal University of Pernambuco in Recife. The company which produces the soy protein isolate, SANERA, is already researching the technical aspects i.e. mixing, packaging, infestation, shelf-life, etc. Economic and ^{logistical} ~~logistical~~ studies will be undertaken in the municipality of Araruama in the State of Rio de Janeiro, and perhaps at a second site near Recife. (Dr. Altschul's recommendations to Minister Ellis, DOM, made after his visit to Brazil and details in Airgram AIDTO CIRCULAR A-869 of April 6, 1970, ~~attached~~ should be considered as integral parts of this PROP and read accordingly).

b) Fortification of Wheat with synthetic amino-acids (lysine and methionine):

The addition of amino-acids raises the qualitative value of the proteins to which they are added. The Ajinomoto company of São Paulo currently imports around 40-50 tons of lysine and methionine monthly, mostly for use in poultry feeding, but is

discussing with SULLIVAN the possibility of support for setting up a plant in the Northeast. Lysine has been used very successfully in India and Japan for bread enrichment and the Institute of Nutrition in Recife is preparing a project on wheat fortification for presentation to USAID for its support. The General Manager of Recife's largest flour mill has promised to contribute the flour for testing, to prepare the mixtures, and if necessary bake the bread to be used in the research. Basic surveys on consumption trends of bread and other wheat products are required, as well as the clinical testing of the fortified products. Both technical and financial assistance are required for this sub-project.

c) FPC (Fish Protein Concentrate):

This is a tasteless, colorless, odorless powder containing 88.1% protein which can be added to a wide variety of baked goods, soups, stews, etc. at very low cost. The Marine Research Institute has developed a process to produce FPC from cheap fatty fish, such as sardine, abundantly available in Brazilian waters. The oil extracted, using ethyl alcohol which is also abundantly available from Brazilian sugar-cane, has potential commercial value and might become an export item as it is used extensively in Europe for margarine. Thus the FPC would become a by-product, at extremely low cost, contributing to improved nutrition and also to the economic development of the country.

A team of 5 PASA technicians surveyed for two weeks the local production methods and utilization of the product in the school lunch program. They recommended a small input of machinery at the Marine Research Institute to permit needed critical experiments prior to large-scale production. Financial assistance is required for the purchase and installation of this machinery (in a building which the Institute has already constructed for it) as well as on the experiments recommended; financing and possibly some machinery may be required for a survey of the fish oil situation. (See FPC Report and Airgrams TOAID A-2256 of 9/30/68; A-444 of 5/15/69; A-881 of 9/4/69 and State 029875 of 2/28/70, which should be considered as an integral part of this PROP and read accordingly).

c) Soy Milk (Solein):

This product is a combination of soy milk and cow's milk, containing ~~55%~~ 55% protein. It has been amply tested at the National Department of the Child of the Ministry of Health (which purchased a small quantity of the product until its funds were cut back and published a report of the excellent results of its use). It can be purchased at a cost lower than milk and could be widely utilized by various institutional feeding programs. Production is seriously hampered by lack of spray drying equipment which financial assistance could make available. In giving this product a high priority, it should be noted that enormous tonnages of U.S. powdered milk are now brought into the country under the Food for Development program. As FFD phases down, local production of milk and/or milk substitutes will have to be increased. Solein is an excellent milk substitute, can be produced at a lower cost, and could make an excellent contribution to the self-sufficiency of Brazilian institutional-feeding programs.

e) Torula:

This is a high-protein product made from sugar-cane waste. Although the Brazilian product has to date been used only for animal feeding, the results have been spectacular. Competent technicians advise that it is not difficult to refine it further for human consumption. (It may be worthy to note that torula is a component of several of the INCAPARINA formulas developed at the Institute of Nutrition of Central America and Panama). A factory for producing torula is half constructed in Recife, but has been paralyzed for over 4 years. If a technical and/or financial input were made available to get it into production, the product would contribute greatly to increasing the protein availability in the Northeast, indirectly through improving animal production and perhaps directly for human nutrition.

Strategy re CNA

An important part of the strategy of this activity is to strengthen the National Food Commission (CNA) as the coordinating institution and the nutrition and food research institutes which are working in this field. The role of CNA is already clearly established. It is providing the backstopping of personnel and support for the economic studies, literature search and other work required to launch the Mandioca project; it is also in close touch with the Marine Research Institute, the CNAE, and the nutrition institutes with respect to their research and plans; ~~XX~~ it will receive and channel to the proper institution the funding received and provide additional technical assistance required to carry out the sub-projects; and it will also participate in the selection of participant trainees. Also, CNA will play the central role in mobilizing the private sector support and coordinating it with USAID and all GOB inputs. On the legislative front it has prepared and classified the recommendations that came out of the 3-day government/industry meeting held in mid-May to discuss the protein problem and is preparing to debate them with the respective Ministers and staffs in small meetings currently being set up. In short, CNA will be strengthened in its attributes of providing the central coordination for nutrition programs in Brazil by its participation in the implementation of this project.

The nutrition and food technology institutes will also be strengthened through their participation in this project as they will acquire additional technological know-how, receive funds to further their research, and also build up their prestige as a result thereof. The successful completion of some of their experiments may facilitate future increased funding from their regular sources as these institutes will demonstrate their significant role in solving Brazil's malnutrition problem.

Cross Relationship with Other Mission Projects:

This project is related to Mission goals in other sectors as follows:

- 1) It will strengthen the maternal/child health programs by making available protein foods at low cost for consumption in health and child-care centers and in the homes of the most vulnerable population groups.
- 2) The production of high-lysine (Opaque-2) corn is a target which ~~XXXX~~ ARDO is actively pursuing. At the present time the utilization of this corn is limited to animal feeding. However, it is an agricultural commodity which can easily be developed into a product for human consumption and in the course of this project it will be considered for use as an additional protein input.
- 3) Through improved nutrition infant mortality may be reduced. This may generate greater receptivity to family planning programs thereby clearing the way for desirable projects in this area.
- 4) The Mission's plans to assist CNAE to improve the quality of the foods consumed by school children are directly assisted by the increased availability of high-protein foods at low cost. Furthermore, one of the principal targets of the school lunch program is to stimulate the ~~the~~ purchase of Brazilian foods to replace U.S. inputs over the next several years. To the extent that fortified foods, FPC, Solein, and other protein products now being tested are made available to and purchased by CNAE to enrich and improve the quality of school feeding the program will be reinforced.
- 5) Brazil is already giving considerable support to developing its fishing industry and USAID is contributing to this effort. USAID support to the Marine Research Institute to develop its FPC will directly complement and assist in reaching this goal.

IV. TARGETS

- 1) To determine the most ~~appropriate~~ appropriate fortification substances for two Brazilian basic foods widely consumed by the lower economic classes and the percentages of such additives that will be tolerated and acceptable to consumers.

- 2) To produce commercially three selected high-protein foods and food fortificants and foment their utilization in nutrition programs reaching target groups and the general public.
 - 3) To fortify the bread and macaroni processed in 5 of CNAE's own factories and in as many as possible of the over-2000 contracted bakeries and pasta-plants; to increase the purchase of Brazilian-produced high-protein foods for use in the school feeding program, especially those brought into production or assisted technically by this project.
 - 4) To utilize high-protein foods manufactured in Brazil such as the soy-milk or locally fortified foods to reach the target groups of pregnant and nursing women, infants and pre-school children; to expand the MCH program currently reaching 600,000 beneficiaries with Food for Development commodities through the use of such locally-processed foods; and to increase assistance to the pre-school age groups in integrated health/education/nutritional programs.
- CNAE and BACF (CPMIL) will be encouraged to purchase increasing amounts of the foods made available under this project to supplement and to gradually replace the current PL 480 commodity inputs.
- 5) To raise the nutritional level, protein consumption, of the target groups to within the range of the FAO and the National Research Council recommended daily protein requirements. Although in some statistical surveys (the National Food Balances, for example) Brazil appears to be meeting these standards, for various geographical, economic and educational reasons, a large portion of the population does not share equally in the food consumption. Hence, by fortifying the food staples most widely consumed by the poorer classes (e.g. mandioca flour and bread), and by making available protein-rich foods at reasonable cost, it will be possible to make better nutrition a reality for other target groups such as those assisted in public welfare and mass-feeding programs, the military, and commercial consumers of the lower economic levels.

Evaluation

It is not possible at this time to predict precisely when the targets and the ultimate goal of this project will have been fully achieved. Hopefully, by the end of the third year, at least two protein ~~fortified~~ ^{fortified} food staples (possibly Solein,

bread and mandioca) will have been developed for mass distribution among needy population groups throughout Brazil. Also, it is estimated that if by the end of the fifth year, these protein enriched staples reach approximately twenty percent of the 62 million inhabitants estimated to be malnourished, the fundamental goal of the project will have been accomplished. In any event, it is expected that by 1976 the institutional and technical capabilities of CNA and the various public and private entities involved in the project will have been upgraded and strengthened to a point where they can continue sustained and concerted efforts to solve Brazil's malnutrition problems with their own resources.

V. COURSE OF ACTION

Various inputs will be used to achieve the targets and goals of this project:

1. Technical assistance will consist of:
 - a) Three technicians for one month each to assist the mandioca fortification project during each year of its 5-year life;
 - b) One technician for one month for 1971 and 1972 to assist in conducting experiments leading to bread enrichment.
 - c) About 8 man/months during 1971, 4 during 1972, 3 during 1973 and 2 each for 1974 and 1975 will be required to execute the FPC plans including assistance for the installation of machinery to process FPC and evaluation of results;
 - d) One man month during FY 1971 to provide the necessary expertise on Solein processing; and
 - e) One man month for the Torula development project.

In each of the projects described, the type of assistance varies. Thus, in the case of the FPC production at the Marine Research Institute, technical assistance is required to help install the machinery, set up and evaluate the critical experiments and subsequently construct a pilot plant, ~~as well as~~ to assist in developing ways and formulas to incorporate this product into habitual foods. For the mandioca fortification project at Ararunna, assistance will be required to find the best and most economically feasible fortificant for mandioca as well as to help promote its use and subsequently assess the results. It is also expected that a top-flight technician (such as Mr. Clinton Brock who was partly responsible for developing Modern Bread in India) will be brought to Brazil to assist in the enrichment of bread, baked items and macaroni, especially those produced in the bakeries and small plants under contract to CNAE throughout Brazil which would reach a very vital segment of the Brazilian population through the National School Lunch Program (CNAE).

The research institutes in the food field are already developed in Brazil; however, they lack sufficient funds to carry out the required testing programs. Therefore, part of the resources allocated will be used to pay the costs of testing the alternative approaches to food fortification on animals and on children, on an at-cost basis.

2. Participant Training:

Will focus on short-term specialized training in the U.S. and in Brazil (about 4 to 6 months) of key Brazilian technicians already involved in food fortification activities to upgrade their capability to develop high protein foods.

3. Commodities:

A limited quantity of experimental or pilot plant equipment will be required, some imported for dollars and the balance acquired through cruzeiro purchases.

4. Counterparts:

~~As a result of the~~ The National Food Commission (CNA), will be the coordinating Brazilian entity, and the sub-projects will be undertaken in collaboration with various academic and food technology centers, the Marine Research Institute, the School Lunch Program (CNAE), and other Brazilian private and public ~~institutions~~ institutions.

1. Local Currency:

Brazilian counterpart agencies, CIA, CNAE, ABIA, the Marine Research Institute and the nutrition institutes will be encouraged to incorporate in their budgets local currency funding required for the project. The research activities shown on Table IV for instance, lack a firm source of funding. The concerned Brazilian counterpart entities will be encouraged to finance to the extent possible, these activities. Other possibilities which will be explored are PL 480 and CONTAP/SUBIN funding, should these resources become available.

BOONSTRA

TABLE I

NON-CAPITAL PROJECT FUNDING (Obligation in US\$000)

COUNTRY: Brazil.

PROJECT TITLE: Protein Foods and Food FortificationPROJECT NO: 512-35-233-288

Fiscal Years	AG	E/G	Total	Cost 1/	YERS. SERV.			Partic. U.S. Agen.	Commod. U.S. Agen.
					AID	PASA	CONF		
Operational FY 1971	AG	G	217.84	18	60.34	18	49.5	90	
Budget FY 1972	AG	G	102.6	18	38.1	18	46.5	-	
B + 1 FY 1973	AG	G	90.1	18	28.6	18	43.5	-	
B + 2 FY 1974	AG	G	79.35	18	23.85	18	37.5	-	
B + 3 FY 1975	AG	G	79.35	18	23.85	18	37.5	-	
All Subs. yrs.	-	-	-	-	-	-	-	-	
Total life	AG	G	647.94 564.24		174.74	90	214.5	90	

1/ Non Add Column

TABLE II
NON CAPITAL PROJECT FUNDING
 (Exchange Rate U.S. \$1.00 = Cr\$4,53 Project Nº 512-15-253-288)

<u>Fiscal Years</u>	<u>Trust Funds</u> (in U.S.\$000) (Table III)	<u>Local Currency</u> <u>P.L.480 or CONTAP/SUBIN</u> (In Cr\$000) (Table IV)		<u>Other Contribution</u> <u>Cooperating Country</u> 3/ (in Cr\$000) (Table V)
Operational FY 1971	12.5	1,285	1/ 283,665 (283.7)	4,377 966,225 (966.2)
Budget FY 1972	12.2	415	91,611 (91.6)	3,315 731,788 (731.8)
B + 1 FY 1973	10.8	200	44,136 (44.1)	4,650 1,026,990 (1,026.5)
B + 2 FY 1974	9.1	100	22,675 (22.6)	4,430 979,241 (979.9)
B + 3 FY 1975	9.1	400	1/ 88,300 (88.3)	4,830 1,046,228 (1,046.2)
All Subs yrs.	-	-	-	- 4,768.6
Total Life	53.7	2,400	2/ 587.8	21,602 4/

1/ Includes computerized cost/benefit studies, research and pilot testing;

2/ Cr\$2,400,000 ÷ 4,53 = US\$529,801

3/ This includes costs of raw materials

4/ Cr\$21,602,000 ÷ 4,53 = US\$4,768,653

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TABLE III
FOOD FORTIFICATION PROJECT
 Estimated Budget Breakdown
 (in US\$ 000's)

	FY 71		FY 72		FY 73		FY 74		FY 75		TOTAL	
	US\$	Costs TF	US\$	Costs TF	US\$	Costs TF	US\$	Costs TF	US\$	Costs TF	US\$	Costs TF
I. Pers. Serv.												
A. Contract												
1. Marion Frazão	18.	3.	18.	3.5	18.	3.	18.	3.	18.	3.	90.	15.5
B. PASA (Food Tech.)												
1. Food Fortif.	9.9	-	9.9	-	9.9	-	9.9	-	9.9	-	49.5	-
2. Bread & Macaroni processing	3.3	-	3.3	-	-	-	-	-	-	-	6.6	-
3. FPC	21.6	-	13.2	-	9.9	-	6.6	-	6.6	-	57.9	-
4. Solein	3.3	-	-	-	-	-	-	-	-	-	3.3	-
5. Torula	3.3	-	-	-	-	-	-	-	-	-	3.3	-
SUB-TOTAL	<u>41.4</u>	-	<u>26.4</u>	-	<u>19.8</u>	-	<u>16.5</u>	-	<u>16.5</u>	-	<u>120.6</u>	-
C. Other Costs-PASA (10% of salaries)	2.94	-	1.7	-	1.3	-	1.1	-	1.1	-	3.14	-
	<u>44.34</u>	-	<u>28.1</u>	-	<u>21.1</u>	-	<u>17.6</u>	-	<u>17.6</u>	-	<u>123.74</u>	-
D. Local PASA Costs	16.	-	10.	-	7.5	-	6.25	-	6.25	-	46	-
TOTAL PASA	60.34	-	38.1	-	28.6	-	23.85	-	23.85	-	174.74	-
TOTAL PERS. SERV.	<u>73.340</u>	3.	<u>56.1</u>	3.5	<u>46.6</u>	3.	<u>41.85</u>	3.	<u>41.85</u>	3.	<u>204.74</u>	15.5
II. PART.-US AGENCIES												
1. Food Fortif.	15.	2.6	15.	2.6	15.	2.6	15.	2.6	15.	2.	75.	13.
2. Bread & macaroni processing	22.5	3.5	22.5	3.5	22.5	3.5	22.5	3.5	22.5	3.3	112.5	17.5
3. FPC	6.	1.7	6.	1.7	6.	1.7	-	-	-	-	18.	5.1
4. Solein	3.	.85	3.	.85	-	-	-	-	-	-	9.	2.57
5. Torula	3.	.85	3.	.85	-	-	-	-	-	-	-	-
TOTAL PARTICIPANTS	<u>49.5</u>	<u>9.5</u>	<u>49.5</u>	<u>9.7</u>	<u>43.5</u>	<u>7.8</u>	<u>37.5</u>	<u>6.1</u>	<u>37.5</u>	<u>6.1</u>	<u>214.5</u>	<u>38.17</u>
III. Commodities												
1. Equipment for FPC	60.	-	-	-	-	-	-	-	-	-	-	-
2. Equipment for Solein	30.	-	-	-	-	-	-	-	-	-	-	-
	<u>90.</u>	-	-	-	-	-	-	-	-	-	-	-
GRAND TOTAL	217.84	12.5	102.6	12.2	90.1	10.3	79.35	9.1	79.35	9.1	569.24	53.7

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TABLE IV

Other Local Currency Costs (in Cr\$000's) *

	<u>71</u>	<u>72</u>	<u>73</u>	<u>74</u>	<u>75</u>	<u>TOTAL</u>
Research and evaluation - Mandioca fortification	250	200	150	50	50	700
Bread and macaroni fortification - research and additives	15	15	-	-	-	30
Research on FPC utilization and fish oil	200	100	50	50	50	450
Pilot testing Solein	120	-	-	-	-	120
Research on utilization and manufacture of Torula for human consumption	200	100	-	-	-	300
Food Fortification Conference	200	-	-	-	-	200
Computerized cost/benefit study - evaluation of fortification inputs	<u>300</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>300</u>	<u>600</u>
	1,285	415	200	100	400	2,400

* From F.L. 480 or CONTAP/SUBIN funds if available.

TABLE V
Basis for calculating Brazilian cash inputs
(in Cr\$000's)

	71	72	73	74	75	TOTAL
Mandioca	200 PAPPE 100 Other Braz. 200 SANBRA <u>500</u>	200 <u>100</u> <u>300</u>	300	300	300	
Bread Fortif.	50 Ajinomoto 30 Flour Mill Recife 100 CNAE travel <u>180</u>	50 <u>200</u> <u>250</u>	<u>250</u> <u>250</u>	<u>300</u> <u>300</u>	<u>300</u> <u>300</u>	
FPC	25 staff time 20 fish <u>45</u>	35 <u>20</u> <u>55</u>	50 30 <u>500</u> <u>580</u>	(give process to industry) machinery		
Solein	30 staff time 2 DFCr purchase 800 raw materials <u>832</u>	10 <u>1000</u> <u>1010</u>	20 <u>1000</u> <u>1020</u>	30 <u>1000</u> <u>1030</u>	30 <u>1000</u> <u>1030</u>	
Torula	300 staff time 1500 machinery <u>1800</u>	300 <u>400</u> <u>700</u>	400 <u>500</u> <u>900</u>	400 <u>600</u> <u>1000</u>	400 <u>800</u> <u>1200</u>	
Gen. Foods	20 market tests 1000 equipment <u>1020</u>	1500 raw mat.	1600	1800	2000	
TOTAL	4377	3315	4650	4430	4830	Cr\$21,602

TABLE VI

Recommended Protein Intake by Various Population Groups (in grams) §

<u>Groups</u>	<u>Age (years)</u>	<u>Amount</u>
Children	1 - 9	32 - 52
Boys	9 - 18	60 - 85
Girls	9 - 18	55 - 58
Men		70
Pregnant women		78
Lactating women		98

Source: U.S. Food and Nutrition Board, National Academy of Sciences, National Research Council (1968).

TABLE VII

Per Capita Protein Consumption by Various Population Groups in Selected Areas of Brazil (in grams)

	<u>Coastal Region</u>	<u>"Mata" Region</u>	<u>"Agreste" Region</u>	<u>Average for Brazil</u>
<u>Families</u>				
Total protein	53.4	54.9	42.3	51.4
Animal protein	23.5	26.2	14.6	19.9
<u>Infants</u>				
Total protein	15.8	19.8	14.9	16.9
Animal protein	13.2	12.2	3.0	10.2
<u>Pregnant women</u>				
Total protein	48.4	47.8	63.3	53.2
Animal protein	19.8	5.2	8.1	10.5

Source: Northeast Nutrition Survey (ICNND, May 1963).