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9. ABSTRACT

The Third African Conference on Nutrition and Child Feeding, held in Tunis, May 25-29, 1970, was sponsored by the Republic of Tunisia and USAID, with participation of the FAO, UNICEF, the UN Development Program, and the WHO. The conference activities recorded in these proceedings include country reports on nutrition in Algeria, Burundi, Cameroon, Central African Republic, Chad, Kinshasa, Gabon, Morocco, Rwanda, Tunisia, and the United States. Also included are thematic presentations and committee reports on nutrition and health, nutrition and agriculture, nutrition and child feeding, nutrition and education, nutrition and industry, and coordination of nutrition programs. The general discussions which followed the thematic presentations reflect the sharp focus of attention on such key questions as health and mental development, the relative importance of food crops versus cash crops, the value of nutrition surveys in providing a basis for agricultural and trade policies, the enormous need for nutrition education, and the critical need for coordination of nutritional and agricultural policies. Recommendations generated by conference participants include these: That governments organize new services for prevention of childhood malnutrition, and reinforce existing services; that they take steps to integrate the science of nutrition into agricultural programs; that they recognize the importance of food crops for national health and development; that they integrate infant nutrition into preventive medicine, and conduct surveys of the nutritional needs of children, by age group and region; that they encourage breastfeeding as the only nursing method that provides total hygenic security; that they encourage the spacing of births; that they institute new programs of nutrition education; that they inventory local foods with a view toward their use in preparation of weaning foods; that they establish agencies to control prices and quality of foods; that they study the nutritive value and acceptability of industrial by-products that could provide

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nutritious foods at low prices; and that they give high priority to creating an interministerial coordinating mechanism to conduct nutrition budget and consumption surveys, nutrition education, food technology improvement, and improved planning in food economics.

Proceedings of the

THIRD AFRICAN CONFERENCE ON NUTRITION AND CHILD FEEDING

Tunis, Tunisia

May 25-29, 1970

Sponsored by

The Republic of Tunisia

and

The United States of America Agency

for International Development

With the Participation of

The Food and Agriculture Organization of the United Nations

The United Nations Children's Fund

The United Nations Development Program

The World Health Organization

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

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Left: The Honorable Chedli Ayari, Secretary of State for Planning for Tunisia, presenting the theme "Nutrition and Coordination."

Above: Left to right, Dr. Zouhair Kallal, Director of the National Institute of Nutrition of Tunisia, The Honorable Driss Guiga, Minister of Public Health for Tunisia, and The Honorable Mir Khan, representative of the United Nations Development Program.

Below: The committees in session.

The conference committees in session.

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INTRODUCTION

The Third African Conference on Nutrition and Child Feeding confirmed the interest of African governments in nutrition and showed an increased awareness of the importance of the nutrition triangle:

- Correct nutrition is the basis of good health;
- Good health is the basis of productivity;
- Productivity is the key to orderly social and economic development.

The conveners were gratified to see the importance which the participating governments accorded to the conference reflected in the high level of the delegates who were sent. It was the first time that cabinet ministers attended a seminar of this kind and participated actively in the discussions, seeking information in fields different from but related to their own and bareing with complete candor and sincerity the problems they were confronted with in discharging their duties.

As the following pages will show, each delegation had prepared an in-depth report on the nutritional status of its country. The general discussions which followed the thematic presentations reflected the sharp focus of attention on key questions, such as health and mental development, the relative importance of food crops versus cash crops, the value of nutrition surveys in providing the basis for agricultural and trade policies, the enormous need for nutrition education, and the essentiality of coordination.

As U.S. Convener of the Conference, I am pleased to seize the occasion of this introduction to thank once more the distinguished delegates for the frankness of their views and the forcefulness of their expression.

Jacques M. May, M.D.

PROGRAM

Monday, May 25, 1970 Morning Session

Opening Ceremonies

Welcoming Addresses

The Honorable Driss Guiga
Minister of Public Health, Republic of Tunisia

The Honorable Edward Mulcahy, Chargé d'Affaires
American Embassy, Tunis

Keynote Address
Dr. Zouhaïr Kallal, Director
National Institute of Nutrition and Food Technology, Tunisia

Presentation of Country Reports

Chairman: The Honorable Pierre Djimé, Tchad

Report on Nutrition in Algeria
Report on Nutrition in Burundi
Report on Nutrition in Cameroon
Report on Nutrition in the Central African Republic
Report on Nutrition in Chad
Report on Nutrition in the Congo

Afternoon Session

Continuation of Country Presentations

Chairman: The Honorable François Kisamare, Burundi

Report on Nutrition in Gabon
Report on Nutrition in Morocco
Report on Nutrition in Rwanda
Report on Nutrition in Tunisia
Report on Nutrition in the United States

Discussion

Tuesday, May 26, 1970 Morning Session

Presentation of Themes

Chairman: Professor Amor Chedli, Tunisia

"Nutrition and Health"
Dr. Julien Mezu, Director
National School of Public Health, Gabon
General Discussion

"Nutrition and Agriculture"
Dr. Julien Périssé, Nutrition Division
Food and Agriculture Organization, Rome
General Discussion

Afternoon Session

Continuation of Theme Presentations

Chairman: Dr. Hadj Lakhal, Algeria

"Nutrition and Child Feeding Programs"
Dr. Mohamed Seffar, Director of Cabinet
Ministry of Public Health, Morocco
General Discussion

"Nutrition and Education"
The Honorable François Kisamare
Minister of Education, Burundi
General Discussion

Evening

Government of the United States Reception for the Delegates
Residence of the USAID Director, Mr. Stuart Baron

Wednesday, May 27, 1970 Morning Session

Continuation of Theme Presentations

Chairman: Dr. Meke-Me-Ze, Cameroon

"Nutrition and Coordination"
The Honorable Chedli Ayari
Secretary of State for Planning, Tunisia
General Discussion

"Nutrition and Industry"
Dr. Samir Miladi, Chief, Division of Food Technology
National Institute of Nutrition and Food Technology, Tunisia
General Discussion

Afternoon Session

Committee Work

Committee on Nutrition and Health
Committee on Nutrition and Agriculture
Committee on Nutrition and Child Feeding
Committee on Nutrition and Education
Committee on Nutrition and Industry
Committee on Nutrition and Coordination

Thursday, May 28, 1970 Morning Session

Consolidation of Committee Reports and Preparation of Conference Resolutions

Afternoon Session

Visit to the National Institute of Nutrition and Food Technology

Friday, May 29, 1970 Morning Session

Presentation of the Six Committee Reports

General Discussion and Conclusions

Afternoon

Luncheon in Honor of the Delegates Given by the Government of Tunisia

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CONFERENCE RECOMMENDATIONS

The Conference recommends:

1. That governments, recognizing that good nutrition is the basis of good productivity and consequently is essential for socioeconomic development, organize services for the prevention of childhood malnutrition and reinforce existing preventive activities.

2. That governments take note of the necessity to integrate the science of nutrition into agriculture programs so that an agriculture-nutrition dialogue can be established in agricultural planning.

3. That governments realize the importance of food crops in the domains of health and development and explore their national as well as international commercial potential.

4. That governments integrate the notion of infant nutrition into preventive medicine and in order to do that undertake appropriate surveys of the nutritional needs of children, conducted by age group and by region.

5. That governments encourage breastfeeding in all possible measure, since it is the only nursing method which gives almost total hygienic security, and that whenever possible, governments establish programs aimed at spacing births in order to give mothers the best health and the necessary functional rest.

6. That governments consider the importance of nutrition education in order to permit the general public to benefit from the nutrition improvements essential to development.

7. That to this effect, governments create study groups aware of the complexity of the problem and capable of establishing directives and programs to extend nutrition education to all layers of society, placing the accent on the mother of today, the mother of tomorrow and all

teaching personnel, including those of the medico-social services responsible for future generations.

8. That governments undertake as soon as possible an inventory of local foods with a view to their utilization by the food industry, especially in the preparation of a weaning food.

9. That governments institute agencies to control price and quality.

10. That governments study the nutritive value and the acceptability of industrial by-products which could serve as a basis for nutritious foods at the lowest possible price.

11. That governments, conscious of the multi-disciplinary character of nutrition, give high priority to the creation of an inter-ministerial coordinating organism provided with the necessary means in personnel and budget to accomplish the following tasks: nutrition budget and consumption surveys, nutrition education, food technology, food economics and planning.

OPENING CEREMONIES

WELCOMING ADDRESS

Presented by the Honorable Driss Guiga
Minister of Public Health
Republic of Tunisia

It is an honor for me to come in the name of the Government of the Republic of Tunisia to open the sessions of this conference and to welcome its delegates from various governmental, scientific, and industrial horizons.

Allow me to tell you how much the government of Tunisia appreciates the opportunity to be host to this third African get together in the new field of nutrition. We are all the more interested now that we are aware to what extent nutrition is still insufficiently understood in our African countries, and how little this field has been explored.

Because of old prejudices, the distinction between food and nutrition is still poorly understood. How many times has the question been raised: how can one take care of nutrition in countries where individual food supplies are inadequate? This is precisely the problem on which your discussions should shed light.

Is it not in fact your role to show how, because of modern technological methods, we are in a better position today to make use of fundamental scientific discoveries in the field of human nutrition? You may show new possibilities of expansion to exhausted economies galloping in hot pursuit of the population explosion.

Nutrition science is not the private domain of saturation societies, as persisting prejudices would indicate. It is, on the contrary, the basis for the great hopes entertained by those who fight famine. It is unhappily not a figment of the imagination, or a Cassandra-like attitude, to predict the rebirth of the ghost of famine in certain parts of the world. Nutrition science is one of the most

effective weapons we have to fight that battle. Because nutrition is a multidisciplinary science, research in this field must be encouraged.

Like all new disciplines, it will meet with scepticism, errors, and even with failure. Do not let this discourage you researchers, engineers, economists, physicians, or prevent you from persisting in your studies.

On your way to the ultimate aim of solving world food problems, you may have an educative effect on the consumer by enlightening him on the relationship between health and food. This educational effort might even change social behavior and contribute to ending nefarious food taboos, in spite of the anachronistic regrets that may be inspired by the loss of certain traditional food habits.

By establishing the Institute of Nutrition, the Government of Tunisia has shown its resolve to work in this direction. I would like to express my thanks on this occasion to the United States Agency for International Development for the effective aid it has given to the Institute, to which I extend my wishes for complete success.

In the name of President Bourguiba, let me extend my welcome to all. I am certain that your discussions will greatly contribute to the greater well-being of the peoples of Africa.

WELCOMING ADDRESS

presented by Mr. Edward W. Mulcahy
Chargé d'Affaires, American Embassy, Tunis

Your Excellencies, Ladies and Gentlemen, first let me present the deep regrets of the American Ambassador, Mr. Calhoun, who was called out of Tunisia at the end of last week. He is profoundly sorry to be unable to express himself our Government's interest in this conference. In his name and in mine, permit me to warmly thank the Government of the Republic of Tunisia for its generous hospitality.

When we suggested some time ago calling a conference on nutrition for all French-speaking countries of north and central Africa, the response of the Tunisian Government was instantaneous and enthusiastic. Moreover, this response was accompanied by the offer to share the costs of the meeting.

Indeed, we in the United States are very anxious to do everything possible to combat malnutrition in the world and to associate ourselves with all governments whose concept of the problem is similar to ours. We are convinced that there exists a close link between social and economic development and the balanced nutrition of the people. I am certain that during the coming days you will hear expert voices underscore the importance of these ties. It is obvious even to a non-expert, that man cannot spend more energy than is provided by his diet and thus that a mediocre diet will be followed by a mediocre life and slow development.

In the United States, in spite of plentiful resources, we have recently discovered vast pockets of malnutrition which we are determined to eradicate. We have also decided that we would join hands with all governments showing the same concern as we do for the nutritional welfare of their populations.

Malnutrition, considered as a social disease, has many aspects. It can find its source in those climatic and

geographical factors which limit food production; it can also find its source in a defective system of distribution, or in inadequate markets, or in poor networks of communication. Yet, the most important factor among all causes of human malnutrition is probably the lack of education. If we do some soul-searching, we may find that few of us know what is really needed to keep our own productive energy at its maximum. Education in the field of nutrition should be universal. It should begin with the mothers, spread to families, to villages, to provinces, and to the whole country. All disciplines must cooperate, as they do here in this new Institute of Nutrition, whose cornerstone we will lay next Thursday.

During the coming days you will no doubt ask yourselves many of the questions I have alluded to and many others. It is my fervent hope that you will find the solutions that you have been seeking and that we are waiting for. In conclusion, allow me to underscore once more the importance attached by the governments of the Republic of Tunisia and the United States of America to the success of this gathering. Permit me once more to thank the Government of the Republic of Tunisia for its generous hospitality, and in closing permit me also to wish you a pleasant and rewarding stay under the beautiful skies of Tunisia.

KEYNOTE ADDRESS

Presented by Dr. Zouhaïr Kallal
Director, National Institute of Nutrition,
Republic of Tunisia

I am pleased to have the opportunity today to present to you the main reasons for our gathering in Tunis. Basically, these can be summarized in the well known but too little practiced saying: "To work hard, one must have a full stomach." Put into scientific terms, this might mean that it is not possible to build up a developed economy of 3,000 calories per person per day with the labor of people who dispose of barely 1,500 calories. This basic truth has been established beyond doubt by numerous scientific projects in England, the United States, Germany, and the Soviet Union. How can we be surprised that part of our population spends the day leaning against tree trunks or sitting at sidewalk cafes? It is not because of laziness, but because they lack the strength to do otherwise.

How can we escape from this state of apathy? Many theories have been put forth. Should we emphasize industrial development, or should we, on the contrary, subsidize agricultural development? And if both are needed, in what ratio must the available funds be distributed to each.

Industrial development has long been presented to us as the path to progress. It should be noted, however, that industrial development depends first of all on the availability of raw materials, which some of our countries lack, on manpower, of which we all have an ample supply, and also on capital, know-how, and markets, which in developing countries need to be imported. But subservience to foreigners is what independence was intended to liberate us from. In addition, industrialization has the inconvenience of increasing the flight from rural areas to cities and of perpetuating the existence of two opposite classes, one very poor and very numerous, the other very rich and small in number.

It is true that industrialization allows the accelerated creation of abundant capital (assuming that

markets are found) which finds its way either into the treasury of the state or the pockets of individuals according to the political regime of the country. Unhappily, experience proves that the capital thus created takes rather a long time to spread out for the benefit of the masses.

You understand, gentlemen, that as a physician my first concern is for the physical and mental well-being of our populations. Under these conditions, the problems of nutrition and the benefit which the country may expect to accrue from a healthy and well-nourished population make me consider the question of development from the specific point of view of health and diet. Human nutrition becomes my main concern because I know professionally that it generates not only good health but also prosperity. The time is no longer when nutrition was a small specialty in the larger field of medicine; the time is no longer when nutrition was the business of a restricted number of "super experts" in the area of biochemistry, that is of scientists whose interest was limited to what happens after the bolus has entered the digestive system of the individual and before it leaves it.

Nutrition now covers a much vaster field and is interested in the foods that constitute this bolus and in all the factors that have led to its constitution. Nutrition has become a multi-disciplinary science grouping food production (agriculture and trade), food distribution (markets, communications, and purchasing power), new product manufacturing (industry and public relations), the safeguarding of crops and foods (storage facilities and insecticides), that is, a whole spectrum of activities whose success plays a great part in the economic development of all countries.

With emphasis placed on agricultural development, a new dilemma arises: should priority be given to food crops or to cash crops? I am confident that during the course of the conference this question will be discussed in depth.

As a physician, I am unable to hide from you my preference for food crops; I am so conscious of their

immediate contribution to our fellow countrymen's diets. In addition, it is not forbidden to hope that these food crops may become cash crops if production is at a sufficient level to create surpluses: and here at once, is agriculture upholding trade, requiring the creation of domestic and international markets, demanding the growth of transportation -- trails, roads, railroads, and even commercial airlines. All these developments enrich the country, provide work for the unemployed, and bring cash into parts of the country where only a subsistence level existed until them.

Finally, as to industry, the food industry begins at the level of the family when the mother learns to preserve in a better way the results of her own harvesting, when field workers learn to build granaries that are safe from rodents and include protection from molds. Later, small factories take the agricultural products of the neighborhood and process them within the rural community, thus increasing employment and insuring cash flow. All this seems to me to be the nucleus of a well-conceived development plan.

I hope that this conference will bring out the points I have just sketched. The schedule in front of me encourages me in this hope. Our distinguished colleagues who will ascend the steps of this podium will consider the questions which concern us most; malnutrition and health.

Indeed, besides the need I have alluded to already for furnishing to workers the calories necessary for efficiency, let us not forget that protein deficiencies cause a serious slowing down of physical and mental development and paralyse the ability to be educated. We are also aware of the fact that malnutrition creates favorable conditions for the spread of communicable diseases by depressing the production of protective antibodies. We are acquainted with the multiple dangers of vitamin and mineral deficiencies, such as the lack of vitamin A and iron which may cause blindness and nutritional anemia.

Next on our agenda are discussions of the many problems inherent to agriculture. Let us not forget that overproduction of industrial products depresses prices on

world markets while the cost of food continues to rise. Our eminent speaker, Dr. Périssé, will surely enlighten us on this important question. Perhaps he will also tell us how it is advantageous for countries which produce little or no milk to substitute for this the intensive cultivation of legumes to be used as the raw material of weaning foods.

The education problem is perhaps the most important of all. Who should receive nutrition education? Mothers, certainly, but governments as well: from the most humble to the most exalted, all need to learn to what extent satisfactory nutrition is essential to development, and to what extent it makes development possible. This problem is present everywhere; the whole country must be made conscious of its importance. I have mentioned mothers and high level administrative officials, but in between there is a wealth of civil servants, rural social workers, teachers, professors, businessmen, even doctors. All will need to study again this ancient question and to give it its place in modern progress.

The feeding of children, about which another physician will speak, is a serious problem. The spread of bottle-feeding has reduced the practice of breast-feeding, the only nursing method which is compatible with the health of the baby as long as the technology of bottle-feeding is not fully understood. The preschool child, the one whom we do not reach at home because he is in the street or in the fields, and whom we do not reach at school, because he is not there yet, is the one who suffers most from malnutrition. What can be done for him? This conference may tell us this.

What is the role of industry in the expansion of efforts toward better nutrition? It is considerable, but full of difficulty. In my humble opinion, a well-conceived food industry will bring solutions to many of the problems outlined above, but cost becomes an essential concern. A wholesome and inexpensive weaning food must be the primary goal of the food industry of developing countries and for this one needs local raw materials rather than imported ones, because they are less expensive; one also needs simple, well-tested techniques. Our Algerian friends have

been very successful in this direction and we are entering into competition with them.

Finally, the question of coordination, for which the Institute I direct was created, deserves our consideration in depth. To be successful, a nutrition institute must group several areas of competence and be in liaison with each national ministry, since each has a contribution to make; it must be in liaison as well with the large international agencies; and it must gather under its roof all the information necessary to the establishment of nutrition programs in all fields and at all stages of development. Without this coordination, separate and disjointed efforts only stretch out the problem instead of solving it.

In this second half of the twentieth century, after spending the first decade in repairing the ruins of war, humanity finds itself confronted by a monstrous plague which, more than nuclear weapons, renders peace on our planet precarious and is in danger of annihilating two-thirds of the world's population. This is hunger in all its forms, that is malnutrition and undernutrition. It is not surprising that nutrition science is growing in importance. In the developing countries, where more than anywhere else the necessity to stop or prevent the evil of hunger is more than ever imperative, the almost general awareness of the problem is in itself a first victory.

With the help of prosperous countries and international organizations, young countries must carry on increasingly detailed and exhaustive surveys of their food and nutrition situation. Some, like Tunisia, have even introduced a nutrition component in their plans for economic and social development, since it is understood that an improvement in nutrition can be an integral part of the concept of the "improvement of man" which is a basic goal of all planning.

I wish you, ladies and gentlemen, good working sessions, and express the hope that at the conclusion of this meeting practical recommendations will be presented by your workshops in which our governments can find inspiration for our efforts toward progress.

COUNTRY REPORTS

REPORT ON NUTRITION IN ALGERIA

Algeria is an immense country covering 240 million hectares. Out of this vast area, only one-fifth may be considered agricultural land. A large part of this consists of grazing lands and range. The useful land area amounts to only 6.5 million hectares, of which about one-half is still left fallow every year. In all, we have at our disposal at present only approximately 1 cultivated hectare per every three inhabitants.

The main feature of our climate is its irregularity which prevents our predicting the harvest from one year to the next. To compensate for the hazards of climate, we are forced to undertake costly projects such as dams and irrigation networks.

The Algerian population exceeded 12 million in 1966 (the census year). The under 20 age group accounted for more than 56 percent of the population; children from 0 to 5 years, those with the most urgent problems, constitute almost 20 percent; persons from 20 to 59 years constitute only 36.5 percent of the population; the over 60 age group accounts for the remaining 7.5 percent. The general mortality rate for the whole country is between 17 and 20 per thousand (11 percent in the capital), while the rate of infant mortality is between 135 and 150 per thousand; in the 1 to 4 age bracket it is still on the order of 70 per thousand, which may be taken as an indicator of the state of nutrition.

The rate of population increase is one of the highest in the world at 3.2 percent per year. Life expectancy is about 50 years. Geographical distribution is such that 96 percent of the population inhabits one-fifth of the country. More than 50 percent of the population is concentrated in five Wilayates (previously called Departments). Nearly 47 percent of the population lives in urban centers of more than 50,000 inhabitants. This important trend to urbanization originated during the war and has continued

following independence. These transplanted people from rural areas create an unstable social environment where serious deficiency diseases often occur.

Rural settlements are usually permanent villages. In terms of economic activity, agriculture provides employment and a livelihood for more than half the population. The yearly per capita income is nearly U.S. $300; in the Algiers area it is $375.

The currently available daily caloric intake is 2,427 calories per person. If the calorie level presents no problem, that is not the case when we consider protein intake. The available daily protein is 80 grams per person, but this figure is misleading, because animal protein accounts for less than 11.5 grams, that is, barely over 14 percent of the total. National agricultural production provides daily for each inhabitant 1,900 calories, 61 grams of protein (of which 10.1 grams are of animal origin), and 4 grams of fats. The difference between these figures and those given above is imported. The aim is to increase the animal protein allotment by 50 percent by 1980 and the caloric ration by 25 percent. Production is intended to meet these needs as much as possible. The lack of animal protein is the most serious nutritional imbalance in Algeria.

Medically, plethoric diseases similar to those of developed nations, and nutritional deficiencies are both seen. The latter seems to us the most vital. Deficiency diseases are primarily observed in the 0 - 5 age bracket, although pregnant and nursing women as well as school children are also vulnerable groups.

Following independence, the Ministry of Public Health, taking into account the urgency of the problem, sponsored a series of surveys. From these it has been possible to obtain an evaluation of the nutritional state of Algerian children. Taking as a criterion the edema index, protein malnutrition was found to be affecting almost 7 percent of the children between 0 and 1 years and 5 percent of the children between 1 and 4 years in the northern part of the country; in the Sahara region, the percentages were 9 and 15 percent respectively. A state

of "severe undernutrition" existed in 16.6 percent of the 0 to 4 age group. From these same studies, it appears that rickets was the most widespread deficiency disease in the country and was found among almost 40 percent of our children aged 0 to 5 years. In addition, endemic goiter is common in an area inhabited by 1.5 million persons. Its prevalence is usually estimated at 12 percent. The symptoms of goiter in Algeria are usually mild; cretinism is very rare. Although nutritional anemias seem to be common, we have not carried out any surveys in this area at the national level.

Taking the situation into account and keeping in mind the various public health concerns, the Algerian Government decided to solve the problem of weaning by providing families with a weaning food. The guiding principle was to manufacture in Algeria, using our own resources, a product that would meet the needs of the Algerian child and would specifically meet his "protein hunger." To make it available to the most impoverished families, this product was subsidized by the state and its price set at 0.80 dinars (Algerian) for a 300-gram package. Manufacturing is assured by the state-owned concern, S. N. Sempac, which holds the monopoly on wheat byproducts (semolina, flour, macaroni products, couscous) and has access to an extensive marketing network. Within 2 years, production increased from 60 to 380 tons.

This was the origin of Superamine, a blend of grains and legumes enriched with 10 percent skim milk and a vitamin-mineral complex. This flour marks the beginning of the dietetic industry in the Maghreb region. In mentioning this achievement, special thanks must go to the international organizations for their very effective help. Instead of offering outside foods, they have helped Algeria to solve its own problems.

Now we need to normalize the supply of raw materials, to diversify flavors, to make an enzyme treated Superamine whose net protein utilization rate will be about 73, to create new packaging, and a new assembly line. We also must, and this is particularly difficult, introduce it and have it consumed in all the homes that need it, especially

those of the rural poor. In spite of its low cost, many families are still unable to purchase it regularly for their children.

The most important achievement of this effort will be to revolutionize weaning habits through a sustained educational effort using local material and human resources. Action will be coordinated by a commission operating under the government. We are, however, well aware that Superamine will not settle the problem of weaning, because it is itself part of a much larger context. The total solution must wait upon a solution to the whole question of family feeding, that is the feeding of the entire Algerian population. Much effort is thus needed beyond manufacturing this weaning food. All possible avenues must be developed, as Algeria is attempting to go through its development plans.

Besides this fight against protein-calorie malnutrition, a rickets project has been in existence for several years. In addition to educating mothers, action takes the form of preventive supplies of vitamin D. It is hoped that endemic goiter may soon be conquered by the iodization of salt. Technically, this presents no difficulty. Studies have been made, and we are in the implementation phase.

These are some of the projects we are carrying out with confidence, knowing how much the health of our children will influence the future of our country.

REPORT ON NUTRITION IN BURUNDI

I. BACKGROUND INFORMATION

Burundi has a total area of 27,834 square kilometers and has to feed a population of 3½ million inhabitants, that is an average population density of more than 122 per square kilometer of whom 95 percent make a living essentially out of agriculture. Let us add at once that from the 2,247,350 hectares suitable to agriculture, there remained at the end of 1968 barely 569,235 hectares still out of cultivation, which will make it impossible after a decade to extend the cultivated area.

This population, which is already dense for Central Africa and which increases each year by 2.5 percent must share the meager output of its soil with livestock that includes 660,000 beef cattle and about 708,000 head of smaller farm animals whose yearly population increase also oscillates between 2 and 3 percent.

The continuous population increase and the constant reduction in lands available for either cultivation or pasture constitute the two great problems for which the government of Burundi must soon attempt to find a solution.

II. DATA ON THE NUTRITIONAL STATE OF THE POPULATION

Although they have sufficient food at their disposal, the people of Burundi are generally malnourished.

A. Studies on Consumption and Production

The available data are those of IRSAC as quoted by Project ABSED and adjusted to the estimated census of 1967 by the Rundi Institute of Statistics (IRUSTAT). These figures were used in establishing the 1968-72 five-year plan and agree with those of the 1967-68 study of food consumption by Mme. Magos, WHO Nutrition Advisor. Other data, based mostly on production, which were included in the 1966 Annual Report of the Ministry of Agriculture and Animal Husbandry, are exaggerated: three-fourths of the

banana, sorghum and millet production are used in brewing beer, and the alcohol calories that result have been included with starchy calories. The following table indicates: (1) the nutritional needs of the Burundi population and (2) (3) (4) the amounts met by existing diets.

Theoretical Nutritional Needs and Effective Contribution
(per person per day)

Calories and Nutrients	Needs (1)	Effective Contribution (2)	(3)	(4)
Total calories	2,300	2,200	2,100	2,819
Animal protein (g)	19.2	3.1	5	?
Vegetable protein (g)	38.6	68.8	+46	72.1
Fats (g)	63.9	17.4	17	25.3
Starches (g)	373.8	460.7	331.5	641.9

(1) Global Project ABSED and data from WHO 1967-68 survey -- theoretical nutritional needs.

(2) IRSAC data quoted by Project ABSED and adjusted to the 1967 IRUSTAT estimate of population.

(3) Data from WHO 1967-68 study -- effective contribution. The total calorie count here includes alcohol calories; the calorie count without alcohol is only 1,683. Because of this, the amount of vegetable protein is lower than in the other columns, since cereals used in beer are not included. The same applies to the low value of starches: those remaining in beer are not included.

(4) Data based on production estimates of the Ministry of Agriculture and Animal Husbandry in conjunction with IRUSTAT. Here, alcohol calories are included with starches, hence the high values.

Percentage of Needs Met by Each Diet

Calories and Nutrients	(2)	(3)	(4)
Total calories	95.7	91.3	122.6
Animal protein	16	26	17.7
Vegetable protein	178	119	186.7
Fats	27.2	26.6	39.6
Starches	123.2	88.9	171.7

Proportion of Nutrients Recommended (1) and Provided by Diets (2) (3) (4)
(percent)

Nutrients	(1)	(2)	(3)	(4)
Animal protein	3.4	0.5	1.2	0.4
Vegetable protein	6.6	12.0	10.8	9.3
Fats	25.0	6.8	10.0	7.4
Starches	65.0	80.7	78.0	82.9

From these tables it can be concluded that there is:

1. A lack of animal proteins;

2. An abundance of vegetable proteins, essentially because of the large consumption of beans;

3. An insufficient supply of fats of both animal and vegetable origin;

4. An abundance of starches, but three-fourths of the production of bananas, sorghum, and millet goes into beer and is therefore transformed into alcohol.

As for nutrition surveys, they do not exist as such. The statistics of the Ministry of Public Health have only available such figures as the average weight of children seen at well-baby clinics, weight gain of pregnant women, number of children per family among the mothers who attend health clinics, etc.

Many statistics on yield, production, and marketing are available, but on a regional basis. We can mention also the investigation carried out by IRUSTAT in cooperation with French technical advisors: the first study was made from March, 1967 to March, 1968 in the Ngozi region: the second study, which included also the Gitega and Ruyigi areas, was concluded at the end of 1969, and the results are not yet published; a third study regarding budgets and consumption is being initiated in 1970.

B. Sources of Food Products

1. Food Crops

Vegetables: beans, which form the staple diet, peas, cajan peas, soybeans, eggplant, squash, tomatoes, onions, cabbage, carrots, etc.

Starchy plants: sorghum, maize, millet, wheat, rice, manioc, sweet potatoes, potatoes, yams, taro.

Oil-producing plants: peanuts and palm.

Sugar-producing plants: sugarcane.

Fruit: bananas, citrus, papayas, avacados.

2. Livestock Raising and Fishing

A paradox exists in Burundi: the diet is mostly vegetarian, although the herds are considerable. People prefer the meat of beef cattle, but it is too expensive. They eat the meat of smaller livestock, such as pork and chicken. Eggs are beginning to appear in the diet as their use is increasingly popularized. In certain regions, game is a part of the diet. Among the byproducts of cattle-raising, only curds and whey play an important role, especially for children.

Fish is eaten only near lakes and rivers.

3. Beverages

The beverages are water, milk, and beer. Principal sources of beer are sorghum, banana juice, and hydromel.

C. Land Use and Production

It should be noted that not all the plants listed below are grown in all regions, since some areas are handicapped by their high altitude.

III. DEFICIENCY DISEASES ENCOUNTERED IN THE COUNTRY

It could be said that all deficiency diseases are observed, except for those against which nature offers protection, either because of geographical factors or soil composition, or other ecological reasons. For example, rickets, which should be widespread, remains mild, since the action of sunlight transforms body sterols into vitamin D. The anemias which occur cannot be blamed on a lack of iron! We can say that the anemias are not essentially nutritional anemias but the result of parasitism (malaria and helminthiasis).

Goiter is not endemic, but isolated cases are found in certain regions located in the neighborhood of extinct volcanoes where the iodine content is low. Ocular symptoms of vitamin A deficiency are rare and abate with the ingestion of fish, palm oil, and carrots which are increasingly enjoyed by the younger population. The causes of the various types of neuralgia which affect certain individuals, mostly persons of an advanced age, have not yet been elucidated, but the symptoms yield easily to the administration of vitamin B complex. Kwashiorkor is generally due to a combined deficiency of protein and calories to which vitamin deficiencies are added. Helminthiasis is common in Kwashiorkor patients.

Area Planted in Crops and Production 1962-1965

Crop	Area Under Cultivation (in hectares)				Production (in tons)			
	1962	1963	1964	1965	1962	1963	1964	1965
Beans	168,500	171,900	180,000	188,000	108,500	134,900	114,300	141,000
Peas	52,900	57,300	63,000	66,500	27,000	32,300	34,600	36,600
Peanuts	4,200	5,500	6,400	6,200	2,900	3,300	4,000	4,000
Sorghum	84,100	95,700	107,800	112,800	87,800	100,000	114,000	121,900
Corn	90,000	101,200	107,500	107,000	92,900	91,900	109,200	107,900
Wheat	9,100	10,600	11,400	12,200	6,500	7,400	7,400	8,200
Millet	24,400	29,200	29,000	32,500	16,800	19,400	20,600	20,500
Sweet potatoes	86,400	73,900	89,700	95,200	656,600	532,100	672,800	714,000
Potatoes	8,400	9,300	9,400	10,200	10,700	81 800	77,600	91,500
Manioc (under cultivation)	73,000	68,600	75,200	70,200	826,400	845,800	891,300	858,400
Manioc (fallow)	73,200	71,800	70,300	69,600	---	---	---	---
Other tubers	5,700	6,400	6,900	6,400	31,500	34,900	43,800	39,300
Bananas	111,100	120,500	125,800	125,800	1,039,000	1,169,000	1,258,000	1,270,600
Rice	1,100	960	1,200	1,050	2,750	2,608	2,880	2,178

IV. DISCUSSION OF THE CAUSES OF MALNUTRITION

A. Social Causes

1. Dietary taboos: some people still do not eat the meat of certain animals or certain vegetable products.

2. Lack of education, especially among women who have less access to schools than men.

3. Inadequacy of cooking facilities and misinformation regarding the art of food preparation.

4. Prevalence of a vegetarian diet.

5. Low yield of traditional agricultural methods and ignorance of agricultural technology.

B. Geographic, Climatic, and Soil Conditions

Burundi is a country with "a thousand hills," which does not lend itself easily to cultivation and precludes the utilization of certain profitable agricultural methods. The rough terrain leads to the erosion of topsoil into valleys and rivers. The end result is the impoverishment and downgrading of the soil. The climate is erratic; prolonged drought follows torrential rains; planting is difficult and often soon destroyed; hail can be damaging.

Soil conditions in Burundi are of three different types: 1) clay-like, sandy, and alluvial in the valley of the Ruzizi and around Lake Tanganyika; 2) lateritic in the interior; and 3) alluvial and marshy in the Mosso and in the east and northeast. Some regions have become sterile because proper agricultural practice has not been followed or because the soil has not been protected against erosion and brush fires, the principal agents of fertility loss.

C. Economic Factors

The problem of economic factors can be approached from two points of view. The first is that of the actual animal protein shortage in the country. The second, and

more important one, is tied to the unequal distribution of commodities among the population. The rich eat many more protein-rich foods than they require, whereas the poor are often unable to buy any at all. To arrive at a solution, we must first of all increase the buying power of the poor, that is, promote economic development and give relief to the poor by increasing the quantity of inexpensive protein foods, basically the protein from native cereals.

Transportation difficulties in carrying agricultural commodities to market are a serious handicap to the development of the rural masses since they are unable to trade their goods to acquire the commodities they lack. Since independence, however, the Government of Burundi has done much to remedy this situation by establishing communal markets whose distance is compatible with transportation by foot.

Another economic factor to keep in mind is the difficulty of importing food from abroad due to the scarcity of foreign exchange and the cost of transportation.

D. Demographic Factors

The population of Burundi numbers 3.5 million. The continuous demographic increase presents a vital problem to the Government of Burundi. The population increase has reached 2.5 to 3 percent per year, while population density in some areas is as much as 223 per square kilometer (census of 1965). The infant mortality rate is currently estimated at 1 percent per year.

The country's area is 27,834 square kilometers distributed as follows:

Land Use

Exploited land	1,715,434 hectares	
Unexploited land	849,606 "	
Total land area		2,565,040 hectares
Lakes		218,360 "
Total Area		2,783,400 hectares

The use breakdown of exploited land is given below:

Breakdown of Exploited Land
(in hectares)

Commercial crops	35,963
Subsistence crops	953,717
Woods and forests	69,206
Fields and permanent pastures	627,538
Built-up and paved areas	25,950
Total exploited land	1,715,434

The breakdown of unexploited land is as follows:

Breakdown of Unexploited Land
(in hectares)

Land with agricultural potential	568,062
Land with woodland potential	146,472
Useless land	134,072
Total unexploited land	849,606

The ratio of tillable land to population is 0.28 hectares per person. The population growth in comparison with the available tillable land is frightening.

V. EXISTING PROGRAMS TO COMBAT MALNUTRITION

A. Agricultural Development Projects

The agricultural development projects of the Ministry of Agriculture and Animal Husbandry are subdivided according to the four ecological zones of Burundi.

1. Low Altitude Zone (775 to 1,000 meters)

This zone, which corresponds to the natural region called Imbo, has an area of 180,000 hectares. Because of the fertility of the alluvial soils and the possibility of irrigation in the Ruzizi Plain as well as fishing in Lake Tanganyika, it is the richest section of our country. Principal commercial agricultural activities

are cotton, robusta coffee, palm oil, rice, peanuts, beans, manioc, sweet potatoes, bananas, and livestock-raising. With this great agricultural potential in mind, the Government has set up several projects with the aim of bringing the whole plain under intensive cultivation so as to make it Burundi's food reserve on which the always increasing population of Bujumbura will be able to draw. The next crop for which production is to be increased is cotton, which is second only to robusta coffee as an export commodity that earns the foreign exchange the country greatly needs.

Among the projects being undertaken in Imbo are:

a. A project to exploit a 5,000-hectare region between the Mpanda and Ninga rivers (FED).

b. The study and setting up of a stock-raising pilot project in the lower Ruzizi (ASB).

c. The reorganization of the Randa farm and dairy (ASB).

d. Re-equipment and improvement of the old peasant cotton plantations (CFDT-ASB).

e. Re-equipment of the Mparambo Farm and improvement of the north sector of the Ruzizi Plain (ASB).

f. Development of fisheries on Lake Tanganyika.

g. Forestation of the west slopes of the Congo-Nile Divide so as to regulate the flow of the Mpanda and Mutimbuzi rivers and furnish lumber for the inhabitants of the capital.

Some of these projects are already under way; others are awaiting a source of investment capital which the government is trying to locate.

2. Intermediate Altitude Zone (900 to 1,200 meters)

This zone includes the Mosso-Buyogoma and Busoni-Bugesera natural regions. Two large projects are being considered for these regions. The first is the integrated rural development of Mosso-Cankuzo. The aim of this project is the total integration of Rwanda refugees into national social life and the preparation of the region to receive Burundi immigrants from the overpopulated regions of the center and northern parts of the country. This project is now being carried out by UNDP/FAO.

The second large project in the intermediate altitude zone is the development of livestock-raising in northeast Busoni-Bugesera. This project is in the planning stage and will be presented to the UNDP Council in June 1970.

It should be noted that this zone is not as rich as the previous one. The only cultivation is that of subsistence crops, particularly beans, manioc, sorghum, peanuts, and sweet potatoes. A little arabica coffee is cultivated as a commercial crop. Cattle-raising is prevalent mostly towards Busoni-Bugesera. During certain years, this zone is subject to drought and causes severe famines in Burundi.

3. Middle Altitude Zone (1,500 to 1,900 meters)

This zone includes the central high plateaus which rise between 1,500 and 1,900 meters. Its climate is characterized by an annual rainfall which may exceed 1,000 millimeters and a dry season lasting 4 months. The mean temperature is 19° to 20°C.

This ecologic zone is especially suited to arabica coffee, the main source of foreign exchange and of the well-being of its population. It is also the most densely settled of the four zones. Population density in some places reaches 223 persons per square kilometer.

The main project under consideration is the chemical fertilization of arabica coffee trees in order to

increase coffee yield. Experiments carried out in this zone have shown that chemical fertilizers could create an increase in yield of approximately 30 percent (IBRD loan).

Other projects have various purposes, in particular the production of subsistence crops such as vegetables, fruit, potatoes, etc.

4. High Altitude Zone (above 1,900 meters)

This zone consists of the Congo-Nile Divide and extends from the Rwanda border in the north to the southern regions of Burundi. The mean temperature is 17°C. Rainfall is 1,400 to 1,500 millimeters with a dry season that rarely exceeds 3 months but is pronounced.

The remains of the natural forest cover the northern part of this zone above 2,200 meters. In addition to the promising recent introduction of tea plantations, this is also the ideal region for livestock-raising, vegetables, potatoes, corn, and wheat.

Taking into account these ecological considerations, several projects have been launched to diversify agriculture as much as possible and some are already giving tangible results. The largest and most interesting is the tea project. Ecologically, tea cultivation in Burundi is almost entirely restricted to the high altitude region. Three projects of 1,500 hectares are being launched, and expansions are being planned in familiar surroundings near the initial projects. One factory is operating, and a second one will soon begin operations. In spite of the relatively restricted suitable terrain, tea cultivation is expected to play an important role in the economic diversification of the country.

In this zone, the Government of Burundi is also planning forestation projects. The most important ones are on the Congo Divide and the forest preserve. The improvement of the Congo-Nile Divide will make this natural forest into an economic proposition by partially and progressively transforming it into an exploitable timber area. The second important forestry project in this area is the exploitation of the Burundi forest reserve. This

reserve covers approximately 3,000 hectares and lends itself to mechanized exploitation over almost its whole extent. It can provide high quality lumber capable of taking the place of imported lumber. This has the potential to provide appreciable monetary resources to the people of the area.

Finally, in hope of maximizing outputs, several steps have been taken in this zone to promote good management and cooperation between agriculture and stock-raising.

Other projects and steps being considered at high altitude are the following:

a. Intensification of truck farming, for the improved management of cultivation and of marketing of produce destined for the population of the capital.

b. Intensification of potato-growing at Ijenda in the province of Bujumbura and at Muramvya, to allow the development of this crop in the regions where it is most adaptable.

c. Study and research on the improvement of livestock -- beef cattle, hogs, and poultry (Isabu Ruvyironza).

d. Improvement of pastureland by the addition of chemical fertilizer, and research on forage crops best adapted to the ecological conditions of the region.

e. Reactivation of rural action areas to increase cattle-raising.

f. Distribution of selected seed to increase the yields of corn, wheat, peas, etc.

g. Beekeeping development projects in three areas of middle altitude: Gitega, Ngozi, and Ruyigi. The purpose is to replace

native beehives by high-yield frame hives, and to set up centers for the manufacturing and processing of honey.

Convinced that agriculture remains and will remain the basis of our national economy, our country is determined to use all means at its disposal to confront this issue and thus arrive at its main objective, that is, to insure an adequate and nourishing food supply, to our population while raising the income of each individual through the sale of surplus commodities. To this end, the Government needs the materials and manpower as well as agricultural investments necessary to improve the traditional methods of cultivation used by the farmers.

In the financial and technical realms the Government is relying greatly on the generosity of international agencies, both multilateral and bilateral. But if Burundi can count on outside help to carry out its program, it is aware that it must first of all rely on its own means and that foreign aid may only complement its efforts. We know, in fact, that foreign economic aid, however important, can be effective only to the extent that the country itself is able to absorb this aid; and this is possible only if the country is in a position to meet its own part of the budget and has at its disposal the staff and labor needed both quantitatively and qualitatively to execute the programs being financed by foreign aid.

B. Nutrition Education

Within the framework of a program of maternal and child health included in a development program for basic health services and in collaboration with WHO, the Ministry of Public Health is participating with the Ministry of Agriculture and Animal Husbandry, the Ministry of National Education, and the Ministry of Social Affairs in the following projects:

1. Nutrition Education

- For mothers when they visit government centers for prenatal and infant care.

- For the whole population through radio programs and party meetings.

2. Teaching of Nutrition Education

- To schoolteachers as well as to rural community organizers and social workers when they attend refresher courses and seminars.

- To student nurses and medical technicians by including in their curriculum as a major subject sanitation education and nutrition education.

There exist at present about 30 health centers and clinics which take part in these educational activities and four schools under the Ministry of Public Health where sanitation education and nutrition education are taught. Under the Ministry of Social Affairs, the training of social workers takes place within a program for the development of women, in collaboration with the Ministry of Public Health. Under the auspices of the Ministry of National Education nutrition is to be included in the curriculum of the primary and secondary schools. As part of the Ministry of Agriculture's program to spread agricultural know-how, the students of the Burundi Technical Institute of Agriculture at Gitega receive nutrition training.

C. Applied Nutrition

There are several applied nutrition programs in Burundi:

1. A program to spread information regarding poultry farming (FAO), including construction of model poultry houses.

2. Creation of school gardens and small animal raising projects (UNESCO/FAO and OLUCOF*).

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*Organization to Combat Hunger (Organisation de Lutte Contre la Faim).

3. Distribution of seeds and agricultural implements (UNICEF and OLUCOF).

4. Demonstration of food preparation at the government health centers and home economics centers.

5. Improvement of diets in secondary boarding schools (World Food Program).

D. Child Feeding

The only ongoing programs involving child feeding aside from the WFP program mentioned above, are the examination of infants at health clinics and the hospitalization of cases of malnutrition. School canteens are not yet in operation.

VI. GOVERNMENTAL POLICY TOWARD MALNUTRITION

To lessen malnutrition, the Government has resolved to mobilize the country's energy by stimulating through all the means at its disposal a national awareness of all the problems relating to the economic and social development of the country. Happily, our population has understood the gravity of the problem and is already at work in community efforts likely to help the Government solve the problem in certain sectors: in the maintenance and development of the infrastructure; the fight against erosion; the drainage of marshlands; forestation, both on a community level and an individual basis; road work, etc.

The greatest concern of the Government is the fight against marasmus and kwashiorkor, which affect our children at disturbing rates of incidence. Since it is well-known that these diseases are due to malnutrition, we advise the people of Burundi to eat protein-rich foods, such as meat, fish, soybeans, and legumes.

In our work, we collaborate with the different international agencies. The Food and Agriculture Organization is already financing the development of fisheries on Lake Tanganyika and the inland lakes, as well as the commercial use of dried fish in some regions. This agency

is also concerned with increasing the popularity in rural areas of the raising of poultry and rabbits. The International Association for Overseas Rural Development is helping us to train men and women as project organizers in pilot centers around the country. It is planned, in this way, to obtain sufficient competent staffing personnel to lead the population toward a well-managed agriculture. Tenant farmers are being trained to improve their livestock and introduce some where there was none.

Concerning vitamin-rich foods, we are encouraging the rural masses to grow vegetables and fruit to bring within everyone's reach a good diet -- that is, a wholesome, balanced, plentiful, and varied one. Here, we are grateful to UNICEF's free distribution of seeds and farm tools. Another agency, the Center for Cooperation for Development (CCD) is assisting us in training truck farmers and breeders. It puts at the disposal of some farmers basic equipment which they lack the money to acquire. CCD does not forget to aid us in education and in the organization of home economics centers. The same agency has just founded a school for agricultural leaders to work at the community level. The first students will complete their course June 12, 1970. We try to reach as many people as possible, both girls and boys, to teach them hygiene and the proper way to feed themselves under good conditions.

By Decree No. 1/104, dated 10/10/1967, the President of the Republic formed the Organization to Combat Hunger. This organization aims to promote, encourage, and organize throughout the Republic of Burundi the fight against poverty, hunger, and malnutrition, and to launch, support, and extend projects and steps to lessen or eliminate directly or indirectly hunger and malnutrition from Burundi.

To achieve this, Burundi has put at the disposal of those in charge the use of national radio, party meetings, and meetings of integrated movements. These are the sole sure and rapid means to reach the complete spread of population to inform and educate it. This consists in strengthening and developing the information and education of public opinion to stimulate agriculture and improve

nutrition. Broadcasts of all kinds are often aired by national radio, and newspapers and slogans also take part in the campaign.

Since Burundi has a single political party headed by the Chief of State himself, it has awakened the driving force of the nation to a common effort to pull the country out of this alarming condition of underdevelopment and malnutrition. Several movements have been started to help the party to implement its aim of "Unity, Work, and Progress" (Unité, Travail, et Progrès).

Among the movements integrated within the party are Rwagasore Revolutionary Youth (Jeunesse Revolutionnaire Rwagasore, JRR), the Barundi Women's Union (Union des Femmes Barundi, UFB), and the Burundi Workers Union (Union des Travailleurs du Burundi, UTB). All these movements are intended to promote and support agriculture for the well-being of the whole population. Striking results have come from the founding of "youth fields" where each young farmer learns up-to-date agricultural and stock-raising methods. The same youth group has already initiated a program to gather unemployed young people who have no education or who are educated but without jobs. The Barundi Women's Union helps women to come out of their ignorance and to participate like other citizens in national reconstruction.

In implementing our programs, we used to clash with traditions, but this problem is almost solved today. In any case, we hope that through steadfast work and goodwill, we will be able to stop malnutrition in Burundi.

A. Nutrition Policy

Conscious of the gravity of the nutritional situation, the Government has established a Department of Women's Development which handles nutrition education in Burundi's home economics centers. Women attend the home economics centers to learn about child feeding. They also learn how to plant home vegetable gardens. Rural centers are set up in the communes to help women and girls unable to reach the home economics centers because of the distance between their homes and the centers.

The Agricultural Extension Department, which provides information and assistance in agriculture, forestry and animal husbandry, through national radio and rural educational programs, is of great help to the people and distributes vegetable and fruit seeds. The establishment of poultry centers to spread the best varieties in rural areas is underway. This will lead to heavier birds yielding more meat as well as better egg production.

The Government has not forgotten to support school-age youth and has planned school gardens and farmyards and introduced nutrition courses into the primary and secondary school curricula. This will teach youth agricultural trades and the way to a good diet, all of which will insure their future.

The Government of Burundi has established dairies to help in disposing of the products of cattle-raising. It is trying to modify certain dietary habits by introducing cheese and butter consumption to stimulate cattlemen to higher production. The creation of stud centers is no less involved in the fight against malnutrition. As a result, the local breeds of cattle are improved, both in standard weight and in meat and milk yield. Each primary center owns a selected bull, and some even have crossbred animals.

The initiation of stockbreeding competitions stimulates breeders to better care of their stock, and to employ diverse means to increase productivity, such as improved forage.

The distribution of bonuses to the best planters of coffee, cotton, and tea. is an excellent incentive to farmers to apply themselves further to these plantings.

B. Food Control Administration

The Government is safeguarding against frauds in matters pertaining to foods by fixing a maximum price for each food item, taking into account the cost of living and the needs of the farmer. A ministerial decree fixes the minimum areas to be planted in each crop by every healthy,

adult male as follows: manioc -- 30 ares, sweet potatoes -- 20 ares, wheat -- 5 ares, peanuts -- 10 ares, millet -- 10 ares, potatoes -- 10 ares. Young people have been requested to report any unlawful export of foodstuffs to foreign countries.

C. Pricing Policies

Minimum prices prevail at harvest time, that is at the start of the dry season (June - July), for beans (second crop), sorghum, millet, peanuts, potatoes, and taro; during November and December for beans, marsh corn, and potatoes; during February and March for beans and peanuts (first crop). Sweet potatoes, manioc, and bananas do not seem to have seasonal price fluctuations, since they are grown over the greater part of the year. Other price fluctuations over a period of time might be due to plentiful harvests, or more frequently to particularly bad ones. The following table contains price quotations immediately after the harvest and several months later.

Prices of Selected Food Crops

Crop	Price per Kilo After Harvest		Price per Kilo Several Months After Harvest	
	Burundi Francs	U.S. Dollars	Burundi Francs	U.S. Dollars
Beans	10	0.11	12	0.13
Peas	10	0.11	12	0.13
Peanuts (unshelled)	8	0.09	10	0.11
Corn	4	0.04	7	0.08
Sorghum	8	0.09	10	0.11
Millet	8	0.09	10	0.11
Wheat	10	0.11	12	0.13
Rice	20	0.22	23	0.26
Potatoes	10	0.11	15	0.17
Sweet Potatoes	3	0.03		
Manioc	3	0.03		
Bananas (bunch)	30 to 40	0.34 to 0.46		

There are often wide price ranges in markets for certain commodities (beans, sorghum, millet, peanuts). These differences arise from the lack of transportation both within a region and to the outside.

On the other hand, sellers do not have access to fast, large capacity means of transportation to take their produce to distant markets. In most cases, they are content to sell at the market nearest their home, even under less favorable conditions. In addition, buyers do their purchasing on foot. They are not acquainted with the whole region nor with the going prices at each market; therefore they stop at the first market or at the one they are used to patronizing. Each market is an autonomous entity in which supply and demand operate at price levels corresponding to the relative abundance of products. By contrast, other commodities show a similarity of prices or a minimal difference: they are the produce in abundant supply at all seasons and with a constant demand (bananas, manioc, sweet potatoes).

Even within a given market, price variations occur. Price quotations are often doubled, which can be accounted for by the absence of labeling and weighing or by the lesser or greater amount purchased at one time.

The gross per capita income is 4,183 Burundi francs or $48, that is a cash income of 1,662 Burundi francs or $19.

This low income level is explained not only by the nonexistence of cash crops and the limited possibilities of salaried employment, but also by the low degree of commercialization of subsistence crops. If these food products supply a relatively important part of the family's income, their absolute value remains minute. Agricultural activity thus remains destined to meet primarily the needs of family groups.

At the regional level, this subsistence economy shows up in only occasional, limited-scope transactions with the outside; practically the whole production of food crops remains in the region itself, and the buyers are

individuals or small scale peddlers with limited range of activity and low buying power.

The complete absence of organized commerce and transportation sharply reduces inter-regional trade. Agricultural output meets the needs of regional consumption, but reserves only a slight surplus for export. Indeed, producers do not try to have regular surpluses. They question the possibility of a just reward for their effort, because of the chancy character of outside markets. Having a surplus for sale is of no interest to them, since it runs the risk of being undervalued or being ruined by the vagaries of climate.

D. Land Use

Each Murundi owns his land with a mortgage. In practice, since the revolution of 1966, each farmer is considered the owner of ancestral land consisting of cultivated parcels, fallow land, pastures and wetlands, sometimes woodlands. Common law rights have been abolished; each Murundi has the right to become a landowner according to written law, but only of cultivated land. The real estate legislation in preparation will include a procedure by which, after an investigation carried out by the commune or the communal council, land title deeds will be given by the Registrar of Deeds.

E. Agricultural Credit

At this time, the National Bank for Economic Development, just founded in Burundi, will make loans to agricultural associations.

VII. PRINCIPAL PROBLEMS TO BE SOLVED

To fight malnutrition, priorities are as follows:

A. Public opinion must be mobilized toward rural development. The essential thing is to promote the modernization of social structures within rural zones, so as to transform the ancestral systems of peasant agriculture and, by raising the standard of living in rural areas, to put a brake

on the massive exodus from the countryside to the octopus-like cities. When the soil does not lend itself to worthwhile cultivation, the people should be oriented to other life styles.

B. High-yield varieties of subsistence crops must be introduced to increase productivity. The lower quality stock that needs pasture lands, and fatally limits the available tillable land area must be eliminated. Agricultural activities must be specialized in natural regions. Exploitations from one region to another must be facilitated.

C. The protein deficiency must be eliminated by multiplying protein-rich foods, especially animal proteins. Oil-bearing crops must be intensified. Stock-raising must be better organized; by-products of livestock must be under good management practices; fishing must be developed.

D. The wastage of food products that occurs at harvest time and in storage, as well as losses due to insects under poor storage conditions should be remedied. To this end, the value of local products must be increased by the creation of local industries.

E. Commercial cropping must be intensified to increase foreign exchange and boost the national economy.

F. Roads and highways need to be built to promote inter-regional trade.

VIII. PROGRAMS UNDERWAY OR IN PLANNING STAGES

Programs now underway to fight malnutrition are as follows:

A. People are being resettled from overpopulated regions to less populated areas (UNDP in Mosso, FED in Imbo).

B. Youth of both sexes are being educated.

C. The WHO project for maternal education continues to expand with the aid of UNICEF.

D. A new program assisted by WFP will improve diet in hospitals and at health centers and clinics engaged in maternal and child care.

E. In addition, we recall the various development projects already described.

REPORT ON NUTRITION IN CAMEROON

I. NUTRITIONAL STATE

A. General

The nutritional state of different population groups in Cameroon is linked to the ecological factors that influence cultivation and stock-raising. It has been said that "all Africa is in Cameroon." This expresses the diversity of its landscape, climate, and people. The production of animal and vegetable dietary commodities varies both quantitatively and qualitatively within regions according to geographic conditions. Almost anything that can grow and survive on African soils can exist in Cameroon.

Several projects and studies carried out in Cameroon are listed at the end of this brief report. As an example, a few typical titles relating to different regions and one work on traditional food practices are listed here.

1956 - Masseyeff and Chambon: Investigation of Food Consumption in South Cameroon (Forest Region).

1957 - Masseyeff, Piermé, and Bergeret: Investigation of Diet in Cameroon, Batouri Subdivision (Transition Region: Forest and Savanna), p. 90.

1959 - Masseyef, Piermé, and Bergeret: Investigation of Diet and Nutrition among the Toupouri of Golompoui (Savanna Region).

1960 - Bascoulergue: Investigation of the Nutritional State of Schoolchildren in the Department of Diamare (Savanna Region).

1970 - Martineaud: Dietary Tradition: Habits, Restrictions, Taboos, Prejudices. To be published in Afrique Médicale.

From all the projects already carried out in Cameroon, both by individual scientists of international agencies and national research centers, and by the Department of Public Health (clinical studies of nutrition, economic and social studies, studies of family budgets and standards of living, statistical data of the Bureau of Maternal and Child Care and Endemic Diseases, etc.), it appears that Cameroon does not suffer from famine; but cases of malnutrition are not rare and are seen even in the richest regions and social surroundings.

B. Deficiency Diseases Known in the Country

The major manifestation of lack of proteins is kwashiorkor, which is more frequently seen in rural areas than in the large urban centers. This is not the classic observation in Africa, where one notes an increase of protein malnutrition cases mainly in large cities. The reason is that in the large centers of Cameroon there has been an apparently effective effort for many years to supplement the diet of children from the age of weaning onward. In 1968, the Maternal and Child Health Center of Yaoundé used almost 3 tons of dried skim milk and almost 2 tons of various flours for its dietetic demonstration sessions, where masses of mothers come daily with their young children to learn to feed them better. Marasmus, an advanced form of protein-calorie malnutrition, is not rare. It is seen in young children either after a progressive reduction in the mother's milk secretion, or after dietary errors following the sixth month of life.

Vitamin deficiencies, such as lack of vitamins A, B_2, and C, are less serious. Among mineral deficiencies, outside of the nutritional anemias often connected with parasitism, iodine deficiency is the most important one in Cameroon. Substantial research has been done on this subject by ORSTOM (Organisation pour la Recherche Scientifique et Technique Outre Mer), and a medical dissertation was presented on June 30, 1969, by Francine Charrier Stephany under the title "Endemic Goiter in East Cameroon: An Epidemiological Study of 39,980 Cases." This study, based principally on primary schools in 1967-68, discloses that the rate of occurrence of goiter reaches 80 to 95 percent in the east.

This lack of iodine has severe consequences in intellectual development which can be shown by comparing the percentage of children likely to be brought to the CEPE (Centre d'Education pour l'Enfance) in each region:

Percentage of Children Likely to be Brought to CEPE's

Region	Percentage
Coastal	92
South-central	83
Northern	83
West Cameroon	83
Western	80
Eastern	71

The low percentage in the Eastern Region indicates a marked retardation of children whose education takes place in the east as compared to their fellow students of other regions. In another study of endemic goiter in the same Eastern Region, Dr. Lowenstein, WHO Secretary for the Joint FAO/WHO/OAU (STRC) Food and Nutritional Commission for Africa, has pointed out cases of cretinism among some goiter patients.

We said that Cameroon did not suffer from famine but that cases of malnutrition were not rare, and we have just outlined the cases that are met.

II. CAUSES OF MALNUTRITION

A. Social Factors

The causes of malnutrition are first of all of a social nature, and the principal one is a lack of education. Quite frequently, indeed, children are weaned directly from a diet of mother's milk to a soft mush made out of millet, corn, manioc, rice, or plantains, depending on the area. Eggs, meat, or fish are not a part of these children's diets. Also, when a child is sick, he is frequently deprived of the solid foods he needs and put on a liquid diet.

The reasons for these attitudes are generally food habits, ignorance, prejudices, and taboos. They are as little convincing for us as they are imperative to those who are subject to them and who deprive themselves of the advantages of the better diet that is generally within their reach. For example, it is thought that milk causes sterility in women, eggs cause a loss of libido, certain types of meat have an evil effect on children, fish causes leprosy, and spotted beans give smallpox. Numerous other foods, generally those that are rich in proteins and whose nutritive value is excellent, are also accused of being the cause of digestive upsets, eye difficulties, or other mysterious hazards.

B. Economic Factors

One of the causes of malnutrition is the deficit in production of all the commodities necessary to a balanced diet in all regions. To this lack of variety of goods, is added the lack of organization of distribution routes that might permit the spread of foods over the whole country. Thus, the south has an abundance of tropical fruit of all kinds, whereas the north is without; on the other hand, the north has large herds of beef cattle and sheep, whereas the south is seriously lacking in meat; the coastal area has a large supply of fish which is not available in the interior.

It should be added that when it is possible to bring complementary food commodities to certain centers, prices are not within the reach of everyone. It also happens, that improvident city housewives, finding themselves out of money and unable to make ends meet, manage to acquire foods of meagre nutritive value but at a minimal price.

The rural exodus to the cities is important in Cameroon. Malnutrition cases are more frequent and continue to grow among urbanizing populations in large cities such as Douala, Yaoundé, Garoua, Victoria, Bafoussam, Foumban, Ngaoundéré, etc. The lack of money and technical specialization of the cityward migrants are the causes.

C. Demographic Factors

Some populations of eastern West Cameroon have a high growth rate in excess of 3 percent (the mean population growth rate of Cameroon being 2 percent). In these regions, the density is often above 200 inhabitants per square kilometer and there is a considerable increase in material resources. On the other hand, regions in East Cameroon are sparsely settled, with a density of 2 persons per square kilometer, very low per capita income, and food supplies that are barely sufficient and little diversified.

It is known that parasitism and communicable diseases are often benign among well-fed people but become serious when they attack populations with a poor diet or who are undernourished. In Cameroon, it is the infant and child population that is mostly prey to malnutrition. Disease and mortality attack mainly young children. Between 0 and 5 years, the mortality rate observed in health centers is actually 30 percent. This means that in Cameroon one out of three children does not reach the age of 5.

III. CURRENT PROGRAMS TO FIGHT MALNUTRITION

A. Diversification and development of food crops.

B. Improvement of livestock (beef cattle, sheep, goats), poultry, and fishing to increase production.

C. Nutrition education in the framework of health education.

D. Development of transportation networks.

E. Organization of markets and trade routes.

F. Training Programs.

Training programs have been organized for persons in charge of administering projects in the field. Trainees come from existing agencies: the Bureau of Maternal and Child Health (MCH), the Bureau of Social

Work, the National Federation for Nutrition and Health Education Projects, the Information Bureau, the Youth Movement, Women's Associations, Rural Development Organizations, Popular Education for Rural Development, Religious Institutions, and especially the Ministry of Planning and Development.

As an example, in the field of information, here are the radio broadcasts that have had a bearing on nutrition:

1. Interview with the regional consultant of WHO in matters of nutrition: "Influence of Nutrition on the Economic Development of a Country; the Nutritional State of the People of Cameroon."

2. The different food groups (food for strength, food for growth, food for health).

3. A diet composed of foods of local origin.

4. Feeding of pregnant women and nursing mothers (an interview with the Chief of Medicine of the MCH center in Yaoundé).

5. Feeding of young children (from weaning to preschool age).

6. Quiz show on nutrition.

7. Beverage in nutrition.

8. Results of the quiz show.

9. Feeding of laborers and athletes.

10. Concluding broadcast on nutrition.

The theme of "nutrition" was presented on the national radio network over a period of 6 months (from November 1969 to April 1970) at the rate of one broadcast per week.

In regard to the centers for maternal and child health, each large MCH center includes a milk distribution center and a diet demonstration room where mothers with their young children go to learn how to feed the children correctly with dishes prepared from local products. There is also a milk distribution area in each pediatric hospital ward.

IV. GOVERNMENTAL POLICY TOWARD NUTRITION

A. National Policy

National policy consists of intensifying the production of food commodities, whether vegetable or animal, and limiting the importation of foreign products, which are much too expensive.

B. Coordination

In Cameroon, there is no National Institute of Nutrition, but nutritional concerns are coordinated by the National Committee of the World Fight Against Hunger. This committee was created by presidential decree, placed under the high sponsorship of the President of the Federal Republic and under the control of the Minister of Planning and Development. It is headed by a president and a permanent secretary. The Committee is made up of representatives of the prime ministers of the federated states, representatives of the ministers of the federal government and of the secretaries of state of the federated governments, and representatives of the Catholic, Protestant, and Moslem faiths. Any other person may be appointed because of his competence or experience.

C. Pricing Policies

Pricing policy is determined by presidential decree. This document allows the Government to regulate price determination and publicity for goods and services as well as commercial activities which could entail a speculative rise in prices at the consumer level or might prevent a justified price reduction. The same decree, dated 18 December 1968, sets up a National Pricing

Committee to act as a consultative agency to advise the Government -- except in cases of emergency -- on all decisions and regulations of national scope. The Committee is composed of the following: The Minister of Commerce and Industry (who serves as Chairman); three representatives of the National Federal Assembly; two representatives of the labor unions; two representatives of the employers' unions; one representative of the Chamber of Commerce, Industry, and Mines.

Another presidential decree of the same date creates within the Department of Commerce and Industry a subsection in charge of price control and economic surveys. It studies all matters pertaining to price regulations, prepares directives for local officials, and enforces the regulations.

The pricing policy is only partly applied because of difficulties met in the establishment of trade routes and because of the inadequacy of viable roads in all seasons, etc.

D. Land Tenure

Concerning land use, there is no distribution of land. Common law remains in force. But land is taken by eminent domain whenever needs of a public nature arise. However, studies are in progress to find a solution to the best management of tillable lands. These land areas have been the subject of a census, and those under cultivation or not cultivated have been enumerated.

E. Agricultural Credit

To encourage peasants to undertake agricultural activities, the Government has requested the president of the Cameroon Development Bank to initiate an Agricultural Credit Bureau. In each administrative region, a Modernization Office has been opened. These offices serve as liaison between planters and the Agricultural Credit Bureau. The Modernization Office includes a board of directors assisted by two technical committees: an Agricultural Projects Committee, and a Regional Credit

Committee. Requests from planters are received and studied by the Projects Committee. The Regional Credit Committee grants loans to the farmers whose projects have been approved. The same procedure applies to stock-raising.

V. MAIN PROBLEMS TO BE SOLVED

The preceding discussion of programs to fight malnutrition is far from finding a solution to the main problems that arise in this struggle. Here are some of the problems and our suggestions to solve them, in the long run, of course, and hinging on the availability of means.

A. Ignorance of the General Public

Health education and nutrition education are imperatives not only from the point of view of health, but also for economic reasons. Educational projects must reach not only urban populations, but also, and in particular, the rural masses. With the help of the agencies listed above, a public information campaign might be launched to emphasize nutrition and food education through the following means:

1. Lectures and Talks

   a. Underlining the importance, the consequences, the diagnosis, the treatment, and the prevention of nutritional diseases.

   b. Underlining the food value of local products, their classification as energy and strength foods, or protective and health foods; emphasizing a balanced diet and the ways of correcting a lack of balance.

   c. Presenting the advantage of food supplementation by the association of foods that complement each other (when the staple food is deficient in protein, vitamins, or minerals) to increase their food value, reestablish the dietary balance, stimulate appetite, and break into the monotony of food habits.

d. Based on the reality of local conditions (nutritional state of the population, subsistence crops, taste, habits, food customs), listing foods and indicating suitable food preparations, the least expensive, the simplest, the best-adapted, the tastiest for the various population groups (children of weaning age, pre-schoolers of both sexes, pregnant women, nursing mothers, school-children, the aged, workers).

2. Radio Broadcasts

The above lectures and talks could be repeated on radio broadcasts in both the official language and the vernacular:

a. Taking care that this audio-visual teaching be adapted to the reality and potentiality of local situations.

b. Making certain that this teaching be imparted by competent persons, well-informed of national issues and well-acquainted with the region and its structures. With this in mind, any national radio broadcasts dealing with questions of health education and social, nutritional or dietary education should be required to have the previous approval of the appropriate national agencies.

3. Other National Education Means

These talks and lectures could be taken up again in the form of advice or lessons, or by any other national educational means: movies, slide shows with commentaries, posters, leaflets, exhibits, demonstrations. The locales of these activities should be schools, women's centers, home economics centers, schools of homemaking, women's organizations, health education groups, rural development centers, maternal and child care centers, literacy centers, youth groups.

B. Education of Mothers and Housewives

Education of mothers is needed to teach them to detect the main states of malnutrition, and education of housewives is necessary to prevent these states by use of local food products. Mothers should be taught to recognize the principal state of malnutrition in preschoolers and educated in the use of traditional foods produced locally, regionally, or nationally which are best capable of insuring the prevention of the frequent conditions of childhood malnutrition.

Housewives can be instructed in the preparation of very simple typical menus adapted to the seasons, by specifying how foods may replace one another with equal food value; for example, replacing this fruit by that one, this food item by this other; if fish is not available, animal protein can be provided by such and such an amount of poultry, meat, game, milk, eggs, insects, shellfish, etc.

For such an educational program to be successful, it is necessary that:

1. These ideas of detection and menus be applied by health educators, on the radio, and among the people in the vernacular tongue.

2. Practical applications be made in women's centers, maternal and child health centers, and by audio-visual displays in information centers.

3. Demonstrations be given in the various women's centers on practical means of food preservation: smoking, drying, salting, cooling, and other simple methods that permit safe keeping for a few days (dipping of eggs in lime water or vegetable oil, burying of manioc and taro in the ground with occasional watering).

4. The danger of eaten spoiled foods be underlined.

5. Mobile teams be formed for periodic demonstrations (weekly or bi-weekly) in public squares, markets, villages, neighborhoods, towns, etc., with priority given to cities where the rural exodus has been largest and most recent.

C. Education of Families

Education of families to the intelligent use of a family budget based on their resources is needed. With the help of the appropriate agencies as listed above, a typical budget should be prepared and distributed; this budget should be based on a minimum income and on an average income. What happens in many African cities happens in Cameroon. City housewives, the poorer ones or the ones with less forethought, find themselves out of cash. They are then more likely to go to the grocer's, if he will give them credit, than to the market. It follows that instead of the local food products they are used to, they buy higher priced manufactured products, whether local or foreign, to which they are usually unaccustomed, but which are more easily accessible than the traditional commodities in times of money shortage.

Fathers must be awakened to their responsibility to provide food for their children and their wives, and to help a woman in her daily chores. A man must do work on the outside to allow his family to buy the foods it needs for proper nourishment.

Wives must be awakened to their responsibility not to squander money that is intended for food, and not to use it for frivolities or unnecessary clothing.

D. The Fight Against Hunger

There is a need for educational posters appropriate to the neighborhoods and capable of bringing about a favorable reaction to the intended goals. There is need to insure the truthfulness of food advertising and to fight deceitful advertising which is a fraud and a danger to the consumer. Films and slides must show victims of malnutrition among our fellow countrymen in a native setting; they must especially show malnourished young children

side-by-side with well-fed children. Regional and national "beautiful-baby" contests must be encouraged with prizes and mass publicity. Each time it is possible, school cafeterias must be established. When they do exist, it should be remembered that the meals are not always balanced and can be monotonous and poorly served. This can be remedied by better training of the women who are kitchen employees, dietitians, and cafeteria managers.

A day must be set aside as a national day of nutrition and feeding, with talks and lectures, exhibits of local products, demonstration of dishes made from these products, and typical menus with, if possible, sampling and tasting tables.

To meet the observed shortage in staple nutrients, national production of food crops must be encouraged. In addition to steps aimed at developing the production and consumption of protein-rich foods, both vegetable and animal, action must be directed toward intensive publicity for the daily consumption of fruit; the country is replete with fruits that spoil at the growing sites when they are not exported.

The local production of animals must be improved. The total livestock of Cameroon is considerable:

Livestock Production
(head)

Cattle	2,000,000
Sheep	1,500,000
Goats	2,000,000
Horses	21,000
Donkeys	51,000
Pigs	300,000
Poultry	8,000,000

Yet our livestock is still poorly utilized. For many breeders, it is still a wealth to be desired for its status value but which is very little marketed. The males in a herd are retained as much as the females. The cattle are a hardy species, slow-growing, and adapted to walking. They grow to 200 or 500 kilograms in weight, depending on

the climatic conditions. They are raised in the north and west of the country.

Dairy production is almost non-existent in Cameroon. Hence, we are forced to import milk and dairy products. Modern dairy farms could be, and should be, built as public or semi-public enterprises to insure the supply of milk, and even of butter, for the large urban centers as is done at present in Senegal with the help of FAO and UNICEF.

Assuming the herd composition given and a 9 to 10 percent yield, as estimated by Dr. Maikano Abdoulaye, Director of Stock-Raising and Animal Industries, the available livestock from the national herd is as follows:

Offtake of Livestock and Poultry

Cattle	250,000	head
Sheep and goats	40,000	"
Pigs	20,000	"
Chicken	500,000	"
Eggs	114,000,000	units

The total production of meat is estimated at nearly 22,000 tons. Fish landings by individual fishermen in Cameroon are estimated to total 34,500 tons of fresh fish, so that our animal protein supply is estimated to be approximately 50,000 tons, that is, about 20 kilograms of meat or fish per person without including other sources of animal protein.

These figures are roughly comparable to what is necessary to meet the protein needs of the whole population, but in practice local consumption is notably inadequate. Figures for animals slaughtered under the control of the Bureau of Stock Raising and Animal Industries in Eastern Cameroon, give only 110,000 cattle consumed: 23,000 in the north, 17,000 in the central region, and 70,000 in the south. The annual consumption of small stock animals is of only 27,000 sheep and goats and 20,000 hogs. Great effort should be put into rational development of the intake of animal protein. This is an objective with high priority. It is an important factor in the

improvement of the health of our people.

To effect a better distribution of available food commodities in the whole Federal Republic, internal trade routes must be established. Therefore, the road construction plans included in the Third Five-Year Plan should have an absolute priority. Trails must be built to allow the easier driving of cattle toward the south from the principal cattle-raising regions to the large consumer markets and slaughterhouses. These trails could be equipped with stockyards to shelter the stock at night, and feed and water it.

School cafeterias should be encouraged both in rural and urban areas. To this end, the development of school gardens and breeding farms for smaller animals is to be promoted, with the emphasis on the training in nutrition and feeding of school teachers and other school personnel. It is imperative to introduce nutrition into the curriculum, from literacy classes to the university, taking into account African realities.

The supply of safe drinking water must have a priority in the fight against malnutrition. Water is the indispensable element in a program of basic hygiene in urban as much as rural areas. The installation of drinking water supplies in villages is a step that should be included in yearly planning programs.

None of these practical suggestions should be considered limiting. They are intended to give examples of what we consider to be feasible and the most worthwhile to improve nutrition and food habits in Cameroon through health education and keeping in mind prevailing conditions and future possibilities.

We are including as Appendix I the "Practical Program of Action of the National Committee of the World Fight Against Hunger," an outcome of the third session of this committee held in Yaoundé May 12-13, 1969.

It is obvious that all these steps cannot be taken at one time, and that priorities will have to be established, based on the most urgent needs, national credit, physical means, available personnel, bilateral foreign aid, and the aid of international agencies.

APPENDIX I

Practical Program of Action of the National Committee of the World Fight Against Hunger

From May 12 to 13, 1969, the third session of the National Committee of the World Fight Against Hunger was held in Yaoundé. The work of this meeting was essentially the definition of a concrete program of action to become the guideline of the committee's activities. The practical steps defined by the committee apply to:

- The production and marketing of food commodities;
- Food consumption, education, and hygiene;
- Information.

The program also leans heavily on the five action priority areas defined by the Director General of the Food and Agriculture Organization of the United Nations, that is:

- Work on high-yield varieties of food crops in extensive cultivation;
- Elimination of protein deficiency;
- War against loss and waste;
- Mobilization of human resources toward development;
- Obtaining and saving foreign exchange.

The practical program of action of the National Committee of the World Fight Against Hunger is based on: a) production and marketing; b) consumption, education, and hygiene; and c) information.

I. PRODUCTION AND MARKETING

In matters of production and marketing, the Committee has fixed its program on the following:

- A study of problems concerning intensification of rural production, taking into account the specific needs and possibilities of each region;

- Launching of small pilot projects in the raising of crops and stock animals, in fishing and in timber operations and crafts, with an insistence on the production of subsistence goods;

- Research on the best production methods, in particular the use of fertilizers, the spread of improved seeds, the fight against plant diseases, introduction and use of small scale modern farm tools (setting up of cooperatives for the use of agricultural implements);

- Research on simple methods of processing and preserving produce;

- Study of methods and projects leading to disposal of local production by the establishment of production and sales cooperatives.

These general directives have allowed the Committee to decide on several small projects in agriculture, stock-raising, forestry, and fishing. Because of its federal nature, the Committee intends to execute these projects in both Eastern and Western Cameroon. At first, the Committee expects to carry out the following projects:

A. Eastern Cameroon

- Intensification of corn cultivation;

- Purchase of units for the milling of paddy;

- Intensification of sorghum cultivation;

- Production of peanut seeds;

- Popularization of soybean cultivation;
- Aid to truck farming;
- Improved management of plantain production;
- Establishment of pig-breeding centers;
- Promotion of breeding of small stock animals;
- Storage of grains;
- Reestablishment of school gardens and cafeterias.

B. Western Cameroon

- Intensification of corn cultivation;
- Treatment of paddy;
- Preparation of rice storage bins;
- Purchase of tools, fertilizers and pesticides for truck farming;
- Marketing of vegetables;
- Importation of potato seeds;
- Protection against diseases that attack yams;
- Improved management of poultry farming;
- Feeding of pigs;
- Purchase of mobile veterinary clinics;
- Improvement of pasturelands;
- Industrial processing of slaughterhouse by-products;
- Planting 500 hectares of firewood;

- Grant of gear and tools to fishermen;

- Storage of corn;

- Storage of potatoes;

- Purchase of grinders for tubers.

II. CONSUMPTION, EDUCATION, HYGIENE

Having underlined the importance of education in the fight against hunger, the Committee intends to orient its activities toward specific points concerning the education of the masses for their socio-economic advancement. This should include specific short-term, middle- and long-range projects, such as:

A. Inventorying, locating, gathering, adapting, completing, creating, and popularizing suitable tools and materials for nutrition education and information in the Federal Republic;

B. Equipping selected bureaus and agencies with the inventoried items;

C. Contacting various educational, information, and organizational groups who reach young people and the masses to have them teach food and nutrition education in their programs and activities under the control of specialized agencies;

D. Emphasizing child feeding from preschool age onward, as well as the feeding of pregnant and nursing women;

E. On a short-term basis, and where conditions are favorable, reorganizing school cafeterias with gardens and, if possible, the raising of farm animals;

F. Giving a priority to the national production and consumption of the food best apt to correct unbalanced diets;

G. Setting up drinking water supplies and latrines in population centers;

H. Inspecting housing: household cleanliness, especially in the kitchens; clean food preparation and wholesome meals;

I. Educating and persuading husbands of a better joint use of family funds and a more just sharing of tasks: fighting vigorously against idleness and alcoholism;

J. Introducing the teaching of nutrition in the African context into the national educational curriculum at all levels, including the university.

III. INFORMATION

Our programs of production, marketing, consumption, education, and hygiene must be brought within reach of the people who will use them. The information program has been conceived as true mass education. It consists of:

- Rural radio broadcasts;
- Printed news media;
- Film news media with auxiliary audio-visuals.

A. Rural Radio Broadcasts

The Committee is planning collective listening centers connected to the organizational structures of the Cameroon National Union Party, the cooperatives, the home economics centers for rural youth, the agricultural offices and the literacy centers. Fifteen hundred listening centers are planned for East Cameroon and 500 for West Cameroon.

The broadcasts will originate from the regional radio stations and be received at the listening centers. In addition to French and English, the languages used will be the most popular Cameroonian languages. Broadcast

themes will be the ones selected by the programs in production, marketing, consumption, education, and hygiene.

B. Printed News Media

The press is requested to lend itself free to the activities of the Committee. Collaboration between the Committee and the staff of local newspapers should allow each paper to devote room for articles and pictures relating to the problems of the fight against hunger.

C. Films and Audio-Visual News Media

Films and pictures are among the most attractive means to bring issues before rural masses. The Committee has taken this into account and at first plans to operate five film-mobiles to be run in five administrative regions; a training program for the necessary operators is also being planned.

IV. OTHER PROJECTS

Among other projects considered are:

- Creation of a laboratory for vaccine production;
- Creation of a slaughterhouse by-products processing industry;
- Founding of an Institute of Food Technology and Applied Nutrition.

Although these projects concern the World Fight Against Hunger, they will be submitted to the United Nations Development Program because of the scope of financial support that they require.

V. PROGRAM IMPLEMENTATION

To carry out its program, the Committee is counting on the financial support of FAO, the other international organizations of the United Nations, and the Government of Cameroon. In planning to be structured as a para-governmental agency, the Cameroon National Committee of

the World Fight Against Hunger, is hoping to have access to the necessary funds to implement its action program. With this in view, the Committee is planning a series of fund-raising activities such as:

- Raffles;
- A "Fight Against Hunger" fund-raising gala evening;
- A football trophy known as the "Fight Against Hunger Cup," or some other sport event;
- A periodic "tax" on admission tickets to places of entertainment;
- The issue of a special surtaxed postage stamp;
- The setting up at the national level of a "Fight Against Hunger Week."

APPENDIX II

List of Nutrition and Socio-Economic Publications on Cameroon Between 1964 and 1970

Year of Publication	Authors	Title
1964-1965	Secrétariat d'Etat aux Affaires Etrangères 20, Rue Monsieur Paris 7è Direction de Statistique B.P. 660, -Yaounde	Survey of the Standard of Living in Yaoundé, 50 pp.
1964-1965	Ministère des Affaires Economiques et du Plan Direction de la Statistique	Standard of Living of the Populations of the Cocoa-Growing Zone of Central Cameroon, 139 pp. Final results of the study of nutrition and rural household budgets carried out in the zone during 1964-65.
1964	Dr. M. Martineaud	Kwashiorkor in Black Africa, 57 pp.
1965	Ministère de l'Economie Nationale Direction de la Statistique	Northern Cameroon. A Summary for Use in Planning. I-Demographic factors. II-Nutrition and Food Consumption. III-Family Budgets in March 1965.
1965	Laurent Kouo Mondi	"Study of Health Education in Cameroon" Doctoral thesis in Medicine, University of Paris.

1965	Dr. M. Martineaud	"Kwashiorkor." Afrique Médicale, Vol. 27, pp. 93-101.
1965	A. Bernard Schewel, R. M. Nicoli, J. Ronque, P. F. Battagliani	"Sero-anthropologic Studies. Research on the Population of Cameroon." Afrique Médicale, 1965, pp. 165-166.
1966	Ministère des Affaires Economiques et du Plan Direction de la Statistique	The Population of the Bamiléké Region and of the Adjoining Departments, 173 pp. Main results of the demographic study of 1965.
1966	Dupin- Dr. M. Martineaud	"Introduction to the study of tropical foods." Afrique Médicale, 1966, Vol. 41, pp. 373-378.
1966	Dr. M. Martineaud	"Symptomatology of Malnutrition in Tropical Africa." Afrique Médicale, 1966, Vol. 41, pp. 381-389.
1966	Dr. M. Martineaud	"Dietetics of Children in Africa." Afrique Médicale, 1966, Vol. 41, pp. 391-394.
1967	Ministère des Affaires Economiques et du Plan Service de la Statistique Générale	The Standard of Living of the People of the Adamaoua, 201 pp.

1967	R. Ekoko Sam Ewande	"Health Conditions in Cameroon." Afrique Médicale, 1967, Vol. 50, pp. 347-350.
1967	Dr. M. Martineaud	"Malnutrition in Tropical Areas." Afrique Médicale, 1967, Vol. 51, pp. 409-418.
1967	Priscille Titi	"Health Education in Hospital Surroundings in Cameroon." Afrique Médicale, Vol. 52, pp. 517-518.
1967	ORSTOM, BP 193, Yaoundé Section Economie Statistique	Methodology for "Standard of Living" Surveys in the African Rural Environment, 300 pages. Inventory of 3 surveys conducted in Cameroon between 1961 and 1965 by G. Winter.
1968	C.G.S.P.P. - Bureau Nutrition. Dr. Delmon, Mme I. Ekani	The Art of Cooking in Africa.
1968	Dr. M. Martineaud	"Vitamins and Vitamin Deficiencies." Afrique Médicale, 1968, Vol. 58, pp. 167-178.
1969	Dr. M. Martineaud	"Nutrition and Development." Afrique Médicale, 1969, Vol. 71, pp. 491-495.
1969	Dr. M. Martineaud	"Vitamin and Mineral Needs." Afrique Médicale, 1969, Vol. 74, pp. 773-774.

1970	F. et J. Stéphany M. Martineaud Cl. Richir	"Endemic Goiter in East Cameroon. Epidemiolocal Study of 39,980 Cases." Afrique Médicale, 1970, Vol. 78, pp. 189-198.
1970	Dr. M. Martineaud	"Food Traditions. Habits, Forbidden Foods, Taboos, Prejudices." Afrique Médicale, 1970, p. 23.

APPENDIX III

Currently Available Publications of the Nutrition Section of ORSTOM* in Yaoundé

Year of Publication	Author	Number of Copies in Existence	Title
1954	Masseyeff Cambon Bergeret	3	The People of Cameroon Facing a New Food
1954	Masseyeff	24	Note on the Diet to be Prescribed to Diabetic Africans
1954	Masseyeff	1	Endemic Goiter in East Cameroon
1954	Masseyeff	1	School Feeding Project
1954	Masseyeff Cambon	1	Investigation of Municipal Restaurants in Douala
1955	Masseyeff	13	Typical Food Rations for Cameroon Workers
1955	Masseyeff	1	Peanut flour: Value, Acceptability, Possibility of Production in Cameroon
1955	Masseyeff	1	Report on Acceptability of Nestlé Jem Milk; Trial Made in Yaoundé, Cameroon
1955	Masseyeff Blache Stauch Cambon	1	Study of the Possibility of Production of Fish Flour in the Logone and Chad Regions
1955	Bergeret	1	Food Chemistry in an Overseas Laboratory

1955	Masseyeff Cambon Bergeret	27	The Evodoula Group, a Study of Feeding
1956	Masseyeff Cambon	1	An Investigation of Food Consumption in South Cameroon
1956	Bergeret	1	Bamiléké Markets in the Dry Season
1956	Masseyeff	12	Relationship Between Intestinal Parasitism and the Nutritional State of Children in Yaoundé, Cameroon
1957	Masseyeff Pierme Bergeret	1	Food Survey in Cameroon. III. Batouri Subdivision
1957	Bergeret	13	Ascorbic Acid Content of Some Foods of South Cameroon
1957	Bergeret Masseyeff	10	Provisional Food Composition Table for South Cameroon
1957	Bergeret	1	Preliminary Note to the Study of Palm Wine in Cameroon
1958	Nave	1	Reports on Visits to Markets in the Ntem Region
1958	Pierme	4	Note on the Diet to be Prescribed to Obese Africans
1958	Bergeret Masseyeff	1	Comments on a Food Composition Table for South Cameroon
1958	Bergeret	1	Note on the Lhores of the Adamaoua

1958	Bergeret Masseyeff	60	Vitamin C in the Fruit and Vegetables of South Cameroon
1959	Masseyeff Cambon Bergeret	25	Food and Nutrition Survey Among the Toupouri of Golompoui
1959	Pierme	10	Report on the Seminar Held at Lwiro, Belgian Congo, from May 18 to 29, 1959
1959	Pierme	2	Food Consumption in Cameroon
1960	Pierme	3	How to Draw up a Balanced Menu
1960	Bascoulergue	6	Notions of Food Hygiene Adapted to South Cameroon
1960	Bascoulergue Pierme	7	Birthweights and Growth Curves of the Black Children of Yaoundé
1960	Bascoulergue	1	Survey of the Nutritional State of Schoolchildren in the Department of Diamare
1960	Pierme	51	Food Rations for the Main Groups of Consumers of South Cameroon. How to Plan a Balanced Menu
1961	Bebey Eyidi Pierme Masseyeff	1	Food Surveys in Cameroon IV. Douala
1962	Bascoulergue		Current Aspects of the Food and Nutrition Situation in Cameroon

1962	Bascoulergue	12	Study of the Health and Nutritional State of Schoolchildren of the Adamaoua
1963	Bascoulergue Le Berre	25	Seasonal Deficiency of Vitamin C Among the Inhabitants of North Cameroon
1963	Bascoulergue	25	Notions of Food Hygiene Adapted to North Cameroon
1965	Pele	4	Food Needs of Growing Children and the Use of Local Products
1965	Pele	20	Draft of a Growth Chart for Cameroonnian Children
1965	Pele	14	Feeding in Cameroon
1966	Favier	20	Why and How to Improve the Diet of the Inhabitants of Cameroon
1966	Pele Le Berre	1	Foods of Vegetable Origin in Cameroon
1969	Laure Favier	2	Fishing and its Products in Cameroon
1969	Laure	11	The Fishing Industry of Cameroon

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*Office of Overseas Scientific and Technical Research (Office de la Recherche Scientifique et Technique Outre-mer).

REPORT ON NUTRITION IN THE CENTRAL AFRICAN REPUBLIC

I. BACKGROUND INFORMATION

Located in the northern hemisphere in the heart of Africa, the Central African Republic is an inland country, but it is connected to the Atlantic Ocean by the Ubangui River, a tributary of the Congo, and by the Congo-Ocean rail line of the Republic of the Congo (Brazzaville). Its boundaries, except for the southern one, are rarely natural; they are the artificial result of international agreements dating from the beginnings of colonization. The Central African Republic is a rectangle with three well-defined angles in the north, east, and south. The area, which is rather average compared to other African states, covers 617,000 square kilometers. The 3 million inhabitants are unevenly distributed over the territory.

A. Topography of the Central African Republic

The Central African Republic is a piece of African bedrock without distinguishing features. It is set between the Chad Basin and the Congo Basin with the Ubangui Valley separating the watersheds. Vast portions of the bedrock are now covered with sedimentary deposits of lacustrine origin, this country apparently not having experienced the advance of the sea.

There are three main regions: the Ubangui Valley, the southern extremity of the Chad Basin; and the northern extremity of the Congo Basin.

B. Climate

The latitude of the Central African Republic places it entirely in the intertropical or hot zone. Not being on the equator, but rather near, it is in a zone of humid tropical climates, and experiences the classical alternation of rainy season and dry season. This climatic rhythm is due to the passage of the sun at the zenith and to the

displacements of the intertropical convergence during the year. The Central African Republic is alternately swept by the southwest monsoon and the northeastern harmattan.

C. Soils

African soils are subject to the fundamental action of climate and especially rainfall. This permits making a distinction between two types of soil: soils that depend directly on climate and soils that do not depend directly on climate. These soils are also of two kinds, the gray ferruginous soils, and the reddish ferralitic soils. As a whole, Central African soils are good and well-adapted to cultivation; but they must be protected against erosion.

D. Flora and Fauna

In Central Africa, as in the whole intertropical zone, vegetation depends on natural conditions and the destructive acts of man. Vegetation is zonal and occurs in north-south bands. In the extreme south of the country, the primeval forest shoots up trees to 50 or 60 meters in height. Further north is the light forest whose trees are less high, rising to 15 or 20 meters. The major part of the territory is occupied by a wooded savanna. In the extreme northeast, the savanna becomes a steppe studded with shrubs.

Central African fauna is very important. It includes many species of large herbivorous and carnivorous animals, as well as a multitude of insects and butterflies.

E. Hydrography

The Central African Republic has numerous waterways. Generally rivers have a slight slope, giving a calm and regular flow between rapids and falls. Climatic factors also influence the flow rate and capacity. In Central Africa, variation between dry and rainy seasons predominates. The many rivers are an unquestionable national wealth. In the more or less distant future, agriculture will benefit from less expensive irrigation.

F. Agriculture

Agriculture is the basis of the Central African economy. Not only does it insure the subsistence of the population, but it provides raw materials and commodities used on the spot or sold as exports. Food cultivation is intense and varied. Besides subsistence crops, the five principal crops of Central Africa are: cotton (165,000 planters, 125,000 hectares, 58,724 tons produced in the 1968-69 season); coffee (22,000 planters, 27,000 hectares, 9,000 tons); oleaginous plants (peanuts, sesame, palm oil -- 135,000 hectares); cattle-raising (570,000 zebus); timber exploitation (a dense forest covers 5 percent of the territory; the annual production capacity is 600,000 cubic meters; three large companies exploit 120,000 ares of concessions; the objective for 1970 is 400,000 cubic meters).

G. Summary

The Central African Republic, an essentially agricultural land with natural wealth unequally distributed in its territory, comprises the following main regions: the northwest (cattle-raising); the center (cotton); the subequatorial areas (coffee); the southwest (timber). Regional imbalance is thus happily avoided.

II. THE NUTRITIONAL STATUS OF THE POPULATION

A. Summary

Quantitatively, the food situation is satisfactory. It is recognized that the country produces a sufficient quantity of food to feed its inhabitants. Central Africa is not a land of famines and seasonal shortages. Nothing contradicts this picture at this time, in spite of some sources of worry, like the periodic lack of manioc supplies in Bangui.

Qualitatively, there exists the problem common to countries in a similar socioeconomic situation of the equilibrium between proteins and calories; the part played by proteins, especially animal proteins, in the diet is

insufficient. Moreover, vitamin and mineral deficiencies have been noted by several observers. But here as elsewhere, deficiencies have regional aspects of an ecological nature: for example, deficiencies in vitamin A can be seen in the dry northern regions of the country, but are the exception where the Elaesis palm tree grows and its fruit is habitually eaten. In some areas endemic goiter is prevalent; this is a geologic factor. Other manifestations of vitamin or mineral imbalance are, however, more generalized: many physicians blame the after-effects of rickets for the frequent obstetrical accidents that occur, and this is in agreement with observations made at the maternal and child health centers of the social services (MCH), which distribute, whenever possible, synthetic vitamin D to the children who attend clinics. Finally, many cases of decalcification are seen among pregnant women and nursing mothers.

On the other hand, as in many countries at the same level of development, food supplies do not prevent the occurence of numerous cases of protein and calorie malnutrition in the most susceptible age group (weaning age). The major form, kwashiorkor, is far from exceptional or rare. This is obviously not due to a quantitative lack of the foods capable of protecting our children from these symptoms (at least in the majority of cases), since the quantities of protein needed for this protection are relatively low; it is more likely due to the continued application of the traditional methods of weaning and of feeding young children -- methods that do not take into account the priority needs of this age group. Less spectacularly, the same phenomenon occurs among pregnant and nursing women who have not yet acquired an understanding of the supplementary need for energy and protective foods.

A thorough investigation of family consumption covering the whole country and completed if possible by a clinical nutritional study would confirm the facts observed in a spot check fashion, and would provide a useful addition to the available information on the nutritional and food situation in the Central African Republic (CAR). To this end, the implementation of the project on budgets and consumption, for which funding has been requested from the United Nations Special Fund, seems particularly useful.

B. Sources of Energy and Protective Foods in the CAR

1. Foods of Animal Origin

a. Cattle

The livestock Service has a long-term program to create a national herd (there used to be one only in the extreme northern part of the country) thanks to imports of adapted, that is trypanotolerant, animals, and to actions of an ecological nature, that is the creation of favorable zones, fight against the tsetse flies, etc. A number of years are still needed, therefore, before one can consider organized slaughter of nationally-raised cattle as a source of supply for the country.

In the meantime, meat is imported from Chad, the animals arriving on the hoof or as carcasses. On the controlled markets of Bangui, meat is sold at regulated prices; 100 CFA francs per kilo with bones, 180 CFA francs per kilo boneless.

Also to be noted is the importance of parasitism (taenia). If animals slaughtered in official slaughterhouses are supervised from the point of view of sanitation, and are therefore safe, the risks of infestation remain considerable with animals butchered in villages or clandestinely in cities.

The dairy farm at Sarki should be able to increase its productivity and to extend it over the whole year. Other dairies could be created. But the outlets for dairy products are not yet sufficient to permit this increase. Emphasis must be placed on the education of consumers as well as on production.

With this in mind, an expert has worked with the Office of Livestock Development to promote this consumption. His efforts have been directed at Sarki cheeses and at women's organizations near the capital:

- Cheeses rather than butter, because for Central African people butter is still an expensive

product and palm oil competes successfully with it in calorie supply and vitamin A for everyday consumption;

- Women's organizations near the capital, because women are the best public for this kind of publicity; because only the money-holding population concentrated in urban areas or the diamondiferous zone can reasonably afford dairy products as economical supplies of calories, proteins, and calcium; and, finally, because only the capital has well-structured women's organizations.

b. Game

This traditional source of meat supply is beginning to dry up in all regions with a certain level of population density, although it was accepted in times past that hunted game could fulfill in part the protein needs of settled areas as a supplement. Regions with a low population density still have an interesting hunting potential and supply the urban centers with a quantity of smoked meat not to be ignored, although at a rather high price in town.

c. Small Livestock Meat and Products

Sheep are not widespread and exist only in some regions. They are often infested with parasites, and this health problem no doubt slows down the increase of the herd.

Goats are very widespread. They are a dwarf variety, trypanotolerant, only slightly, if at all, milk producers. They are present in all villages where they represent one of the rare meat supplies, often consumed on special occasions. But the dietary advantage they represent is offset by the damage they cause to crops. It is impossible to have gardens near the villages (backyard gardening) and it is difficult to raise trees; it is necessary to plant fields far from dwellings, sometimes several hours away on foot, to keep them safe from damage, and this

has a sizeable effect on agricultural productivity whether of subsistence or commercial goods.

Not to lose this "meat capital," however, while limiting the inconvenience, the expert has tried, with the help of various rural development and agricultural extension centers, to introduce the idea of watching the herds or of tying up the goats at least during the growing season. With few exceptions, this true revolution in habits has not yet been accepted, and will not be without lengthy in-depth education. For this reason, some specialists recommend, as in other countries, the complete suppression of goat-raising, considering that the products of this breeding are far from compensating for the agricultural and horticultural inconveniences.

The raising of pigs, as it is practiced traditionally, is also responsible for much agricultural damage and presents some health hazards. It seems premature, therefore, to encourage pig-raising under present conditions and in family surroundings. This is again a long-term educational problem in which the education of women and closer contact with trained personnel should be emphasized.

Poultry farming consists almost exclusively of the breeding of chickens. There is practically no raising of other domestic fowl such as domestic guinea fowl, geese, turkeys. A few ducks are raised, but rarely.

In the traditional farming method, poultry are free to wander around the cabins without being tended in any special way. They are small birds, not demanding, sturdy, and with good resistance to the common diseases. The hens are good incubators and brooders, but very poor layers.

The small amount of care given, the poor laying qualities, the large number of birds lost because of the numerous predators and automobiles explain the low density of poultry. According to a survey by the livestock service, there are fewer fowls than inhabitants in the CAR. These factors explain the low consumption of poultry meat and the customary absence or insignificance of egg

consumption. But in the last few years farming of imported chickens has been initiated. These are larger birds and better layers, but they require careful handling.

In addition to the poultry farms of the public sector (National Pioneer Youth) and the commercial private enterprises situated near cities, some family poultry farming has been started both in towns and in rural areas. In this latter case, especially, the presence of a poultry business created by the above-mentioned program has been a determining factor. This tendency is particularly encouraging and should continue to grow, thanks principally to the planned home economics project.

Modern poultry farming results in an increased consumption of meat, the creation of egg consumption, the introduction of breeding methods where they were not known yet, the practical demonstration of good food practices (since on an unbalanced diet, the hens rapidly stop laying), the introduction of cash -- profitably, if the enterprise is well run -- because of the necessity of buying the fowl, the concentrated feed, and the vaccines, etc., which implies the sale of part of the production. To this end, the Livestock Service has had the promising idea of creating tenant-operated poultry farms with laying hens, so that the cost of birds and other accessory costs may be reimbursed by eggs. This is the typical start of home economics action with the dietary, educational and economic side effects that ensue.

The breeding of rabbits is not common and is essentially commercial in nature, with a European clientele, except for a few isolated instances at women's development centers, parochial schools of homemaking, or more rarely public schools. Although this type of farming is attractive to part of the public, it will be difficult to extend it without adequate personnel especially because of the sanitary difficulties involved. A simple means to combat coccidiosis would, however, bring this interesting breeding activity within reach of families who would find it particularly profitable.

d. Fish

An increase in fish production can come from:

- The increase of fishing in areas rich in fish, but entails the cost of improving storage and transportation toward the populated regions with available cash,

- The development of fish farming. The Conservation Department is studying this project. In addition, the now operational FAO/UNICEF project with headquarters at Bangui will also promote fish farming.

When these programs bear fruit, the need will remain for an intensification of the educational campaign on all levels, stressing the education of women through the home economics program to encourage fish farming on a family scale and the consumption of fish, and to fight the still numerous restrictions against fish-eating generally, and against *Tilapia* and *Heterotis* in particular.

2. Foods of Vegetable Origin

The vegetable foods whose production and consumption is insufficient are the ones rich in protein nutrients (legumes and even cereals richer than manioc) and the ones rich in vitamins and mineral salts (vegetables and fruit). Production and consumption are linked; production of many of these foods is easy; it remains low only because home consumption and outside demand are small. The reasons for this are:

- The hold taken by manioc, which has replaced cereals, and which is easily cultivated;

- The ignorance of needs and priorities.

C. Existing Nutrition Studies

1. Food Situation in CAR, Dr. Gresta (FAO)

A study of food and nutrition, production, consumption levels, and food habits including the evolution and importance of nutritional requirements in relation to increasing purchasing power and the population expansion.

The results of these food studies indicate that:

a. From the point of view of energy, consumption levels seem to be satisfactory. It should be noted, however, that calories are furnished essentially by starchy foods, especially manioc, which supply from 76 to 82 percent of the calories.

b. The intake of fats varies from one region to another and does not exceed 40 grams per person per day. These levels, although low, are quite comparable to those observed in various tropical countries of Africa and the Far East, and seem to be characteristic of the diet of these regions.

c. The supply of animal protein is generally low, notably in the Bouar region where protein consumption does not exceed 4.2 grams per capita. Vegetable proteins are also in short supply. The diet consists mainly of starchy foods (manioc, bananas) poor in protein content. The vegetables which might raise the protein intake level (legumes, cereals) are eaten in too small amounts. As a result, the total protein supply is everywhere inferior to the estimated requirement of 35 grams per person per day. This deficiency is particularly severe in the Berberati and Bouar regions with respective protein deficits of 30 and 50 percent. This lack of protein-rich foods affects the state of

health of the population, especially children. It is in regions where the protein deficiency is the most severe that clinical signs of protein malnutrition are the most numerous.

d. The consumption of calcium is low and distinctly inferior to the amounts recommended by NRC.* It is known, however, that some people live at low levels without showing signs of deficiency. Since clinical investigation has not disclosed cases of rickets, it can be assumed that consumption levels are sufficient to meet requirements.

e. The recommended requirements for thiamine and riboflavin are respectively 1 mg and 1.55 mg per person. All studies show an intake inferior to these figures because of the low consumption of protective foods. The cases of angular cheilosis noted in the clinical investigation and generally attributed to riboflavin deficiency seem to confirm the data. The supply of iron, niacin, and vitamin C appears to be satisfactory in all studies.

f. In all areas, except the forest zone (Nola), the consumption of vitamin A is much inferior to recommended amounts. Vitamin A is supplied essentially by vegetables in the form of carotene. It is known that its absorption is negligible when the diet is low in fats, as is the case here. It is thus probable that poor utilization is coupled with a deficiency in supply. This vitamin A deficiency seems to be confirmed by the cases of hyperkeratosis, xerosis, and Bitot spots noted during the clinical investigation.

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*National Research Council of the U.S. National Academy of Sciences.

In conclusion, it can be said that the calorie intake is just sufficient to meet needs. The protein supply is low everywhere, with deficiencies especially marked in some areas. Vitamin deficiencies are of the B group (B_1 and B_2) and vitamin A.

2. Other Studies

The results of the clinical and nutritional studies of Guillemans, and of dietary investigations, indicate that signs of malnutrition are widespread, especially in regions where the protein consumption level is low. Glossitis, latent and active forms of kwashiorkor, and goiter are the most widespread symptoms of malnutrition. Hemoglobin levels are generally low: 30 percent of the population does not exceed 10 g per 100 ml. If it is likely that a dietary cause contributes to this hypohemoglobinemia, other factors must be taken into account, such as blood and intestinal parasites, whose importance must not be underestimated, as well as hemoglobin pathologies of hereditary character (sickle cell anemia) that are favored by endogamic marriages.

As far as goiter is concerned, it should be emphasized that it does not occur among Babinga pygmies. This is of no significance in the Nola region where the Babinga live in symbiosis with other populations with relatively low rates of endemic goiter; it is, however, surprising that in the M'Baiki region the Babinga are exempt from goiter whereas other people who live in this area have a 25 percent rate. In the same zone, in the same locale with the same climate, two ethnic groups are living, one that is not affected by this disease, and one that is severely hit.

The values observed for the sub-scapular cutaneous fold are normal. Weight and size, even among adults, are below European norms, although it is not possible to determine whether this is due to racial or dietary factors.

III. DEFICIENCY DISEASES OCCURING IN THE COUNTRY

From January 1, 1969 to April 30, 1970 (16 months), a study was conducted at the pediatric ward of the Bangui General Hospital. Excluded from this study deficiency diseases of adults and deficiency diseases of children that do not lead to hospitalization. During these 16 months, 2,281 children were admitted to the ward. Among these hospitalized patients, 162 or 7.1 percent, were admitted for nutritional deficiency diseases. The total number of deaths among these 2,281 patients was 386, or 16.9 percent.

Among the 162 patients with "deficiencies," the total number of deaths reaches 42, or a total mortality of 25 percent, so that, although deficiency diseases represented only 7.1 percent of the hospitalizations, they accounted for 10.8 percent of all deaths. Their seriousness is thus notably superior to that of other illnesses considered as a whole.

The deficiency illnesses encountered during the 16 months were, in order of frequency:

A. Kwashiorkor

There were 62 cases of kwashiorkor, including 3 cases of protein deficiency edema. Of the total, 24 patients or 38.7 percent died; 27, or 43.5 percent, were discharged as cured or definitely improved; the 11 others escaped after a few days.

B. "Nutritional" Anemias

Under this heading are classified anemias for which no etiology was found and which were cured without specific anti-anemic treatment, simply by providing the children with a quantitatively and qualitatively adequate diet. However, patients who on admission had a red cell count inferior to 2 million received an initial transfusion of whole blood calculated on the basis of 20cc per kilogram, but nothing later.

These "nutritional" anemias numbered 41, of which 21 received initial transfusions. The total number of deaths was 6 (of which 3 had been transfused), that is 14.6 percent. Patients who were cured (more than 4.5 million red cells when discharged) or noticeably improved (more than 3.5 million red cells when discharged) numbered 29, or 70.7 percent, of whom 16 had been transfused. Four patients escaped, two remained unchanged.

C. Athrepsias

Included in this category are babies under 2 years of age who have been fed -- or so-called fed -- with artificial milk or mush; at any rate, they have been deprived of mother's milk and exhibit a marked weight retardation and chronic dehydration, but no digestive symptoms. These patients received no medication, only a nutritious diet quantitatively and qualitatively related to their weight and adjusted as they improved.

There were 27 such patients. Nine were completely cured, that is they had regained the normal weight for their age when they left; eight were considerably improved and would certainly have been cured if their parents or guardians had consented to let them remain in the hospital a little longer. Thus there was a 63 percent cure or improvement rate. On the other hand, three or 11 percent died, five escaped rapidly, and two remained unchanged and finally left.

D. Underweight Due to Dietary Insufficiency

Underweight young children were treated with an adequate diet. There were 13 cases, out of which 10, that is 76 percent, were cured or much improved, one died (7.6 percent), one escaped, and one remained unchanged.

E. Debility Due to Starvation Among Older Children (10-15 years)

These 13 cases were treated like the previous ones with a quantitatively and qualitatively adequate diet. Of the total, 7, or 53.8 percent were cured or left (at their

own request) much improved; five, that is 38.4 percent, died (but one of the five died of paralytic ileus); and the thirteenth escaped.

F. Nutritional Cirrhoses

There were three such cases, with two deaths and one improvement.

G. Multiple Vitamin Deficiencies

There were two cases of multiple vitamin deficiencies with skin and mucous lesions following the measles. One died and one improved.

H. Early Cancer of the Liver

One case occured, if one accepts that it is of nutritional origin.

All these deficiencies, finally, are due to large insufficiencies in the supplies of protein, starches and fats. On the other hand, the typical vitamin deficiencies -- scurvy, beriberi and rickets -- are nonexistent. One must emphasize the seriousness of these deficiency diseases in young children (kwashiorkor) and older children (starvation cachexia) because they entail in these two groups a mortality of nearly 40 percent. Much better results are obtained in treating athrepsic infants and malnourished children between 2 and 8 years.

Note: the treatment of kwashiorkor at Bangui Hospital consists of protein-enriched milk, sardines in oil, butter, multiple vitamins, and potassium chloride (if it is unhappily impossible to obtain magnesium lactate). In severe cases, intravenous feeding is used.

IV. CAUSES OF MALNUTRITION

A. Social Factors

1. Education

There exist in the CAR nutritional deficiency problems that may be corrected to a great extent by better education, especially of women. But women see little value in diversification of food crops and do not realize the consequences of dietary restrictions and poor traditional food habits. Very busy with numerous chores, they have little time to devote to unusual food preparations. In rural areas, some schools are still short of teachers. Home economics, when it is offered, is limited to sewing lessons.

The Government of the Central African Republic is aware of this problem, and the State Department Four-Year Plan allows for the education of women by means of the activities of Rural Women's Development Groups.

2. Food Taboos (see Appendix)

B. Geographic Factors (Climate and Soil Conditions)

These factors are nonexistent, when we take into account the low density of population resettled in the savanna zone. Out of 617,000 square kilometers, the CAR has 170,000 hectares of tillable land and 35,000 hectares of timber lands. The western zone of the CAR, thanks to a more humid climate, is the best suited to cropping.

C. Economic Factors

According to the 1967 Davout Report, the average real income in rural areas does not exceed 10,000 CFA francs per year.

It should be noted that the production of protein-rich foods, especially of animal origin but also of vegetable origin, is insufficient for the whole population,

although the production of vegetable-protein foods could easily be increased.

Home consumption of foods by the growers is very important in rural areas where it amounts to nearly 50 percent.

Other factors are the time elapsed between harvest and sales; inadequate processing; the poor condition of trails and the duration of transportation; lack of storage facilities. All these present often discouraging problems to producers.

D. Demographic Factors

The average population density is about 9.3 inhabitants per square kilometer. With this low density goes dispersion of the population, 83 percent of which is scattered among more than 6,000 villages, half the villages having less than 200 inhabitants. Urbanization applies to some centers, such as Bangui, Bambari, Bouar, Bangassou, M'Baiki, Sibut, and Bossanoga. The rate of population growth is 1.8 percent.

V. CURRENT PROGRAMS TO FIGHT MALNUTRITION

In 1963, Dr. Stagile (FAO) of the Applied Nutrition and Nutrition Education Program had as directives to:

"- Advise the Government of the Central African Republic on the organization of a National Nutrition Service to be established at the ministerial level and in which would participate the two trainees designated by the Government of the Central African Republic to attend the Nutrition Specialist Training Course given at Dakar (Senegal) from November 1961 to February 1962.

- Facilitate negotiations between the Government of the Central African Republic and the appropriate international agencies relating to the applied nutrition program that the Central African Republic wishes to initiate during the second half of 1969.

- Help in the implementation of this project.

- Together with the concerned officials, establish a plan for future activities in matters of nutrition, these activities to be carried out in the Central African Republic with the aid of all public or private agencies and organizations whose interest lies in this domain."

Plan of Action

- Create an Executive Bureau for Nutrition according to the directives of the Interministerial Committee for Nutrition.

- Outline an applied nutrition program.

- Conduct a 4-week national seminar on nutrition.

- Organize school lunch programs.

- Organize model school gardens.

- Organize school-connected fish farming.

- Prepare audio-visual aids for nutrition education.

- Organize food consumption studies.

- Conduct clinical studies of nutrition.

The applied nutrition program was begun in 1969 and is still in effect.

A. Nutrition Education

Taking the food situation into account, the Government has directed its main effort to the field of food and nutrition education. The production of protein-rich and energy foods is insufficient to cover all needs and the poor utilization of these resources (ignorance of the priority needs of vulnerable groups, irregularity of protein consumption, etc.) aggravates the consequences of

this situation; at the same time, ignorance of the importance of these nutrients and of the simple means of obtaining them prevent the desirable evolution.

All available means for the promotion of education have been utilized. In the future, the nutrition program is to be extended in the direction of instruction in family budgeting and home economics, an indispensable further step in nutrition education. The media utilized so far have been:

1. The school, with the publication of the Stabile-Pfulg Manual of Food Education by FAO/UNICEF and the distribution of record cards, in addition to practical work in gardening, forestry, and poultry-raising, and the instruction given to teachers and future teachers. It should be noted that nutrition education has been officially included in the curriculum for all mother and child health centers in the hygiene course which is connected to the natural sciences; and as part of a project for the spread of a rural emphasis in teaching, practical work has been made compulsory by decision of the Chief of State in January 1967.

2. The press, both technical and popular, by the publication of articles on general and specific problems (in the magazines Développement, Terre Africaine, etc., and in education journals); and by the publication of duplicated material intended for specialized audiences.

3. Radio. The Director of the Executive Bureau for Nutrition is responsible for a weekly broadcast on nutrition education.

4. Television, through the preparation of two telecasts and contribution to other programs related to questions of food and nutrition (drinking water, weaning, etc.).

5. Lectures and courses given to selected audiences to promote specific methods of production and specific methods of consumption (dairy products, rice, eggs, vegetables, etc.).

6. Documents handed out to various secondary school teachers (sciences) or teachers in agricultural schools (Ouakombo).

7. Talks, both public and broadcast.

8. Popular booklets intended for a wide audience: very simple texts excluding all scientific and technical terms and illustrated with concrete examples taken from daily life, printed in French and in the national tongue (Sango). The practical aim of these booklets is two-fold: to present simple background material for mass education in foods and nutrition, and to provide valuable printed material to persons concerned with literacy in Sango. Funds have been granted by UNICEF for the publication of these booklets.

With forethought of another approach to food education, a collection of local cooking recipes has been gathered in a cookbook that includes the nutritive values of each dish, the potential food imbalances, and the correction of imbalances.

Home economics is an indispensable adjunct to the nutrition program, and education in this area is necessary. During 1967, a specialist from FAO headquarters visited the CAR, and an international expert spent three months in our country in 1968. His mission was intended to give rise to one of longer duration and ended with a report to the Government. In the future an FAO home economics expert will be assigned to the CAR. The Government is expected to request the funding of this post by UNDP, and to ask for help from UNICEF for the implementation of this part of the program.

Following a preliminary mission in 1966, a UNESCO expert in the education of rural women was assigned to the CAR for 1967. His activities relate in part to those in home economics, and the addendum to the joint plan of the Government, FAO and UNICEF for the implementation of the nutrition program takes into account women's education.

Women being the choice audience for nutrition education, one part of the "education" phase of the program is included in the activities and projects outlined above.

Nutrition education must take place within the framework of the education of rural women, and the teaching of home economics. The national structures on which must depend this part of the program are the centers and organization of feminine orientation: Social Service, Women's Development Service, Rural Women's Development and Organization Centers coordinated by the Ministry of National Education (in the Women's Section of the Office for the Rural Development of Education) and the Public Health Department.

Nutrition education not strictly feminine in orientation must be carried out in the schools within the framework of existing curricula according to the decisions of the Ministry of National Education and within the program of health education initiated by the Ministry of Public Health. As part of reforms of the Public Health administrative offices, a larger role has been reserved for prevention and especially for education. It is clear that nutrition education of the public at large, not directly under national education or public health, will be integrated to this program.

Part of nutrition education will now take place within the FAO/UNDP program for agricultural training and extension.

The new nutrition education program in the schools has the following aims: continuing instruction in elementary nutrition in the middle grades of school; continuation and extension, whenever possible, of school-connected activities in gardening, forestry, poultry-raising, and

fishing under the direct control of the Director for Primary Education, these activities to lead wherever possible to school cooperatives run by the students themselves under supervision of their teachers.

B. Applied Nutrition

The under-consumption of foods rich in mineral and vitamins presents different regional aspects that it would be interesting to elucidate by an ad hoc investigation. Ignorance is an important factor, especially among the most vulnerable priority groups: children to the end of adolescence, with the most serious consequences during the period surrounding weaning; pregnant and nursing women; parasite-infested persons, who are numerous; and persons recovering from wounds or from illness.

It should be noted that parasitism plays an important role in the genesis of the deficiency diseases outlined above. It is a sensitizing factor, operating in conjunction with the nutritional condition and inseparable from it. This is why the activities of the Public Health Department cannot be artificially separated from activities leading to a better diet.

(The most common forms of parasitism in the CAR are -- and they are very frequent -- bilharziasis (schistosomiasis), ankylostomiasis, malaria, and onohocerciasis, to which are added the very numerous helminthiases with nematodes and platyhelminths, anguilluliasis, etc. In another area, although this is not well-known, the incidence of tuberculosis is far from being negligible.)

C. Child Feeding

The State Department for Social Affairs has a World Food Program (WFP) preschool nutrition program for the children who attend preschools. This program is coming into effect this year; the foodstuffs have arrived and have been distributed in the farthest corners of the country.

Milk distribution centers operate throughout the country, thanks to the initiation of mobile MCH units with

144 stations for weighing children and distributing foodstuffs. All orphans are taken care of by the Social Service. They receive weekly rations of milk and flour and are brought up by foster parents in the village. Those for whom no guardian has been found are sheltered at the government orphanage (Pouponnière Orphelinat) at Bangui.

VI. GOVERNMENT POLICY TOWARD MALNUTRITION

A. Planning and Coordination

A national committee for nutrition exists. It combines all services and official agencies concerned with feeding and nutrition in the Central African Republic. An example of high-level thinking and planning, the committee includes officials from the various organizations at the highest level, ministers or their representatives, directors, administrative heads, etc. It is presided over by the Minister of Development or his representative.

The committee meets once a year. It prepares the balance sheet for the previous year, outlines projects for the coming year, defines their objectives, issues resolutions and recommendations. Its reunions are reported on in detail.

An annual meeting has until now proved sufficient, but the committee can be called into extraordinary session if required, and can set up commissions, on a more or less permanent basis, to study in detail any particularly important problems.

Finally, in light of the evolving structures of the CAR, the annual meeting of the committee has been placed under the sponsorship of the recently created Interministerial Committee for Agricultural Training and Extension.

The Executive Nutrition Bureau is the permanent agency for project initiation, information, and coordination. It is not intended to take direct action and to take the place of existing agencies and services, but to be the liaison, information carrier, and coordinator between the various projects, and if necessary to act as a catalyst.

The Executive Nutrition Bureau consists at this time of a bureau chief and an administrative office.

B. Prevention of Fraud Regarding Food Products and Price Policy

Both fraudulent activities and prices come under the control of the Economic Control Service which functions in city markets where food commodities are sold and in stores that handle manufactured food products. The role of this service is defined by a law, Number 60/193, dated 23 January 1961, introducing price control in the Central African Republic. The Price Control Service is empowered to:

- Establish prices of food commodities;
- Verify prices of their different components;
- Enforce price quotations on appropriate documents;
- Issue summonses in cases of duly noted violations;
- Prepare judicial action;
- Clarify the application of price control regulations;
- Seize products involved in infractions or the means of transportation involved in the infractions;
- Inspect any industrial commercial, agricultural, private, or cooperative establishment.

In the latter category, the Price Control Service supervises the price supports fixed by the administration to see that they are scrupulously followed.

C. Land Use

In the Central African Republic, land belongs to the state, which disposes of it at will. But by prescribed procedures, the state may grant land to individuals as real estate. Property owners exploit the granted parcels according to the wishes they expressed when they requested land. Large agricultural exploitations are beginning to appear (rice, peanuts, potatoes, manioc, maize). On their own land, people may build structures for human habitation or commercial use, cultivate subsistence or commercial crops, exploit timber or underground resources. Thus in the CAR, the exploitation of land takes place in many ways: agriculture, stock-raising, timber and water resources, tourism, mines, road network, etc.

D. Agricultural Credit

In granting credit in the Central African Republic, the National Bank for Development distinguishes between three categories of agricultural enterprises: 1) agricultural enterprises of a family type, employing strictly family labor, and with a cultivated area not exceeding 5 hectares; 2) agricultural enterprises employing paid labor, but not equipped with facilities for processing and storing products, and whose cultivated area is between 6 and 10 hectares; and 3) agricultural enterprises of an industrial nature, whose profitable operation allows amortization of industrial product processing facilities.

With these definitions in mind, agricultural loans are available from the bank in one of the following ways: collective, short-, middle-, and long-term loans intended for the Cooperatives and the Regional Offices for Development for their own operations; and individual loans of small amounts to agricultural enterprises of the family type. A personal investment is always required of the borrower, although exceptions may be made for the members of cooperative and mutual aid organizations.

To establish an agricultural insurance fund, a contribution equal to 1 percent of the principal is required from all borrowers of middle- and long-term loans.

Short-, middle-, and long-term loans may be granted to finance: the maintenance and harvesting costs of hectares already planted or the purchase of fertilizers or insecticides; the purchase of agricultural implements or processing tools; and the construction of warehouses, drying platforms, or other commercial structures.

The capital investment expected of borrowers is as follows:

Total Invested Capital (CFA francs)	Borrowers' Investment (percent)
up to 500,000	0
500,001 to 1 million	5
1,000,001 to 3 million	10
3,000,001 to 6 million	15
more than 6 million	25

The interest rates on individual loans are as follows:

Agricultural Enterprises	
Short-term	7.5 percent
Middle-term	7.0 percent
Long-term	6.5 percent

Enterprises of an Industrial Nature	
Short-term	8.0 percent
Middle-term	7.5 percent
Long-term	7.0 percent

In addition, a deposit of 0.50 percent is collected on all middle- and short-term loans.

APPENDIX

Food Restrictions in the Central African Republic

Predominant Ethnic Group and Other Races	Main Religion	Foods Forbidden to Everyone	To Women
Bayas, Dagba, Vales, Haoussa, NGama, Litos, Kaba Batangafo	Protestantism	Snails	Monkeys, hens, pork, ducks, panthers, lions
Sango, Yakoma, NGbougou, Yacpa, Baguiro, Bouraka Mobaye	Protestantism		Antelopes, Mbangue: monkeys
Langbassi, Yacpa, Banziri, Gbougou, Linda Kouango	Animism	Mboka: fish	Snakes, monkeys, Mboka: perch
NZakara, yakoma, Zande, MBangui, Dendi, Arabs Bangassou	Protestantism		Nzakara: panthers Yakoma: monkeys
Mandjia, Bando, Lito Sara, Haoussa	Catholicism and Protestantism	Lions, panthers, millipedes, scorpions	
Bayas, Panas, Karre Bocaranga	Animism		Chickens, tigers, pigs, eggs
Mandjia, Banda, Bayas, Bandigris, Kabas Bouca	Protestantism	Some meat and vegetables	Eggs, chickens, monkeys
Bandas, Arabs, Moroubas, NDoka, Sara, Mandjia NDele	Hamism		
Bayas, Boffi, Moslem, Banou, MBaka Boda	Catholicism		Pork, sheep, ducks, monkeys, turtles

APPENDIX
(continued)
Food Restrictions in the Central African Republic

Predominant Ethnic Group and Other Races	To Pregnant Women	To Girls	To Boys	To All Children
Bayas, Dagba, Vales, Haoussa, NGama, Litos, Kaba Batangafo	Antelopes, rabbits caterpillars, fish			Panthers, lions
Sango, Yakoma, NGbougou, Yacpa, Baguiro, Bouraka Mobaye	Boars, monkeys, antelopes hippopotami			Panthers, crocodiles, red antelopes, snakes
Langbassi, Yacpa, Banziri, Gbougou, Linda Kouango	Elephants offals	Pork, chicken warthogs		
NZakara, Yakoma, Zande, MBangui, Dendi, Arabs Bangassou				
Mandjia, Bando, Lito Sara, Haoussa	Fish, beans, eggs, gozo			Eggs: not before 15 months
Bayas, Panas, Karre Bocaranga	All snakes and margouillats			
Mandjia, Banda, Bayas, Bandigris, Kabas Bouca	Elephants, turtles, crocodiles, snakes, caterpillars, honey	Big lizards, chicken at age 10	Turtles, snakes big lizards at age 10	Honey until 3 and 4 years old
Bandas, Arabs, Moroubas, NDoka, Sara, Mandjia NDele	Mammals			
Bayas, Boffi, Moslem, Banou, MBaka Boda	Antelopes, goats		Antelopes before 6 years old	Turtles, pigs, goats

APPENDIX
(continued)
Food Restrictions in the Central African Republic

Predominant Ethnic Group and Other Races	To One Religion	To Widows	During Menstruation	To Women with Twins	Other Restricted Foods
Bayas, Dagba, Vales, Haoussa, NGama, Litos, Kaba Batangafo	Moslems: pork	Beef, red monkeys		Hares, snakes, turkeys	Snails, dogs, eggs
Sango, Yakoma, NGbougou, Yacpa, Baguiro, Bouraka Mobaye		Elephants during time of mourning	Moslems: pork, boars, monkeys	Elephants, boars, hippopotami, snakes, big fish, ducks	
Langbassi, Yacpa, Banziri, Gbougou, Linda Kouango	Moslems: pork				
NZakara, Yakoma, Zande, MBangui, Dendi, Arabs Bangassou	Moslems: pork				Snails
Mandjia, Bando, Lito Sara, Haoussa			Lemons, Bananas, fish	Snakes until the death of the children	
Bayas, Panas, Karre Bocaranga		Goats, fish		Rabbits, turkeys, black squirrels	Snails, dogs,
Mandjia, Banda, Bayas, Bandigris, Kabas Bouca	Moslems: pork, dried meat		Fresh meat	Rats, palm kernels, snakes,	Snails
Bandas, Arabs, Moroubas, NDoka, Sara, Mandjia NDele	Moslems: pork, wine	Fish			Snails, dogs,
Bayas, Boffi, Moslem, Banou, MBaka Boda	Moslems: pork	Game, fish, boars, buffaloes		Gazelles, snakes	Dogs

REPORT ON NUTRITION IN CHAD

To describe Chad is to indicate its vocation as a transit zone, a land of convergence; it is sufficienc to survey this assembly to realize that Chad is a transition element between North Africa and paleo-negritic Black Africa. A zone of confluence in the heart of Africa, it has been called "the turntable of the Black Continent." Chad extends over 1,280,000 square kilometers in the heart of the continent, which limits the possibilities of trade with the overseas world. And you may guess the difficulties in matters of exchange. Since we are considering the field of nutrition, you may realize the problems posed by distance in obtaining food supplies from outside, should it be necessary. Exchange difficulties and the need for food supplies require an immense effort toward the development of self-sufficiency in providing adequate food supplies.

This country extends over a vast area between the eighth and twenty-third parallels, on either side of the thirteenth parallel, which indicates a diversity of climatic zones, a variety of economic potentials, both agricultural and pastoral. The grassy southern savanna, a humid region, is suited to agriculture. There, stock-raising exists but in a limited way, fishing takes place on a large scale, and the larger part of the population is concentrated. A middle zone, also grassy, with clearings and scattered thorny trees, is a relatively humid zone where agriculture hangs on, and the transhumance of livestock becomes important, the breeding of cattle and smaller animals representing the vital resource of this region. From there we go to the northern zone, the truly desertic part of Saharan Chad, where the camel predominates and agriculture gives way completely except in a few oases in the extreme north. On these oases the people engage in the cultivation of vegetable gardens, complementing in a fortunate way the global calorie supply, which is insufficient, as you might expect. In general, then, in each zone, the rainfall determines living conditions, agricultural potential, ways of living, and available foodstuffs.

What is the food potential of this region? First some demographic facts: there are about 4 million inhabitants, unequally distributed, with the greatest concentration

in the south, especially the southwest, a zone lending itself well to agriculture and stock-raising. Thus one-third of the population lives in approximately one-tenth of the land area.

The crops are numerous and varied, but they are mostly cereal crops: millet, the staple food of the Chadian people, amounts to about 800,000 tons per year; corn to about 32,000 tons; rice, whose cultivation is rationalized in modernized agricultural regions, amounts to about 50,000 tons per year; peanuts, beans, and wheat around Lake Chad in areas in full agricultural expansion; manioc, the substitute for millet and a gap filler, especially in difficult times, in the southern areas; various truck gardening products; cotton, an industrial plant, still meets some food needs, especially through the extraction of cottonseed oil; dates, in the north; fruit, because of an extremely sizable expansion of orchards.

The raising of livestock is a principal resource of Chad, with at least 4 million cattle, 4 million sheep, fowl of all kinds, and an extremely varied and rich fauna that invites game-hunting tourists. As to fishing, waterways are not many, but the Chari-Logone complex constitutes, according to everyone, one of the world's richest fishing grounds.

This has been a summary of the food supplies at the disposal of the Chadian people, whether stock-breeders or farmers. But what is truly within reach of the farmer or the breeder? I would like here to consider several sociological aspects of the peasant world. Before independence, agriculture and animal husbandry were practiced according to traditional methods. The use of a hoe, representing as it does an extremely low level of technology, obviously limited productivity; no effort, no imagination was put into improving means of cultivation; the use of fertilizers and other means of improving the soil were practically unknown or neglected. Thus the farmer was hardly able psychologically to depart from the traditional ancestral farming methods.

The situation is quite different today, thanks to the introduction of cultivation methods of a more advanced technological level. Even though it may be archaic at this period of time, the plow is for Chad an advanced technique.

Due to the use of tools and of fertilizers, and especially due to the experience of greater profitability by those who use them, the peasant is more and more led away from traditional procedures and tempted by the technical and modern environment in which he lives. He aspires more and more to new ways. Today, in fact, the whole issue revolves around the credit rating of farmers in regards to means available to them to increase the efficiency of their use of nature. With the help of the Government and credit organizations, this problem is capable of solution. The same can be said of stock-raising, where efforts at rural irrigation and pilot farming operations are under way. It can be said that, as projected into the future, Chadian agriculture and stock-raising can effectively solve the food problems of the country, at least in a quantitative manner.

How do the Chadian people make use of the available foodstuffs? The use made of these commodities varies with the region. The uses are multiple in the south, much more limited and monotonous in the north; but one thing is certain, there is a uniform tie in that the staple food remains everywhere a paste of millet traditionally called "boule de mil" ("millet ball"). A Chadian has not eaten until he has eaten his boule de mil. (I hasten to reassure our Tunisian friends that we are very adaptable and will know how to appreciate the excellent Tunisian cuisine.) Millet, then, constitutes the major carbohydrate food, more or less rich in vitamins and certain other elements, depending on how much of the bran has been removed in processing it. With the millet paste goes a sauce that supplies the major protein nutrients, a sauce composed of a protein ingredient (meat, fish, or game), various vegetables, fats, and spices.

What is the nutritive value of this food? As a whole, the total caloric contribution of this food is distinctly sufficient; the average calorie intake of the Chadian people is estimated at 2,800 to 3,500 calories daily. I am not including, obviously, the extremely rare cases of some families with a daily calorie intake of 10,000 to 15,000 calories. The protein intake is also adequate, being evaluated at 80 to 125 grams per day. Therefore, Chad is the first, or at least one of the first, countries in Black Africa where the supply of total calories and specific

proteins is adequate. I usually tell student assistants in my department that the best dish for a Chadian, the best balanced dish, the richest in nutrients, is millet paste with a sauce based on dried fish, and hence very rich in protein, to which is added peanut paste that is very high in fats and in vegetable protein; and I always tell them that it is very difficult to find a dish which by itself is so rich in nutrients.

Among other ways of utilizing these foodstuffs, meat can be consumed in all forms, grilled or boiled; milk, fresh or curdled; beans, boiled alone or in sauces; fish cakes, fried, dried, or smoked, in sauces. In short, there are many recipes to be discovered only on the spot and which invite us to touristic excursions. Of course, tea, coffee, and the local and imported alcoholic beverages add a little pleasure to the daily menu.

The supply of vitamins and minerals is the real problem of Chad; especially vitamins of vegetable extraction, and vitamin C in particular. Efforts are under way to develop fruit orchards. As of now, with imports from neighboring regions, it is possible to remedy the lack of vitamins. In certain regions, iodine deficiency obviously gives rise to endemic goiter. Iron deficiency anemia is of parasitic or nutritional origin.

Two cases I would like to mention are the case of the month of Ramadan and the case of nutrition in the Saharan regions. The month of Ramadan is the one in Chad when people are really the best fed, from the most humble to the wealthiest. The diet is extremely varied. Each person tries, at least during this one month, to eat the best, most nutritious food, and on a regular schedule. During 30 days, people eat as they should, although this is not true in the northern regions, the desertic regions that remain on the whole dependent on the south.

The outline I have given, I have sketched out, is more valid in the south below the 13th parallel. Beyond the 13th parallel, towards the north, the rainfall is extremely low and the desert of Chad offers only dates, the milk and meat of camels, some game, but less abundantly than

in the south, vegetables from oases, and fruit, as well as millet coming from the south. In fact, in these regions, tea is the essential element of the diet and the major preoccupation. This is to say that from the point of view of the total calorie intake, as well as the intake of specific proteins, the situation is not as good as in the southern zones. Children, however, escape from the major protein deficiencies since their inadequate diet at least assures them of the correct protein intake through milk and butter.

What is the state of child feeding? Actually, looking at the available food supplies of the country, it could be assumed that there are no problems for adults or for children. This is false. We have feeding problems, but these problems do not manifest themselves in the same acute terms as in some regions where the calorie and protein intakes are a nightmare. I mean to say that deficiency diseases, kwashiorkor for example, are rare in Chad. I am not saying that they are not seen: they are seen in some medical services; cases may arise two or three times a year; but this is not a real problem for us.

Ignorance, which is at the source of taboos, is one of the largest problems. Unfavorable sanitary conditions encourage a multiplicity of children's diseases, parasitic and infectious, which impair the biological equilibrium of the child. Another important problem is the ignorance of the specific dietary needs of children, the ignorance of the variations in need with age. Child feeding should vary with age, and it is not customary to feed a child differently from an adult once he is taken off milk. There is also ignorance of the nutritive value of local foodstuffs and the tendency to imitate European modes of feeding with flours, canned milk etc. It should also be underlined that certain specific taboos forbid children to eat meat and eggs, which does not help the situation. In general, a child is breast-fed until 18 or 20 months, except in urban centers where bottle feeding is sometimes forced by the imperatives of modern life, as well as being regarded as a sign of social evolution and advancement. Unhappily, the most elementary precautions connected with bottle feeding are often ignored, and the child sucks in with his milk a few germs that later cause gastro-intestinal difficulties. In traditional surroundings, where the child is at the breast for 18 months,

weaning is rather brutal. The child goes from milk to the adult dish, the common family bowl, where the very smallest is in the presence of the biggest. The child is not competitive, does not know how to take care of himself, and ends up with the carbohydrate staple base of the common dish, especially since it is absolutely forbidden to a child to eat meat when he has a meal in the company of grownups. The consequence among the very young, the very small, is the type of child with a prominent abdomen and thin legs, the child with a large head, obviously malnourished, but who, with growth and an increasingly developed sense of competition, conquers his place at the common dish and succeeds with age in restoring his nutritional equilibrium. These are essentially the dimensions of the problem of child feeding.

I would like here to mention some problems concerning the international aid given to us in the area of nutrition. We must, of course, be grateful for the possibility of benefiting not only from the experience of different countries but also from their active contributions; There are, however, a few remarks to be made, and often it seems that this aid is in need of adaptation. I would like to outline a program we have in Chad under the World Food Program whose objective is nutrition education for mothers, and which has been in operation for several years without valid results. Why? Because, first of all, these programs are conceived in a way that does not correspond to the fundamental data. I am not saying that nutrition education is not a problem, but in the wide context of our extensive problems, it is not considered a priority issue; and it is not always understood why this non-priority question should have privileges, and be taken care of to the detriment of priority problems. The implementation of such programs entails absolutely exhorbitant recurring costs, as well as the setting up of a new organization subject to fussy requirements, which we understand very well, but which, in the context of our present state of under-development (and under-development must be considered a global problem), are extremely difficult to accept. Often it is necessary to detach from an already skeletal organization a new administrative entity, or to assign to it new tasks, making work extremely laborious and inefficient.

The second point to emphasize has to do with the use of new food commodities in all these programs, foods unknown to the populations to whom they are given, foods that have no part in their food habits. These items are obviously poorly received, accepted only so as not to refuse them; and later, one does something else. The objective has not been reached. It is, therefore, desirable to use not only known foodstuffs, but foods that are within economic reach and are sociologically acceptable because known to the population.

It is important to aid in the training of personnel to administer these programs. We are now revising one such training program along these lines.

In the immediate future, how do we resolve the few nutrition problems, and especially those of an educational nature? This takes place mostly in the home economics centers for the education of women and through evening radio classes broadcast in the vernacular. The High Commission for Popular Education addresses a daily program to the different fields of domestic activity of women. In the long term, it would obviously be desirable to integrate nutrition instruction into the general curriculum of schools.

In urban circles, the nutrition problem arises particularly among well-to-do social levels. This is the problem of adopting without a clear understanding the European mode of life, especially the practice of bottle-feeding. The bottles, powdered milk, formulated baby cereals and milk substitutes are quite expensive. This is a serious load on a usually very limited budget, and to the detriment of the general diet of the family: a can of milk costing 400 to 500 CFA francs represents about 2 days of food for a family of 3 or 4 persons. Worse, the use of bottles is in neglect of all aseptic practice. It is not rare, therefore, to encounter even children of government employees in a complete state of nutritional disequilibrium. Thus, it is not always lack of cash, but very often lack of thought and a lack of education.

In conclusion then, the nutritional problem of children in Chad is defined not in terms of specific deficiency, nor calorie or protein deficiencies; one can only

barely speak of vitamin deficiency. The only true problem is that of nutrition education of adults, mothers, educators, and all those who from near or far are called upon to deal with the growth of children. This, naturally, must be integrated in a general program for economic and social development.

REPORT ON NUTRITION IN THE DEMOCRATIC REPUBLIC OF THE CONGO

I. NUTRITIONAL STATE OF THE COUNTRY

A. Background Information

The Democratic Republic of the Congo is a vast country of central Africa, with 37 kilometers of Atlantic coastline, and a surface area of 2,336,392 square kilometers which is equivalent to about one-thirteenth of all Africa. One could call it a continent, which is to state at the outset how difficult the nutritional problems and their solutions are in this country.

Hydrographically, our country has the advantage of the vital artery that is the Congo river, which is classified as one of the greatest in the world with its length of about 4,300 kilometers, the extent of its watershed (3,650,000 square kilometers), and its mean annual flow rate (40,000 cubic meters per second). Before it empties into the Atlantic, several tributaries increase its flow and stretch its banks. The river and its tributaries are navigable over a distance of 12,712 kilometers. Since it is not navigable along its whole length because of falls, rapids, or shoals, a network of railroads and highways connects the navigable stretches. Rail lines total about 5,424 kilometers, and roads more than 150,443 kilometers. Several lakes, such as lakes Tanganyika, Albert, Kivu, Leopold II, etc., complete the navigable network of the Congo basin. As will be seen later, this immense quantity of water at our country's disposal shelters tons of fish of all kinds.

The essentially rural population numbers 20.5 million inhabitants, of whom approximately 50 percent are under 15 years of age, according to the latest census (1969). Thus, our country does not escape from the general rule that applies to all countries of the third world; it has a young population. The average population density is 8.7 inhabitants per square kilometer, a small number compared to other countries, so that family planning finds an application only under specific conditions.

As to vegetation, the Democratic Republic of the Congo has the advantage that its lands straddle the equator; approximately one-third is located north of the equator, two-thirds south, which spares it the aridity and deserts that characterize Africa. Over the whole country, one finds forest or savanna, hence there are great possibilities for agriculture and stock-raising.

To this vegetation that is naturally favorable to agriculture is added the climate with two principal zones: equatorial and tropical. The equatorial zone, which straddles the equator, extends to 2° latitude north and south. Rain falls during all months of the year. The temperature is relatively high: $30^{o}C$ by day, $20^{o}C$ by night.

The tropical zones extend north and south of the equatorial zone up to $5^{o}30'$ north and 14° south, respectively. In the tropical zones, the year has two seasons: a rainy or hot season, and a dry or cold season. The rainy season is characterized by heavy rainfalls that may reach 800 to 1,500 mm, and a steady heat that may reach $40^{o}C$ by day and $25^{o}C$ by night. The dry season is characterized by a total absence of rain and a drop in temperature sometimes to $3^{o}C$ or $4^{o}C$ in some areas. It extends from May 15 to October 15 and lasts about 6 months. This alternation of wet and dry seasons is very beneficial to agriculture in our country and especially to its food equilibrium. Because at the time of sowing in the north, the southern harvest is reaching maturity. All that is necessary is an efficient distribution system for food commodities, and the country need not know a "hungry season."

A third temperate zone includes the whole eastern section. It is favorable to stock-raising and the growing of plants commonly cultivated in Europe, such as the potato.

From all that precedes, we may conclude that in the Congo everything grows, or at least can grow.

B. Food Resources

Thanks to its climatic conditions, its very fertile soil, its immense forests full of game, and its waters rich in fish, the Democratic Republic of the Congo has an enormous food potential.

1. Tubers and Roots (see Table 1)

a. Manioc, an euphorbiacea of South American origin which is cultivated throughout the country, is the staple food for the whole country. It is used in many forms in different regions: as chikwangue, flour, or boiled chips. In 1968, 18,771,554 tons were harvested.

b. The sweet potato, also called camote, is very widespread. It is an important item in the diet of the Congolese, especially those of the Ituri (northeast of the Republic). It is eaten boiled, fried, or braised. The 1968 production was 620,433 tons.

c. Potatoes, imported into the Congo by the National Institute of Agronomic Studies, are eaten everywhere by dwellers of high altitude regions. The 1968 production was 86,913 tons, to which must be added 3,482 tons that were imported.

d. Taro or colocase is used in the same way as potatoes. It is very much cultivated. The annual production often exceeds 20,000 tons.

e. The yam is a tuber adapted to forest regions. With manioc and sweet potatoes, it is the tropical crop richest in carbohydrates.

2. Bananas and Plantains

Several kinds of bananas and plantains are grown in the Congo, some edible some not. Among the edible ones, a distinction should be made between fruit-type bananas eaten as sweet fruit and plantain bananas which are eaten as flour or boiled. Plantains have an important role in the diet of the Congolese. They are eaten all over the country and the annual harvest often exceeds 1,000 tons.

3. Cereals (see Table 2)

a. Corn is cultivated everywhere in the Congo, but mostly in the savanna and at higher altitudes. The 1968 production was 721,004 tons, to which must be added 57,677 tons that were imported.

b. Rice is always considered a luxury food. The equatorial region is the one where production is most important. For the whole country, 1968 production was estimated as 186,749 tons, plus 16,260 tons which were imported.

c. Sorghum, also called Congolese wheat, was the principal cereal of the country until the introduction of corn. Production in 1968 amounted to 17,748 tons.

d. Millet, barley, oats, finger millet, and wheat complete the cereal choices available to the Congolese. Their total production amount to 11,000 tons per year.

4. Sugar

In his coffee or tea, the Congolese likes to add cane sugar, whose production in 1968 totaled 38,408 tons. An additional 9,540 tons were imported.

5. Legumes (see Table 3)

a. Beans are the most frequently eaten legumes in the country. They are grown in all regions of the Congo, particularly in the plains. The annual harvest in 1968 was 472,602 tons.

b. Peas are produced in amounts oscillating between 15,000 and 30,000 tons (1968).

c. Bambara groundnuts (voandzou) are widely eaten in the Congo. Production has been around 10,813 tons annually.

d. Soy beans, which are very rich in protein, are presently cultivated in the Congo, mostly in the Kasai regions. Soya can be eaten as whole pods before reaching full maturity or as beans before or after maturity. The beans can be made into a flour that lends itself to numerous food preparations. It can also be mixed with manioc flour as a supplement in a 1 to 3 ratio. The average annual production from 1967 to 1968 was 1,872 tons.

6. Oleaginous Plants (see Table 4)

Among the oleaginous plants found in the country, we will mention the following:

a. Oil palms, from which palm oil is derived, exist in the whole Congo in both wild and cultivated states, but less in the north-east. From this same palm tree comes a delicious wine that is quite intoxicating when fermented. Palm oil production was 242,216 tons in 1968.

b. Peanuts are an important dietary staple, especially in the savanna region where the oil palm is more or less absent. They

remedy the relative lack of palm oil. In 1968, production amounted to 379,502 tons, of which 264 tons was peanut oil, the rest having been consumed roasted or as a paste used in sauces.

c. Sesame has a 25 percent protein content and is often eaten toasted. Ground, and mixed with sugar, sesame seeds may be used in pastry and candy. The 1968 production was on the order of 15,855 tons.

7. Garden Vegetables (see Table 5)

Truck gardening vegetables constitute the principal source of vitamins. The total 1968 production was 98,854 tons.

8. Fruit Crops (see Table 6)

Fruit is also a source of vitamins. Although consumed mostly outside of regular meals (no dessert is served with Congolese meals), much fruit is produced in the country: pineapples, papayas, guava, safou, etc. To this list can be added stimulants, such as pepper, coffee, and tea.

9. Livestock

In spite of its immense pasturelands, the Congo does not have enough livestock to cover its requirements for animal protein. In 1968, there were 886,896 head of cattle, 433,039 pigs, 1,544,750 goats, 521,820 sheep, and 6,035,068 farmyard animals. The production and total available supply of meat in 1968 was 34,309 tons, with 6,411 tons of imports (see Tables 7 and 8).

10. Fish

The consumption of fresh, dried, and salted fish is important. Manioc leaves are never eaten without fish on the side. The Congo has access to walt water fishing through PEMARCO. Numerous lakes rich in fish occur throughout the country. Individual fishing and occasional

commercial fisheries exist in many areas (Lakes Albert, Tanganyika and Leopold II). At the time of writing, illustrative figures are not available.

11. Game

To the other sources of animal protein should be added the traditional and perennial game hunting. This supplements the deficiency in protein from domestic animals since livestock is often raised to meet spiritual needs only.

C. Summary

Taking the preceding figures into account, and if food commodities were equitably distributed, in 1968 each Congolese would have had at his disposal the following:

Theoretical Food Availability
Per Person in 1968

Food	Total Weight (kg)	Approximate Daily Ration (g)
Tubers and roots	560.95	2,000
Legumes	56.46	155
Garden vegetables	27.43	8
Fruit	87.84	240
Palm or peanut oil	12.05	33
Meat	1.67	5

At first glance, one could conclude that the Congolese people are malnourished, but this is a misleading picture due to the shortage of statistical data. In the rural areas, there are no public slaughtering facilities: each one butchers his own goat without veterinary control. In the same way, it is difficult to give an accurate livestock census. Like all Africans, a Congolese is afraid of taxes. He thinks that any census means an impending tax collection.

It is therefore impossible for officials to have an exact idea of food production and supplies, at least at present, but we think that mass education can change this attitude. Only a systematic study of the population, especially of children, is capable of exhibiting the nutritional status of a developing country. Surveys of nutritional conditions have been made, but they have often remained regional, or even local, and therefore cannot present the national nutrition picture.

II. DEFICIENCY DISEASES

In several regions of the Congo, one observes on a regular basis and often with marked peak periods, numerous cases of food deficiencies, in particular protein malnutrition (kwashiorkor), vitamin A deficiency diseases in the dry regions of the east, iron deficiency anemias, and many other vitamin deficiency diseases, especially of the B group (beriberi and ariboflavinosis). Iodine deficiency is particularly marked in the Uelé and the province of Kivu.

But, obviously, it is protein malnutrition, or kwashiorkor, that is the most important deficiency in the country and even constitutes a public health hazard. Persistent and endemic in many regions, in particular savanna regions where, as shown by Dr. De Maeyer, manioc is the dietary staple, it has in recent years (before the New Regime headed by General Mobutu), taken an extremely serious epidemic aspect in several places. For example, in Kivu, one or two children out of five to eight suffered from protein malnutrition, and this figure reached up to 30 percent of the population in some Kivu villages.

In large cities, such as Kinshasa, the capital, this deficiency had taken frightening proportions: in some pediatric wards, the largest number of hospitalized children were malnourished. Studies of height and weight gain of preschool and school-age children had revealed a 15 to 25 percent deficit from normal weight in children from 1 to 12 years.

But since the start of the New Regime and the proclamation of 1968 as an agricultural year by General

Mobutu, things have changed. Periodic malnutrition is again within its usual boundaries, as described by De Maeyer; that is, endemic in the large cities, and in the Kwange, Kasai, and South Kivu regions.

III. CAUSES OF MALNUTRITION

After the long period of insecurity that prevented peasants from cultivating the soil, the causes of malnutrition in our country can now be said to be essentially social and economic. Geographic and demographic factors are only locally significant. They affect only certain regions and the large cities.

A. Social Factors

Among social factors, ignorance and late social evolution deserve to be mentioned. The latter exhibits itself, in particular, in poorly prepared foods with little variety unlikely to stimulate the appetite, especially in the presence of fevers and parasitism. Mothers are ignorant of the proper diet to give young children. In particular, and this is the crux of the matter, they do not know how to prepare foods for these children.

To the lack of education are added medical factors: communicable diseases (measles), because of the fever and anorexia they entail; parasitic diseases (intestinal worms), because of the spoliation syndrome and digestive disturbances (diarrhea) they induce.

B. Economic Factors

Unsatisfactory distribution of food commodities across the country and low purchasing power are the main economic causes of malnutrition in our country.

IV. THE FIGHT AGAINST MALNUTRITION

To fight malnutrition, the Democratic Republic of the Congo has several public and private agencies. As soon as the New Regime ended the rebellion, several social work bureaus arose throughout the country. For example,

the National Organization to Fight Hunger (ORNAFAIM) was organized within the Ministry of Agriculture with the help of FAO; a Committee to Fight Hunger, the Mbwaki, was established in Kivu; Catholic missions (Caritas), Protestant missions (Entr'aide Protestante), the United States Agency for International Development and Catholic Relief Services rushed into the country, some with seed supplies, some with machetes, hoes, etc. Food supplies were distributed here and there throughout the zones involved in the rebellion.

After this tumultuous period, the Government proclaimed 1968 the year of agriculture. At this time, food supplies are not short on the Congolese market, so that the efforts of the Government and the private sector consist essentially in the education of the masses through the Family Care Bureau.

During prenatal clinics and well-baby clinics, nutrition education classes are organized. These are held at social centers, clinics, and hospitals. Since the centers are scattered in the whole country, it is believed that more than half the population is thus sensitized to nutrition, especially when radio broadcasts play a part. In addition, personnel are continually being trained.

Milk distribution to preschool children will soon be organized in the social centers. Before the end of 1970, this will be in operation in Kinshasa.

V. GOVERNMENT POLICY TOWARD NUTRITION

Having been sensitized to the problem of malnutrition, the Government intends to fight this plague by all the means at its disposal. This is why it cannot hear of a conference being held somewhere on the fight against malnutrition without sending a representative. In fact, in 1967, a seminar of this nature was held in Kinshasa under the sponsorship of the International Center for Children.

A. Coordination

Several agencies are working on nutrition problems in the country, but they are, unhappily, not coordinated in their efforts. Although we are not at this time grouped as a national entity, we all know each other and we believe that the authorities will not be long in combining us. The outline of a National Nutrition Bureau is already in the hands of the Government. It is intended to group representatives of Health, Social Affairs, National Education, and Agriculture, as well as philanthropic organizations such as Caritas, Entraide Protestante, Catholic Relief, etc.

Concerned with the proper feeding of its populations, the Government watches over food prices. The Ministry of National Economy, which implements governmental price policies, has organized a corps of inspectors whose mission is to enforce price regulations. Due to the scarcity of certain items that arises from inadequate distribution, prices are often in excess of market quotations.

B. Land Tenure

The land belongs to the state since the passing of a law known as "Loi Bakajika," which allows each citizen to make use of land according to his ability. Before this law was in existence, problems arose, especially in the feudal regions of Kivu where land belonged to the Mwami (king), and in many other highly industrialized regions.

C. Agricultural Credit

Always concerned with the well-being of the people, the Government just established an Agricultural Credit Bank to allow farmers to increase their production.

VI. PROBLEMS TO BE SOLVED TO FIGHT MALNUTRITION

To fight malnutrition in the Democratic Republic of the Congo, our first concern remains education of the people and training of personnel whose role will be the education of mothers in matters of nutrition. The

education of mothers consists in explaining the importance of maternal breast-feeding and teaching the classical methods of weaning, the food value and use of local products, and cooking practices suitable for young children.

The next steps are to rid all children of their parasites; to encourage the raising of small stock in the family and the growing of vegetable gardens; to insure milk distribution in day care centers for preschool children; and to insure an equitable distribution of food commodities in the whole country, especially in large cities and industrialized areas.

With the help of WHO, our Government intends to reach the following objectives:

A. Immediate Objectives

Along the lines of public health services, and especially maternal and child health care, and personnel training, the government will:

1. Provide nutrition education to mothers and to preschool children at all hospital pediatric wards and health education centers.

2. Insure, through the medium of the Medical Education Service of the Ministry of Health, the in-service training of medical and paramedical personnel in matters of nutrition and nutrition education.

3. Insure, in cooperation with the other agencies of the United Nations, bilateral assistance programs, and volunteer organizations, the instruction, training, and continuing education in matters of nutrition of all persons who are or might find themselves active in this area.

4. Plan and organize a network of nutrition technicians at all levels, central, provincial, district and territorial, and insure staffing of the projects developed at each level.

5. Organize and strengthen communications between medical nutrition services and agricultural and social services so as to obtain proper nutrition education and its extension to child care centers at the various levels of the health network.

6. Organize and develop cooking demonstrations based on regional food habits; rectify unbalanced diets; study the supplies available at local markets (this action will be taken in collaboration with FAO, according to the interagency agreement of February 1966).

7. Organize uniform training in the diagnosis of nutritional diseases to permit precise evaluation of their part in general epidemiology.

8. Organize periodic revisions of the nutrition curriculum intended for medical and paramedical personnel, to insure that programs are up to date.

9. Conduct nutrition education in conjunction with health education.

B. Intermediate Objectives

With the aid of WHO and UNICEF, the Government is planning to:

1. Reinforce nutrition education activities, especially for mothers at the urban pilot health center at N'Djili.

2. Organize and implement nutrition education activities at the Kinshasa General Hospital, the Kintambo Hospital, and successively at the other hospitals according to established priorities.

3. Enroll personnel already involved with nutrition in refresher courses.

4. Consider realistically and according to the needs of the nation the teaching of nutrition in training schools for paramedical technicians.

5. Classify nutrition trained and specialized personnel into categories which will fit into the hierarchical organization of activities at the central, provincial, district, and territorial levels.

6. Assist the training of specialists: at the central level, by scholarships for foreign study; at the provincial level, by trying to use the medical training center; and for the other levels, by on-the-job training of the existing auxiliary personnel (social workers) in the pilot health centers.

C. Final Objectives

Arrive at the structure of a National Nutrition Service network capable of studying, planning, and implementing the actions necessary to control and solve public health problems in the field of nutrition.

TABLE 1

Production and Imports of Roots and Tubers, 1959-1969

(in metric tons)

Product	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Potatoes	11,914 (+10,540)	16,632 (6,940)	17,204 (3,320)	14,712 --	17,670 (4,850)	17,958 (2,550)	25,000 (4,595)	39,232 (4,915)	51,997 (3,199)	36,913 (3,438)	15,000 --
Fresh manioc	7,214,807	6,044,939	5,934,469	5,924,000	6,073,000	6,221,000	7,735,579	8,753,406	8,657,396	10,771,554	10,000,000
Yams	316,112	373,962	299,456	295,000	291,000	265,634	191,736	227,060	252,174	620,433	350,000
Dried onions	18,732	4,384	4,910	5,499	6,311	6,574	7,000	8,436	8,458	17,199	15,000
Taro	18,732	16,774	19,061	21,660	20,788	15,159	22,557	29,956	44,668	?	20,000
Total	7,590,987	6,468,631	6,328,420	6,260,871	6,413,619	6,528,875	8,036,467	9,063,005	9,012,802	11,499,587	10,400,000

Note: Figures in parentheses indicate imports.

TABLE 2

Production and Imports of Cereals, 1959-1969
(in metric tons)

Product	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Milled flours	56,730	45,455	55,151	70,837	100,301	65,110	87,767	87,881	77,776	78,998	---
Wheat	2,431	824	2,127	2,970	2,892	3,084	3,000	3,300	3,956	2,806	3,000
	(38,700)	(29,100)	(33,700)	(40,700)	(74,700)	(41,600	(55,660)	(52,253)	(60,301)	(49,412)	---
Rice	64,766	124,000	71,000	74,000	60,000	55,000	48,880	90,663	100,423	186,749	130,000
	(2,300)	(2,500)	(15,400)	(35,500)	(39,900)	(17,000)	(22,840)	(33,425)	(23,146)	(18,260)	---
Sorghum millet	41,371	39,455	46,979	42,000	43,000	44,000	24,021	24,863	26,351	17,748	30,000
Corn	332,690	330,000	250,000	226,000	252,000	237,000	232,222	270,364	297,400	721,004	350,000
	(5,900)	(20)	(800)	(38,800)	(61,700)	(73,400)	(45,830)	(74,355)	(68,532)	(57,677)	---
Barley	41,371	551	439	439	392	352	541	382	401	2,020	1,000
Finger millet	41,371	9,970	12,828	12,267	657	6,200	8,202	7,956	8,354	101,922	10,000
Total	627,630	581,875	488,424	543,513	635,542	542,746	528,963	645,442	666,640	1,236,596	524,000

Note: Figures in parentheses indicate imports.

TABLE 3

Production of Legumes for Human Consumption, 1959-1969
(in metric tons)

Product	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Dried beans	72,097	68,189	68,804	69,575	72,274	75,202	75,719	66,797	65,200	472,602	75,000
Dried peas	72,097	70,585	66,594	68,857	75,068	80,404	80,913	8,740	15,510	--	25,000
Bambara groundnut	--	4,323	4,602	5,154	7,553	4,319	4,299	4,143	4,690	10,813	6,000
Soybeans	--	1,800	1,180	1,322	1,420	2,200	2,000	2,000	2,163	81	1,500
Total	144,194	144,897	141,180	144,908	156,315	162,125	162,931	81,686	87,563	483,496	107,500

TABLE 4

Production of Industrial Crops for Local Consumption, 1959-1969
(in metric tons)

Product	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Sugar cane	3,966,902	446,580	325,630	420,368	395,820	291,781	323,058	322,160	395,409	420,713	420,000
Sugar	39,448 (7,925)	38,048 (1,274)	28,920 (1,008)	41,427 (6,956)	39,436 (2,165)	27,136 (636)	33,167 (337)	31,874 (6,073)	34,599 (10,900)	38,408 (9,540)	40,000 --
Soybeans	--	1,300	1,180	1,322	1,420	2,200	2,000	2,060	2,163	81	1,500
Peanuts	174,121	175,196	148,000	129,000	130,000	122,000	137,000	149,104	163,266	379,502	200,000
Sesame seed	5,972	5,338	2,054	4,893	1,595	2,017	4,875	3,707	3,930	15,855	3,500
Sweet peppers	4,979	4,441	3,970	4,050	2,034	1,929	3,365	3,769	3,100	1,607	3,000
Palm oil	245,216	217,700	204,623	197,000	185,000	171,000	120,000	124,670	149,460	242,216	245,000
Total	4,444,563	890,377	715,385	805,016	757,470	618,699	623,802	643,417	762,827	1,107,922	913,000

TABLE 5

Production of Garden Vegetables, 1959-1969
(in metric tons)

Product	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Cabbage	4,691	4,189	3,739	3,338	2,979	4,928	4,589	3,823	4,900	23,410	5,000
Lettuce	17,940	15,252	13,420	10,388	10,325	16,232	2,688	2,869	3,050	1,220	3,000
Other vegetables	17,124	34,472	11,296	12,652	11,361	10,246	12,485	11,801	14,282	16,628	16,000
Squash	15,324	14,405	17,438	24,727	18,616	16,416	26,842	24,739	28,862	13,548	15,000
Cucumbers	259	242	250	243	470	164	98	125	190	870	250
Tomatoes	21,178	16,084	14,940	19,112	17,990	24,679	19,488	23,292	23,615	43,178	25,000
Carrots	228	168	130	109	95	108	272	369	439		250
Radishes	73	48	41	34	30	32	42	55	60		60
Total	76,817	84,860	61,254	70,603	61,866	72,805	66,504	67,073	75,398	98,854	64,560

TABLE 6

Production of Fruit Crops, 1959-1969
(in metric tons)

Product	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Oranges	44,232	41,779	39,397	30,890	34,621	38,610	33,335	42,510	45,360	65,527	65,000
Tangerines	25,010	21,416	22,498	20,237	27,620	23,660	28,761	20,735	22,135	99,294	25,000
Lemons	5,325	4,414	3,622	3,770	3,807	7,086	8,054	7,812	5,784	648	5,000
Grapefruit	7,722	5,018	9,206	10,292	11,396	16,468	23,047	12,207	8,345	1,107	8,000
Mangoes	83,332	87,432	90,113	64,623	73,026	72,303	62,678	67,998	70,485	164,478	70,000
Avacados	7,406	7,296	6,904	6,539	6,189	6,480	8,179	8,566	9,005	244,459	10,000
Bananas	47,757	50,802	45,000	45,000	49,000	41,242	42,482	35,763	33,696	198,505	85,000
Plantains		1,243,888	960,896	724,687	524,219	437,719	446,635	463,986	496,675	880,720	900,000
Pineapple	26,000	30,000	30,000	27,000	29,419	27,419	25,770	25,180	25,990	145,768	28,000
Other fruit	15,164	17,620	24,080	23,720	29,780	20,326	20,213	18,194	17,284		17,000
Total	261,948	1,509,665	1,231,716	956,758	789,077	691,313	699,154	702,951	734,759	1,800,506	1,213,000

TABLE 7

Production and Total Available Supply of Meat, 1959-1968
(in metric tons)

Type of Livestock	1959	1966	1967	1968
Cattle	17,810	13,538	13,686	14,632
Pigs	6,593	6,066	6,150	6,309
Sheep	725	646	722	652
Goats	1,800	1,285	1,499	1,467
Imported meat and edible offals	5,408	15,172	13,133	5,950
Total	32,336	36,707	35,190	29,010
Total domestic production	31,432	24,535	25,256	27,898
Total imports	8,008	18,272	14,853	6,411

TABLE 8

Imports of Animal Products, 1959-1968
(in metric tons)

Products	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Live animals	--	--	--	--	--	--	--	367	96	42
Meat and edible offals	5,408	4,256	6,984	13,772	16,230	12,395	13,876	15,172	13,133	5,950
Packaged meat products	2,600	1,800	3,100	2,500	3,300	3,300	2,300	3,100	1,720	461
Fish and shellfish	28,828	24,376	31,158	27,543	18,794	25,155	38,428	30,952	25,674	12,280
Packaged fish products	5,400	5,400	9,860	6,640	5,170	6,040	4,290	7,440	4,030	7,706
Dairy products, eggs, honey	11,398	6,579	11,353	11,507	18,302	3,221	6,938	9,043	7,745	8,427
Total volume	53,634	42,411	62,455	61,962	61,796	50,111	65,832	65,707	52,302	34,824

REPORT ON NUTRITION IN GABON

I. BACKGROUND INFORMATION

A. Geography

Gabon is situated on the equator, on the west coast of Africa. Its territory occupies an area of 267,000 square kilometers, of which 200,000 are covered by a dense forest. It is bounded in the north by the Federal Republic of Cameroon, in the northwest by Equatorial Guinea, in the east and south by the Republic of the Congo (Brazzaville) and in the west by the Atlantic Ocean along a coastline of about 800 kilometers. Gabon extends approximately 500 kilometers in the east-west direction; the average north-south distance is also about 500 kilometers. From the point of view of topography, climatology, hydrography, and vegetation, Gabon is homogeneous.

The country is hilly, except in a low region of less than 300 meters altitude, which extends along the sea for 30 to 200 kilometers, and in a few savannas mostly in the south; plateaus broken with series of hills cover the greatest part of Gabon. In the northwest and in the center of the country, the contour rises above 1,000 meters, the highest point being Mount Tboundji, at 1,575 meters. The dense hydrographic network consists almost entirely of the Ogooué and its tributaries, whose basin spreads over 220,000 square kilometers. Except for some savanas on the Atlantic coast and on the high plateaus of the southeast, the near totality of Gabon is covered with forests.

B. Climate

The climate is equatorial, hot and humid. It is characterized by small temperature variations around a mean of 26°C. The humidity level is high. Annual rainfall varies on the average between 1,500 mm in the center of the country and 3,500 mm at the estuary of the Ogooué. The rainy season lasts about 7 months and is followed by a dry season of about 5 months.

C. Demography

At the time of the last census in 1964, the population of Gabon was approximately 445,000 inhabitants. As of 1970, the population of Gabon can be estimated at 470,000 inhabitants, which corresponds to an average density of 1.7 per square kilometer.

The towns of Libreville (75,000 inhabitants), Port-Gentil (30,000 inhabitants), five urban centers of more than 5,000 population, and nine urban centers of more than 2,000 population together comprise about 100,000 people. The remaining 80 percent of the population is living in villages of 100 to 200 inhabitants along the rivers and roadways. This quasi-rural population is under the influence of the urban agglomerations and the agricultural and forestry centers.

The sex and age distribution of the population is given in the following tables.

Inhabitants by Sex and Age, 1964

Age	Sex		Total
	Males	Females	
1-6 months	4,043	3,968	8,011
6-11	2,804	2,795	5,599
1-10 years	47,084	46,001	93,085
11-20	27,657	28,364	56,021
21-30	30,309	41,078	71,387
31-40	32,941	46,912	79,853
41-50	31,314	34,680	65,994
51-60	17,978	19,798	37,776
61-70	7,168	10,436	17,604
71-80 years & over and age not given	3,601	5,536	9,137
TOTAL	204,899	239,568	444,467

Age Distribution of Women and Children

Women		Children	
Age Group	Number	Age Group	Number
15-19 years	24,000	0-11 months	14,537
20-24	18,000	1-4 years	43,239
25-29	11,300	5-9	51,100
30-34	12,100	10-14	56,300
35-39	12,600	Total	165,206
40-44	11,000		
45-49	11,500		
Total	100,500		

Children in Gabon make up 34.7 percent of the population, whereas in Africa as a whole the percentage is currently 50 percent. The total number of women and children in Gabon is 265,706 or 55.8 percent of the population, whereas in Africa they account for 65 percent.

Other demographic figures are as follows:

Net reproduction rate: 1.4 percent
Masculinity ratio (number of men per 100 women):
- General 88
- Villages 79
- Urban centers 112
- Industrial areas 123

Gross birth rate: 35 per thousand
Gross mortality rate: 30 per thousand
Natural population growth rate:
- Gabon
  - 35 minus 30 = 5 per thousand (0.5%)
- Africa
  - 20 to 40 per thousand (2-4%)

Infant mortality rate: 229 per thousand

The natural population growth of 0.5 percent is seen only in urban centers; the growth rate is negative in villages. This very low 0.5 percent rate is accounted for by an especially low fertility rate and a high mortality rate. The latter, however, does not seem to apply to large cities where the concentration of medical services has partly been able to remedy the situation.

The low birth rate has two main types causes: socio-economic and medical and health. Among the socio-economic causes, the explosion of traditional structures triggered by industrialization has had the consequence of disrupting the demographic equilibrium of the population by rural outmigration to industrial areas and cities. But this rural outmigration has been selectively male. As a result, the already low general masculinity ratio for the whole of Gabon of 86 men per 100 women falls to 79 in villages, and climbs to 112 in urban centers and 123 in industrial areas. If one remembers that the 79 males in villages are children and aged men, and there are few women in industrial areas, this accounts for the small number of pregnancies.

In addition to the usual causes, the high sterility rate, both male and female, is due to medical and health factors, specific to Gabon and not yet well understood. Therefore, the Government wishes to study in depth the causes of sterility to be able eventually to apply the appropriate corrective measures.

In 1964, the active sector of the population amounted to 232,000 persons who were employed as follows:

Employment by Category, 1964

Category of Employment	Men	Women
Agriculture and Fishing	56,300	99,500
Students	5,000	1,200
Wage earners (total)	64,700	5,300
Total	126,000	106,000

Persons employed in agriculture, both men and women, represent 66 percent of the active labor force, that is 94 percent of active women and only 43 percent of active men. This corresponds in part to the tradition that field work is the province of women and also to the attraction that more remunerative modern sectors hold for the men.

The fact that schooling is compulsory to age 16 and affects 90 percent of that age group puts a heavy burden on

the future evolution of the active segment of the population by accelerating their disaffection from manual labor to the benefit of the secondary and tertiary sectors.

D. Social Conditions in Gabon

With about 450,000 inhabitants, Gabon is slowly developing its population. Communication difficulties, particularly in the rainy season, impede health activities, especially against endemic diseases and infant mortality. Considerable effort has been made, however, since independence (family allowances, prenatal allowances, birth bonuses).

Education is compulsory from age 6 to 16 for all Gabonese children, regardless of sex. Gabon has one of the highest schooling levels of Africa. Primary education reaches the most distant villages, but this places a heavy burden of public funds. Secondary education in Gabon is increasing; there were 300 students at the baccalauréat examination in 1964 and 340 will take it in 1970. Technical education is on the increase. There is one technical high school, technical colleges, public and private professional schools; there will soon be a Polytechnic School in the framework of the University of Central Africa, and the Forestry School will be transformed into an Institute of Forestry Studies.

Gabon has a high school attendance level (90 percent), and learning enjoys great prestige. Girls reach an essentially equivalent level to boys (43 percent against 44 percent, for a total of 79,110 students among 621 schools). Parochial schools are slightly more important than public schools; the two systems are coordinated and follow the same curriculum.

The education budget amounts to more than one-fifth of the total budget of the country, which shows the value the Government places upon it. There is a marked difference between secondary or technical education and elementary education, this latter being less favored.

The total output of elementary education is low, partly because of the professional level of teachers who

were until now required to have the Elementary Studies Certificate. Out of 1,000 students, 105 obtain the certificate. To improve the pedagogic qualifications of teachers, a center for pedagogic training has been in operation in Libreville for a year as a UNESCO-UNICEF project.

II. ECONOMIC DEVELOPMENT FACTORS

A. General Information

Gabon has an area of 267,000 square kilometers and a population of 479,000 inhabitants increasing at 0.5 percent per year. The average per capita income is 73,000 CFA francs ($269). Since the average income in rural areas is only 20,000 CFA francs ($72), there is a tendency to urbanization. In 1960, 80 percent of Gabonese people were living in rural areas; this figure was to drop to 65 percent by 1970.

Three sectors can be identified in the Gabonese economy:

1. Primary sector (30 percent of the population
   - Agriculture (15.2 percent)
   - Forestry (14.9 percent)
2. Secondary sector (35 percent)
   - Mines and oil deposits (23.7 percent)
   - Energy (1.0 percent)
   - Public Works (5.7 percent)
   - Forestry industries (2.7 percent)
   - Other industries (1.9 percent)
3. Tertiary sector (33 percent)
   - Transportation and communications (5.5 percent)
   - Services (4.9 percent)
   - Commerce (24.6 percent)

B. The Role of Agriculture

Contrary to many African countries, the Gabonese economy is not dominated by agricultural production, or in particular by single-crop cultivation. Here, timber exploitation and mining and related industries almost

totally dominate the economy. In Gabon, one can talk of a heavy industry economy, which is why development problems are important and subtle. Competent Gabonese must function at all levels of production. This should permit a reduction in the cash outflow to foreign countries by foreign personnel. Private enterprises agree that the employment of natives of equal competence and qualifications would markedly reduce their general expenses and at the same time lead to an improved balance of payments for Gabon.

Because of the emphasis on forestry and mining, as well as the low population density, the agricultural sector plays an unusually small role in Gabon. The rural areas of the country have essentially no agricultural tradition. Most of the agricultural labor falls upon women. The men hunt, clear land, and build houses, while women prepare the soil, plant and cultivate the crops, harvest, and market the produce. Only in areas where permanent cultivations are well-established do men take an active part in agricultural activities and contribute to cash income.

In most of the rural areas of Gabon, males are seriously underemployed. One of the objectives of the development plan is to induce the masculine element to participate in rural activities. It will be impossible to obtain this participation if technical innovations do not break the psychological chains that determine the divisions of labor.

The agricultural sector occupies a very modest place. In 1963, total Gabonese production amounted to 42 billion francs ($153 million). Only a fraction of this amount, 5 billion francs ($21 million) came from the agricultural sector, including foodstuffs consumed on the spot. Consequently, agriculture plays in the national economy of Gabon an entirely different role from the one fulfilled by this sector in other African countries.

The weakness of agriculture is confirmed by the fact that out of a territory of 26,700,000 hectares, only 125,000, that is 0.46 percent, are devoted to agriculture. The areas devoted to subsistence and industrial crops amount to 35,000 hectares, 28 percent of the total cultivated area, or 0.13 percent of the territory of Gabon.

C. Agricultural Production, Stock-Raising, Fishing

Data are available from two sources: statistical data of the Office for Processing and Control of Export products and of the National Office for Agricultural Trade (NOAT). The table below shows figures for products subject to processing control. On the whole, figures for the year 1968 are higher except for coffee, and slightly lower in 1967-68 for cocoa.

Processing of Agricultural Products 1963-1968
(in tons)

Product	Year					
	1963	1964	1965	1966	1967	1968
Cocoa (Oct.-Sept.)	3,742	4,021	3,738	3,832	4,296	4,061
Commercial coffee	730	847	847	244	306	266
Palm oil	555	1,067	1,146	1,103	1,123	1,374
Palm kernels	10	290	407	271	198	439
Paddy rice*	673	997	1,017	550	562	596
Peanuts (shell base)	360	422	451	434	135	232
Peanuts (unshelled)	185	250	415	246	135	232
Peanuts (shelled)	175	172	36	88	--	--

*Paddy is partly destined for Gabonese consumption; the rest is shipped to the Congo. It does not come under processing control.

Source: Processing Control Office

As the table below shows, the marketing of coffee by the National Office for Agricultural Trade has been decreasing; however, it cannot be concluded that production has diminished. On the other hand, the development of trade in garden produce continues, and this is related to the purchase price of highly profitable vegetables (130 CFA francs per kilo, or about 40¢, on the average) and to the opening of the Tchibanga Production Center and the reopening of the one at Medouneu.

Marketing of Agricultural Products by the NOAT

Product	Amount (in metric tons) 1966/67	1967/68	Purchasing Price (in CFA francs) 1966/67	1967/68
Peanuts (shell base)	293	125	30	30
Coffee beans	1,610	1,255	50	50
Cocoa	105	85	80	85
Paddy	562	596	20	20
Palm kernels	2	--	17	17
Calabar bean	4	5	110	110
Salted fish	53	63	90	100
Garden produce	152	270	130	130
Total	2,781	2,399		

1. Coffee

Only the coffee produced in southeastern Gabon comes under processing control; in 1968, this amounted to 266.5 tons or 40 tons less than in 1967. Trade in this product is through NOAT, which buys coffee from the producers and handles local sales and exports. During the 1967-68 season, NOAT handled 1,255 tons of coffee. The purchase price in 1968 was 50 CFA francs (or 16¢) per kilogram.

Processing Control of Coffee for Export 1964-1968
(net weight in tons)

Grade	1964	1965	1966	1967	1968
Prime	--	5.0	--	--	--
Superior	339.3	108	27.6	117	132.7
Common	204.7	185.8	130.7	49.7	97
Acceptable	232.9	58	16.1	79.5	36.8
Total	776.9	356.8	174.4	246.2	266.5

2. Peanuts

NOAT traded only 125 tons of peanuts in the shell in 1968. There was no production of decorticated peanuts. It seems that the financial incentive is not strong enough to permit an increase in production. Rural development procedures are being undertaken to try to adapt methods and means susceptible of improving yields. A higher production was indicated for 1969.

Since the sales figures of NOAT and those of the Processing Control Office are not for the same period, they are not comparable.

Processing Control of Peanuts
for Export 1964-1968
(in metric tons)

Grade	1964	1965	1966	1967	1968
Peanuts (unshelled)	246	375	246	135	232
Peanuts (shelled)	165	25	62	-	-

3. Paddy

The amount of rice marketed by NOAT in 1968 was slightly above that of 1967, but according to estimates of NOAT, paddy production was expected to drop in 1969. One reason for the disinterest of planters in this crop is the purchase price of 20 CFA francs (7¢) per kilogram, which is not very profitable.

Production of Paddy in the Nyanga Region, 1961-1968

Year	Tons
1961	785
1962	553
1963	673
1964	997
1965	1,017
1966	550
1967	475
1968	596

4. Palm Oil and Palm Kernels

Industrial production of palm oil and kernels is limited to the Palmevea-Sogabol complex. The Moabi Cooperative Company did not produce oil in 1968.

Production of Palm Oil and Palm Kernels, 1967-1968
(in tons)

	Oil		Kernels	
	1967	1968	1967	1968
Sogabol	299	35	39	--
Palmévéa	1,826	1,927	310	381
Coopalmo	38	--	--	--
	2,163	1,962	349	381

The Sogabol production was sold directly to Palmevea in bunches (2,916.6 tons). Sales of palm oil were as follows:

Sales of Palm Oil in 1968

Sales	Quantity (in tons)	Unit Price CFA Fr/ton
Exports	1,232	33,840
Domestic sales	730	52,000

Estimated production figures for 1969 are 2,068 tons of oil, and 365 tons of kernels.

5. Stock-raising

The cattle population at the Sogel Ranch increased in 1968 to 3,235 head. During the year there were 649 births and 122 deaths. Estimates for other stock are as follows: sheep, 43,000; goats, 47,000; pigs, 5,100; poultry, 268,000.

The construction of a stock-raising center at Moanda continued in 1968. This herd now consists of 142 sheep, 13 goats, and 11 cattle. During the year, the poultry station at Moanda expanded its sales of eggs, chickens and hens. More than 130,000 eggs were produced and 116,000 were sold; 1,681 chickens were sold commercially, and 1,814 were used for educational purposes. The sale price for vulgarization is 600 CFA francs per chicken, and the commercial price is 500 CFA francs per kilogram. The entire receipts are turned over to the Moanda Rural Collective.

6. Salt water fishing

The three fisheries now in operation landed 1,587 tons of fish in 1968, or a little less than in 1967. But one of the companies had to interrupt operations for part of the year to repair a boat. Monthly landings were as follows:

Monthly Fish Landings in 1968

Month	Tonnage Landed in Gabon	Tonnage Landed at Libreville
January	115	115
February	147	118
March	121	93
April	150	121
May	137	103
June	111	86
July	97	75
August	156	130
September	97	92
October	158	93
November	126	41
December	172	114
	1,587	1,181

Main Species of Fish Landed in Gabon

Specie	Tons Landed
Sea bass	277
Perch	245
Porgies	164
Pan Fish	207
Spade Fish	97
Sole	53
False tuna	49

Shipments of fish to the interior amounted to 409 tons. An agreement has been signed with a Japanese company specialized in industrial fishing. The experimental fishing season started in early 1969. First experiments have been devoted to seeking out shellfish beds.

III. DIET OF THE GABONESE POPULATION

Staple foods in Gabon are roots and tubers, mainly manioc and plantains. However, if the majority of calories are furnished by foods of this type, a variety of fruit and vegetables completes the diet. Animal proteins come mainly from game and fish. As a whole, caloric needs are estimated to be met. Among deficient foods, protein should be mentioned. Children, who have a vital need for them during growth, are the most deprived in this respect.

A. General Characteristics

Gabonese foodstuffs are of the "equatorial African" type. This diet is distinguished from the sudano-sahelian type where cereals are the staple food. Since cereals contain on the average 10 percent protein compared to 1 percent for roots and tubers, this gives a quantitative reason for the lack of protein. On the other hand, these vegetable proteins are incomplete and could not, even in large quantities, supply a balanced protein diet. The small part played by fruit and vegetables in the diet, moreover, causes a deficiency of vitamins A and C. Finally, the sudano-sahelian zones are characterized by a marked hungry season due to the cyclical nature of cereal cultivation. This is not true in equatorial zones, even where the low protein content of vegetables does not make up for the general protein deficiency. Here, vitamins A and C are supplied in sufficient amounts by fruit, vegetables, and palm oil. Another advantage is the absence of a marked inter-season thanks to roots and tubers.

In almost eight-tenths of the inhabited regions, 740 consumer units were studied for a week, using a group sampling procedure involving the observation of 4,500 persons. Sixty thousand meals were observed and weighed. In addition, a special study was made of the feeding of 300 children from birth to 36 months. The first results are as follows:

1. The average Gabonese food ration, subject to a later revision of the data, is about 2,000 calories, including 70 grams of protein, of

which more than half is of animal origin. The caloric content is somewhat inferior to the need.

2. Some food groups (legumes) are absent from the Gabonese diet.

3. There are seasonal differences: foodstuffs are more readily available and consumption is higher during the dry season.

4. Food consumption is higher among rural than urban people.

5. There is a striking inverse relationship between food consumption and family size. Large families of seven children or more are definitely disadvantaged.

6. A wide dispersion of food intakes is noticed, indicating an inequality and irregularity in the distribution of foodstuffs. According to the investigations carried out to this time, the energy content of food rations in the rural areas is slightly inferior to 2,000 calories.

7. Nearly 50 percent of calories are contributed by starchy roots, not an unusual fact at these latitudes. The different varieties of manioc are of considerable importance, but in several areas such foods as taro and yams compete with it. The favorite food of a Gabonese is traditionally manioc sticks or balls; the various ways of preparation have been studied by the Nutrition Service and this is a useful reference.

8. Plantains are in second place, supplying nearly 20 percent of the calories. In Gabon, there are manioc regions and plantain regions, according to soil conditions. A later study will consider the balance between these two staple foods.

9. Nuts and oilseeds are in third position with a 260-calorie contribution, or 13 percent of the energy ration. Coconut, to a lesser degree squash seeds, and peanuts are choice foods. It would be logical to include in this group the oils (3 percent of the calorie ration), mainly palm oil.

10. Among rural people, cereals contribute on the average only 3 percent of the calories, but this level is higher in regions where corn and rice are eaten. Rice is especially liked and cultivated in the south.

11. It is striking that the daily consumption of meat and fresh fish or its equivalent is 100 grams, although the exact amount varies from one family to another and one region to another. One should also note the large quantity of salted and dried fish, mostly imported, that is consumed (20 grams per person per day). We should expect, therefore, the ratio of vegetable proteins to animal proteins to lean definitely in favor of the latter.

This should not be surprising. On the one hand, Gabon has in its rivers, lakes and lagoons, and its 800 kilometers of coastline immeasurable possibilities for fishing. On the other hand, game, which accounts for the near totality of meat consumption, can reproduce in peace throughout 270,000 square kilometers, disturbed only by some gunshot arising solely from roads and navigable waterways.

It is not certain, however, that this happy situation will prevail indefinitely. Already there are regions in the brush where it is difficult to obtain meat by hunting. We recommend that a study be made on the supply of game for the coming 10 years. The results of the present investigation may contribute to this inventory. In any case, the average Gabonese diet includes a relatively high level of

protein. Even assuming over-estimates, we can assume that the ratio of protein calories to total calories is above 0.12.

Pending the determination of a definitive table of food compositions, the adjustment of data to account for the different sampling techniques used for different categories of food consumption, and the synthesis of the results of this study with those of the national statistical service in Ngounie and Woleu-Ntem, we can provisionally establish as a maximum estimate the Gabonese food ration at 2,000 calories and 70 grams of protein, two-thirds of which are of animal origin.

B. Kinds of Foods

Aside from manioc, the monotonous source of 50 percent of the total calories, the remainder of the diet is quite varied and includes tubers and plantains (bananas, taros, yams, and sweet potatoes), cereals (corn and rice), fish (fresh fish and imported dried fish), meat from domestic animals (goat, sheep, poultry, pig), game meat (monkey, antelope, hedgehog, warthog, civet cat, palm rat, squirrel, elephant, buffalo, bird, snake, crocodile, iguana, pangolin, lizard, caterpillar, turtle, panther, frog, etc.), vegetables and leaves (eggplant, mushrooms, cucumbers, squash, manioc and taro leaves, sorrel, vines, stems of wild yams, pumpkin, turnips, tomatoes, green beans, onions, cabbage, etc.), oleaginous plants (peanut, coconut, palm oil), fruit (atanga, pineapple, grapefruit, lemon, mango).

The following table provides a comparison with studies carried out in other hot climates:

Comparative Availability of Calories and Proteins in Selected Hot Climate Countries

Country	Calories	Proteins (grams)
Gabon	2,000	70
Ivory Coast		
Bougouanou camp	2,355	79
Bougouanou village	2,015	61
Venezuela (Caracas)		
Population of the *quartiers*	2,136	61
Poor class	2,070	70
Middle class	2,183	76
Africa (average food supply) (1)	2,360	61

The study of the other constituents of Gabonese diet (fats, starches, vitamins, minerals, amino acids) has not been completed yet because of the deadline for publication of these first results.

C. Gaps in the Gabonese diet

Our studies show:

- A near total absence of legumes (2);
- The nearly non-existent consumption of eggs in rural areas;
- The almost complete absence of dairy products in the purely rural zone;

Other foods are eaten in small quantities: on the average, 37 grams of vegetables, although in the south this is often more than 100 grams. If one separates sweet bananas, which it is more logical to include with plantains, the average intake of fruit is small at 17 grams.

Final recommendations will need to specify whether it is necessary and to what extent to introduce the neglected foodstuffs into the country's dietary supplies.

These recommendations will need to be cautious, knowing how difficult it is to modify the habits of a people.

D. Influence of the Size of Consumer Units

Both in regard to the per capita food consumption and the calorie and protein supplies, an examination of the data suggest an obvious negative correlation between food intakes and family size.

1. Calories

In households of seven or more persons, the minimum requirement of 2,000 calories is never reached for any of the categories, seasons, or regions studied. In households of four to six persons, the minimum caloric requirement is reached or exceeded in seven subgroups out of 14. In households of one to three persons, the optimum caloric requirement (2,400 calories) is reached or exceeded in nine subgroups out of 14.

2. Proteins

The protein requirement (60 grams per capita per day) is satisfied on the average for households of one to three persons, as well as for households of four to six persons. Many subgroups have a high consumption in excess of 100 grams. In households of seven or more persons, the 60-gram level is reached only for six out of 14 subgroups.

Even without the necessary calculation refinements and adjustments, we can already conclude that large families containing seven or more consumers are distinctly disadvantaged. The minimum energy requirement seems to be met or exceeded only for half the consumers. The protein requirement seems not to be satisfied for one-third of the consumers.

It will be noticed that this difference in food intakes related to family size has been recorded in other food consumption studies: first of all, in the study of budgets and standards of living of the National Bureau of Statistics. In the middle Congo and in Cameroon,

Bascoulergue and Coll have recorded similar occurrences.

It may prove useful later to specify the number of school children and preschoolers among the disadvantaged households of seven persons or more, cradles of vulnerable groups.

E. Calorie and Protein Supply by Season, Rural/Urban Category and Region

It will be necessary to test the averages obtained by season, rural/urban category and region. The remarks made here are only provisional.

1. Seasons

The calorie and protein supplies are lower from October to March than from April to September. In the dry season, rural persons go to work and stock up on provisions at the plantations or even sometimes at distant encampments, fishing is easier, and hunting is more frequent. This activity seems to be reflected in the food consumption of urbanized people and of those of large agglomerations.

2. Rural/Urban Categories

Calorie supplies are higher among rural people (weighted average 1,989 calories) than among urbanized people (1,775 calories). At Port-Gentil, the average of the first and second seasons indicates 1,913 calories. The opposite holds for the protein supply; 69 grams in rural areas, and 75 grams in urban areas and Port-Gentil, but this difference may not be significant.

3. Regions

Among rural areas, the southern regions of Ngounie and Nyanga seem disadvantaged as compared to other regions. It will be necessary to test the data further.

F. Effect of Urbanization

Before considering this question, we must define the categories that have been studied. Port-Gentil (GC)

contains a large inventory of socio-professional categories, salaried government employees being only in small number. This latter group, however, is in the majority among urbanized people of the outposts (U). If it is statistically possible, it may be worthwhile to study separately and to compare certain professions that have many representatives among the urbanized people of the outposts (U), such as law enforcement, teaching, health professions, and clerical and administrative work.

This discussion of the profession of the head of household in no way explains why the calorie supply of category U is low (1,600 calories in the rainy season, and 1,960 calories in the dry season) even though the average minimum energy requirement is higher than for rural people (R). From direct calculations, U=2,150 and R=2,002.

The calorie deficiency of urban people (U) can be explained by defective production and distribution of food commodities. During the rainy season, when production decreases, the brush sends a smaller quantity of foodstuffs to the city, except perhaps for expensive items like meat and fish.

It is interesting to examine for each group of products the modifications that seem at first sight to result from urbanization. Tubers and bananas, which together furnish nearly 70 percent of the calories of rural people, supply only 40 percent for urbanized people and those of Port-Gentil. The consumption of meat and fish (in fresh fish equivalent) goes from 200 grams for rural people to 300 grams for urbanized people and those of Port-Gentil. The consumption of nuts, seeds and oil is shown in the following table:

Percent of Calories Supplied Per Capita
by Nuts, Seeds and Oil

	Population Category		
	R	U	GC
Nuts and seeds	13	9	3
Oil	3	9	12
Total	16	18	25

R=Rural U=Urbanized GC=Port-Gentil

It is evident that urbanized people prefer to use oil. One should note also their distinct preference for imported oil (peanut oil, cooking oil), whereas rural people use mostly palm oil.

Sugar consumption is higher among urban than rural people, which should not be surprising. Milk consumption is not nonexistent in urban areas. Sweetened condensed milk and milk powder supply 10 calories per capita, or the equivalent of 14 cubic centimeters of fresh milk per person per day. A favorable fact is the distinct increase in the use of cereals by urban people (bread, rice, corn).

It is therefore certain that urbanization has brought about some changes in food habits, some of them favorable. It is, however, regrettable that the calorie intake of urbanized people is lower than that of rural people.

Will qualitative or quantitative changes take place in the future? In rural areas, protein sources of food are on the decrease. In past years, hunting provided a protein contribution not to be neglected. Recently, hunting licenses have been more widespread and caused depopulation among game animals. Many conservation officials think that in 3 or 4 years game will be almost nonexistent in zones previously rich in game. Increasingly hunted down, animals are fleeing from inhabited areas. Moreover, many animals that have been wounded by firearms of insufficient caliber survive their wounds but no longer reproduce. There seems

to be an irreversible trend, which should be taken into account not only to deal with current food deficiencies, but also to prevent future shortages.

Without being as marked, the trend is the same for fish. The constant increase in fish imports, both dried and smoked, is not only a symptom of the growth of the salaried class, but also of the reduction in local fishing, although Gabon enjoys truly favorable conditions (coastline, many rivers and inland lakes).

If present sources of animal protein do not have especially favorable development prospects, this is not the case for most vegetable products. Here, we have a comfortable margin, thanks to the low percentage of cultivated areas. In Francophone Africa, the area under crops constitutes about 20 to 30 percent of all cultivated land (18). In exploitation, however, there are important variations as to the percentage of total land area in use, from 50 percent to less than 1 percent. For example, in Togo and Senegal, almost 44 percent of the land area is being exploited. (This percentage drops if one considers land under cultivation annually, because of the land left fallow). The lowest land use figures are for Gabon (0.7 percent) and Mauritania (0.9 percent). If, in Mauritania, the beginnings of the Sahara Desert is the main reason for this low land use value, this does not hold for Gabon, where soil characteristics cannot be considered particularly unfavorable for an African country. Thus, in this area, Gabonese populations have a favorable outlook, if they do not as regards hunting and fishing.

G. Forbidden Foods and Special Habits

Food restrictions are varied and numerous. The most interesting to study are those affecting children. Usually, protein foods are forbidden; even eggs do not escape from the restrictions of which the African child is a victim. They are eaten by adults, but not by children. Other food restrictions apply to pregnancy. The supposed effects of certain foods according to various ethnic groups are listed in the following table:

Foods Restricted During Pregnancy and Their Supposed Effects

Forbidden Foods	Ethnic Groups				
	Galoa	N'dumu	Bapoundou	Fang	Badjabi
Eggs	Malformation of the fetus	Malformation of the fetus	Malformation of the fetus	Malformation of the fetus and difficult birth	Malformation of the fetus and late rupture of the water sac
Ripe banana	Too large a baby	Hypertrophy of the spleen			
Wild cat		Genital malformations			
Mushrooms			Delay in fall of the umbilical cord		
Pineapple	Mange and mycosis in the child	Mange and mycosis in the child	Mange and mycosis in the child	Mange and mycosis in the child	Mange and mycosis in the child
Salted fish		Mange and mycosis			Mange and mycosis
Rice	Mange	Mange			
Sugar cane	Vomiting in the baby				

Foods Restricted During Pregnancy and Their Supposed Effects (continued)

Forbidden Foods	Ethnic Groups				
	Galoa	N'dumu	Bapoundou	Fang	Badjabi
Preserved meat and fish			Otitis and abcesses in the baby	Otitis and abcesses in the baby	Otitis and abcesses in the baby
Eggplant				Difficult delivery	
Liver				Hypertrophy of the baby's spleen	
Brains				Otitis	
Boar				Malformation of the head	
Sorrel					Tremors during delivery
Peppers				A child inclined to cry	
Animal skins	Closes the fontanelle and prevents the fetus from feeding				
Asparagus		Anal itching			

IV. CONCLUSIONS

As can be seen from the data presented, the problem of nutrition and feeding in Gabon is not seriously acute. However, it does exist, taking the following forms:

- Nutrition problems among the most vulnerable groups -- pregnant women and children -- affected by medical and health factors, education factors, food restrictions, and family budgets.

- Production problems conditioned by the characteristics of Gabonese agriculture.

- Storage and marketing problems.

- Distribution problems affected by shipping difficulties and the cost of air, sea, river, and road transportation.

A. Nutritional Problems of the Vulnerable Groups

By its immediate and distant consequences, malnutrition constitutes a serious threat to the health of mothers and children. It is a public health priority, especially in maternal and child health. The causes and clinical evolution of nutritional diseases are now well-known. What is needed at this time is effective programs for the treatment and prevention of malnutrition.

1. Pregnant Women

It has been proved that diet has a strong influence on the course and the issue of pregnancy. Birthweight and the mortality of the fetus and the newborn are directly affected by the nutritional state of the mother during pregnancy. Not only is there a low birthweight among children of malnourished women, but nutritional deficiency during pregnancy affects the intelligence quotient of future children and their school careers, and hence lessens the chances for harmonious development during their lifetimes.

The nutritional problems of Gabonese women are due to various parasitic diseases (mostly intestinal), ignorance of a good pregnancy diet, and an insufficient family budget, whether absolute or caused by the inability to plan a budget in agreement with resources.

2. Infants

The negative effects of malnutrition on the physical and psychological development of children are well-established. Some mental difficulties, such as the mental symptoms of pellagra, are known to originate in nutrient deficiencies. These mental consequences are easy to prevent, but when malnutrition is of long-standing, the biological development of the central nervous system becomes irreversible. Nutritional deficiencies should, therefore, be attacked as early as possible in the life of the children.

In Gabon, nutritional problems among infants often arise from insufficient breast-feeding. The importance of breast-feeding must be emphasized, since women tend to abandon it, although the role of maternal milk in disease prevention has been proved by all investigators and its ease of handling and economic advantages should make it accessible to all mothers.

A widespread taboo forbids all sexual relations to a nursing woman. As much in fear of this taboo (not to "kill" their children) and for esthetic reasons, our women, especially the young ones, prefer to give up breast-feeding and to use bottles which may be given even by other persons during working hours. This practice is hazardous to the health of young children. Public health measures will be needed in addition to the simple advice of physicians. It might be possible to require by government decree that mothers breast-feed their children up to 3 months, since even working women have a maternity leave of 14 weeks and have the time to nurse their babies. It is also possible to use a mixed lactation, the artificial milk being given during working hours by someone other than the mother.

Other problems contribute to malnutrition among young children:

a. The ignorance of mothers in matters of weaning makes this an abrupt event with the consequences this entails.

b. Multiple parasitism, especially after the second year of life, has consequences of protein and calorie malnutrition, nutritional anemias, and vitamin deficiencies.

c. Food restrictions and food habits such as having the adults eat before the children ("the biggest piece for father") deprive children of an adequate diet.

B. Nutrition Projects Being Implemented

1. Maternal and Child Health

Conscious of the needs of mothers and children, the Gabonese Government has given to maternal and child health (MCH) priority in its First Economic and Social Development Plan. This priority will be maintained in the Second Development Plan now being prepared. With the cooperation of WHO and UNICEF, the Government has initiated an MCH project in the Basic Health Service Development Plan (Gabon Project 20). To attack the medical and health problems of mothers and children, a network of regional MCH centers is being developed; the pilot MCH center at Libreville opened in 1962; the regional MCH center for Ogooué-Maritime opened at Port-Gentil in 1968; the regional MCH center for Ogooué-Ivindo opened at Makokou in 1969; and the regional MCH center for Woleu-Ntem is due to open at Oyem.

At the same time, the improvement of MCH in medical centers has been achieved by the integration of MCH units into centers. Twelve are already in existence. This program is continuing at the rate of one regional center and three integrated units each year, and will continue until our population's health needs are covered. The activities of the centers include prenatal, postnatal, and infant

clinics. In these clinics, the supervision of mothers and children, systematic diagnosis, the distribution of vitamins and iron to children, advice on feeding, and food demonstrations are the methods used in fighting malnutrition and its problems.

The Health Services that handle drug prescriptions and care in MCH centers are not equipped to alleviate nutritional problems of mothers and children. What is needed is food supplementation for the children from 0 to 6 years, for lactating mothers, and for pregnant women who are seen at MCH centers in Gabon.

Since infant mortality is very high, the World Food Program (WFP) food supplement, by improving the nutritional state of children, will give them additional resistance, improve their general health, and therefore reduce mortality and morbidity. The project has already helped in the creation of MCH centers in Gabon. It is proceeding satisfactorily. Appendices I and II give the number of prenatal and children's medical examinations and gives the proportion of children examined or hospitalized out of the whole population. Appendices III and IV give data on the number of recipients offered supplements at MCH centers and the estimated content requirements for the supplements.

Because of the very low natural population growth rate of Gabon, due as much to the high infant mortality rate and to the low birth rate, the Government places great value and a high priority on the development of maternal and child health as part of the whole economic and social development plan for the country.

The course in nutrition education given at the Home Economics School by national personnel with the help of WHO personnel, and the program for applied nutrition and feeding education coordinated with the national activities of MCH also help to solve problems of education, food restrictions, and family budget planning.

2. Agriculture

To solve nutrition problems that depend on the characteristics of Gabonese agriculture, the Government has established an agricultural policy. The objective is to train modern agricultural entrepreneurs and their staff so that they will have the necessary professional knowledge to exercise their professions in the most profitable way, leading to an increase in production and the development of the country.

3. Stock-raising

In the second phase of development (1971-75), Sogel Ranch is to be organized for the sale of beef. The Okouma ranches near Moanda are breeding cattle to be distributed to local breeders as soon as the herd reaches 1,000 head. The remainder will be used as sires. An experiment in sheep-raising in the south (Haut-Ogooué, Ndéndé, Tchibanga Plateau-Batéké) might attain about 2,000 head in 5 or 6 years.

The importance of this policy can be understood when it is recalled that we have an insufficient meat supply and 4,000 tons are imported each year. The improvement in standard of living and the increase in meat consumption may lead in the next 10 years to a meat requirement of 15,000 tons. It is important, therefore to begin to plan marketing procedures, and this is being done in connection with a cold storage project being studied as part of the second five-year plan (1971-75) for the fishing industry.

4. Fishing and Cold Storage

It is planned to set up throughout the country a chain of cold plants adapted to the needs of individual fishing, that is, of fishing by canoe and of fish farming. Since the most important fishing areas are the furthest removed from communications arteries, the main obstacle to the progress of this industry lies in the preservation of fresh fish. Locations under consideration are the Nyanga, Moyen-Ogooué, Ogooué-Maritime, the Estuary, Woleu-Ntem, and Ngounie.

a. Needs to be Met

Although no accurate data are available, it is commonly known that the demand for fish exceeds the supply. Where does the fish supply originate? It is estimated that the three saltwater fisheries now operating unload about 2,000 tons of fish on ice annually. Individual fishing is estimated to contribute about 1,000 tons per year. Inland fishing amounts to 3,000 tons per year. Each year, Gabon imports the equivalent of 2,000 tons of fresh fish, that is, 40 percent of the tonnage offered for sale. But the needs of Gabon are estimated at 10,000 tons, or double the available supply.

This project answers a double need:

1) By an important modern infrastructure, it allows a short term increase in fish supply from individual fishing of about 2,000 tons per year, and thus remedies the fish shortage.

2) It will progressively contribute to a reduction of the deficit in interior production while drawing to the rural sector the increasingly necessary cash flow.

b. Current Situation

The principal fishing areas are underexploited because fishermen are neither prepared, equipped, nor organized to take large catches. They are satisfied with small scale individual fishing and are restricted to a subsistence economy that discourages progress.

c. Changes Brought About by this Project

The installation of a cold-storage chain offers fishermen a rational organization connected to the general economy of the country. It contains three elements:

1) A network of fish collection stations at the scattered production sites.

2) Centralized fish storage in a refrigerated facility located near a main communication artery.

3) The means of transporting stockpiled fish to consumption centers.

To take advantage of the services of this chain, fishermen will be led to move their permanent dwelling near the cold storage facility, which will become the headquarters for fishing activities, and to fish out of the encampments where fish collection will be scheduled. This regrouping of fishermen will facilitate loan operations of the National Rural Credit Bank. Loans will be made more extensively, since repayment will be facilitated by the fact that all fish production goes through the cold-storage chain where control can be exercised. These loans will lead to more modern fishing equipment, making fishing more attractive and profitable. Moreover, the concentration of fishermen along the lines of the cold-storage chain facilitates the supervision of fishing and administration, and encourages monetary flow.

d. Meeting Governmental Objectives

This project is based on the two essential government policies: the administrative, economic, and social integration of the country; and the search for the two points of equilibrium, rural-urban and interior-exterior.

First, this project sets up at the national level a rural activity until now diffuse; it creates administrative relationships and economic exchange; it permits social advancement. Secondly, this project seems capable of slowing down the rural exodus by the modern, profitable activities it encourages. On the interior-exterior level, it lowers fish imports.

More specifically, this project answers the four governmental objectives:

1) It initiates rural economic development by a rise in cash incomes;

2) It increases the value of a commodity by improving its preservation and appearance;

3) It reinforces economic unity in the country by the infrastructure network it creates;

4) It increases and puts a premium on the contribution of rural people to national production.

Since the feeding of people is a problem with many aspects, its rational and definitive solution can only be expected from the coordination of the activities that will lead to solutions for each aspect of the problem. In Gabon, the economic policy of the Government is a liberal policy, and this is how the Government acts both as a promoter of private ventures and as a direct agent where they are lacking.

The improvement of the transportation infrastructure already in progress, the perfecting of our marketing system, and the creation of a network of storage facilities for perishable goods will help to solve the complex nutrition problem of the Gabonese people. And this is a field for international cooperation.

APPENDIX I

Number of Patients Received at MCH Centers in 1970, by Center

Center	Children 0-2 years	Children 2-6 years	Nursing Mothers	Pregnant Women
ESTUAIRE				
London Libreville	4,000	707	0	614
Cocobeach	150	116	60	0
Kango	116	140	50	0
Maternity Clinic	0	0	2,820	0
OGOOUÉ MARITIME				
Port-Gentil	857	1,006	1,919	0
Omboué	500	200	0	0
OGOOUÉ-IVINDO				
Makokou	1,922	4,798	23	296
Mekambo	51	18	0	162
Booué	50	20	0	232
OGOOUÉ-LOLO				
Koulamouto	420	53	0	444
Lastourville	150	25	0	200
Pana	40	10	12	9
WOLEU-NTEM				
Oyem	200	60	0	0
Mitzic	80	20	0	0
Bitam	300	[illegible]0	0	0
Minvoul	90	[illegible]0	0	0
Medouneu	270	220	0	0
NYANGA				
Tchibanga	820	0	0	484
Mayumba	120	0	0	280
Moabi	100	0	0	50

APPENDIX I (continued)

Number of Patients Received at MCH Centers in 1970, by Center

Center	Children 0-2 years	Children 2-6 years	Nursing Mothers	Pregnant Women
MOYEN-OGOOUÉ				
Lambarene	200	220	50	50
Ndjolé	200	50	185	250
NGOUNIE				
Mouila	150	50	140	578
Ndendé	413	1,044	0	328
Lébamba	157	76	100	406
M'bigou	150	80	0	150
Mimongo	100	46	100	230
Fougamou	200	0	0	408
HAUT-OGOOUÉ				
Franceville	200	100	0	362
Okondja	214	825	0	250
Lekoni	160	100	0	230
Akieni	50	12	15	10

APPENDIX II

Number of Patients Received at MCH Centers in 1970, by Region

Region	Children 0-2 years	Children 2-6 years	Nursing Mothers	Pregnant Women
ESTUAIRE	4,266	967	2,930	614
OGOOUÉ MARITIME	1,357	1,206	1,919	100
OGOOUÉ IVINDO	2,023	4,836	23	690
OGOOUÉ-LOLO	610	88	12	653
WOLEU-NTEM	940	410	0	0
NYANGA	1,040	0	0	0
MOYEN-OGOOUÉ	400	270	235	300
NGOUNIE	1,170	1,296	340	2,100
HAUT-OGOOUÉ	624	1,037	15	854
	12,430	10,110	5,474	5,311

Total Children 22,540

Total Mothers 10,785

These figures are actual figures and possibly already exceeded. Using an annual increase of 2 percent in births and mothers, we arrive at the following figures:

APPENDIX II (continued)

Year	Children	Mothers
1970 (actual figures)	22,540	11,599
2%	451	232
	22,991	11,831
1971 (start of project)	22,991	11,831
2%	460	237
	23,451	12,309
1972		
2%	469	241
	23,920	12,068
1973		
2%	478	246
	24,398	12,555
1974		
2%	488	251
1975		
2%	24,886	12,806

APPENDIX III

Estimated Rations of Food Supplements at MCH Centers, 1971-1975

Number of Rations During 5-year Period

For Infants:	119,646 x 365 =	43,670,790
For Mothers:	61,569 x 365 =	22,472,685
TOTAL		66,143,475

Breakdown of Rations per Year

	Infants	Mothers
1971	8,391,715	4,318,315
1972	8,559,615	4,404,820
1973	8,730,800	4,492,785
1974	8,905,270	4,582,575
1975	9,083,390	4,674,190
	43,670,790	22,472,685

APPENDIX IV

Estimated Food Quantities Required for Supplements, Distributed at MCH Centers, 1971-1975

Supplies	1971		1972		1973		1974		1975		Total Infants and Mothers
	Infants	Mothers	Infants	Mothers	Infants	Mothers	Infants	Mothers	Infants	Mothers	
	8,391,715 kg	4,318,315 kg	8,559,615 kg	4,404,820 kg	8,730,800 kg	4,492,785 kg	8,905,270 kg	4,582,575 kg	9,083,390 kg	4,674,190 kg	66,143,475 kg
Flour	839,171	1,295,494	855,961	1,321,446	873,080	1,347,835	890,527	1,374,772	908,339	1,402,257	11,108,882
Meat	83,917	86,366	85,596	88,096	87,308	89,855	89,053	91,651	90,834	93,484	886,160
Fish	83,917	215,916	85,596	220,241	87,308	224,639	89,053	229,129	90,834	233,709	1,560,342
Powdered milk	355,668	172,732	342,384	176,193	349,232	179,711	356,211	183,303	363,336	186,967	2,645,737
Eggs	41,958	43,183	42,798	44,048	43,654	44,928	44,526	45,826	45,417	46,742	443,080
Sugar	83,917	86,366	85,596	88,096	87,308	89,855	89,053	91,651	90,834	93,484	886,160
	1,468,548	1,900,057	1,497,931	1,938,120	1,527,890	1,976,823	1,558,423	2,016,332	1,589,594	2,056,643	17,530,361
	3,368,605		3,436,051		3,504,713		3,574,755		3,646,237		

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REPORT ON NUTRITION IN MOROCCO

I. NUTRITIONAL STATE

Various nutritional studies have been made on different segments of the population. The following are examples.

A. Report on the Food and Nutrition Situation and Food Supplementation Programs in Morocco (April-July 1958 by Professor Ferro-Luzzi).

The author observed clinical signs of malnutrition in a study of the food consumption habits of 650 persons and in a survey of the nutritional state of several thousand school children at urban and rural schools. The observations were:

- Evidence of calorie, protein, calcium, and vitamin D malnutrition among the majority of infants up to age 2;

- Evidence of calorie, iron, and perhaps protein malnutrition in almost half the children between 5 and 12 years of age;

- Evidence of calorie, protein, iron, and less often vitamin malnutrition in a small minority of adults, especially women.

The report can be summarized as follows:

1. Nutrition Balance Sheet (See Tables 1 and 2)

2. Caloric Intake

The 1960 average caloric intake amounts to 2,170 calories per capita per day. Taking into account 5 percent waste at the consumer level, this becomes an average diet of 2,060 calories per day which is insufficient to meet Morocco's needs of 2,250 calories per person

per day. Cereals, starches, and sugar represent almost 80 percent of the total caloric intake (see Table 2).

3. Protein Intake

Table 1 indicates that the whole population has an average protein intake of 58.7 grams per day, of which only 11 grams are animal protein, which seems to be rather satisfactory for the total protein intake. However, 42 percent of the population (those in the low income bracket) consumes only an average 44.2 grams of protein per person per day. Moreover, in a well-balanced diet, animal protein should comprise about 20 percent of the total protein intake; but it has been observed that 42 percent of the population (again, the low income group) consumes only 5.1 grams of animal protein, that is 11.3 percent of the total protein intake.

4. Fats

Fat consumption is on the whole insufficient.

5. Calcium

The calcium supply is 375 milligrams per capita per day compared to the recommended 600 milligrams, which indicates a distinctly more serious deficiency in the low-income population.

6. Vitamins

The deficiency is more or less great depending on the vitamin. It is highest for vitamin A (2,837 international units, when the recommended amount is 4,160 IU) and for vitamin C (49 milligrams out of a recommended 70 milligrams).

The most vulnerable segment of the population consists obviously of nursing mothers and children. This was demonstrated by the medical investigations on the nutritional state of children. Calorie deficiencies and protein malnutrition have a very real effect on the weight and growth curves of children.

B. Sampling Survey of the Nutritional State of Moroccan Children from 1 Day to 14 Years (carried out in June 1967 by Dr. Raoult in collaboration with the specialized services of the Ministry of Public Health)

This survey provided clinical and biometric data on 1,412 children. The results can be summarized as follows:

1. Biometric Data

Biometric data, especially concerning weight, are good indicators of the nutritional health of a young child. The survey carried out in 1967 by a WHO expert in collaboration with the Ministry of Public Health confirms the results previously obtained on the weight curve of infants. The graphs show that the birth weight of Moroccan children does not vary from the control group (Meredith's norms), but that around the sixth month, the growth curve bends and from then on remains below the reference median until age 11. It can be concluded that this underweight condition is the consequence of inadequate feeding, in quality if not in quantity.

2. Protein Malnutrition

The survey shows that the age group most affected by protein malnutrition is that between 6 months and 3 years. Among 277 children examined at Casablanca, Rabat, in the Rif, and in the Tafilalet, 15 percent exhibited noticeable edema. The greatest number of edemas occurred among southern children, 32 percent of them being affected. In addition, 32 percent of children between 6 months and 3 years presented signs of malnutrition and qualified for a supplementary corrective diet.

3. Rickets

Evidence of rickets is present to various degrees in 30 percent of the children under 2 years of age and in 43 percent of those between 2 and 4 years. These results of the survey have been confirmed by another survey

of hospitalized infants in the pediatric ward of Avicenne Hospital, where 50 percent of the patients show signs of rickets; 5 percent of them are admitted to the hospital for rickets. The causes of rickets are:

a) The deficient supply of natural endogenous vitamin D, that is, insufficient photosynthesis in spite of the large amount of sunshine. This is due to the habit of swaddling infants and of overprotecting children against the weather.

b) The lack of exogenous vitamin D due to the exclusive or predominant reliance on milk in the infant diet.

II. DEFICIENCY DISEASES KNOWN TO OCCUR IN MOROCCO

A. Protein Malnutrition

Protein malnutrition affects all children at the time of their late and sudden weaning at about 12, 15, 18 months, or later. It takes the form of edemas and hence is known as the "edematose weaning disease."

B. Undernutrition

Undernutrition due to calorie deficiency may reach the state of marasmus.

C. Rickets

Rickets begins with the very young infant and often entails pulmonary complications (rachitic lung).

D. Osteomalacia

Osteomalacia occurs in pregnant women.

E. Anemia

Iron deficiency anemia is latent in all young children.

F. Vitamin A Deficiency

Vitamin A deficiency is sometimes severe enough to cause keratomalacia.

III. CAUSES OF MALNUTRITION

A. Food Habits

In Morocco, one finds food habits but no true food taboos. Malnutrition in the young child is more often due to the complete ignorance of the needs of children.

B. Dispersion of the Population

Because 10 million inhabitants, that is 70 percent of the total population, are scattered in rural areas, the spread of new ideas and nutrition education is difficult.

C. Low Standard of Living

The average standard of living of the population is rather low. A 1960 Ministry of Planning (Ministère du Plan) statistical survey indicated that the annual expenditure per household was 2,500 dirhams and the per capita expenditure was 450 dirhams. The present per capita expenditure is 784.53 dirhams. A new investigation of food consumption is under way at this time. The average standard of living in cities is about 15 percent higher than in the countryside.

D. Population Growth Rate

Finally, the population explosion and its economic consequences are essential factors contributing to malnutrition. The population of Morocco currently numbers 14,320,000 inhabitants. In 1935 there were only 6,620,000 inhabitants. The annual population increase is 400,000 per year which is a growth rate of 3.2 percent or 32 per thousand. The mortality rate is 17 percent and the birth rate is 50 percent.

The improvement and development of sanitary conditions has lowered the mortality rate in the last 20 years in the same ratio that it was reduced in Western Europe in one century. At this rate, by 1985 the population will have reached 26,500,000. Assuming that the birth rate remains the same and the death rate continues to decrease, thanks to the expected economic and sanitary progress, the population will have doubled in 20 years.

The number of young people is very high; 46 percent of the present population is under 15. This percentage will reach 50 percent in 1985 when there will be 13,000,000 young people in Morocco. Children between the ages of 0 and 4 years account for 18 percent of the population. The child mortality rate, that is, the number of children who die during the first year of life, is 100 per thousand in urban surroundings and 170 per thousand in rural areas.

E. Weaning Practices

Mortality of the newborn accounts for only a small number of deaths. The principal causes are linked to life style: diarrhea and respiratory infections are the most frequent. The immediate causes of death are officially infectious agents, but in reality, conditions of malnutrition following weaning are the true causes of death, although they are only seldom so indicated in statistics. The infant is actually perfectly fed by maternal lactation until about 6 months.

Between 1 and 3 years, the mortality rate is from 10 to 40 per thousand. Between 3 and 6 years, the rate goes down to less than 3 per thousand, and death is due to infections or accidents. It can thus be concluded from the data that the drop in mortality rate after age 3 is due to the fact that at that age the child begins to eat a better balanced diet. Between the ages of 0 to 3 years, malnutrition after weaning is the true cause of child mortality.

IV. PROGRAMS TO FIGHT MALNUTRITION

Much aware of the problem of malnutrition, the Moroccan Government is putting great effort in finding adequate solutions. The Moroccan diet is based on cereals, mostly wheat and barley. Vegetables, animal products, and fats are adequately present among available food supplies, but they are consumed in sufficient quantity by only part of the population. Fresh vegetables (carrots, turnips, tomatoes, squash) and some fruit (melons, grapes, figs, watermelons) are a quasi-constant addition to the staple cereal food. Dry legumes and potatoes play a lesser part.

Meat is eaten in small amounts, and this quantity is a function of the economic level of the family. One can estimate that almost 50 percent of the people eat 150 to 200 grams of mutton once a week. The consumption of fish is almost nonexistent outside of the coastal regions, even though our territorial waters are rich in fish and Safi is the first sardine fishing port in the world.

The use of dates is limited to the southern palm groves, and even there in small amounts. The consumption of sugar, on the other hand, is particularly excessive (80 to 110 grams per day).

A. Action by the Ministry of Public Health

At each neighborhood clinic, a maternal and child health (MCH) center handles the health supervision of preschool children. The children's growth is closely watched, and this implies supervision of their feeding.

Children are protected against rickets by vitamin D given every 6 months, from birth to 1 year: at birth, a vial of Sterogyl 15 containing 600,000 units of vitamin D is given by mouth; this is a delayed-action dose, and it is repeated at 6 months and at 1 year. Other children who are not seen at birth but at various ages are given vials of Sterogyl 15 repeated at 3- to 6-month intervals.

But the prime role of MCH is educational. By its actions and through them, it informs mothers of the precautions to take to protect their children and make sure that their diet is correct. In this way, MCH insures this protection and the proper dietetic approach to convalescence.

The MCH activities are integrated into preventive programs and are fundamental. In the provinces, this work is under the supervision of the Provincial Chief of Medicine supported by a Chief of Preventive Medicine for Urban Areas and one for rural areas. The chiefs of preventive medicine are responsible for the coordination of MCH activities in urban and rural areas.

The provinces are divided into districts, each with a health center for 45,000 inhabitants where the Chief of Medicine maintains his office. Clinics are connected to the health center on the basis of 1 for every 15,000 inhabitants, and it is usually at the level of clinics that maternal and child health activities take place.

These activities are focused upon the central fundamental premise of nutrition education and prevention of malnutrition. Thus, every morning is reserved for dietetic sessions. The rest of the time is devoted to weighings, vaccinations, and prevention of rickets. Weighing is a means of checking up on the growth, and hence the diet, of a child; it is also used as an educational opportunity to sensitize the mother to the harmonious development of her child. The weight is noted on a file card which also shows the upper and lower limits of the average normal weight range.

Dietetic sessions are held each morning for 1) children whose weight curve is not normal and who come on referral from the pediatric services or following an MCH weight check; and 2) children who are MCH patients and whose diet is in need of modification for a change from milk to a cereal mush, or for a diversified diet, etc.

The mother is asked to bring her child for 3 to 6 consecutive days, depending on the speed of adaptation of

the child to his new diet. During these sessions, mothers are familiarized with their children's diet by having them participate actively and even giving demonstrations themselves under the supervision of two nurses. The number of children who attend generally does not exceed 12.

Aside from its educational role, MCH handles the nutritional rehabilitation of children who suffer from deficiencies (serious hypotrophy or beginning deficiency edema). This is outpatient treatment, and hospitalization is avoided. The children are referred by a physician and are followed for 15 days, 1 month, or more, and are given a protein-rich diet. This group of children presents an administrative problem to the MCH units which should have primarily an educative function. A proposal for setting up rehabilitation centers is therefore currently being studied.

In an attempt to be the most effective possible, the dietetic rules recommended to mothers are related to their economic level and their customs. As a means of avoiding the weaning trauma, children are very early offered a diversified diet (cereal mush, puréed vegetables, etc.) while they are still at the breast.

Suitable foods are selected from the family's diet to feed the young children. For example, legumes, chickpeas, beans, and lentils when they are well-cooked and strained are well-tolerated and liked by young children. Slightly older children are introduced to supplementary foods in addition to their usual diet.

On an entirely different level, the professional training schools of the Ministry of Public Health give 24 hours of lectures yearly on the subject of nutrition.

B. Action by Private Agencies

The Ministry of Health is seconded in its efforts by such private agencies as the League for the Protection of Childhood. The League effectively improves children's nutritional state by serving them at its day care centers a breakfast and snack whose menus have been standardized

by the Nutrition Service of the Ministry of Health. At nutritional rehabilitation centers, the League takes the responsibility for the proper feeding of malnourished children referred on medical prescription. The present 13 centers will be increased in number.

C. Action by Other Ministries

1. The Ministry of Youth, Sports, and Social Affairs is working in the same sense by means of its Centers for Women's Development staffed by adequate instructors and materials (See Appendix I).

2. The Ministry of the Interior maintains "maisons communales." The instructors at these community centers and at the women's development centers have received some rudimentary training themselves in elementary nutrition and the main deficiency diseases.

3. The Ministry of National Education has included elements of nutrition in the high school science curriculum, and the secondary school teachers are made aware of this problem at lectures they attend. Elementary principles of nutrition and food hygiene have been introduced in the elementary school curriculum, and the grade school teachers have also been sensitized to the problem. These programs are in collaboration with the special section of the Ministry of Public Health.

We should also mention the school canteens set up in the most disadvantaged sections of the country. They give out both a protein-rich food to the students and a theoretical and practical nutrition education.

4. The Ministry of State Responsible for Secondary Education, Technical Education, Higher Education, and the Training of Professionals and Staff Personnel has introduced the study of nutrition in the secondary school curriculum (See Appendix II). The fifth year curriculum of the Medical School includes nutrition.

5. The Ministry of Agriculture and Land Reform lends its support to any project in nutrition education or

applied nutrition by supplying technical assistance as well as materials (See Appendix III).

D. Mass Media Programs

We must not forget, finally, the education of the public at large by radio and television. These media are beginning to present problems of public health, including nutrition, at round-table discussions.

All these programs of the different ministries and other agencies combine education and rehabilitation to improve the nutritional health of the child and to prevent deficiencies.

V. GOVERNMENT POLICY TOWARD MALNUTRITION

The Government is aware of these problems, and a stress has long been placed on the importance of nutrition. There is in existence an Interministerial Commission for Food and Nutrition, as established by the decree of May 8, 1959. Its president is the Minister of Planning, and its secretary is the Minister of Health. The role of the Commission is to coordinate and promote the various activities that favor nutrition (nutritional surveys, nutritional education at all levels, launching of protein supplements), and to develop a true policy with the now known factors.

A. Repression of Frauds

Numerous regulations have been issued relating to falsification of food commodities and agricultural products, and ample legislation on frauds is on the books. New legislative documents to reinforce the current laws are pending.

B. Price Policy

There is no general policy on prices, but a specific policy for each sector -- a protectionist policy in agriculture, and a semi-liberal policy for trade and industry.

Price control protects certain industries and prevents illicit price increases. At present, regulations allow for a free-price sector, and a regulated sector that includes all commodities of prime necessity, including foodstuffs.

C. Measures to Combat the High Cost of Living

The cost of living is the most important aspect of the problem. A number of steps have thus been taken for a long time to keep up with the cost of living, to control and regulate certain prices, and to harmonize fiscal policy with the fight against the high cost of living.

1. Study of the Cost of Living

Until 1965, the cost of living in Morocco was measured by the retail price index known as the "Index of the 111 Articles." In 1965, on request of the Central Commission for Wages and Prices, the Central Statistical Service prepared a new index known as the "Index of the 152 Articles" so as to extend the range of the retail price index to a larger more representative number of articles consumed by a typical Moroccan household. This study will be taken up again on the basis of the new household survey to be completed in June 1971.

2. Price Control and Regulation

Measures relating to price control are summarized in documents dated from 1956 to 1969 which:

- Specify the principles and the structure of price control and regulation (approximately 10 decrees);

- Define the products and applicable conditions for price control and regulation (10 to 15 regulations).

Whereas price control and regulation are social measures, research on the general price structure is a

concern of the Government, including:

- Effect of the price of supplies and materials on the final income of farmers;

- Determination of a policy for the control and regulation of prices of interest to consumers.

3. Harmonization of Fiscal Policy

The first two considerations are involved in determining a harmonious fiscal policy. Knowing the price structure and taking into account the policy of control and regulation aimed at protecting the consumer, the Government determines a fiscal policy in which the social point of view (consumption) and the economic point of view (production) are taken into consideration. Between these two points of view, production and consumption, other economic data find their application (savings, wages, etc.).

D. Land Use

Out of Morocco's 49,870,000 hectares, 7,447,000 hectares, or 15 percent of the total land area, is in use for true agricultural purposes to meet the needs of the population. The population of Morocco was of the order of 14,500,000 inhabitants at the time of the last census, which would allow a little more than one-half hectare per person. Livestock raising is as important an activity as cropping.

Prevailing conditions and unfavorable structures are the factors that stand in the way of rapid agricultural development in Morocco. In addition, the country is subject to vagaries of climate: the greater part of Moroccan land receives insufficient or irregular rainfall.

According to studies, however, the use of irrigation water from the many streams that arise in the mountains will provide a sizeable increase in the water supply available for agricultural needs -- and the mountains themselves receive sufficient water. This explains the large scale national irrigation policy initiated by His

Majesty the King; a maximum number of dams are planned, some of which have already been built, and others are in planning stages.

Current statistical data indicate that the usable agricultural area, that is, cultivated land plus fallow land and pastures, is on the order of 15 million hectares. Excluding fallow land and transition pasturage, it appears that Morocco devotes to annual and perennial crops only 5,497,000 hectares, and hence there is a need to increase the per hectare productivity in order to increase in particular the vegetable crop yield. Table 3 shows the land use in Morocco in detail.

E. Agricultural Credit

The National Bank for Agricultural Credit (NBAC) with headquarters at Rabat is in its eighth year of operation and already has 71 branches throughout the Kingdom. These branch offices and the central office are grouped into 10 branch banks and five regional offices, in turn connected to local offices.

The various subsidiaries of the Bank have the following jurisdictions.

1. Farmers who pay no agricultural tax remain clients of the Agricultural Savings and Loan Associations (ASLA) where they may obtain small loans for rural purposes, consisting mostly of seed distributions in spring and fall in proportion to their land holdings.

2. Farmers whose income is above U.S. $280, the taxation threshold, but below U.S. $800 are clients of the local credit offices. Following a brief investigation, their requests are studied by a local committee and rapidly acted upon. A certain number of projects are retained by the local credit offices, their locales being diversified, and all loans are proportional to the income of the exploitations being granted aid. Each borrower,

usually a landowner, maintains his own account at the local credit office.

3. Farmers whose income exceeds U.S. $800 make their loan requests to the regional credit offices which investigate them to the extent necessary.

4. The central office of the NBAC investigates the loans requested by the ASLA for their ordinary operations as mentioned above, and the loans to various cooperatives, pre-cooperative mechanization and fertilization groups (FAO project), to any group of individuals, to the regional offices for land exploitation, to the provinces, to companies, in fact to all organizations of the private and public sectors.

However, within the general framework of the agricultural extension policy of the Ministry of Agriculture and Land Reform, the NBAC also makes loans which, when they are redistributed to farming operations of all dimensions, deviate from the scheme outlined in the first three points of this section. This is the case of loans to the ASLA for Operation Fertilizer, and of loans to regional offices for so-called integrated operations like cotton and sugar beet, which finally reach large-scale agricultural enterprises.

F. Research

Agricultural productivity has generally remained low in all parts of the world until substantial progress has been achieved in agricultural methods, thanks to research activities. There is a close relationship between agricultural productivity and economic and nutritional development. The countries with the greater productivity are among the most developed ones in the world. Increased food production is a main objective of national development.

In Morocco, information obtained by means of research and passed on to farmers will result in increased crop yields and stock production. Partial results have already been achieved by the utilization of a large number

of modernized methods and techniques, including the use of improved varieties, fertilizers, pesticides, and herbicides; and one must not forget water conservation and mechanization which have made it possible to plant, cultivate, harvest, process and market the crops under more profitable and rational conditions.

Research is of two kinds. First of all, research is aimed at the scientific interpretation of the results of experiments conducted to obtain as valid and rapid answers as possible to the questions raised by the exploitation of the country's agricultural resources. These research results can be obtained in intermediate (5 years) or short term (2 to 3 years).

But this research does not provide a solution to the basic problems, and this is indispensable to obtaining an agricultural production as perfect as possible both in quantity and quality and at the least cost. The detailed knowledge of all conditioning factors, water, soil, climate, the farmer himself, and the processing of products, necessitates a long-range project. Only then can one specify the best approach to exploiting the resources of the country.

Exploitation follows tirelessly upon the work of agronomic research, and applies the results. The following means are employed:

- Water conservation, by a vast program of dam construction;

- Reforestation, soil preservation and enrichment, by the use of tree varieties and orchards appropriate to the climate and to the environment;

- Integrated operations -- plowing (<u>touiza</u>), Operation Fertilizer;

- National development;

- Development of agricultural cooperatives, peasant groups, and various producer groups, adequately

staffed to help the farmers adapt to better living conditions and show them how to extract a larger profit from their production from the point of view of nutrition as well as from the point of view of commercial profit;

- The fight against locusts, and against birds and rodents;

- On-the-job training of middle level specialists;

- Training of upper level professionals, both in Morocco and in foreign countries -- planning engineers, applied engineers, and upper level technicians;

- Use of the press, radio, and television to publicize news of nutritional or agricultural interest;

- Organization of country fairs and agricultural contests, where food-oriented demonstrations will usually be given.

VI. PRINCIPAL PROBLEMS TO BE SOLVED

The principal problems to be solved to fight malnutrition are the ones that are found in all developing countries. In addition to general problems such as research on increased productivity and land use, personnel, the population explosion, the scattering of rural populations, etc., one of the obstacles to be surmounted is that of food habits. Only a powerful, coordinated, continuous action well-adapted to local conditions is capable of contributing to the modification of food habits, and hence to the solution of the malnutrition question.

TABLE 1

Average Nutritional Balance Sheet, 1960

A. Total Moroccan Population

Population	Calories	Total proteins (g)	Animal proteins (g)	Fats (g)	Calcium (mg)	Vitamin A (IU)	Vitamin C (mg)
Urban (26%)	2,080	60.4	13.1	44.1	357	3,874	87
Rural (74%)	2,204	58.6	10.4	34.4	381	2,473	35
Total	2,170	58,7	11.0	36.7	375	2,837	49
Recommended Levels	2,210	63.0	25.0		600	4,160	70

B. By Income Level

Income class	Environ-ment	% of the population	Calories	Total proteins (g)	Animal proteins (g)	Fats (g)	Calcium (mg)	Vitamin A (IU)	Vitamin C (mg)
Low income	Urban	10	1,489	41.4	5.0	26.4	197	2,570	54
	Rural	32	1,646	47.0	5.2	22.8	256	1,843	25
High income	Urban	16	2,473	72.0	18.5	56.0	463	4,751	110
	Rural	42	2,626	74.6	14.4	43.4	482	2,995	42

TABLE 2

Relationships Between Certain Elements of the Daily Available Food Supply per Inhabitant

A. Total Moroccan Population

Environment	Total Calories*	Proteins: Protein calories	Proteins: % of total calories	Proteins: Total prot. (g)	Proteins: Animal prot. (g)	Proteins: % animal of total	Carbohydrates: Carbohyd. calories	Carbohydrates: % of total calories	Fats: Fat calories	Fats: % of total calories
Urban (26%)	2,080	241	11.6	60.3	13.1	21.7	1,519	73.0	397	19.1
Rural (74%)	2,204	250	11.3	62.6	10.4	16.6	1,782	80.8	310	14.1
Morocco (100%)	2,170	246	11.3	61.6	11.0	17.9	1,714	79.0	330	15.2

B. By Income Levels

Income Level	Total Calories*	Protein calories	% of total calories	Total prot. (g)	Animal prot. (g)	% animal of total	Carbohyd. calories	% of total calories	Fat calories	% of total calories
Low										
Urban (10%)	1,489	166	11.1	41.4	5.0	12.1	1,177	79.0	238	16.0
Rural (32%)	1,646	188	11.4	47.0	5.2	11.1	1,358	82.5	205	12.4
High										
Urban (16%)	2,473	292	11.8	72.9	18.5	25.4	1,747	70.6	504	20.4
Rural (42%)	2,626	298	11.3	74.6	14.4	19.3	2,103	80.1	391	14.9

*Without deducting 5% for losses.

TABLE 3

Land Use
(in hectares)

Land Sown in Crops			
Winter cereals	4,052,000		
Spring cereals	537,000		
Legumes	364,000		
Oilseeds	26,000		
Industrial crops	55,000		
Vegetables	82,000		
Forage	48,000		
Miscellaneous	36,000		
Less sous-etages*	-130,000		
Total Sown in Crops	5,070,000		
Orchards and Vineyards			
Vineyards	59,000		
Olive trees	168,000		
Citrus trees	65,000		
Other	135,000		
Total Orchards and Vineyards	427,000		
Total Cultivated Land		5,497,000	
Fallow Land		1,950,000	
Total Cultivated and Fallow			7,447,000
Timber Land			62,000
Reforested Areas			170,000
Natural Forests			4,770,000
Pastures, Steppes, Unusuable Land			37,421,000
Total Land Area			49,870,000

*Sous-étages crops are cultivated under fruit trees. The land used in this manner is recorded both as fruit plantation and as annual crop land. Therefore, this acreage is subtracted from cultivated land so as not to record its use twice.

APPENDIX I

Nutrition Education Sponsored By The Ministry of Youth, Sports and Social Affairs

The Ministry of Youth, Sports, and Social Affairs, has two concerns, on the one hand to integrate youth activities into the national scene, and on the other to supplement these social functions. In its action programs for the benefit of Moroccan women held at home economics centers, it reserves an important place to nutrition education and applied nutrition. There are at present 150 home economics centers, of which 54 are situated in urban areas, and 96 in rural areas. The leadership of these centers is in the hands of 415 instructors -- 228 in cities, and 187 in the countryside.

At numerous working sessions, women study principles of nutrition, child care, and hygiene, and are led to an awareness of their new responsibilities both within their homes and in their community activities in the light of the economic and social development of their country.

Also to be mentioned are the current experiments in gardening and stock-raising intended to initiate women to modern production methods as part of the larger design of the Ministry of Agriculture.

APPENDIX II

Nutrition Education Sponsored By The Ministry For Secondary, Technical, and Higher Education and The Training of Professionals and Staff Personnel

Aware of the food and nutrition problems of Morocco, the Ministry of State Responsible for Secondary, Technical, and Higher Education and the Training of Professionals and Staff Personnel has initiated the study of nutrition at the secondary school level.

A. Part 1 of the Secondary Curriculum

- Elective: comparative study of diets among the vertebrates, during the first year of secondary education.

- Elements of nutrition as part of the third-year science course for both boys and girls: study of the characteristic reactions of simple foods, vitamins and vitamin deficiencies; compound foods, classification of compound foods, diet, diet deficiencies.

- Food hygiene (1 hour per week), as part of the home economics classes given to girls in the second year of secondary school.

- The feeding of infants, as part of child care classes given to girls in the third year of secondary school.

B. Part 2 of the Secondary Curriculum

- Nutrition of human beings, principles of autotrophy and heterotrophy in the sixth year of secondary school (about 23 class hours).

- Crop and animal nutrition (23 hours) as part of the sixth year economics course.

C. Two-year Teacher Training Courses

- Food hygiene is taught in 14 class hours during the fourth secondary school year.

- Nine hours of the fifth secondary school year are spent on human activities related to fishing, farming and stock-raising.

It is apparent that the future managers of the nation will have been exposed during their school years to the problems of food and will be inclined to appreciate any project tending to improve the population's nutritional state.

APPENDIX III

Nutrition Education Sponsored By The Ministry of State Responsible for Agriculture and Land Reform

Morocco's resources are multiple and abundant: the land is suitable for irrigation; the climate allows a varied range of agricultural enterprises; but the country's financial and technical means remain limited compared to the requirements for exploitation projects. On the other hand, the rapid population increase entails a considerable increase in foodstuff requirements. It is thus essential for the country to extract the maximum good from its resources to insure dietary equilibrium and avoid the trade balance deficit that would be brought about by increasing imports.

Studies of agricultural development potential have shown that a strong majority of traditional farm managers do not easily accept modern production methods. The Ministry of Agriculture and Land Reform is therefore particularly concerned with and lends its support to any project in nutrition education or applied nutrition.

The school gardens and school-connected farms for the raising of small animals set up by the Ministry of Primary Education are the ideal place to popularize new methods and materials. The people observe with interest what takes place at school and tend to adopt either the methods in use or the selected products that have been employed by the child. As a consequence, the Ministry of Agriculture gives assistance to the applied nutrition program.

1. Its specialists participate in the seminars and training and refresher courses for the teaching personnel responsible for action.

2. The Ministry donates materials, seeds, and selected animal varieties.

3. It participates in plowing and drainage projects.

In addition to this involvement, the Ministry of Agriculture sponsors its own nutrition and nutrition education program.

1. In May 1964, a food studies office was established at the National Agricultural Research Institute. This office is currently connected to the Food Technology Laboratory of the same agency.

2. In July 1966, the Food Studies Office took part in a survey in collaboration with the Planning Division of the Ministry of Development and Planning. The object of the survey was to establish "the supplies, needs and food deficiencies of Morocco."

3. In December 1968, the same office published a list of foods consumed in Morocco.

4. In the near future, a professorship in Food and Human Nutrition will be founded at the National Agronomic Institute Hassan II, where a 6-year theoretical engineering degree is offered. In this project to set up a Food Economics and Applied Nutrition Department, which is assisted by the Nutrition Division of FAO, the objectives are:

   a. The training of future agronomic engineers in one of the essential and products of their calling, that is the proper feeding of human beings;

   b. The grouping of all technical and educational activities relating to the problems of human feeding.

5. Courses in food technology and food industry which discuss the processing of vegetable and animal products for human consumption to be given at the National Agricultural School at Meknès where a 3-year degree in applied engineering is offered.

REPORT ON NUTRITION IN RWANDA

I. NUTRITION SURVEYS

The following is a summary of surveys and information from various sources concerning the state of nutrition in Rwanda.

A. Qualitative Investigation by Dr. Close (November 16-28, 1953)

This investigation was carried out over the entire Rwanda territory. The sample was selected according to natural regions and their population density without, however, being proportional to the population.

1. Food Habits

Number of Meals Consumed per Day
(percentage)

	1 meal	2 meals	3 meals
Men	20	72	8
Women	9	75	15
Children	1	38	61

The high percentage of men appearing to take only one meal per day, the evening meal, is caused by men working on the outside. In 75 percent of the cases the second meal is taken at noon. The leftovers from the evening meal are the first meal of the next day.

2. Foods

Meals are generally composed of vegetable foods of two kinds, or of only one in times of shortage. The staple foods are: beans at 50 percent of the meals (replaced by peas at high altitude); sweet potatoes at 56 percent of the meals; manioc, 6 percent; bananas, 13 percent.

The secondary foods important in some areas and at certain times are: green vegetables, leaves (brèdes), beans, taro, sweet potatoes, manioc, potatoes, wheat, peas. Occasional and regional foods are: mushrooms, tomatoes, peanuts, rice, leeks, celery. As spices, rural people use peppers (80 to 85 percent of meals) and onions (40 percent).

a. Meat, Fish, and Milk

The consumption of fish is almost nonexistent in Rwanda except around lakes Rugwero and Muhazi, and the meat is mostly of cattle origin. Currently, the ancient taboos regarding the meat of goats, pigs, sheep, and poultry are disappearing, but there are still women who never eat meat. The very low meat consumption is caused by the low cash incomes making purchases rarely possible. Dr. Close notes that in 1953, 86 percent of the population ate meat at least once a week. The short span of the study makes this figure doubtful.

According to the study, the consumption of meat was distributed as follows: cattle, 63.5 percent; goats, 18.5 percent; sheep, 4 percent; pigs, 8 percent; poultry, 6 percent. The consumption of milk is strongly dependent upon ownership of cows. Cow's milk is well liked, and in 1953, about 45 percent of the population consumed some. Goat's milk is reserved for young children.

b. Fats

The use of palm oil seems to be more frequent than that of butter. Further intake of fats is directly linked to that of meats, since 77 percent of the population use fats only once a week or less and usually at the same time as meat.

c. Alcoholic Beverages

Fermented drinks are consumed by 97 percent of the population. According to regions and times of the year, bananas and sorghum are the source. (Bananas, at the end of the year in the Bugarama, Impara, Budaha, Bugoyi, and Gisaka regions.)

3. Menus and Food Preparation

The typical menu is composed of two vegetable ingredients, of which one is almost always beans (peas at high altitude). To this staple are added peas, manioc, bananas, squash, green vegetables or a paste made of manioc, millet, wheat, but only rarely out of sorghum which is not liked and is eaten only in times of famine. Salt is always used while peppers and fat are rarely added. Near the end of the dry season, meals often consist of only one ingredient (sweet potatoes or even brèdes), a sign that famine is settling in. Meats are usually accompanied by paste. Food preparation is simple; cooking in water is the rule, in a single pot or in separate pots.

4. Comments

Dr. Close's study is essentially qualitative and gives no indication of the quantities eaten. The investigation is representative of the whole territory but is biased by its short duration (13 days). Food consumption varies with the seasons, and this study bore only on the most critical period of the year, the end of the long dry season just before the harvest of the short rainy season. Nevertheless, the results are very useful because they give a good idea of the kind of feeding prevailing in rural areas.

B. Conclusions of the Colloquium on Food and Nutrition in Rwanda (Gisenyi, December 8-14, 1966)

1. The staple foods of Rwanda remain beans, sweet potatoes, bananas, sorghum, peas, maize, potatoes.

2. Although information is not exact, it is estimated that the Rwanda people consume 2,200 calories, an amount approximately adequate according to international standards.

3. As a whole, the daily intake of proteins does not exceed 35 grams.

4. As far as is known now, the intake of minerals is adequate, at least for calcium, phosphorus, and sodium chloride. Exception should be made for iodine, since it is estimated that in 1953, from 20 to 30 percent of the population was suffering from endemic goiter. (This figure is certainly higher now.)

5. The average Rwanda diet is generally poorly supplied in fats.

6. In Rwanda, the total consumable production of meat reaches 3,500 tons per year. If a human being is expected to eat 20 grams of protein per day, that is, 10 grams of animal protein, the 3 million inhabitants of Rwanda require 21,600 tons of meat, that is 6 or 7 times the present production.

   The annual production of milk yields 36 million liters annually; but to satisfy the requirements of the population, an annual production of 133 million liters is necessary.

C. Social Medicine Seminars Organized by the Medical School of the National University of Rwanda

1. Nutrition problems in Rwanda (by Dr. Fontyne January 18, 1965)

   a. Dr. Fontyne takes up the picture presented by Dr. Close in 1953 but underlines that, since independence, the social revolution has changed the structure of the country and there is great need to renew these data.

   b. The consumption of green vegetables is very sporadic and is especially common among poor people (leaves of bean plants, squash, manioc, sweet potato, or taro).

c. Meat, especially that of cattle, is considered a prestige food reserved for adult males. A taboo, now being repressed, used to forbid the use of other meats, especially among women.

d. Fish is consumed along the shores of Lake Kivu, near other lakes rich in fish, and around fish farming ponds. The small available supply of fish and the small amounts marketed do not encourage an increased consumption in the country.

e. The milk of cows is consumed by only a small slice of the population.

f. Rwanda suffers from a great lack of fats, which represented only 6.8 percent of the total food intake in 1959. There are no oil palms. The only oleaginous plants are soybeans, peanuts, and avocados, but on a small scale.

g. Beers are low in alcoholic content and are rich in B vitamins.

2. <u>Presentation by Dr. Mol, Director of the Pilot Medical and Social Center at Kibilizi (Butare) (January 25, 1965)</u>

a. In September 1963, 6,000 children under 5 years of age were weighed at the demonstration center. This included healthy, sick, and malnourished children. It was found that 14 percent of children under 1 year of age are malnourished; 16.6 percent of the children between 1 and 5 years are malnourished. This is a serious problem in Rwanda.

b. It is estimated that the 600,000 Rwanda children under 5 years should receive 120 million liters of milk. To reach this

figure, 60,000 wellfed cows must replace the present 500,000 poorly fed cows. Wellfed cows have a capacity of 6 liters per day instead of 400 milliliters per day. Translated into tons of industrial skim milk, the required 15,000 tons would cost half the whole national budget.

II. DEFICIENCY DISEASES KNOWN TO EXIST IN RWANDA

A. Under-nutrition

The lack of proteins and calories leads to kwashiorkor and marasmus.

B. Mineral Deficiencies

Goiter occurs mainly in the southwest. The most recent investigation of endemic goiter over the whole territory dates from about 15 years, and the rate of occurrence was 20 to 30 percent. The present rate is certainly higher. This endemic disease is related to the low iodine content of the soil and to the rains that wash over the high mountains.

C. Vitamin Deficiencies

Vitamin A deficiency leads to hemeralopia, follicular hyperkeratosis, xerophthalmia, and keratomalacia. Thiamine deficiency produces beriberi. Other associated deficiencies occur, whether due to ascorbic acid and vitamin B_2 or ascorbic acid and niacin.

D. Anemias of Chronic Malnutrition

III. CAUSES OF MALNUTRITION

A. Social Factors

1. Ignorance

In 90 percent of the cases of malnutrition, we notice the ignorance of parents regarding the dietary requirements indispensable to the normal growth of the

child. Some riches are left unexploited because traditions determine behavior beyond logic and notions of profit. For example, the ownership of many cows that give no milk or meat but are kept because they lend a certain social status.

2. Taboos

The meat of sheep is disliked, being reserved to a special ethnic group, the Batwa, who are despised by the rest of the population. Few women eat goat's meat, the majority because they are afraid of growing beards. Goat's and ewe's milk is not accepted, except that goat's milk is tolerated to treat children with kwashiorkor. Fish and game are not eaten enough. The low economic level coupled with ignorance make the masses avoid eating eggs, fresh vegetables, and fruit, for they prefer to sell them to those rich whites and blacks with an understanding of nutrition. The peasants think that protein-calorie malnutrition (kwashiorkor or irungu) is not a nutritional disease but a sign of poisoning, hence their attitude of changing nothing in the diet of the child. By custom, the best meal, well-prepared and rich in nutrients, is reserved solely for the head of the household, and children past weaning receive only starches, which is the cause of cases of kwashiorkor except in families with an adequate supply of milk.

B. Geographic Factors

Entirely surrounded by other countries and with an area of 26,338 square kilometers, the Republic of Rwanda is 1,100 and 2,000 kilometers, respectively, from the Atlantic and Indian Oceans by air.

The population is scattered in mountains and hills, which does not facilitate certain profitable methods of cultivation (excessively rough terrain, strong erosion). Rwanda, on the other hand, is favored by its climate: abundant rainfall; a mean temperature of 18°C; an average altitude of 1,600 meters; a not overly long dry season of 3 to 4 months; beneficial and moderate rainy seasons in March, April, May and November, December; numerous lakes, rivers, and wetlands.

Although the soils of Rwanda are basically good, as witnessed by the agricultural potential which supports high population densities, they are already losing value. This impoverishment arises from deforestation to allow pasturage for an essentially unproductive herd, from overgrazing, and from a very short fallow period. Thus, much land is becoming chemically exhausted, short of humus, and of low carbon content.

As a whole, Rwanda is located in one of the African zones where the danger of erosion is the most marked, and Rwanda has in fact lost much natural soil fertility by erosion. Exact information on the varied soils of Rwanda is lacking; there is as yet no pedological map or land use map.

The population is quite scattered. Kigali, the largest population center, has only 14,000 inhabitants. Except for the small towns of Butare, Gisenyi, and Cyangugu, and the administrative centers for the prefectures, there are practically no villages; the people of Rwanda live here and there next to their fields.

C. Economic Factors

The low per capita cash income (estimated annually at 1,700 Rwanda francs* or $17), which is not equally distributed, means that purchasing power is practically nil, especially in isolated areas. A worker in the Kigali region earns $0.35 per day, in an isolated area $0.25 per day; miners earn $0.45 per day. Low-level white collar workers earn about $50 per month, and higher government employees larger salaries.

There is a need to adjust the balance of payments. For a few years, the value of imports has been exceeding exports. In 1968, exports, 50 percent of which consisted of coffee and the rest of tea and minerals such as

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*Or, if one includes the value of home-consumed crops, estimated at 4,300 francs or $43.

casserite and wolfram, amounted to 16.1 million francs, against imports valued at 19.4 million francs. An increase in production of export commodities is important to maintain the present standard of the population and to adjust the balance of payments.

The lack of a local industry necessitates importing textiles, food commodities, and machinery. Among Rwanda industries are: partial processing of Arabica coffee and green tea; processing of pyrethrum flowers; mining and quarrying; electricity; construction; manufacturing of non-alcoholic beverages and brewing of barley beer; manufacturing of furniture, soap, cookies, and cigars; milling of wheat; canning of fruit; manufacturing of pots, suitcases, boats; and goldsmithing. With investments local industries could be developed to process peanuts, work in leather, manufacture handbags, fabrics, plastic objects, and concrete, and, in general, to process, treat and transform the raw materials of Rwanda and neighboring countries. To promote investments, legislation (Investment Code, Articles 12 and 13, 1964) exempts from import duties those raw materials and goods imported for future export following their processing in Rwanda.

D. Demographic Factors

1. Population Density

Rwanda has a dense population compared to most African countries. It is estimated that the population is more than 3 million inhabitants. The average density in settled areas is 163 persons per square kilometer. Most estimates of population growth place the rate at 3.2 to 3.6 percent. The first census after independence was taken in 1964 and gave a total population of 2.8 million inhabitants. For the total area of 26,338 square kilometers, the density amounted to 114 persons per square kilometer, and tillable lands accounted for 8,083 square kilometers, not including pastureland and forests. This mass, less the urban population which is negligible in any case, reached a physiological density of 367.4 persons per square kilometer.

Demographic studies carried out in 1949 using sampling techniques had indicated a birth rate of 4.22 percent, a mortality rate of 1.95 percent, and hence a growth rate of 2.2 percent. Today's higher rate of population increase is largely due to the decrease in mortality rate effected by better medical services.

We should also note the 1966 estimate of annual growth rate made at the time of the Food and Nutrition Conference held in December in Rwanda. Based on the available data for the population size in 1940, 1944, and 1964 as 1,530,000 inhabitants, 1,920,000 inhabitants, and 3,018,000 inhabitants, respectively, the growth rate was placed at 3.5 percent.

This same conference indicated that out of a theoretical potential for subsistence crops of 3.7 million tons per year, the 1965 production had reached more than 2 million tons. Faced with the population expansion, the theoretical potential will no longer be adequate in 15 or 20 years. An unfavorable factor could trigger famine.

The population is young, being estimated in 1966 as 52 percent under 15 years. These young people, pregnant and nursing women, and the potential mothers between the ages of 15 and 45 comprise nearly 70 percent of the population.

IV. PROGRAMS IN PROGRESS IN 1970 TO FIGHT MALNUTRITION

To fight this plague, home economics centers and nutrition centers have opened their doors in Rwanda.

A. Home Economics Centers

There are 373 home economics centers (of which 353 are government run and 20 are private) where women are trained and taught to feed their families better, to educate and dress them better, and to take on their responsibilities toward the nation. Home economics centers reach about 49,463 women and girls each month. Parallel to the training given to women in home economics centers, the

national radio gives regular broadcasts on health and nutrition education. This is quite important, because it is the means of reaching those who do not attend the centers just mentioned. Unhappily, the number of radio sets is estimated at only 3,000 in the whole country.

B. Nutrition Centers

A nutrition center is a school for parents who want to learn how to treat their children stricken with malnutrition and how to prevent these diseases from hitting the other children in the family.

For a long time, kwashiorkor was associated with poisoning of children. Traditionally, when by misfortune the young child started to show the classic signs -- straightened and lighter hair, smooth and discolored skin, edemas, etc. -- the healer was called and administered emetics to eliminate the poison, but many children died.

By treating kwashiorkor patients in a hospital with serums, proteins and vitamins, and European foodstuffs, European medicine succeeded in curing many cases, who however relapsed when they returned to the traditional food habits of the family. This was a reinforcement of the poison idea, which even the hospital cannot completely eliminate. Studies and experiments lead us to the belief that medical care and the distribution of foodstuffs cannot bring an end to malnutrition. Only the progressive and continued education of parents in matters of health and nutrition could eradicate this disease.

To implement this idea, a first nutrition center was opened in 1963 in the north, with the collaboration of local authorities and the aid of Caritas Rwanda, OXFAM, and the Catholic Relief Services. This medical and social project, designed for a very specific hill community of the Ruhengeri Prefecture, (300 inhabitants) included a feeding study, the weighing of all children, the diagnosis of all illnesses, and the teaching of a protein-rich diet so that parents could treat at home their children who were ill with kwashiorkor.

An unexpected result was that the first parents who cured their children of severe kwashiorkor by using local foods could not keep it a secret. Their experience with nutrition was told from person to person, until after one year, children came to us from everywhere in severe states of nutritional deficiency. It became necessary to organize daily consultations for the children of the different hills and communes in the prefecture, so that the greatest possible number of parents could benefit from the instruction. Soon, people were no longer speaking of the poisoning of children but of deficiencies in their diets.

Note: A pilot health center operated jointly by WHO and the state, and the National Health Institute connected to the local medical school are working on nutrition problems with the equipment and advice of WHO.

V. GOVERNMENT POLICY TOWARD MALNUTRITION

A. The Role of Nutrition in Development Plans

Anxious to put an end to under-nourishment, sickness, poverty, under-employment, etc., the government of Rwanda in 1963 initiated a pilot medical and social center charged not only with medical care, maternal and child health (MCH), health education, sanitation, the fight against endemic diseases, feeding, and social work, but also charged with being a training center for all medical and social personnel to be integrated into a training operation for health and sanitation in the whole country.

In 1967, Rwanda finished the provisional document of the Interim Emergency Plan for total development of the country. In the chapter on health, malnutrition is classified among diseases of greatest concern. Kwashiorkor and the other deficiency conditions are responsible for 11 percent of deaths; and, by creating deficiencies within an organism, malnutrition affects the evolution of other diseases, playing a particularly important role in pneumonia, tuberculosis, whooping cough, measles, and gastro-intestinal conditions.

Localized surveys indicate a very serious state of malnutrition among children, with 14 percent of those examined weighing less than two-thirds of the average of the Boston curve, less than the limiting weight for severe malnutrition.

In the same area of development, special effort must be placed in the fields of agriculture and stock-raising to improve the level of nutrition.

In talks broadcast by the national radio, the ministries of Public Health, Agriculture and Stock-Raising, and Family and Community Development place an emphasis on diet improvement.

B. National Coordinating Committee for Nutritional Affairs

A National Committee for Nutrition does not exist in Rwanda, but the 1966 Conference on Food and Nutrition held at Gisenyi stimulated interest in this subject. For example, in his opening remarks, His Excellency, Dr. Sixte Butera, then Minister of Public Health in Rwanda, concluded his listing of general preventive measures with: "A national interdisciplinary commission for the study of the problem of feeding and nutrition should be created to centralize the activities of each discipline in this matter." The final recommendations of the conference committee included: "The creation of a nutrition consultative committee for Rwanda, to act as a coordinating agency between the various disciplines and services concerned with feeding and nutrition problems: Public Health, Family and Community Development, Agriculture, Planning, Education, ISAR, INRS, the University, etc."

Note that the Medical School of the National University of Rwanda includes a National Health Institute whose purpose is the same as that of the Pilot Health Center mentioned previously. This Institute, whose range of action includes more than nine surrounding communes, has promoted the consumption of local foodstuffs rich in animal and vegetable proteins, in fats, and minerals. At meetings on health education, it has corrected dietary taboos and

stimulated an interest in worthwhile plants, such as soybeans, avocados, and other fruit trees.

C. Prevention of Frauds and Food Enrichment

Nothing is being done in the area of preventing frauds in matters concerning food, or in the area of enriching flour or other staples.

D. Pricing Policy (4 December 1966)

After the devaluation of the national currency, the Ministry of Commerce, Mines, and Industries distributed to the whole country a memorandum (Number 3/05-43) regarding maximum prices, that is price ceilings, which it is forbidden to exceed, but which anyone may lower as he finds it in his interest to do so.

In the future, after the intensive cultivation of subsistence crops appropriate to each region has been established, uniform price levels will be easy to maintain (see Annex on land use in Rwanda).

VI. RECOMMENDATIONS

Rwanda hopes to receive from friendly countries and private organizations effective help and support in the following areas:

A. Initiation or continued implementation of the various measures proposed in the ten-year plan and the global study: anti-erosion work, soil protection, adequate fertilization, modern methods of cultivation.

B. Study of fishing and fish farming possibilities.

C. Regional specialization of stock-raising: introduction of new forage crops, improvement of animal hygiene, increased fight against parasites, improvement of breeds, processing of livestock products.

D. Study and distribution of cooking recipes based on local foodstuffs, intended to supplement or improve the general diet and especially that of vulnerable groups.

E. Creation of small industries based on agricultural products to open up markets for them and stimulate production.

F. Development of creation of agricultural instruction at all levels: higher education, technical and professional schools; creation of training schools for farmers; including notions of agronomy and animal husbandry in the curriculum of primary schools; strengthening of the technical staff concerned with animal and veterinary questions.

ANNEX

LAND USE

Estimated Subsistence Crop Production 1965-1969
(area in hectares, production in tons)

Product	1965*		1966		1967		1968**		1969	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
Bananas	130,185	1,202,250	121,000	1,452,000	130,000	1,560,000	134,500	1,615,800	136,500	1,638,000
Beans	126,925	95,194	154,000	130,900	155,000	131,750	156,300	116,225	162,360	146,124
Peas	48,215	39,054	74,000	59,200	64,500	51,600	65,400	45,780	72,880	60,948
Peanuts	8,551	19,843	6,000	4,500	21,000	15,750	14,800	9,600	7,225	5,780
Soybeans	--	--	--	--	--	--	--	--	550	385
Sorghum	93,740	130,000	130,000	143,000	132,000	145,200	129,000	122,550	125,800	125,800
Corn	43,157	43,157	48,900	48,900	53,200	53,200	53,200	42,800	41,300	41,300
Millet	3,735	2,116	3,000	1,800	2,000	1,200	1,800	810	2,700	1,350
Wheat	565	480	125	100	375	300	731	621	953	810
Rice	--	--	--	--	110	207	315	662	440	1,144
Potatoes	14,419	43,257	9,500	57,000	16,500	107,250	17,500	78,750	17,200	129,000
Sweet potatoes	58,068	203,238	36,800	257,600	48,000	360,000	52,500	367,500	60,650	324,225
Manioc	14,808	177,696	19,800	198,000	23,000	230,000	26,000	233,300	28,250	282,500
Yams	100	1,250	--	--	2,000	16,000	2,100	11,550	310	1,860
Taro	1,245	10,582	--	--	2,500	10,000	1,950	6,825	6,700	33,500
Total	513,713	1,968,117	603,125	2,353,000	650,185	2,682,457	656,396	2,652,773	663,818	2,792,726

*In 1968 the 1965 production figures for beans and corn were corrected.

**Production figures for beans, peas and corn in 1968 have been corrected.

REPORT ON NUTRITION IN TUNISIA

I. BACKGROUND INFORMATION ON THE FOOD SITUATION IN TUNISIA

The relationship between per capita cash income and nutrition is seen between countries and within a given country at the different levels of population. Nutrition can be influenced by ignorance, religious beliefs, and social mores, but even so, the per capita cash income remains the most influential factor affecting the quantity and quality of the diet. That is, variations in nutritional level of the various socioeconomic groups according to per capita income are encountered inside each system.

In Tunisia, however, socio-religious and social factors do not generally have a significant prejudicial effect on the diet of the Tunisian. Except for pork, the range of food products of both animal and vegetable origin consumed in the country is as diversified as in any other Mediterranean country. The nutritional deficiencies observed in the diet of a sizeable proportion of the Tunisian population are mainly due to the relatively low level of per capita income; although, obviously, the ignorance of cooking methods and of the nutritive values of different foodstuffs as a function of their cost, can also have a bearing on the appearance of nutritional deficiencies. But the existence of these factors is not a characteristic of Tunisia. Moreover, their deleterious effect is weaker as food consumption becomes greater with a high income level.

The correlation between income and nutritional state, however, cannot be governed entirely by the income factor, since it can be itself associated with other factors, such as the education level, the type of employment, and the place of residence. The effect of income on nutrition can only be isolated by developing an econometric model using the further correlations between these factors.

Past investigations of the food consumption and nutritional state of the Tunisian population have been of

limited scope and have concerned mainly the city of Tunis. In fact, the only general survey encompassing the totality of the country and considering all socioeconomic segments of the population was the one made in 1966 by the Study Division of the Secretariat of State for Planning and National Economy. It covered food consumption throughout the four seasons of the year, and included 7,147 households, that is 42,589 persons, or about 1 percent of the population as of 1966.

It was found that the yearly per capita cash income is about 75 dinars, that is 72 dinars for private spending, out of which, on the average, 36 dinars are spent for foodstuffs. This annual per capita expenditure provides the equivalent of 2,360 calories per day, or approximately the required calories for an average person.

Averages alone, however, can only give a distorted picture of the reality they are intended to convey. Even if, on the average, a Tunisian satisfies his caloric requirement, it is important, for a more exact picture, to know the distribution above and below the average as well as the nature of the calories. Since income distribution data are not available, this idea will be included in the discussion of total consumer goods expenditures for which the study obtained the following distribution for the sample households:

Population Distribution (sample) as a Function of Consumer Expenditures and Place of Residence
(percent)

Annual Expenditures (dinars)	Large Cities*	Other Towns	Scattered Units	Total (Urban)	Total (Rural)	Total (Tunisia)
less than 30	4.1	19.9	22.5	11.2	22.1	17.7
30 to 50	12.7	25.6	30.6	18.4	29.01	25.1
50 to 70	18.8	19.3	20.6	19.0	20.3	19.9
70 to 100	20.4	16.4	14.0	18.6	14.6	16.0
more than 100	44.0	18.8	12.3	32.8	14.0	21.3

*Tunis, Bizerte, Sousse, Sfax.

In analyzing the 72 dinars of total expenditures, it is seen that 62.7 percent of the population spends per person and per year less than 70 dinars. At the same time, by considering urban and rural areas separately, we see that urban conditions are more favorable so far as per person spending is concerned. Within the urban group itself, the inhabitants of the four large cities are even more favored than the rest of the urban population. In addition, 71.6 percent of the rural population spends less than 70 dinars per person per year, whereas 48.6 percent of the urban communities and 36.6 percent of the large cities spends at this same level.

However, since the mode and conditions of life in urban areas differ from those of rural areas, the differences in expenditures do not necessarily entail analogous differences in the quantity and quality of foods consumed. Urban people, particularly in large cities, have a tendency to buy foods whose processing involves more handling than those of the rural regions. Handling increases food costs. In rural areas, on the other hand, foods produced by the households form an important part of the total consumption. The cash value of these family-grown food commodities is estimated according to the basic costs of wholesale products, which eliminates the costs of processing, shipping, and warehousing, etc., which are borne by the households in large cities.

The effect of handling on the cost of purchased goods is proportional to the degree of urbanization of the community. This is shown by the following table which gives the average daily caloric intake per person and the annual per capita expenses for food products in urban and rural areas.

Average Daily Caloric Intake and Annual Food Expenses Per Capita
(in dinars)

	Large Cities	Other Towns	Scattered Units	Total (Rural)	Total (Tunisia)
Calories per person	2,550	2,230	2,413	2,315	2,360
Food expenses per person (dinars)	52,300	33,400	30,400	31,300	36,000

The average spending for food in the four large cities is superior by 45 percent to the average spending for the whole country. But this difference only contributes an 8 percent surplus of calories over the average for the whole country. What is even more significant is that the population of large cities spends 67 percent more than rural people for food purchases, but in so doing only acquires 10 percent more calories per person. Towns of lesser size spend on food purchases 6.7 percent less than the average of the whole country, and their calorie intake is only reduced by 5.6 percent. The rural population spends for food 8 percent per person less than the average of the country, but consumes only 2 percent fewer calories. The calorie supply per unit of expenditure is the highest for the scattered rural communities.

The data and conclusions need further clarification, though, because it is possible to have sufficient calorie intake without having a nutritionally adequate diet. The foods eaten may be rich in some nutrients but poor in others. To ascertain whether the diet is nutritionally balanced it is therefore necessary to know the origins of the nutrients. The sources of calories in Tunisia are indicated below on a percentage basis.

Sources of Calories
(percent)

Type of Calories	Large Cities	Other Towns	Scattered Units	Total (Rural)	Total (Tunisia)
Starches	62	67	68	68	66
Proteins	11	11	11	11	11
Fats	27	22	21	21	21
Total	100	100	100	100	100

In the whole country, most of the calories, or about two-thirds, come from cereals. The grains contribute 64 percent of the total calorie count in rural areas, whereas in the four large cities their contribution is only 4 percent of the total. In these cities, the diet is better balanced than in the whole country. On the other hand, scattered units have the least well-balanced diet. Here, grains alone amount to more than 66 percent of the total calorie count.

As far as other nutrients are concerned, the diet of an average Tunisian exhibits on the whole a deficiency of animal protein, calcium and vitamins, except for vitamin B_1 which is theoretically present in sufficient quantity because of the amount of cereals consumed.

The protein intake, in grams per day, for an average Tunisian is as follows:

Average Daily Protein Intake
(in grams)

Proteins	Large Cities	Other Towns	Scattered Units	Total (Rural)	Total (Tunisia)
Total proteins	67.7	59.8	67.3	63.7	64.8
Cereal protein	41.4	43.4	53.5	49.3	47.1
Animal protein	15.0	8.3	7.0	7.4	9.3
Animal protein as a percent of total	22%	14%	10%	12%	14%

The total protein intake seems adequate, but it is the low level of animal protein that brings about a qualitative deficiency. In the whole country, the ratio of animal protein to the total supply is 50 percent below the level above which a diet is considered to be balanced. Only the population of large cities comes somewhere near this level without, however, reaching it.

It appears that the population of smaller towns may have a deficiency in both total proteins and animal protein. But in our opinion this is not likely, since the food consumption pattern of small towns is probably closer to that of large cities than of semi-nomadic people. The following tables give a more detailed analysis of the nutritional characteristics of Tunisian diets.

Distribution of Calories and Nutrients by Economic and Social Level

Lower Level

Calories and Nutrients	Consumption Level	Percentage of the Population		
		Rural	Urban	All Tunisia
Calories	< 2,000	30	12	25
Total protein	< 5 g	30	12	25
$\frac{AP}{TP}$*	< 20%	70	34	61
Calcium	< 400 mg	50	27	44
Vitamin A	< 4,000 IU	50	27	44
Vitamin C	< 55 mg	30	12	25
Vitamin B_2	< 1.4 mg	70	35	61

Middle Level

Calories and Nutrients	Consumption Level	Percentage of the Population		
		Rural	Urban	All Tunisia
Calories	2000 - 2500	30	25	29
Total protein	55 - 70 g	50	50	45
$\frac{AP}{TP}$*	20% - 40%	29	46	33
Calcium	400 - 600 mg	40	30	42
Vitamin A	4000 - 5000 IU	30	25	29
Vitamin C	55 - 70 mg	40	40	40
Vitamin B_2	1.4 - 1.7 mg	20	26	22

Upper Level

Calories and Nutrients	Consumption Level	Percentage of the Population		
		Rural	Urban	All Tunisia
Calories	> 2,400	40	63	46
Total protein	> 70 g	20	58	30
$\frac{AP}{TP}$*	> 40%	1	20	6
Calcium	> 600 mg	10	43	18
Vitamin A	> 5,000 IU	20	48	27
Vitamin C	> 70 mg	30	48	35
Vitamin B_2	> 1.7 mg	10	30	17

*Ratio of animal protein to total protein.

These tables show that as a whole the urban population has a better balanced diet in terms of total calories and essential nutrients, although even in the urban population a large proportion of the people are undernourished. This is seen particularly among the new immigrants from rural areas who live in the suburban zones of Tunis. These immigrants are attracted by the hope of employment, but since they are lacking in skills and aptitude, the employment they find is sporadic and poorly paid. Since the cost of living is higher in cities than in the countryside, and the urban way of life requires that a portion of income be allocated to expenses other than food in competition with nutrition, the level of nutrition of this segment of population is probably one of the lowest in the country.

The consumption of processed foods remains limited in Tunisia, both in diversity and in quantity. Vegetables, fruit, milk, fish, and meat are generally eaten fresh. This tendency may be prejudicial to the over-all yearly distribution of the consumption of the nutrients judged necessary to a balanced diet. The Mediterranean climate, however, is well-suited to produce a wide variety of fruit and vegetables all year long. Throughout the year Tunisia has a wide range of fruit and vegetables, but some regions do not benefit from them. The production and marketing of these goods are determined by climate, irrigation possibilities, and the availability of storage facilities, transport, distribution, and advertising.

In all aspects the coastal region is favored over the interior, for many reasons:

A. Inland, the climate becomes more continental the further one is from the sea. More severe winters and warmer summers are not favorable to the cultivation of many products and limit the growing of others to distinct periods of the year.

B. Means of communication are not as well-developed inland as along the coast. This is mainly due to the fact that the interior population is widely scattered and there are no urban centers.

C. The population of the interior has a predominantly rural character, a lower per capita income, and makes more use of home consumption than the rest of the country. That is, it spends per capita much less than the coastal population for marketed food products, which limits the development of markets in the region.

D. For one reason or another, the practice of irrigation is less widespread than along the coast. Although this situation is rapidly evolving and some areas are becoming important centers of irrigated crops, for example Kairouan.

Since the coastal zone contains the largest urban centers and a high degree of concentration of population, since the production of fruit, vegetables, fish, etc. tends to be concentrated there, and since transportation and marketing facilities are more developed there, that is where the consumption of foodstuffs is concentrated. The volume of goods sold in each inland consumer center is limited and does not justify the building up of an infrastructure to facilitate the flow of merchandise. The necessary investments tend to raise retail prices with the effect of reducing the market and limiting consumption.

The Bureau of Fisheries has encouraged the development of a demand for fish in the interior of the country by the purchase of refrigerated trucks and the creation of sales outlets in this region. But since the price of fish is identical to its price on the coast, the refrigeration and transportation costs are subsidized in large part by the coastal population.

It can be concluded that in the interior, the consumption of many foods necessary to a balanced diet remains relatively low and sporadic for reasons of an economic, social, and geographic nature. This situation will improve in the future, paralleling the development of markets and transport facilities, the extension of urbanization, and the reduction in local consumption brought about by economic and social development.

Crop diversification in the interior will progressively contribute to dietary improvement and restore the nutritional equilibrium of the local population.

II. DEFICIENCY DISEASES

Tunisian studies of deficiency diseases are very fragmentary and not numerous, but a general outline of the principal aspects of Tunisian pathology can be made. The main deficiency syndromes that are typically Tunisian are protein-deficiency, undernutrition, calcium deficiency, deficiencies of vitamins A, B_2, and C, syndromes and disequilibriums of malnutrition, and deficiencies of iodine and fluorine (trace elements).

A. Protein Deficiency Undernutrition

The existence of various syndromes confirms this undernutrition, which is mainly of a qualitative nature. The observed effects are: edematose syndromes; nutritional oligotrophies; hypogalactias; rachitic syndromes with reduced calcium levels; reduced weight-gain curves until the preschool age; vulnerability to disease due to reduced resistance to parasitic and infectious agents. There is no specific figure for protein malnutrition, but it can be assumed that the incidence of kwashiorkor is 0.25 to 0.50 percent, that of edemas 5 percent. Underweight conditions (up to 20 percent) and growth retardation (13 percent) are due to this deficiency.

B. Calcium Deficiency

The characteristic syndromes that are typically Tunisian take three forms. The classic form of rickets is very frequent, occurring in 20 to 30 percent of persons up to the age of 20. Osteomalacia affects 12 to 25 percent of females up to the age of 45. Dental defects are of two kinds: 1) dental caries, which occur at all ages in increasing proportion and affect 5 to 25 percent of the children and on the average 30 percent of the adults; 2) dysmorphisms, which are frequent until past puberty.

C. Vitamin Deficiencies

1. Vitamin A deficiency (inadequate intake) has two vascular complications: xerophthalmia and keratomalacia. A 10 percent rate of occurrence is given as the average of the whole population of all ages.

2. Vitamin B_1 deficiency (imbalanced diet) gives rise to neuritis and polyneuritis; actodynia is often seen; the high starch diet of Tunisians increases the requirement.

3. The existence of vitamin B_2 deficiency has never been proved in man. The syndromes observed in Tunisia are rough and are involved in a vitamin and protein multiple-deficiency syndrome; however, dermatologic and visual involvements have been observed with a predominance of skin conditions.

4. Rudimentary and seasonal forms of vitamin C deficiency (by malnutrition) have been noted, especially with expulsive stomatitis. In infants, this deficiency takes the form of hemorrhagic scurvy. The figures given seem to us exaggerated: 10 to 20 percent of all age levels, although it should be noted that these figures are the averages for under-21 year old patient populations.

D. Trace Elements

The lack of iodine leads to endemic goiter (5 percent of adults) and that of fluorine to dental caries.

E. Systemic Diseases Resulting from Malnutrition

Among the observed syndromes are dermatosis, arthritis, diabetes, hyperacedemia, atheroma, and syndromes of plethora. No statistics are available, but the occurrence of these illnesses is in direct relationship to the

qualitative and quantitative aspects of the diet.

It should be noted that the percentages given in the preceding sections reflect the rate of occurrence of deficiency diseases in hospital wards and clinics among all patients seen.

III. CAUSES IN MALNUTRITION

Several causes are incriminated in malnutrition, especially in developing countries. These causes may be classified as social, geographic, economic, and demographic.

A. Social Factors

Under this heading come traditions, religious laws, the mentality of various ethnic groups, their habits, and their ways of life. This complex of factors determines the food traditions followed through the centuries and sanctioned by the national dishes.

Except for pork, food taboos have almost completely disappeared from Tunisia. However, the national dishes suffer from a nutritional imbalance that education already under way is tending to correct. Some of these dishes are high in starch, and others high in fats. It is possible to retain the national character, while reducing the amount eaten and adding to these dishes other food items likely to reduce the imbalance.

B. Geographic, Climatic, and Pedologic Factors

Tunisia is a land essentially suited to agriculture. It is therefore obvious that agriculture is to be blamed for malnutrition or at least for part of it, since the principal role and the objective of the agricultural sector is to produce in sufficient amounts what is necessary to meet the nutritional needs of the population.

It is certain that, operating at a technical level still far from optimum, incompletely liberated from the aftermath of the colonial period, agriculture cannot

immediately reach this goal. But this is not the only obstacle. The difficulty is intrinsic, that is, inherent to natural conditions.

Inconsistent rainfall, irregularly distributed in time and space, an insufficient number of reliable permanent waterways, and the low fertility of soils are natural factors only more or less amenable to control and acting as a brake on the development of agriculture. To this is added the problem of erosion which is only lessened at the expense of a considerable effort.

The consequences of this situation are clear: irregular food production from one year to the next and unequal production potential in different regions -- consequences that can be said to have a direct bearing on the food situation of the country.

The hazards of climate often accentuate the dependence of the country on foreign supplies of food commodities. If city people are not sensitive to this phenomenon since they live in a market economy, it is certain that rural areas are affected by dry years with much less cushioning, and it is very probable that per capita consumption decreases in the rural regions when they are short of cash. There is even a difference between the more favored north and the sub-arid south central rural areas.

C. Economic Factors

Economic factors and their effect on the food and nutrition of the population were considered in the first part of this report.

D. Demographic Factors

As in many developing countries, the demographic pressure should not be neglected as a cause of malnutrition. A few years ago, the population growth rate was estimated at 2.3 percent per year, and little importance was assigned to it. The census of 1966, however, has set the total population at 4.5 million inhabitants and revealed a population growth rate of the order of 2.8 percent per year.

Based on this new data, the population increase is now expected to be one of the future causes of malnutrition, because it will place the country in a more sensitive situation in terms of the effort to be made to achieve better nutrition.

In 1970, the total population is about 5 million inhabitants. From now on, and assuming that the annual growth rate remains at 2.8 percent, Tunisia will have to feed 140,000 additional mouths annually. The country needs to insure in the future a better diet to an increasingly numerous population. The effect of the demographic phenomenon on the general food situation is incontestably loaded with consequences.

The increase in population corresponds to an increase in consumed foodstuffs. And this quantity must increase at a rate higher than 2.8 percent if we are to achieve an improvement in per capita diet. Since it is understood that because of the balance of payments the country is not in a position to allocate part of its foreign exchange reserves to the importation of food commodities, the nation must increase its production of subsistence crops each year. But the purchase of food products by consumer units implies a higher purchasing power, and hence a higher cash income. The whole economic sphere is thus called upon to respond to the consequences of the population explosion and to avoid the deterioration of an already inadequate nutritional situation.

The ratio of population to arable land can in some cases put a brake on any improvement of the food situation. This is especially true of countries with a small arable land area, as Tunisia certainly is. But it does not appear that the population-to-area ratio presents serious problems, whether immediate or future. The present yields per unit surface are still low and capable of being raised. It is not unthinkable that most crop yields could be doubled or even tripled.

In 1968, with a total population of about 4,790,000, agricultural exploitation was as follows:

Cultivated Land by Type of Crop
(in hectares)

Type of Crop	Total Land Area	Land Area per Capita
Fruit trees	1,307,000	.273
Cereals	1,570,000	.328
Legumes	76,000	.016
Vegetables	51,000	.011
Other	344,000	.072
Total	3,348,000	.700

The demographic causes of malnutrition are aggravated by the nature of the solutions to the problem. There is in fact, a priori, only one solution, birth control. In spite of the moral, religious, and psychological difficulties, birth control is the only solution, as well as an effective, fundamental means of lessening the extent of the problems posed by the population explosion. The recent creation in Tunisia of the Family Planning Institute is encouraging; and there is hope that scientific progress is contributing to the chances of success of this enterprise.

IV. PROGRAMS IN EFFECT TO FIGHT MALNUTRITION

A. Nutrition Education

Ignorance of the elementary principles of proper nutrition is at the origin of a large part of cases of malnutrition. In conjunction with a poor utilization of the available resources, this ignorance often leads to undernutrition. A fundamental means of promoting a better diet is to make the people aware of nutritional needs and of practical ways of meeting them.

The need for action in the field of food and nutrition from the triple point of view of instruction, training, and education is based on social, economic and cultural considerations as follows:

1. The adequate feeding of the population is a sine qua non condition of the concept of the promotion of man, a major concern of the Tunisian Government. The fulfilling of nutritional needs is basic to the optimization of the physical and mental well-being of citizens, of their health, and of their ability to work, so many elements contributing to the development of the country.

2. Tunisia produces a considerable volume of food commodities. For a developing country, it is imperative to limit waste and arrive at a better utilization of the available goods. A determining role is played by nutrition education as much at the level of the producers as at the consumer level.

3. Since purchases of foodstuffs, from the household sector to the production sector, represent more than half the total expenses, it is important to educate the economic groups and to orient the consumers to rational spending. With an increase in buying power, we could be afraid that without the appropriate educative action the demand might develop haphazardly and lead to bad habits rather than to the expected results.

4. The satisfaction of food needs through national production is the goal to which the whole population must bring its attention. The people can contribute to the realization of this goal when, being permanently sensitized to the economics of food, and with the incentive to feed themselves better, they set up supplementary sources of food at the family level by gardening, raising small animals, etc.

5. Culinary and gastronomic traditions, inasmuch as they have nutritional validity, are a precious cultural capital which it is important to

preserve and improve, and also to introduce to foreign visitors as part of the promotion of tourism.

B. Programs

Nutrition education has been an active subject matter in Tunisia for over 20 years. It has been the concern of an increasing number of ministries.

1. National Education

The concern for nutrition started in Tunisia at the level of this development through the initiation of instruction at various levels:

a. Institut des Hautes Etudes

Within the college of sciences a degree in dietetics and food hygiene was started in 1953. This is both a post-graduate course of instruction for university graduates, and an undergraduate degree for holders of secondary school diplomas. There have been 13 advanced degrees awarded, and 82 at the lower level.

b. Teachers Colleges

After three years of training seminars, this training was integrated into the official curriculum of the practice teaching year of education students; since 1963, the program has included nine lectures per year under the title "nutritional and pedagogic training."

c. Nutrition Extension Program

One-week long seminars have been held over a period of 5 years and attended by 1,250 teachers and administrators in charge of school canteens. For further para-professional training, a lecture was organized in June 1964 for the professors and students of the Electro-Technical Institute. In June 1969, a seminar was held for the dietitians of secondary schools.

d. Education of Elementary Schoolchildren

During the last two years of elementary school, 18 lessons in nutrition are given by the teachers: six in the next to last year, and 12 during the last year. This instruction in nutrition makes use of audio-visual aids and of two booklets designed to perfect the teacher's knowledge in the field of nutrition. The booklets are of two levels of difficulty. Both are intended for instructors who are either bilingual or unilingual. In addition to the booklets, two film strips are used in the classroom to cover subjects of nutritional interest. Some 25 posters have been approved and reproduced in 90,000 copies to illustrate for the pupils the nutrition ideas presented in the lessons. The teacher also uses flannelgraphs. All the audio-visual materials were largely financed by UNICEF.

The meals served at school are also a practical means of imparting nutrition education. The composition of menus allows the supplementation of the unbalanced meals taken at home by the pupils. The number of children who take advantage of the free meals offered at school canteens is about 25 percent of the total school population. In 1957-58 the number of school canteens was 752 with 91,639 participants; we had reached 1,473 canteens in 1964-65, with 160,000 children served. Planning for 1969-70 anticipates that canteens will number 2,000, with 210,000 students involved.

2. Public Health

a. School for Patient Care

Parallel to classes in therapeutic dietetics intended for male student nurses, there are 12 classes in nutrition, which brings the total to 20 classes a year. This nutrition program was initiated in 1951.

b. Hammam-Lif School for Nurse-Hygienists

A training course of 14 lectures in nutrition has been given since 1963. Industrial health workers have had the benefit of a 12-lecture course since 1964.

c. Seminars for Hospital Dietitians, Purchasing Agents, and Midwives

Twenty-seven persons received nutrition training in November 1963.

3. Social Affairs, Youth, and Sports

After a few nutrition training seminars had been held solely for health educators and rural social workers, it was decided to include nutrition education in the official curriculum in the form of theoretical and practical lectures, internships, and guided tours.

a. Health Educators

Seminars were held for 3 days in February 1958, 6 days in February 1959, and 6 days in August 1959. Regular lectures were scheduled starting in 1960.

b. Social Workers and Rural Extension Workers

Seminars were held in 1961 for Algerian social workers. Regular lectures have been held on the average 20 times a year since 1963.

c. Staff of Children's Villages

July 18-30, 1964, nutrition lectures were given to the staff of children's villages. Already in 1962, a 3-day seminar with 38 participants had allowed the staffs of Enfants de Bourguiba centers to hear 16 lectures relating to the planning of menus for the children.

d. Teachers of Physical Education

Under the sponsorship of the National Sports Institute, a course of 12 lectures a year given in the second and third years was started in 1963. The special needs and diets of athletes are amply commented upon in this course of instruction.

e. Directors of Summer Camps

A series of eight lectures was offered in April 1964.

4. Cultural Affairs

Nutrition education gained entrance to this new field of action by means of the fight against illiteracy with six lectures in August 1964. In March 1963, a training course of eight lectures was given to rural teachers.

5. Agriculture

a. Seminar

To awaken the personnel in charge of rural production to the problem of animal proteins and their importance, workshops were held in October 1962 in the amphitheater of the National Agricultural School in Tunis on the theme of the "breeding of small animals." For 6 days, the 121 persons who participated in 19 workshops and tours had the opportunity to study all the problems concerning the breeding of small farm animals as it relates to the health of man and to food production.

b. Curriculum of Agricultural Schools

As the subject matter discussed in their courses evolves from one chapter to the next, students receive concise nutritional instruction on the needs of man and the manner to meet them. It is expected that the gardens will lead to further interest in food raising and its role in covering the needs of man.

6. Education of the Public

We try to make use of every opportunity to publicize the notions of nutrition capable of improving the diet of Tunisians.

a. Fairs

Each year, at the Tunis Fair held in October, a wing is reserved for nutrition, whether human or animal, and exhibits on the development of animal products. In 1961, the fair at Nabeul, main town of Cape Bon, had a booth for the Ministry of Public Health and Social Affairs; its theme was "Human Nutrition and a Balanced Diet." In April 1965, the Nabeul fair again was active in nutrition.

b. World WHO Day

On April 8, 1963, the anniversary of WHO, the theme of "The Diseases of Hunger" was selected by the international agencies to stress once again the hunger that threatens the world, especially the less industrially-developed areas, and to fight more effectively this terrible threat to all humanity. As part of this world-wide event, Tunisia discussed its nutritional problems extensively, both abroad in London or Geneva, and at home with the officials of the nation, united under the Néo-Destour party, as part of the social reconstruction program.

c. Meetings to Popularize Concepts of Nutrition

Invitations are received from all governorates to present to the public and to the officials of Néo-Destour cells and of the National Union of Tunisian Women simple notions of nutrition and good feeding. Already from March 16 to 19, 1964, four presentations were made in the Governorate of Nabeul -- at Soliman, Nabeul, Grombalia, and Kélibia. Others are in preparation for the governorates of Sousse and Gafsa. At these meetings, two types of publications are handed out, both with a maximum of figures and minimum of text. The titles are "Diet and Health" and "What You Need to Know to Eat Better."

Popular articles on nutrition have appeared in Ikra, the newspaper published by the Ministry of Cultural Affairs to initiate illiterates to reading.

d. Tunisian Society for Dietetics and Food Hygiene

Since its foundation in 1956, this group has been concerned with the study of probable causes of malnutrition in Tunisia. Tunisia's protein problem was the theme of a symposium on the occasion of Tunisian Dietetics Day and was the subject of a special issue of the Society's journal in April 1956.

Other questions relating to nutritional deficiencies observed in Tunisia have been covered in studies and popularization programs aimed at the different social strata. Radio Tunis broadcasts of the Tunisian Society for Dietetics and Food Hygiene held once a week for the last three years, continually inform the public of dietary requirements and of economic means at the disposal of the consumer. Active members of the Society have gone to all maisons du peuple of the Tunis Governorate to present two series of talks dealing with alcoholism and its ill-effects, and with low-cost balanced nutrition.

Since its location in 1970 at the National Institute of Nutrition, the Society has been able to enlarge its extension activities. On February 13, 1970, it sponsored a lecture on "The Biological Value of Olive Oil" which was delivered by a specialist in the field.

Two subsidiaries of the Society have been formed: the Association of Tunisian Diabetics and the Association of Tunisian Food Industries.

A "free forum" for diabetics provided further instruction to these patients by having them taste beverages and cakes prepared by the Food Technology Division of the National Institute of Nutrition.

Nutrition extension meetings are taking place in the governorates at the request of the governors to inform local officials of local nutritional problems and of the means recommended for solving them. Seeing the satisfactory results obtained in Kasserine, le Kef, Jendouba, Médenine,

Gafsa, Sfax, and Béja, the governors would like to have all delegates of their departments benefit from this nutritional training.

The Society also directs its activities to the public with a quarterly bulletin whose first issue is at the printer's.

7. Nutrition Education by Simple, Practical Means

Nutrition education is being carried out at all consumer levels (mothers, pregnant and nursing women, children, adolescents, and adults). The techniques are designed to hold attention, be easy to remember, and relate usefully to applied nutrition projects.

a. Mothers and Pregnant Women

Instruction is given to women who attend MCH centers or child care services in several ways. Practical demonstrations are made of the preparation of baby foods and weaning foods. All attempts are made to suggest the most worthwhile. Audio-visual aids, such as posters and flannelgraphs, teach mothers the proper diet for their children. The value of breast-feeding is emphasized.

b. Children

In the various groups they attend, children are given food that complements the family meals; these occasions are an opportunity to instruct children in nutrition. School canteens offer all pupils this opportunity. Children in "Bourguiba villages" are entirely fed at their respective centers, where meals are planned to cover all physiological needs. The distribution of a cup of milk at some other child care centers compensates in large part for the deficiency observed in these children. At the National Institute of Physical Education, the boarders, most of them adolescents, find that the meals served them during the day contain the necessary ingredients for the harmonious development of their physical and intellectual faculties.

c. Adults

The feeding of some adult groups is also supervised and controlled to provide balanced and adequate diets. On request of the physician in charge of Military Health for the Armed Forces, a series of menus has been established to meet the needs of soldiers. Factory canteens have expressed the same desire to provide meals for workers with the essential nutritive elements to meet their physiological needs. Prison inmates have received the same attention and a diet calculated as a function of their very different physical and physiological needs. Some hospitals have initiated structural reforms to include dietetic food preparation. Already, one of the principal hospitals in Tunis has such a service with dieticians in charge. In other hospitals, dietetic kitchens are included in the expansion plans of the institutions.

8. Nutrition and Planning

In 1969, the Tunisian Government expressed the firm desire to provide the population with the benefits of rational nutrition. The level reached by the country in the field of nutrition education and popularization must now be evaluated so that we may better coordinate programs and reach the objective of an improved diet for the population. This is the task assigned to the Sectorial Committee for Nutrition and Food Planning, which delegated it to the Sub-committee for Nutrition Education. In its report of 1969, the sub-committee examined nutrition education according to a four-point plan:

- The motive of education;
- The major themes of education;
- Ways and means;
- Beneficiaries and their nutritional requirements.

It appears from this study that a prime consideration is to identify the nutritional problem within its

geographical context. It is also extremely valuable to combine action in nutrition education with research in the field. In practice, this will consist, whenever possible, of associating with social workers operating in the field, a team of nutritionists, sociologists, and economists responsible for analyzing the project and drawing from it elements and themes suitable for effective use in teaching, training, and information. To insure a maximum of success, it is desirable that all concerned sectors operate in close liaison with one another so as to insure the desirable cohesion, coherence, and efficiency, and to avoid the dangers of dissipated effort and a lack of homogeneity.

9. Conclusion

Nutrition education is thus proceeding slowly within state and private institutions, with a well-trained technical staff and the right materials to achieve the greatest success in the campaign for a good diet. Here lies the hope that man may be sheltered from poverty, famine, and underdevelopment and live his promise as the essential element of a better society.

C. Applied Nutrition and Child Feeding

1. Feeding in Schools

Applied nutrition holds a priority position in current programs to fight malnutrition. To this end, the serving of food in educational institutions is the most extensive program in scope and number of beneficiaries. It affects more than 500,000 persons, that is, 10 percent of the present population of Tunisia. Approximately 87 percent of this group are students of elementary schools, that is children between the ages of 6 and 12 to whom the school lunch is of vital importance. At this stage of their development, nutrition is especially important, and the typical family diet is generally not well-adapted to the particular needs of growing children. Table 1 gives data on the school food programs. Several typical menus served in various educational institutions are given in Tables 2-5.

2. Feeding of Other Groups

The Government's concern for improving the feeding of the population has not been limited to schools. Actions of this nature are encountered in all governorates. They affect quite varied groups and take the form of distribution of food in as large amounts as the resources of the country allow. Although it is not possible to give the exact number of beneficiaries of these programs, the available information leads to an estimate of 35,000 persons among the following groups: professional training centers; children's centers (enfants de Bourguiba and child care centers); boarding institutions of the National Committee for Social Welfare; institutions for the elderly; government work projects; vocational centers; rural girls home economics centers; training centers for coordinators; civil service institutions; some places of employment (factories, administrative offices, etc.); MCH centers.

It is apparent that group feeding is becoming increasingly important in Tunisia. This feeding must meet two objectives: fulfill the needs of the recipients and educate them to become active vectors of nutritional education.

Because of its importance, great attention must be paid to group feeding. The figures mentioned above indicate that this type of nutrition may play a determining role in the general nutritional situation in Tunisia.

V. GOVERNMENT POLICY TOWARD MALNUTRITION

A. Nutrition Policy in Tunisia

For some time, Tunisia seems to have had on hand all that is necessary to establish a policy toward malnutrition. In the last few years, a number of components of this policy have progressively come to light. Nutrition sections have been created in some ministries (Public Health and Social Affairs, National Education, Agriculture, and Planning, etc.). Actions in the area of nutrition have been taken in various fields in answer to the multi-disciplinary character of this discipline. We can mention in particular:

1. A number of food and nutrition investigations are intended to determine the food situation, and the extent of nutritional deficiencies.

2. Food hygiene legislation protects the health of the consumer.

3. Nutrition education has been initiated at different instructional levels; publicity campaigns and training seminars are held with a view to the preparation of future generations in a more rational attitude toward diet.

4. Programs of food distribution to school groups and others, provide at the same time a food supplementation and the correction of the habitual diet of a number of recipients.

5. The development of a weaning food and the experimental project of lysine enrichment of cereals, are a happy orientation of applied research to nutrition.

6. In general, the satisfaction of man's fundamental need for food is a major objective in the 10-year projections for economic and social development and expresses the government's will to offer a better diet to the population.

B. The National Institute of Nutrition

The Government's will has taken concrete form in the creation of the Sectorial Committee for Nutrition and Food Planning to formulate recommendations to achieve the above objective within the framework of development plans. The Committee consists of four sub-committees: the Sub-committee for Nutritional Standards, the Sub-committee for Group Feeding, the Sub-committee for Nutrition Education, and the Sub-committee for Food Economics.

At the same time, the creation of the National Institute of Nutrition provides immeasurably more effective coordination and permits nutrition activities to flourish

in all forms. The creation of the Institute gathered under the same roof the concerned organizations previously scattered among the various administrative sectors of the country. The activities of the Institute take place within four divisions: The Division of Applied Nutrition and Nutrition Pathology, the Division of Food Technology, the Division of Nutrition Education, and the Division of Food Planning and Economics. These divisions are discussed in the Appendix.

C. Elimination of Frauds and Enrichment of Food Products

1. General Comments

We cannot talk of fraud elimination nor of standardization in general without recalling the decree of October 10, 1919, which covered all possible avenues to be followed in the field of fraud repression at that time, for example: definition of falsification and fraud; range of application of fraud repression; executive agents; administrative procedures (inspection, sampling, review); technical procedures (product analysis, interpretation of analytical results); judicial procedures (experts, expert opinions, contradictory opinions, penalties); standardization, quality and characteristics of different products (chemical and organoleptic criteria, calibration, labeling, etc.).

2. Repression of Frauds

a. Organization

Because of the diversity of products to be controlled, the Repression Board, acting under the economic authority that has in turn been the Board of Industry and Commerce and the Ministry of National Economy, is experiencing an expansion of its range of action. This expansion, however, can only be qualitatively and quantitatively effective in the appropriate executive framework. Thus around 1950, this office split into the Fraud Repression Board and the Export Control Board, working still in close collaboration.

Although the Export Control Board has control over the quality of export commodities, the judicial aspects of exportation remain under the jurisdiction of the Fraud Repression Board.

b. Proposed Legislation, Decrees, Regulations

Although in his own field anyone may prepare modifications or amendments to a law, a decree, or a regulation that has become obsolete, only the Fraud Repression Board can give it official sanction (initiate the project, call a meeting of the appropriate commission, then after ministerial approval has been obtained, enter it in the official record, the Journal Officiel).

c. Analysis of Samples

Only the Central Laboratory and the Pasteur Institute, both state agencies, are empowered to make analyses.

d. Executive Agents

Inspectors, fraud controllers, and export controllers carry a heavy administrative and economic responsibility. Called upon to act as advisors, guides, and judges, these officials must be well-versed in administrative, technical, and judicial matters. The necessary staff which should originate in our developing countries remains limited. This will be taken into consideration in the near future.

e. Standardization

Although this chapter of food legislation is rather voluminous, it is nonetheless incomplete or obsolete in some cases. Many staple products, such as sugar, tea, some fruit juices, extracts, honey, etc., do not fall under standardization regulations. The articles concerning wines, liquor, and beer are rather old and in need of revision. The section concerning such products as jams, jellies, marmalade, canned fruit, artichokes, etc., are only verbatim

copies of other standards (AFNOR) ignoring any cultural and climatic consideration proper to our country.

f. Revision, Future Projects

Future project: According to decree 69/178 relating to the creation of the National Institute of Nutrition, the Institute is assigned the responsibility of revising, completing, and preparing new laws regarding fraud prevention.

Project being implemented: Gathering in a single volume all laws and regulation pertaining to fraud.

Projects to be implemented: Analyses of Tunisian products, establishment of norms for various foodstuffs and agricultural commodities according to the values arrived at after analysis. This can be initiated only after the Institute is located in permanent headquarters with adequately equipped laboratories as planned.

3. Enrichment

Tunisian legislation is silent on the subject of food enrichment. This operation therefore needs to be regulated by the appropriate documents, based on the experiments currently underway in the country concerning the enrichment of cereal products.

D. Pricing Policy

The Tunisian economy is essentially a market economy in which prices are determined by supply and demand. But it is also a planned economy necessitating governmental intervention in the fields of consumption, capital investment, imports, and exports; the Government is responsible for the allocation of resources, for meeting the goals of the plan, and for accelerating the economic and social development of the country. Governmental intervention in the allocation of resources cannot take place without administrative action and price control.

This question can be approached in another way. Planning probably requires that pressure be applied on the

total resources of the economy, possibly giving rise to inflation; and inflation in turn may cause either a price rise, or an unsatisfied demand, or both together, as well as difficulties with the balance of payments. Under these conditions, a shortage of foreign exchange reserves becomes apparent, which makes control and rationing of foreign exchange earnings an integral part of planning.

Price regulation and control, then, has a double function. On the one hand, the prices of imported goods can be fixed so as to discourage consumption and relieve the pressure exerted by imports on the reserve of foreign exchange. On the other hand, price control of imported goods reduces the profit margin arising from import licenses and prevents the prices of imported goods from triggering a general price increase in the rest of the economy.

But price control cannot take place without taking into consideration the forces that affect supply and demand. For example, prices cannot be kept constant in an inflationary period, unless the demand is itself controlled.

In this context, what concerns us most is the price of food commodities, although the prices of other goods tend to suffer the same fate. For purposes of price control, products marketed in Tunisia are divided into four main groups.

1. Perishable Agricultural Products

Perishable products have wholesale prices freely determined by quotations of supply and demand; the retail prices are based on the wholesale prices plus a margin fixed by the authorities to account for subsequent expenses and the profits and losses of retailers. The main exceptions are the prices of meat and milk which are fixed and adjusted at the retail level by the Government.

2. Products Carrying a Sales Tax

Some imported products considered nonessential, such as tea, coffee, chocolate, and cigarettes, are highly taxed at point of sale both for reasons of budgetary income

and to discourage their consumption. The prices of these products are fixed by the authorities uniformly throughout the country.

3. Uniform Prices

This is the category of products manufactured in Tunisia starting from either local or imported raw materials. The price is set according to the production cost and taxes, with a margin to cover selling costs and profits. In this category are sugar, canned goods, bread, macaroni products, flour, and a few other manufactured products intended for home use that are not food items. Since trade in food grains falls under government monopoly, and local prices are fixed by decree, the prices of cereal products, such as bread are also fixed and are modified only by government decree. The same procedure applies to sugar.

4. Self-determined Prices

Self-determination applies to imported products sold as they were imported. The retail price is then determined as a function of the CIF import price and a margin corresponding to sales costs and profits.

It should be noted that in all cases described, the fixed or determined price is a ceiling price which it is illegal to exceed. But aside from certain products like cigarettes, merchants may sell at lower prices, Again, the production cost on which the retail price is based is the average total cost per unit of production in each industrial category.

Aside from the heavily taxed items, which are a special case, prices in Tunisia are determined taking into account the interests of the consumer and the producer. They are, therefore, constantly subject to revision each time that their determining factors change.

The enforcement of price control is under a national committee and regional committees, one in each governorate. Permanent inspectors watch over the enforcement of the prices decided upon by the committees. They have the power

to prosecute any infraction of the regulations.

The following tables show the evolution of various commodity prices between 1960 and 1969.

Cost of Living in Tunis
(1962 = 100)

Expenditure Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Food	100	103	100	102	107	115	119	123	126	133
Housing	100	100	100	100	104	110	113	113	116	123
Health and medical care	114	115	100	105	108	112	118	130	132	130
Transportation	99	100	100	101	110	117	122	128	140	150
Clothing	91	93	100	113	119	120	126	127	129	129
Other	100	99	100	100	104	108	111	111	117	118
General index	98	100	100	105	110	114	118	122	125	130

Wholesale Prices
(1962 = 100)

Expenditure Item	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Food	98	108	100	107	109	115	120	127	134	137
Local products	97	102	100	104	105	115	119	127	133	136
Industrial products	99	97	100	103	113	135	142	143	144	146
Imported products	100	99	100	107	119	138	143	143	146	148
Total	98	100	100	105	110	124	129	134	138	140

The analysis of these tables indicated five points:

a. The Tunisian economy has been going through a somewhat inflationary period, especially between 1963 and 1969.

b. The year 1964 is an important year in the evolution of prices during the period mentioned, and this is due to the devaluation of the dinar by 25 percent in September 1964, the effect on the prices of imported products having been immediate as seen by comparing 1965 prices with 1963.

c. Since industrial products marketed in the country are either imported or manufactured in Tunisia from imported materials, their price has evolved parallel to that of imported products.

d. Although the prices of food commodities and other local products are not directly affected by devaluation, as were the prices of imported products, they are definitely affected by the inflation which resulted from the devaluation.

e. Whereas the prices of imported products were somewhat stabilized between 1966 and 1969, the prices of food commodities and other local products have continued to increase, thus diminishing the gap between them and imported products. This continued rise in food prices and other local goods is in part due to the rapid growth in real demand as opposed to available goods. The weighting coefficient of food commodities in the general price index of local products is rather high. This explains why the prices of local products evolve parallel to food prices.

The growth of our food production has been slower than the effective demand caused by the population growth

and the increase in per capita income. This has occasioned the deterioration of our foreign trade in food commodities, as can be seen by the evolution of our cereal imports and exports.

Average Annual Imports and Exports of Cereals
(in tons)

Period	Exports	Imports
1955 - 1959	116,782	95,734
1960 - 1964	99,561	252,900
1965 - 1969	24,946	325,851

Tunisia, which used to be on the average an exporter of cereals, has become since 1960 more of an importer.

E. Land Use

The utilization of land is an important factor regulating the structure of agricultural production and consequently is basic to the concept of nutritional self-sufficiency. The essential element of land use policy, as stated in the 10-year development plan, is crop diversification. This diversification is to bear rather on the extension of yet underdeveloped cultivation than on the introduction of new crops. Truck gardening and orchards for consumer use, market gardens for industrial use, tree cultivation, and stock-raising will be expanded. This should prevent perpetuating the situation that prevailed in 1962 at the beginning of the decade, which was characterized by single-crop cereal and oil cultivation subject to climatic hazards and market fluctuations.

The results expected from diversification are:

- Of an agricultural nature, by allowing the preservation of agricultural equilibrium;

- Of an economic nature, by the improvement of exchange rates and the diversification of

export commodities;

- Of a social nature, by raising the level of employment and spreading it over the agricultural year;

- Of a nutritional nature, by increasing the range of goods made available to consumers.

The evolution of agricultural land utilization from 1962 to 1968 is presented in the following table.

Cultivated Land According to the 4-year Plan 1968-1972
(in hectares)

	1962	1968	Difference
Trees	151,500	1,307,600	+156,100
Citrus	10,000	13,000	+ 3,000
Grape	52,000	46,000	- 6,000
Palm	10,000	10,000	--
Olive	950,000	1,070,000	+120,000
Almond	95,000	120,000	+ 25,000
Apricot	10,000	17,000	+ 7,000
Fig	13,000	16,000	+ 3,000
Pomegranate	3,000	3,000	--
Peach	3,500	5,600	+ 2,100
Plum	2,000	2,000	--
Apple	2,000	2,500	+ 500
Pear	1,000	1,500	+ 500
Pistachio	--	1,000	+ 1,000
Garden Vegetables	41,000	51,000	+ 10,000
Potatoes	3,000	5,000	+ 2,000
Tomatoes	6,000	7,500	+ 1,500
Peppers	5,500	6,500	+ 1,000
Artichokes	1,400	2,000	+ 600
Melons & watermelons	8,000	9,000	+ 1,000
Other	17,100	21,000	+ 3,900
Major Crops	2,110,000	1,990,000	-120,000
Wheat	940,000	1,050,000	+110,000
Other cereals	626,000	520,000	-106,000
Beans	31,000	50,000	+ 19,000
Peas & chick-peas	20,000	21,000	+ 1,000
Other legumes	3,500	5,000	+ 1,500
Sugar beets	1,500	3,000	+ 1,500
Flax	1,000	1,000	--
Fallow Land and Forage Crops	487,000	340,000	-147,000

This table shows the tendency to diversification in agricultural activities. For example, in the section on trees, it should be noted that there has been an increase in land area planted to all kinds of fruit-bearing trees, excepting wine grapes.

In the area of garden vegetables, the increase in land under cultivation is even more noticeable, being an increase of 25 percent between 1962 and 1968. In the section on major crops, the decrease in land use is essentially due to the reduction of fallow land. Land areas under cultivation have on the other hand increased. The increase in land area reserved to leguminous crops should be mentioned. In addition, although this table does not exhibit this fact, there is among the wheat crops an increase in land sown with soft wheat, corresponding to the growing needs of the country for this particular variety.

F. Agricultural Credit

The total population of the country is growing at the rate of 2.8 percent per year, and about 55 percent of the population makes a living from agriculture. These figures indicate the importance of agriculture in the Tunisian economy. The development of agriculture and an increased productivity in this sector are indispensable to the economic progress of the country. This not only to raise the standard of living of the rural masses, but also to achieve an increasing yield per agricultural worker and thus feed the urban population growing parallel to economic development. Without increased agricultural productivity, food commodity imports would increase, occasioning difficulties in the balance of payments which could slow down the development of the country.

Conscious of the importance taken by the development of agriculture, the Tunisian Government has always granted this sector a significant part of the total invested resources of the country. Since 1960, investment in agriculture has taken more than 25 percent of the country's gross investments. The financial sources of this investment are as follows:

1. Budgeted Investments

In Tunisia, as in the other developing countries, the state's budget reserves constitute the most important source of investment capital. From 1960 to 1968 this source represented about 60 percent of all agricultural investments. But it must be noted that 85 percent of this government investment in agriculture was spent to create or protect the national wealth and to establish the infrastructure necessary to agriculture development (reforestation, fight against erosion, dams and other irrigation works, exploitation of land, research and agricultural extension).

A large part of the remaining 15 percent was spent as subsidies to encourage capital investments by producers in fruit tree plantations, irrigation, or the development of stock-raising.

2. Investments Outside the Budget

The Government has invested "outside the budget" important sums arising from foreign aid. During the period 1962-1968, this source contributed to approximately 10 percent of the total agricultural investment, in identical proportion to budget investments concerning the various agricultural enterprises.

3. Auto-Financing

This source represented approximately 25 percent of all agricultural investments during the period 1962-1968. However, the distribution of auto-financing between the different agricultural activities differs from that of government investments and is as follows:

- Irrigation and exploitation	15.0	million dinars
- Stock-raising	7.3	" "
- Agricultural machinery	12.0	" "
- Planting	11.6	" "
Total	45.9	million dinars

4. Credit Advanced by the National Agricultural Bank (NAB)

This bank was created in June 1959 with a capital of 400,000 dinars of which 51 percent was the state's contribution. It furnishes short- and long-term loans to agriculture and finances marketing operations and the processing and storage of agricultural products such as cereals, olive oil, and wine.

Before the creation of the NAB, agricultural credit was available from commercial banks or the following institutions:

- Mutual Agricultural Credits Bank of Tunisia. This was essentially a cooperative, almost exclusively at the service of Europeans (colons).

- Tunisian Provident Association and Real Estate Savings Bank of Tunisia. These administrative organisms operated with the help of budget reserves and state-guaranteed loans. These latter institutions were the ones to which Tunisians addressed themselves.

The existence of these institutions was terminated with the creation of the NAB.

The credits advanced by the NAB are of two types:

a. Short-term loans are made to finance the purchase of seeds or fertilizers and for other running expenses necessary for the agricultural season. These loans are financed by bank deposits made by the borrowers. It should be noted that these loans are usually paid back at the end of the growing season.

b. Intermediate and long-term loans are usually made to finance the purchase of agricultural equipment and selected stock

animals, the construction of farm buildings, and the planting of fruit tress. The source of funds for these loans is a renewable fund established by the Government and the long-term foreign loans obtained by the NAB and guaranteed by the state. These loans are made to farmers on the basis of criteria established by the Government in a series of decrees issued in 1964.

Loans made by the NAB were distributed as follows:

Loans Made by the National Agricultural Bank, 1959-1969

Year	Short-term		Long-term		Total
	Personal Loans	Loans to Cooperatives	Personal Loans	Loans to Cooperatives	
31 December 1959	798.2	--	161.2	--	959.4
" " 1960	1,133.5	--	702.0	--	1,835.5
" " 1961	1,423.7	--	634.6	--	2,058.3
" " 1962	3,284.0	--	589.0	--	3,873.0
" " 1963	3,052.7	--	777.1	--	3,829.8
" " 1964	1,830.8	702.1	324.7	1,553.4	4,421.0
" " 1965	1,687.4	2,852.8	361.0	1,708.8	6,710.0
" " 1966	1,659.7	2,561.4	830.4	1,830.8	6,882.3
" " 1967	1,326.3	5,377.3	455.1	2,571.3	9,730.0
" " 1968	1,147.7	6,374.7	491.3	5,623.6	13,637.3
" " 1969	963.7	6,602.1	224.7	2,987.5	10,778.0

Note that short-term loans vary from year to year, as a function of the rainfall variations in the fall.

VI. PRINCIPAL PROBLEMS TO BE SOLVED IN THE FIGHT AGAINST MALNUTRITION

It has already been noted in preceding pages that the improvement of the nutritional state of the population is a complex enterprise because it calls upon several aspects of the socioeconomic activity of the country. This complexity is the result of the very nature of the phenomenon: man works to live, and to live he must satisfy his most urgent need, the need to eat. In other terms, all activities, whether at the scale of the individual or of the nation have as principal end to feed oneself well. To clarify this presentation, the problems to be solved in fighting malnutrition will be combined into five categories.

- The problem of income;
- The problem of production;
- The problem of education;
- The problem of technology;
- The problem of health.

1. Income

It is certain that income determines in a general way the level of nutrition. Indeed, at a time when barter and the exchange of food gifts have practically disappeared, when the population living on the production of subsistence crops is decreasing more and more, the necessity of offering the means of purchasing food products in the markets is more than ever imperative.

The improvement of nutrition depends then on the improvement of per capita income.

2. Production

By contributing to the growth of the national income, and thus to the purchasing power of the population, increased agricultural productivity allows the consumer access to a sufficient quantity of food commodities. Crop diversification makes possible the satisfaction of all nutritional needs by expanding the gamut of available food products. It is therefore, desirable to orient production

in harmony with the desirable structure of consumption in answer to nutritional equilibrium.

3. Nutrition Education

The degree of diet improvement induced by the factors mentioned earlier depends greatly on the effectiveness of nutrition education. A cash surplus can lead to the development of a consumer demand for the less necessary products, whether food items or not. Although it is not possible to ascertain to what extent these consequences can be ascribed to the urbanizing process or to the whole accelerated sociocultural evolution, there is no doubt that these two phenomena are often accompanied by the exacerbation of various forms of undernutrition and malnutrition. Thus, nutrition education becomes indispensable, whether in the form of instruction in the schools at all levels, or as mass education affecting the home and the place of employment, whether grafted as enrichment on agricultural extension, or in the context of home economics.

Guided by the reality of the country, based on adequate knowledge of needs as revealed by investigation, and taking into account buying power and available foodstuffs, nutrition education will certainly contribute to rationalizing the behavior of consumers by teaching them a better utilization of their resources.

4. Food Technology

a. Definition

Food technology is the application of pure science (chemistry, physics, biology, mathematics, microbiology) to the field of foods to study their composition, their preservation (drying, freezing, refrigeration, sterilization, fermentation, irradiation, etc.), and the changes induced in these products by storage, aging, and processing. Food technology also exercises control over raw materials and finished products, and over the prevention of waste during processing, and the utilization of by-products.

b. <u>The Role of Food Technology</u>

1) Preservation of food supplies (fresh or processed) according to the most favorable technological and economic conditions for the region or country. Preservation by freezing is not recommended in some cases, but natural drying in the sun is to be preferred in hot climates (salted meats, dried raisins, etc.). Salting is a method of preservation well-adapted to certain countries and some products, such as fish. Lactic fermentation allows products such as vegetables to retain their nutritional value. Refrigeration, sterilization, and pasteurization are recommended for certain products (milk and its derivatives).

2) Prevention of losses due to long periods of utilization. The utilization period of fresh products may be spread by processing them during the whole year; for example, orange juice, canned fruit and vegetables, fish, etc.

3) Utilization of some products is made possible by transforming them: oil (olives), sugar (beets), flour (wheat), starch (corn or rice), etc.

4) Reprocessing of some by-products of the more popular productions: molasses from sugar refineries to make yeast; by-products of milling and bolting to make a protein-rich food; utilization of olive pits, etc.

5) Manufacturing specially formulated or enriched foods, such as protein-rich foods and dietetic foods, e.g.: enrichment of flour, the main dietary

staple, with one of the amino acids and with vitamins B1, B2, niacin (PP), iron, and calcium; addition of vitamins A and D to milk; addition of iodine to table salt.

6) Issuing laws and standards for the protection of the consumer and the manufacturer.

7) Identification of toxic ingredients, such as additives, coloring agents, etc., and natural toxins.

8) Study of the biological value of various foods.

9) Establishing nutritive value tables for fresh and processed food products.

10) Helping manufacturers to solve their technical problems and informing them of all technical innovations concerning food technology.

In conclusion, food technology is the practical effective tool to maximize the utilization of the food resources existing in the country and to help in solving nutritional problems and improving public health.

5. Health

The relationship between nutrition and health is sufficiently known and recognized not to need to be discussed here. Good nutrition is certainly the most effective medication one can prescribe. Within the sphere of preventive medicine, it is less costly and more beneficial to the health of the population.

VII. PROGRAMS UNDER WAY OR BEING PLANNED TO FIGHT MALNUTRITION

The fight against malnutrition and undernutrition constitutes an immense undertaking for which it would be presumptious, even utopian, to give credit to only a few persons. The participation of all vital elements of a country is more than desirable.

The end goal of all activities of a nation is the improvement of living conditions for man. The essential component of a better life and health happens to be the satisfaction of nutritional needs. The means to achieve this fundamental objective have in part been extensively discussed in the preceding pages. What follows will simply list in outline the actions already under way or planned in the fight against malnutrition.

A. Structuring and Training of Staff Personnel

1. Creation of the National Institute of Nutrition to coordinate the efforts and the implementation of a nutrition policy.

2. Creation of a Sectorial Committee for Nutrition and Food Planning to facilitate going from "programming" to "action."

3. Training of personnel in Tunisia and abroad to meet the current shortage.

B. Current Programs

1. Studies and Research

Food enrichment. Cereals, with lysine, vitamins, and minerals; milk, with vitamins A and D; table salt, with iodine. Salvaging of wheat germ and other by-products for use in enrichment. Utilization of fish meal. Research on such by-products as olive pits.

Promotion of new products. Weaning food based on local products. Flour products: enriched bread and couscous. Improvement of group feeding by use of protein-rich foods and the formulation of new products for group feeding.

Miscellaneous. Relationship between income, biological value, and nutritive value of foods. Tables of food composition. Revision and establishment of food legislation. Aid and technical advice for food manufacturers. Improvement of facilities for storage and processing.

Nutrition education. Preparation of audio-visual materials. Publication of booklets. Publicity for nutrition and education of the public. General extension of instruction in nutrition.

Food planning. Guidance of food crop cultivation. Prediction of food demand. Determination of food consumption levels. Establishment of ration cards. Price reductions for primary food commodities.

Medical investigations. National investigation to establish the relationship between nutritional diseases and the qualitative or quantitative aspects of the diet. Clinics for the treatment of nutritional deficiency diseases, nutritional plethora diseases, and metabolic deviations. Research program in applied nutrition concerning medical nutrition experiments. Physio-pathological studies of the large nutritional syndromes as they relate to levels of food intake.

TABLE 1

Average Cost of Meals Served at Schools

Institution	Meal	Cost (millimes)*
School canteens:	hot meat	25
	cold meat	25
Secondary boarding schools:**	breakfast	26
	lunch	80
	snack	12
	dinner	69
University restaurants:	lunch	200
	dinner	200

*1 U.S. cent = 5 millimes

**Boarding schools are limited to spending a total of 185 millimes, and therefore purchase their supplies wholesale, but the limit is often exceeded.

Note:

It should be noted that menu planning at almost all public institutions does not take into account nutritional balance. Their first concern is to balance their budgets. Nutrient analysis of a number of menus brings out the deficiencies: there is a shortage of calcium and of vitamins B_1, B_2, and even A, but an abundance of starchy foods.

At all secondary schools, the students are served at tables. In the university restaurants of Tunis, a single menu is served in cafeteria self-service lines. The food is prepared according to the traditional methods of Tunisian cooking. The boarders at public institutions are all adolescents in a stage of rapid growth. Their physiological state stimulates their appetite, and therefore they eat everything given to them. However, some foods may be refused because of prejudices, for example, fish, raw vegetables, milk, cheese, even sometimes meat, or because they were poorly prepared (dishes ruined by the cook).

TABLE 2

Number of Meals Served at Schools and Number of Recipients

Educational Level	Number of Meals Served	Types of Meals Served	Number of Recipients	Age (years)	Comments
Elementary (day schools)	1	Cold or hot meal	480,000	6 to 12	300,000 meals of bread and milk: 180,000 hot or cold, depending on the canteens
Elementary (boarding)	4	Breakfast Lunch Snack Dinner	1,803	6 to 12	
Secondary	4	Breakfast Lunch Snack Dinner	52,654 boarders 5,069 day students	12 to 20	In some institutions a snack is not served
Private schools	4	Breakfast Lunch Snack Dinner	421 boarders 1,624 day students	6 to 20	Four meals are served to boarders; the noon meal and a snack to day students.
Higher Education	2	Lunch Dinner	5,572	over 20	In some restaurants breakfast is served.
Total			547,183		

TABLE 3

Meals Served in School Canteens

Cold Meal Served on Three Days
(the 2nd, 4th, and 5th)

Food	Quantity (g)	Cost (millimes)
Milk	30	
Sugar	6	0.50
Chocolate	2	1.50
Flour	125	2.00
Oil	10	2.00
Carrots (raw or cooked)	30	1.50
Parsley	5	0.50
Onions	10	0.50
Olives	3 to 5	0.50
Potatoes	30	3.00
Harissa	3 to 5	1.00
Sardines (2)	40	12.00
Fresh fruit and lemon juice	100	
Total		25.00

Cold Meal Served on Two Days
(the 1st and 3rd)

Food	Quantity (g)	Cost (millimes)
Milk	30	
Sugar	6	0.50
Flour	125	2.00
Chocolate	2	1.50
Oil	15	2.00
Carrots	20	1.00
Parsley	5	0.50
Onions	10	0.50
Potatoes	20	2.00
Harissa	3 to 5	1.00
Egg (½)		10.00
Fresh fruit and lemon juice	100	4.00
Total		25.00

TABLE 3 (continued)

Meals Served in School Canteens

Hot Meal Served One Day

Food	Quantity (g)	Cost (millimes)
Milk	30	
Sugar	6	0.50
Flour	125	2.00
Chocolate	2	1.50
Oil	15	2.00
Tomatoes	5	1.15
Harissa	5	1.00
Dried Peas	20	1.70
Fresh vegetables and potatoes	150	4.50
Fresh fruit	100	4.00
Sardine (1)	20	6.00
Total		24.35

Hot Meal Served on Two Days

Food	Quantity (g)	Cost (millimes)
Milk	30	
Sugar	6	0.50
Chocolate	2	1.50
Flour	125	2.00
Oil	15	2.00
Egg (½)		10.00
Harissa	5	1.00
Tomatoes	5	1.15
Dried peas	20	1.70
Fresh vegetables	100	3.00
Fruit (dates)		2.15
Total		25.00

TABLE 3 (continued)

Meals Served in School Canteens

Hot Meal Served on Two Days

Food	Quantity (g)	Cost (millimes)
Milk	30	
Sugar	6	0.50
Chocolate	2	1.50
Flour	125	2.00
Tripe	50	12.50
Oil	15	2.00
Harissa	5	1.00
Tomatoes	5	1.15
Dried peas	10	0.85
Fresh vegetables	100	3.00
Total		24.50

Note: Milk and flour are in principle provided free.

TABLE 4

Meals Served in One Day at a Secondary School

Meal	Quantity (g)	Cost (millimes)
Breakfast		
Fresh milk	¼ liter	15.00
Chocolate	2	1.20
Jam	20	3.00
Bread	100	7.00
		26.20
Lunch		
Appetizer:		
Parsley	5	0.50
Onions	10	0.50
Salad (carrot, or fennel, beet, radish, lettuce)	50	1.50
Oil	10	2.00
Lemon juice or vinegar		
Sardine (1)	20	5.00
		9.50
Main Course:		
Meat, poultry, or fish	75	34.00
Onions	20	1.00
Oil	15	3.00
Fresh vegetables	300	10.00
Tomatoes	10	2.00
Spices		2.00
Dried peas	20	2.00
Fruit (1 orange)	100	4.00
Bread	200	13.00
		71.00
Snack: (chocolate and cheese on alternate days)		
Bread	50	3.50
Chocolate		3.00
		4.50
Bread	50	3.50
Cheese		15.00
		18.50
	(average cost	12.50)

TABLE 4 (continued)

Meals Served in One Day at a Secondary School

Meal	Quantity (g)	Cost (millimes)
Dinner		
Meat	75	34.00
Onions	20	1.00
Oil	15	3.00
Vegetables	300	10.00
Tomatoes	10	2.00
Spices		2.00
Dried peas	20	2.00
Fruit	100	4.00
Bread	150	11.00
		69.00
Total cost of meals for one day		188.70

TABLE 5

Typical Menus Served in a University Restaurant

Meal	Dish	Composition
Lunch		
Appetizer	Green salad hard-boiled egg mayonnaise	50 g lettuce 50 g grated carrots or radishes 1 egg ½ egg yolk in mayonnaise 5 g oil
Main course	Roast chicken potatoes	chicken weighing 1.25 kg 250 g oil and butter 250 g potatoes spices
Dessert	Fruit	2 oranges
Average cost of the meal: 200 millimes		
Dinner		
First course	Cream of vegetable soup	200 g vegetables
Main course	Chakchouka with eggs	1 egg 10 g oil 10 g tomatoes spices 100 g *merquez* 150 g potatoes 150 g bread
Dessert	Cheese and 2 oranges	portion of cheese 200 g oranges
Average cost of the meal: 200 millimes		

REPORT ON NUTRITION IN THE UNITED STATES

The United States occupies a large part of North America as well as the Hawaiian Islands. The States proper cover a surface area of 9.4 million square kilometers, Alaska 1,523,000 square kilometers, and the Hawaiian Islands 16,700 square kilometers. In 1967, the population of the United States numbered 200 million inhabitants of various ethnic groups, of whom about 25 percent were under 15 years of age and 9 percent were 65 or over. The birth-rate in 1965 was 19.4 per thousand and the mortality rate 9.4 per thousand. The natural demographic increase was approximately 1.5 percent per year between 1960 and 1965.

In 1964, the life expectancy of an American was 70.2 years. The ten major causes of death, in order of importance, were as follows in 1964:

1. Heart disease
2. Malignant tumors
3. Vascular lesions affecting the central nervous system
4. Accidents
5. Certain diseases of early childhood
6. Influenza and pneumonia
7. General arteriosclerosis
8. Diabetes mellitus
9. Other diseases of the circulatory system
10. Other respiratory diseases

I. FOOD PRODUCTION

Out of a population of 200 million inhabitants, less than 5 percent devote themselves to agriculture. In 1954, 60.8 percent of the total land area of the country was tillable; in 1959 this figure had dropped to 58.9 percent. Hawaii and Alaska are not included in these figures. For the sum total of 50 states, an area of 1.4 million hectares was cultivated. In 1961, the agricultural yield was 67 percent higher than that recorded in 1939.

Although food production in the United States is in the hands of a very low percentage of the population, intense mechanization of agriculture and the use of fertilizers permit growing enough food for the entire population and even exporting agricultural surpluses. For example, in 1965, export figures for some commodities were as follows:

Meat	150,000 tons
Dairy products	300,000 tons
Corn	14 million tons
Wheat	19 million tons
Rice	12,000 tons

II. NUTRITION PROBLEMS AND MEASURES TAKEN TO FIGHT THEM

Considering the enormous production reflected by the above figures, one might think that the United States has no nutrition problems. Unhappily, this is not the case. We have to face the same problems that Africa needs to solve; the essential difference is in the intensity of these problems and, up to a point, in the differences in age distribution of the population.

In great part, nutrition problems in developing countries are associated with the scarcity of food products, which manifests itself in deficiency diseases. We, on the other hand, suffer to a greater degree from disorders associated with abundance, although we are also subject to disorders due to food deficiencies.

Because of the nutrition problems that exist in the United States, the Government recently created (August 1967) a Nutrition Program within the Public Health Service, as part of the National Center for Disease Control. The Program is divided into two sections: the International Section, and the Domestic Section. The International Section is concerned with the food difficulties of foreign countries and assists them in solving their nutrition problems. The Domestic Section has conducted nutrition investigations in some states of the United States and will continue its work until the studies have covered the 50 states.

The data that follow are a preliminary report based on the rather hasty evaluation of the partial results obtained during surveys carried out in five American states (three in the south -- Texas, Louisiana, and Kentucky -- and two in the north -- New York and Michigan). These surveys summarize the general characteristics of the populations under study from the point of view of nutrition.

It must be underlined that the population samples were not chosen on the general basis of the United States, but selectively by state in the poorest regions concerning the least fortunate quarter of these populations. Criteria for selecting these samples were age, sex, ethnic origin, annual income, housing, parents' education, and the importance of participation in the programs of public assistance and school canteens. As a whole, the groups so selected have the following characteristics:

1. They include a large percentage of young people (under 15 years) and old people (over 65 years); the average age varies with the states, but in the selected groups the average age is younger by 10 years than the general population.

2. A high percentage of the population of the United States is of African or Puerto Rican origin, and were given a large representation in this study.

3. There are large variations between states, some having a population of African origin representing 80 percent of the total, others, a population of European origin with the same percentage. The income level is also quite varied, going from extremely poor groups to relatively well-off groups.

4. The education level revealed that the majority of heads of household in the study had 8 years of school, but a strong minority had less than 4 years.

5. The number of families taking part in food assistance programs is in general limited to those with the lowest income, but a lack of statistical data prevents establishing a close correlation between poverty and malnutrition.

In summary, the people studied in the five states that were the object of this survey have the following characteristics: poverty, inadequate housing, poor education, little participation in the food programs of the government, and a majority of African and Puerto Rican origin.

A. Nutritional Problems

The studies revealed numerous nutritional problems whose clinical signs are evident in the skin, the visual organs, and biochemical analyses. Among the subjects of the investigation, 3.8 percent of the population suffers from goiter, even though the iodization of salt is practiced by a large number of states.

The most important deficiencies noted during the survey were the following:

1. Anemia

In all the states we studied, hemoglobin levels were deficient in an important percentage of the subjects. These levels are the lowest among members of the poorest families. But the prevalence of this deficiency suggests a public health problem that should be treated in a general way.

2. Iron

Perhaps in connection with these anemias, the iron content in diets is notably insufficient. But although anemia seems to relate to poverty, iron deficiency seems to relate to the ethnic make-up of the sample. One should then in these cases increase the iron intake by enriching cereals, and some states are considering a 50 percent increase in iron consumption thanks to these supplements.

3. Vitamin A

The lack of vitamin A is remarkable in a large number of subjects and seems most marked among the young in the age group 6 to 16. There seems to be no correlation

between this deficiency and income. The studies indicate a generalized insufficiency which, therefore, presents a serious risk that needs to be dealt with urgently. We are now looking for the means to increase the consumption of this vitamin, especially by the young.

4. Vitamin C

The intake of this vitamin is also insufficient in a large number of persons. It appears especially in the oldest age group and has only slight relationship to incomes. This leads us to think that this problem must be treated at a general level.

5. Vitamins of the B Group

These vitamins are sometimes deficient; from 4 to 20 percent of the populations have insufficient excretion rates; there is no obvious relationship between these deficiencies, age, and income.

6. Protein

On the other hand, the lack of protein is not common in the United States; and if it exists, it represents a minimal fraction of the nutrition problem.

III. CONCLUSION

One may be surprised that in a country that exports food commodities and as a whole enjoys a high level of development, the problem of malnutrition is not completely solved. This very recent discovery has incited us to think that the problem must be even deeper in countries that are less well-favored than ours. It is this discovery that has led us to give a priority in our domestic and foreign policies to the solution of malnutrition problems, both known and still to be discovered. We firmly believe that the improvement of the nutrition of the masses, the elimination of pockets of malnutrition where they exist, are indispensible to economic and social development and to progress. It is this conviction that brings us today in front of you, in the hope that we may help each other to raise the standards of living of our people.

THEME PRESENTATIONS

NUTRITION AND HEALTH

Presented by Dr. Julien Mezu,
Director, National School of Public Health, Gabon

Recent discoveries, such as those of Cravioto in Mexico, Monckeberg in Chile, and Coursin in the United States are throwing new light on the importance of nutrition during early childhood. It is not only the survival of the child that is threatened, it is his intelligence, his future role in the development of the society of which he is a part. This is of particular interest to us whose main concern is health. The new data must not make us forget what we already know, that is, that the resistance to infectious diseases is conditioned in large part by the quality of nutrition. It is also well-known that an individual's productivity, his capacity for work, the extent of his mastery over his environment, are also conditioned by his quantitative and qualitative diet.

Under these circumstances, one may ask why the problems relating to the nutrition of our people are not in the very forefront of our political and social preoccupations.

A. Nutrition and Mental Development

The most recent statistics indicate that 300 million children, representing approximately two-thirds of the world's children between the ages of 1 and 10, consume quantitatively and qualitatively inadequate diets and have some degree of physical and mental retardation as a consequence of their malnutrition.

Recent studies carried out in Uganda, Nigeria, Mexico, Peru, and Indonesia have clearly demonstrated that undernutrition affects the mental development of children. Psychological tests have shown that malnourished children function at a level inferior to those who have been well-fed.

The development of organs can be measured by the number of cells which they contain at a specific moment. The quantity of DNA in cell nuclei is constant for each animal specie, so that by measuring the total quantity of DNA in an organ one can calculate the number of cells it contains. It has been observed that during the growing phase, the number of cells in the brain is influenced by nutrition. When nutrition is inadequate, the number and quality of brain cells is diminished. The consequences of this discovery cannot escape you. In man, the most important development period for the brain occurs during gestation. At the end of the first year, a child's brain reaches 70 percent of the weight it will have at the adult state. At the end of the second year, its development is nearly complete.

As a result, the intellectual development of the child goes through an early critical period during which the future of intelligence is at stake. This critical time starts in the womb and it is probable that the child's brain development may be determined by his mother's diet. This is a fact to be taken into account. It is not yet certain that the changes caused by malnutrition in the number and quality of the cells are absolutely irreversible, but this seems extremely probable and points to the importance of nutrition in the first two years of child development. If malnutrition continues, the brain continues to grow, but its content of sodium, potassium, and chlorine is inferior to what it should be (Widdowson, Dickerson, and McCance, 1960).

Gaber has shown that among children of developing countries, muscular efficiency is often superior to the norm for European children of the same age. This condition persists if the children are fed adequately. If, however, their food is insufficient and poorly balanced, their physical and mental activity drops by 25 percent below the norm for their age (Cravioto, 1968).

It seems evident that the duration and intensity of the nutritional deficiency influences the normal maturing of brain cells. Gaber and Dean have shown in Uganda that children precocious at birth are capable of maintaining their precocity during breast-feeding but lose this

advantage during the second year when their food consists mainly of bananas and low-protein mush. Gesell and Thomas have shown that the children of underdeveloped countries who at the start of their lives have a psychomotor development superior to American and European children of the same age, lose this advantage as their nutrition further deteriorates. The oldest child gives the worst results.

Cravioto, in his work, has examined the performance of children malnourished for 6 months, between 6 months and 30 months, and more than 30 months. Psychological tests were repeated every two weeks. The first tests constantly revealed motor deficiencies and anomalies in social behavior and the development of language. The diets were then gradually improved and the performance improved in parallel manner. Interestingly, the mental age quickly caught up with the chronological age, but the development of language took longer (Cravioto, Robles, American Orthopsychiatric Association, 1964). Similar results were obtained by Ramos Garvan in Central America and by Canosa in Columbia. Gallais and his collaborators have indicated that the number of abnormal electroencephalograms among young adults was higher in regions where kwashiorkor is frequent. Stock and Smythe, comparing in Capetown a group of marasmic children with controls of the same age and sex, found in studies continued over 11 years that the malnourished group continued to exhibit a considerable physical and mental retardation as measured by their weight, size, cranial circumference, and psychological tests.

Monckeberg, at Santiago in Chile, has tried to show the relative importance of malnutrition and cultural deprivation in two comparable groups. These children all belonged to a social group with low economic means where intellectual stimulation was equally inadequate; but whereas one group received a satisfactory diet, the other was getting a deficiency diet. The psychological tests revealed 3 percent mental anomalies in the well-fed group and 40 percent in the malnourished group. In addition, it has been demonstrated that defective genes cause disturbances of protein metabolism resulting in mental disturbances revealed by phenylketonuria. If a proper diet is instituted early, the consequences of this malformation can be avoided.

All these facts relating to children allow us to give positive answers to the following questions based on animal experiments:

1. Does malnutrition at the start of life cause a measurable and important mental retardation even after the diet has been improved? The answer, according to Barnes working with animals, is positive.

2. Is this insufficient performance due to the inability to learn or to a lack of motivation to learn? The answer is that the desire to learn has probably been damaged by malnutrition at a critical age.

3. Are the consequences of malnutrition on the capacity of the subject to receive education temporary or permanent? According to animal studies, it is extremely probable that these effects are permanent.

4. What is the degree of malnutrition necessary to obtain important differences in human behavior? The answer is that even a small degree of malnutrition occurring at the start of life can cause an irreversible retardation.

It seems then that there is an impressive correlation between the results of human observations and those of experimentation on animals.

B. Nutrition and Productivity

To these new ideas, fundamental as regards underdeveloped countries where education plays a prime role, should be added the older and well-established notions concerning the relation between productivity and nutrition. Consolazio recently recalled that in Taiwan two groups comparable as to sex and age and asked to perform the same task under identical conditions, gave very different performances according to whether the diet fed the teams contained sufficient amounts of thiamine, riboflavin, niacin, and vitamin A.

The restricting of calorie intake has considerable influence on the ability to work for an extended period. This was demonstrated in the United States during the Second World War as well as in Germany in coal mines and elsewhere. I do not wish to burden you with graphs and figures, but I can assert that these notions have the desired mathematical confirmation.

C. Nutrition and Disease

The third point to which I would like to draw your attention is that of the relations that exist between infectious diseases and malnutrition. The World Health Organization has devoted a well-documented technical report to this question. I believe that this report should be read by everyone and its conclusions should give us much to think about. The report underlines that there is no doubt that the combination of malnutrition and diarrhea is one of the more important causes of mortality. During the first year of life, the rate of occurrence is 100 times as high in developing countries as in developed countries. In the age group 1 to 4 years, this rate is 500 times greater.

When we consider measles, the importance of malnutrition in the prognosis of this disease is striking. According to Morley, 50 percent of the children in West Africa catch measles before the age of 20 months, and 75 percent have caught it before the age of 3 years. On the other hand, in England, only 50 percent of children have had measles before they are 5 years old. The mortality caused by measles is infinitely higher in countries where malnutrition is common than where it is not. Morley found a mortality from measles of 25.3 percent; in Sénégal, Cantrelle found a 17 percent rate.

The mortality from whooping cough is considerable in underdeveloped countries and its relation to kwashiorkor is evident.

But the most serious thing is that our vaccinations lose their effectiveness in malnourished regions. Viteri, in Guatemala, has shown that smallpox vaccinations cause a lowering of nitrogen retention in one-half of children in a

state of malnutrition. Brown and Katz have shown that the production of antibodies initiated by yellow fever immunizations was seriously handicapped by malnutrition. The WHO report mentioned earlier declares that children who suffer from kwashiorkor produce only few or no antibodies when they are vaccinated against typhoid fever or diphtheria. All this is not surprising when we know that the quantity of gamma globulin in malnourished children falls from 1,000 milligrams per 100 cubic centimeters of serum to 400 milligrams.

In conclusion, I would like to state that the specific points I have discussed are of major importance in planning for development and could induce planners to shift some priorities in favor of human resources.

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GENERAL DISCUSSION

Prof. Chedli (Tunisia): Let me first thank Dr. Mezu for his presentation so rich in useful references and valuable information. We all know that there are, of course, other areas beyond those mentioned, in which the diet influences health conditions: the role of protein in the accelerated metabolism in case of fever, or its role in compensating biological losses during infection are also important. But I understand that the speaker has chosen to stress the least known points. The floor is open for discussion.

Dr. Chakroun (Observer): Any correlation between mental development in the child and the state of nutrition should be measured through psychological testing. I would like to ask the speaker which standards were used in the Gabon tests? How were these tests calibrated? In Tunisia we are cautious in applying foreign psychological testing methods to our local populations.

Dr. Muremyangango (Rwanda): I would like to ask the speaker to give us more information on the relationship between malnutrition and congenital malformations. What is the mechanism for these changes?

Dr. Seffar (Morocco): For my part, I would like clarification on the following point: in his paragraph 7, the speaker quotes Gaber who found that muscular strength in children of developing countries was often greater than that of European children of the same age.

Dr. Buyoya (Burundi): I would like to ask the speaker if the research conducted using well-nourished and poorly-nourished children took place in the home among the family or in clinics or hospitals.

Prof. May (United States): Mr. President, before calling upon Dr. Mezu for his answers, may I make a few points myself? I fully agree with Dr. Zakroun on the caution which should be used in any interpreting psychological tests developed in one culture and used in another. Also, I would like to tell Dr. Buyoya that I agree with him when he underlines that there can be significant differences

in the results of a test, depending on whether it is given in the home or in the hospital. Obviously, in a foreign milieu the response of the child is bound to be less favorable than at home. All these psychological tests have only relative value, but they permit us to confirm certain suspicions and they encourage further investigations. Animal testing allows more precision but it is always difficult to assert that such results apply to man. In Guatemala, very convincing experiments were made using samples from the same culture but in different environments.

Finally, I would like to congratulate our speaker for limiting himself to three of the least understood consequences of malnutrition because they are bound to have considerable importance in developing countries: mental development, because if it is true that poor diet inhibits the growth of cognitive faculties, then obviously it is more important to provide children with proper diets than to send them to school; immunity, because if it is true that antibody formation is inhibited by protein or other deficiencies, then again we should be certain that the populations we vaccinate have adequate diets before we challenge their antibody response; and thirdly, productivity, because it is nowhere more important than in developing countries.

Dr. Mezu (Gabon): I wish to state that I have not carried out any of these research personally. In this case, we have limited ourselves to a summary of the most important problems which we hoped would be of interest to the group.

Dr. Lakhal (Algeria): The speaker made a point in which we are extremely interested. Neither have we in Algiers made any conclusive experiments. So far, we have limited ourselves, in collaboration with the Medical School, to some research on psychomotor development in relation to nutrition, continuing similar research made by Professor Sarrouy's team.

Our major problem is one of priorities. Since we do not have enough money to do all the investigative work that should be done, we are compelled to choose. Once we have chosen, we have to convince the economists to give us the funds needed for our research and programs. Planners

have a way of answering that "planning is nothing but the art of organizing scarcity." Well, we would like to persuade these economists that something should be done to prevent out children from acquiring any irreversible handicap even before they reach school age. These people want figures -- cost/benefit relationships -- which, of course, we do not have. Therefore, we have to support our requests with intuitive opinions and considerable circumstantial evidence; but nothing that would convince fund providers that we should feed our people decently, if only to valorize our human resources.

Dr. Kallal (Tunisia): I would like to turn the discussion to three subjects which are important in Tunisia. I would like the representative of the Swedish Development Authority (SIDA) to tell us a little about his work at Kebili and about his experiment concerning the relationship between parasitosis and nutrition. Then I will ask Dr. Hamza to tell us something about his experience with rickets and protein deficiency in Tunisia. Finally, I would like Dr. Young to talk to us briefly about the work he has undertaken here concerning the relationship between nutrition, growth and intelligence.

Dr. Borjeson (Observer): In February 1969 we examined all the children between the ages of 0 and 5 years in two villages in Tunisia, making a total of 372 children. We found that 13.7 percent of all these children suffered from protein-calorie malnutrition: 31.6 percent of the children between 12 and 24 months presented the same symptoms. Many children between 6 and 24 months have a weight which is inferior to the norm. Thirteen percent of these children had rickets; between 6 and 12 months the rate was 39 percent. Eighteen percent had a hemoglobin rate of less than 11 grams per 100 milliliters. Between 12 and 24 months, the rate of anemia reached 25 percent. Angular stomatitis, a symptom of riboflavin deficiency, affected 13 percent of all the children, but particularly those aged 4 years, among whom the morbidity rate was 25 percent. Various skin infections were seen in 25 percent of the cases. The number of intestinal worms increased with age. The children were all reexamined in October 1969 and, as we had expected, we found more cases of protein-calorie malnutrition following the period of diarrhea which coincides with

the summer season. By contrast, the cases of rickets had almost completely disappeared.

These facts confirm that the weaning period is a critical period for the infants. A nutrition survey made at the same time supported the clinical results. Following these surveys, our nutritionists developed an easily prepared weaning food based on local products. We are introducing it at this moment.

Dr. Hamza (Tunisia): We do not have in Tunisia any conclusive evidence to offer showing the adverse relationship between nutrition and mental development. Regarding kwashiorkor, we have made some followup studies of children we had treated and cured. Unfortunately, out of 180 cured children, we were only able to trace 20, all of whom had developed normally physically. Regarding their mental development, we found it difficult to evaluate and to correlate this with diet, because we also recognize the role of the environment. To reach an opinion, these children would have to be followed through the school years. But even then, the distinction between dietary and environmental factors would be difficult. All we know is that in animals dietary deficiencies in the pregnant female seem to influence the litters. But it is always difficult to extrapolate such results to man.

Regarding rickets, there is an apparent contradiction between its high rate of prevalence in North Africa and the abundance of sunshine. I do not believe, however, that our rickets can be blamed on protein deficiency; when this exists, we find growth retardation but not necessarily rickets. As for the influence of sunshine, we must not forget that local habits do a lot to circumscribe its beneficial effects. Many children are kept indoors much of the time during the summer because of the heat and during the winter because of the cold. Moreover, infections play a role, whether intestinal or respiratory, and this, in my opinion, predisposes the child to rickets. We often give injections of vitamin D_2 to our children between the ages of 3 and 6 months, but our results have not yet been tabulated.

Concerning nutrition and immunity, let me say that in Tunisia we have been giving massive vaccinations for many years. No school-age child can escape. As a result, we have not had a single case of smallpox since 1948. We started mass vaccinations against poliomyelitis in 1963, but this disease, which has disappeared from Europe and North America, is still very common in underdeveloped countries, especially in North Africa. Yet, I do not believe that this is due to malnutrition. There are too many other factors which could be responsible for this situation. I agree that the problem of the relationship between infection and malnutrition is very important. As a matter of fact, I am willing to say that malnutrition makes the bed for infection and increases its intensity.

Dr. Young (Observer): Since early 1966, the Harvard School of Public Health, and more recently, the Departments of Pediatrics and Public Health of Yale University School of Medicine, in collaboration with the Tunisian Ministry of Health, have been exploring relationships between degrees of poverty and infant and child development, both physical and mental. Systematic sampling of children by social class from birth to 11 years, has provided sufficient information to confirm the major findings of the feasibility study of 1966. These results, confined for the moment to males from 6½ - 11 years, show a constant relationship between socioeconomic class and human development. The less privileged were smaller and lighter and performed far less well on the three non-verbal intelligence tests, that is, Kohs' Blocks, Porteus' Mazes and the Goodenough-Harris Draw-A-Man, Draw-Yourself tests. These were all significant differences, and in the case of the psychological tests, very highly so. In addition, the impoverished had a lower level of physical health, significant in the areas of skin dryness, skin infection, lordosis, muscle mass, and upper and lower respiratory infection.

These relationships are, in toto, between social class and the human condition. Selection for social class has not been controlled and factors within social class which might be responsible have not been identified. However, intensive family interviews in the feasibility study of 1966 indicated inadequate nutrition among the underprivileged and great differences across the social spectrum.

In order to explore possible causal relationships, we carried out a small longitudinal nutrition study confined to small children 12 - 24 months of age. This study was interventional in nature; observations were confined to physical growth. The experimental (food-supplemented) group grew more in bone muscle arm circumference, had a better health index, and advanced in neuromotor development in a more satisfactory manner than the control groups who received respectively: a calorie (normal protein) supplement plus medical care; and medical care alone. It seemed, therefore, that the supplement of more than 1 g of animal protein per kilo of body weight per day may have been causally related to the health and growth differences. These results must be confirmed in a longer and larger study in which mental development will also be observed.

Prof. Chedli (Tunisia): The relationship between malnutrition and immunity is of considerable importance. I cannot say that I have personal proof that it exists, but I will admit that there are disturbing facts. On the one hand, we can see that there is no longer any smallpox in this country. On the other hand, in spite of the vaccination campaigns reaching all children over 3 months at least once, and sometimes twice, there is still poliomyelitis in this country. Is it possible that there is a difference in the duration of the immunity raised following vaccination in underdeveloped countries and in developed countries? Yet, our strains are the same as those from developing countries; our vaccines are also the same. It is, however, true that the immunity in our country seems to disappear after 3 or 4 years while in developed countries it seems to last 5 or 6 years. This should be explored further to give us the answer to the problem of the relationship between nutrition and immunity.

Dr. Bono (Chad): In the report we have heard, the speaker insist upon the correlation between productivity -- the capacity to do work -- and the qualitative and quantitative diet. This is a valid observation with two consequences. The first is that it seems that it would be sufficient to feed an individual to make him productive, but this has not yet been observed. The second is a corollary of the first: why are not nutrition problems in the forefront of our political and social concerns? I am glad to hear our

Algerian colleague approach this problem directly in terms of priorities. We may have other priorities. We notice what technological advance can bring, and we notice our backwardness by contrast. So we want to take the shortest path, use all the most effective means to try to catch up; therefore we set up priorities, and the health service does not necessarily get the best place.

We are brought to ponder our role as physicians, and I believe that it is a very small role. It is limited to analysis, to becoming aware, to sounding an alert, but we cannot do more. We come up against the economists, the planners, the financiers who tell us to develop activity sectors, which when they are in full bloom will permit us to solve our other problems. And this is true: we cannot fight malnutrition in the context of economic underdevelopment. Yesterday, we heard that the United States has problems of malnutrition, although they do not occur among the higher economic levels but among the disadvantaged. A man who can afford it improves his diet spontaneously. A poor man is willing to take anything edible he finds in a garbage can.

Dr. May (United States): To the delegate from Algeria, I want to express my sympathy, because the task of explaining to economists the importance of nutrition in development is a difficult one, and I have often been frustrated by it. We who are convinced that health is the beginning of development rather than its end have for years tried to preach this gospel, and we have gathered the most convincing documents. We have so much evidence that the most stubborn economist cannot help but pay attention to our suggestion that it is not possible to develop a consumption economy of 3,000 calories per person on a subsistence diet of 1,800 calories. I shall send you these documents on mental deficiencies due to malnutrition.

We are also convinced that it is not enough to put money into people's pockets to improve their diets. To Dr. Bono I would say that while it is true that malnutrition is more widespread among the poorer strata of society in the United States, there is also malnutrition among the rich which is the result of different food habits, just as defective. My point is that dietary improvement does not

run parallel to wealth and there are many studies in support of this contention. The work which is needed for development can be done only by people who have some education and who are well-fed. The purpose of this meeting is to convince the highest governmental authorities that this is the truth.

Dr. Bono (Chad): I would like to ask Dr. May another question: How can we turn the non-productive diets we suffer from into productive ones? I want to emphasize that I am not recommending simply handing out money to people, but also creating an infrastructure extending into the agricultural sector, stimulating a high level of industrial productivity, and increasing the national income. When this infrastructure exists in a society, the mentality changes: there is a different world outlook between the man who walks on the moon and the man who walks behind a plow, while perhaps suffering from malnutrition. I have a hard time believing that people have to be fed before they can develop; and in this case how can we first increase the nutritive value of the diet?

Dr. May (United States): How to increase the nutritive value of diets? By placing the emphasis on subsistence crops until salable surpluses accumulate. If in addition you improve the quality of education, you have a good mix. If you put development ahead of health, you create a two-class society, one class of technocratic managers, and the other of obedient manual workers. Of these two classes, one exploits the other. The technocracy can only be benevolent if it arises from a large middle class that is 10 times more numerous than the two other classes together. If you look at history, you will see that the expansion of technology began with agriculture; when Europe ate dried herring and poor quality flour, no one was walking on the moon.

Professor Kallal (Tunisia): I would like to add that there are plethora diseases in underdeveloped countries, and deficiency diseases in developed countries. Here in Tunisia, we see diabetes, high fat and high cholesterol syndromes, and high levels of uric acid in the blood. One may wonder whether, because of the monotony of the diet, there may not be an intermediate metabolism responsible for

the modification of any nutrient to transform it in an unfavorable direction.

Concerning the children from underdeveloped countries who start off at an advantage, is this not a consequence of breast-feeding which imparts a more durable immunity and sustains the child for a while, after which the benefits of this cultural trait are lost?

Dr. Mezu (Gabon): May I answer Dr. Seffar about his question concerning the muscular strength of children from underdeveloped countries who allegedly are ahead of children of the same age in developed lands? I do not think there is any need for experimental support for this clinical observation which has been made many times and which anyone can repeat. It so happens that the author I quoted has confirmed it statistically.

Dr. Raba (WHO): It appears that the major reason for the better early performance of the African child is that this child remains closer to his mother during his early life. In Europe, for various reasons, mothers act differently and the European child receives less close attention than the African child. As far as intellectual development and calorie and protein malnutrition are concerned, work done in recent years has clearly indicated a correlation. However, I do not think there is need to dramatize, because it is admitted that in the majority of developing countries 80 percent have a deficient diet. It cannot be denied that such a diet causes injuries that may be permanent. But for that to happen, the child must be affected during the first 6 or 7 months. The deficiency must be very pronounced and last a certain length of time. This is very important, because corrective programs must be started with the young child during his first year. Secondly, it seems that because of urbanization, weaning takes place ever earlier and this causes the deficiency to occur in ever younger children.

Mr. Kisamare (Burundi): I would like to tell the delegate from Algeria that the African countries may have difficulty defining their priorities for moral reasons, because they are not the masters of these priorities. When a country

has established its priorities, it has to find financing for the projects involved. It then turns to the developed countries or the international agencies who, in turn, orient the priorities to another field. There is talk of unprofitable projects even when these projects have been planned in the context of national realities. Let me give an example: let us suppose that a country plans a social and educational project. It is often very difficult to finance this project, whereas a mining or economic venture will easily find financing. A moment ago, Professor May said that he had in his office many projects intended to contribute to the improvement of health and nutrition in underdeveloped countries. I am asking him to tell us whether he has found it easy to finance them.

Dr. May (United States): I will answer this in a very simple way. The Minister of Education of Burundi is absolutely right. It is extremely difficult to make economists and funding agencies understand this point of view. But I can tell him that the governments of the United States and of Tunisia understand it in large part -- since this conference is taking place.

Mr. Adandé (Gabon): After this comment by the Minister of Education of Burundi, I do not think that I have anything more to say, because I was just going to comment along the same lines. I would like only to emphasize that the delegates should not leave this hall thinking that economists exist to close their doors to physicians. I would like to emphasize that we economists and you physicians speak almost the same language, since we start our thinking from the same outline. Consequently, I only want to say what all of us here know, that economics does not have priority over politics.

Dr. Lakhal (Algeria): May I ask Dr. Young if, in connection with his studies, he has explored the nutrition of mothers during and after pregnancy? The important fact that he stressed was the absence of difference in the development of children from wealthy parents and from poor parents during the first month of life.

Dr. Dziri (Tunisia): Our colleague Dr. Lakhal from Algeria asked whether mothers had been studied in the two group

investigated by Dr. Young. I am myself taking part in this work and we have made food surveys in the families. Since the sample children are from poor and middle-income families, there is no great difference in the social and economic levels. In fact, food preparation habits are the same for these two social groups, at least in Tunisia. What would be very important to see would be whether there are differences between the very well-to-do classes and the very poor, because there the economic potential is very different. But between the middle class and the poor there is no difference since the method of food preparation is the same. We carried out our little survey on a sample of 75 children from three groups, and we questioned their mothers and found no differences.

Dr. Mezu (Gabon): I would like to share with the conference the results of a personal observation. I am a young doctor and do not have much experience yet. I have not yet done any research. But I want to say that at the maternity hospital of Libreville we are now collecting statistics on the somatic characteristics of newborns. These statistics are still fragmentary, so that the results we have obtained so far are not entirely valid. We have observed that in Gabon a rather large number of newborn infants have a small birthweight, and these disadvantaged children all come from the poorest families. I think that this confirms what I said in my paper. One of the critical periods in a child's development is the gestation period. When a woman is well-fed, this is reflected in the development of the child.

Prof. Chedli (Tunisia): During this session we have reviewed the relationship between health and nutrition. This is a question of prime interest for us. We must discriminate between malnutrition and undernutrition; and if health disturbances occur due to malnutrition, there are also, as mentioned by Professors May and Kallal, problems of excess or of nutritional imbalance; but this second aspect of the problem is much less acute than the deficiency problem.

NUTRITION AND AGRICULTURE

by Dr. Julien Périssé and Dr. Marcel Autret
Nutrition Division, FAO

All economic development plans have as a goal raising the standard of living of the population. It is then evident that one of the priority objectives must be the improvement of the diet and the nutritional state, since in developing countries, man spends the greater part of his time in insuring his subsistence. On the other hand, good nutrition is indispensable to increase ability to work and productivity, and finally to insure the success of the development plans that make an ever increasing demand on human investment.

Agricultural development, then, can be neither anarchic nor spontaneous. At the national level, it must be inspired, oriented, even directed so as to take into account the consumers' nutritional needs, the budgetary constraints of the households, production potential, financial resources, and the amount of foreign exchange available to the country to provide itself with necessary equipment.

Some economists say, "Leave it to us; the rise in purchasing power will take care of all your problems." Yes, but when will this goal be reached? Should the nutritionist fold his arms while economists base agricultural development on industrial crops, although large segments of the population are underfed and malnourished? Should he be content with scattered small educational projects associated with the charitable distribution of gift commodities to the poorest people? This "ladies aid" concept must find its proper place in our minds as we turn to the essentials of the problem.

The essential aspect of the problem, in our opinion, is that the nutritionist must play an active role in the planning of agricultural development and in the

establishment of food policies -- so that development schemes, which often have a tendency to ignore man, may take into account the behavior, the wants, and the needs of the consumer.

I. NUTRITIONAL APPROACH TO FOOD PLANNING

Starting from the recent experience of the Indicative World Plan prepared by FAO, I am going to try to show you how we envisage a nutritional approach to food planning. Planning starts from the situation existing during the base year and attempts by means of coherent models to determine a set of goals for the target year. In food planning, the economist and the nutritionist will attempt to create a coherent development model simultaneously using monetary value and calories and nutrients. They will later be drawn into dialogue with production and exchange specialists to define food policy.

The evolution of a plan goes through three stages: a planning stage, an implementation stage, and a control and adjustment stage. Here we will only consider the first step or planning stage. It consists in the following steps:

- Establishing for the base year inventory data and an analysis of existing structures.

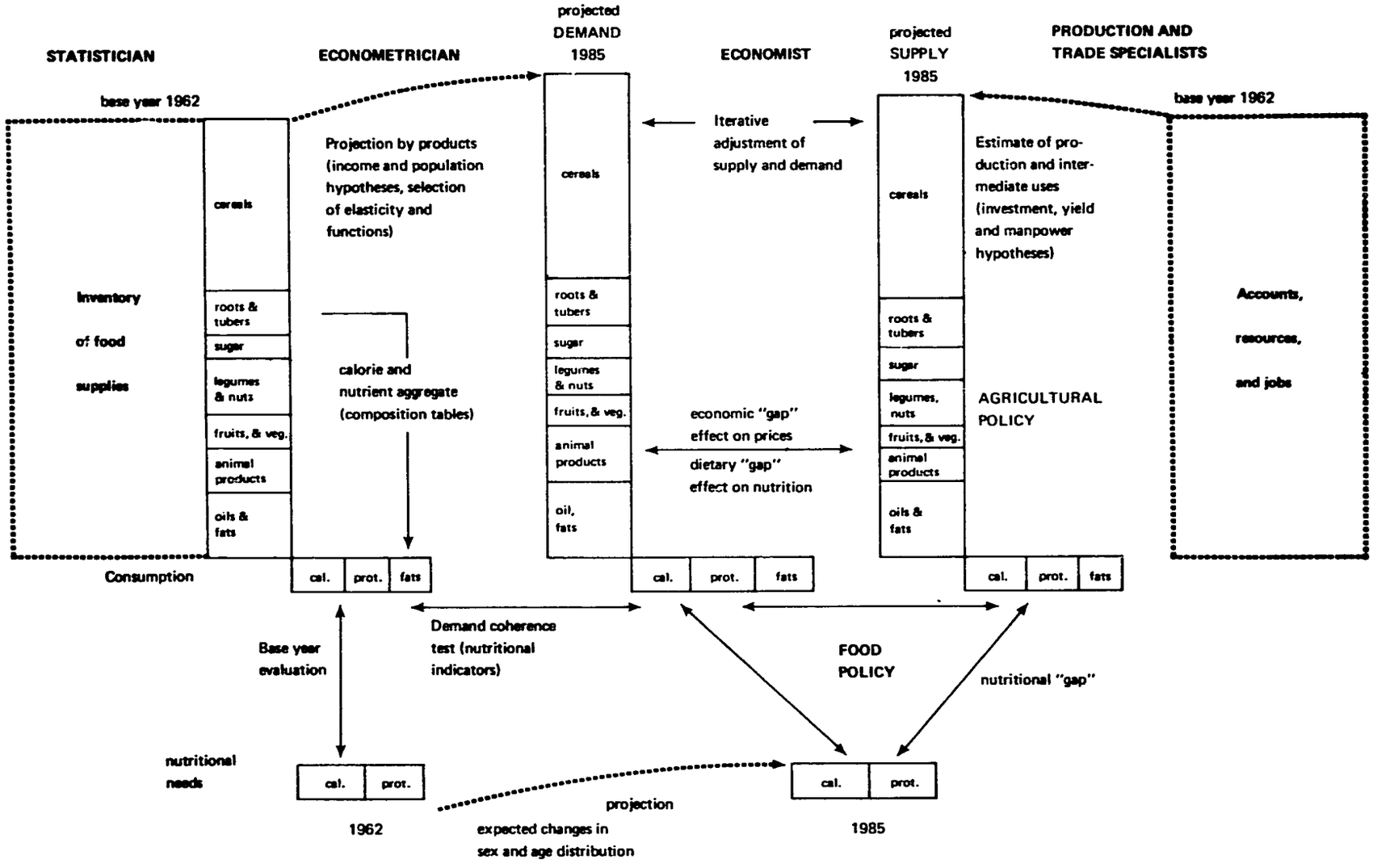
- A priori determination in a quantitative way of the desired goals for the target year.

- Research and calculation of the technical, financial, human, and other means necessary to reach the desired goals.

- Adaptation of the desired goals to the available means by shifting objectives and establishing successive iterations.

In the area of food planning with which we are concerned, the phases outlined above take the form shown in the accompanying graph.

AN INTERDISCIPLINARY APPROACH TO FOOD PLANNING



A. Inventory Data and Structural Analysis for the Base Year

1. Inventory of Available Food

Starting from the economic data of the nation, the economist, together with production and trade specialists, prepares individual product accounts (resource and use accounts, indicating quantity and value) showing the various stages of utilization and processing until the consumption stage.

Food supplies are then expressed as physical amounts per capita. The nutritionist then steps in to apply to the different products the appropriate food composition tables and expresses consumption in terms of calories and nutrients. The nutritionist must be able to express his opinion on the net available supplies and must maintain a critical attitude. As it is, many data on production, animal feed, seeds, industrial use, losses, and exploitation costs are often based only on gross estimates. Based on his own knowledge of local food habits, he is then led to suggest modifications for certain products to bring them more in line with what is known of consumption levels. Experience shows that some foodstuffs with little economic significance, but which are interesting from the standpoint of their nutritive value, such as game meats, wild foods, and fruit, may have been omitted or erroneously entered in the columns relating to "non-food usage." This gives rise to underestimates which must be corrected. In other cases, notably roots and tubers, the figures given sometimes represent a "potential" harvest that is not necessarily collected, hence a sometimes considerable overestimation of supplies.

2. Estimate of Physiological Needs

Starting from the demographic, climatic, and anthropometric data, the nutritionist evaluates the per capita calorie, protein, and eventually vitamin and mineral needs. In the same way, the economist takes from population statistical data the population growth rates, the urbanization rates, and other data he will need to formulate hypotheses for the development model.

3. Structural Analysis by Consumer Surveys

Inventories of food supplies are only a national average that hides the different aspects of the food problem. Only a consumer survey using sampling techniques and employing weighing and interviews will provide the required knowledge. It allows tracing the harvested foods from the households through the processing they undergo, noting quantities that are rejected or sold, and quantities that are bought, bartered, offered or received as gifts, and to categorize these foodstuffs as autoconsumed or marketed, as local or imported. It is a dynamic study of family activity that is achieved.

From the results, the nutritionist can define the nutritional type of the investigated population, study the consumption habits and the solutions adopted to preserve or prepare foods, and evaluate their nutritional value.

The economist will be able to use the data on utilization of commodities to refine the production and foreign exchange statistics, to itemize valuations by product type, and to estimate the added valuation at different intermediate stages. In addition, knowing the family budget helps to place in perspective the relative needs, both objective and subjective.

The consumer survey is thus an unequalled tool to estimate food conditions in a given country at a given time. In the agricultural field, it is the only means of establishing national economic accounts and realistic inventories. But the survey is more than that. By the suitable breakdown of the sample, it can account for seasonal variations, and for the influence of socioeconomic factors on consumption. The nutritionist can then:

- Identify the most critical periods of the year;

- Find out through distribution analysis the number of families affected by diet deficiencies;

- Identify the most disadvantaged human groups by means of correlations with family size, employment, and income;

- Measure the effect of diet deficiencies in nutritional terms;

- Finally, suggest appropriate practical measures.

The analysis of the different entries under total expenditures and food expenditures permits an economist to:

- Study the seasonal variations of demand and evaluate the capacity of trade circuits to satisfy it;

- Notice at what level in the economy the different segments of the population exist;

- Identify the groups most capable of change;

- Establish correlations with income and elasticity coefficients for quantity and value, which will make it possible to predict consumption trends.

It will then be possible to estimate future food demand and to take into account population growth, urbanization, and changes in income levels, and their implications on agricultural production and imports.

Such a food survey becomes the first step in and the basis of development plans.

B. A Priori Determination of Goals for the Target Year - Food Demand

It is tempting for a nutritionist to imagine a target diet such as to satisfy physiological needs. Actually, he is often asked how much should one consume of beans, oil, etc. The question is badly put -- an ill-informed nutritionist may be tempted to formulate an answer, and in some countries, well-intentioned planners have erroneously taken these answers as economic

objectives. In fact, a nutritionist is able to estimate needs in terms of calories and nutrients (rather like a physiological demand) but, to supply these nutrients, there exists an infinity of food combinations. He would be in error if he tried to indicate to a planner the actual quantities of products to be consumed in the target year. He would arrive at an arbitrary normative diet, which could not be justified scientifically, and which most likely would not be economically realizable.

An economist, on his own, may be tempted to suggest a diet that would satisfy physiological needs at the least possible cost. It is possible by linear programming to select the various elements of the diet so as to minimize cost for the optimum biological value. That is what is successfully done by producers of cattle and poultry feed. But man feeds himself primarily with foods and not with nutrients. And it is not possible to neglect the psychosociological aspects connected to the act of eating that have a profound conditioning influence on the acceptability of foodstuffs. This approach will lead nowhere as long as it is not possible to quantify motivation by means of suitable investigations so as to include it in mathematical form with the other parameters that define foods in economic and nutritional terms.

It remains for econometric techniques to provide the planner with the means to imagine the changes that will occur in household consumption for the duration of the plan. These techniques utilize the consumption functions[1] and coefficients of elasticity.[2] They are used in some

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1 Consumption functions: log log, semilog, inverse log, inverse log log. See L. M. Goreux, "Income and Food Consumption," Monthly Bulletin, Economic & Statistical Agriculture, Vol. IX, No. 10, Oct. 1960.

2 Coefficients of elasticity. The elasticity of the consumption of a product relative to income is the ratio of the relative increase in consumption (y) of this product to the relative increase of consumer income (x).

$$\frac{\frac{dy}{y}}{\frac{dx}{x}} = e$$

developed countries in market analyses to predict the evolution of demand for consumer goods, especially industrial products. One of the merits of the Indicative World Plan is that it attempts to apply this method to the various subsistence products that make up the available food supply, so as to estimate national demand for the target year.

This method not only permits taking into account the increase in demand due to population increase (an easy but inexact procedure) but also the quantification[3] of structural changes in the diet due to a rise in personal income as anticipated in the plan.

The evaluation of demand thus becomes coherent from the economic point of view, for the projected increase of the different elements of the diet will be compatible with the anticipated rise in personal income.

These econometric techniques are therefore very attractive. The nutritionist must, however, be aware of their weaknesses and their limitations, as well as of the means of reducing projection errors to reasonable dimensions.

1. Methodological Difficulties with Econometry

Actually, there is at this time too little information on the evolution of food demand as a function of income. Most of the time, what is available is qualitative coefficients of elasticity based on too infrequent budget analyses usually done in urban areas; but what we want to quantify is the evolution of demand at the national level (urban and rural) not only qualitatively but

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3 Income is only one of the variables that account for changes of behavior; its interest arises from the fact that it can be measured, but it is only the result, at the consumption level, of a number of economic and sociocultural factors so interrelated that they cannot at this time be isolated and separately quantified.

quantitatively. Quantitative coefficients of elasticity are also available from the study of chronological data. These figures, as opposed to the first ones, are directly applicable to the national level, but unhappily the body of statistical data available in developing countries is essentially concerned with imports.

In rural areas, an important part of consumed goods comes from autoconsumption. It can be assumed that a higher income will not have the same effect on these products that it will have for consumers in a market economy.

In countries where consumer surveys exist, it would be possible to improve the precision of demand projections by making a distinction between urban and rural people. One would then take into account both the rate of population growth and the urbanization rate, and one would make different income hypotheses for each of the two strata. These two sets of projections would later be integrated into the national level.

From the point of view of food, this entails defining two types of diets representative of the population groups, and hence making use once again of a national budget and consumption survey, instead of being satisfied with the national averages found from the inventories of food supplies. One conclusion is already apparent: demand projections will only be correctly made if:

- Economists and nutritionists are given the results of a national budget and consumption survey;

- These results are treated with modern analytical techniques to correlate income and consumption levels for the different groups studied.

It will then be possible to lift the uncertainty from the coefficients of elasticity and the consumption functions (log log, semilog, etc.) and appreciably improve the quality of food supply information to be used as the base year.

To reduce the errors inherent in the method, a coherence test must be applied to the results. This test must bear on nutrition, for the economist does not dispose of the means of judging whether his projection of demand corresponds to a physiological reality and whether it is near or far from the nutritional optimum. Since he must deal individually with each component product of the diet -- products which are numerous and consumed in quite unequal quantities -- he runs the risk of a much greater error than the one that can be made by the nutritionist evaluating as he does much larger aggregates (total calories, proteins, fats) and protected as he is by the guard rail of physiological data. It is, therefore, the nutritionist who must make a value judgement of the calorie and nutrient demand.

2. Nutritional Coherence Test

Starting from the base year inventories, the economist applies to each food or group of foods in the diet what seems to him to be the most appropriate coefficient of elasticity and consumption function, according to the data he has available. At this stage, the economist, with monetary units, and the nutritionist, with calories and nutrients, test the coherence of the data.

The economist calculates the cost of the projected diet (qualitative aggregate) and the qualitative elasticity resulting from the food demand and the income. He evaluates its validity by comparing it to the results of budget surveys and national accounts, and by comparing it to other nations. He checks whether, assuming constant prices during the target year, the part of income used for food expenditures has increased in absolute value and decreased in relative value.

To find out whether the projected demand levels are realistic, the nutritionist expresses this demand in terms of calories and nutrients and compares it to physiological needs. He then examines whether the structural changes in the diet imposed by income effects are coherent in nutritional terms. To do this, he expresses the calorie and protein value of each of the projected products and calculates for the totality of products the per capita demand for 1985.

The nutritionist finds this result acceptable because he notices as compared to the base year:

- A slight increase in calorie level (slightly positive caloric elasticity of 0.4);
- A percentage increase in animal protein compared to total protein;
- A very slight change in protein calorie level;
- A more noticeable increase in the fat calorie level;
- A reduction of the starch calorie level;
- A lowering of the percentage of calories due to cereals, roots and tubers, and sugar, as compared to total calories.

This evolution of the different indices agrees with what is known of the effect of income on dietary structure.

We can see that the nutritionist has the means, starting from the information given him by the economist, to judge the coherence of demand projections. In fact, in countries where the hypothesis of increased income is high, modifications in the dietary structure are considerable; the coefficients of elasticity and the demand functions must be handled with care. Only a calorie and nutrient analysis is capable of keeping within reasonable limits the error inherent to the product projection method. The dialogue between economist and nutritionist is therefore not only desirable but imperative. It will lead to an interdisciplinary exchange of ideas richly instructive for the establishment of a food policy.

3. Nutritional Analysis of Food Demand

What is meant by this demand? It is the reflection of laissez-faire. It is what the consumer would consume if the hypothesis of higher income proved true and if the potential for increased productivity and foreign exchange were able to come up to the level of this demand.

At this stage, the nutritionist may open the dialogue with the economist to identify certain elements of food policy, but the actions to be taken can only be truly formulated when it is known at what level supply will operate.

By using as reference the projected needs, the nutritionist is able to say whether the demand is near or far from the nutritional optimum. He is then able to identify the products that have a favorable or an unfavorable effect on dietary equilibrium and to formulate qualitatively what seems to him a desirable orientation; for example, reduce the demand level for sugar, increase the demand for legumes, for certain fruit, obtain the shift from tuber consumption or from some imported cereal to some other traditional cereal. These new alternatives will be suggested to the economist who will transmit them to the technicians responsible for the study of supply.

If the nutritionist finds, for example, that in a given country the projected level of sugar consumption is such that it is an important factor in the calorie and protein disequilibrium, he may suggest putting a brake on demand by taxation measures. To quantify this alternative, the economist assumes a fiscal policy (quota or taxation) and he will introduce elasticity in prices so as to reduce the elasticity/quantity of demand. In this way, he will revise on the down side the demand objectives of the product in question. Consequently, sugar, which, for example, was entirely imported because local production costs were too high in comparison with world prices, may because of this taxation become a profitable enterprise. It may then be possible to consider a local production facility and refinery, and their effect on employment, investments, etc. will need to be studied.

C. Projected Level of Supplies for the Target Year - Supply Level

As a first step then, the dietary demand has been established for individual products, with alternatives in some cases (as for sugar), and the global coherence has been tested in terms of calories and nutrients.

The second step consists in evaluating the supplies. In this case, livestock and crop production specialists and trade experts will estimate, by product, what are the levels of supply that may be reached by the target year of the plan, taking into account possible improvements in productivity and import-export possibilities. The economist will assign cost figures to the necessary capital investments (dams, fertilizers, technical training, etc.) to reach these production goals. He will study whether this is compatible with the predicted resources and employment level as they arise from the projected economic accounts and the development model (economic coherence).

In the same way, the nutritionist will compare the projected level of supply for the different products with the projected demand from the preceding estimates. It may happen, for example -- and this is likely in a number of semi-arid countries with intensive livestock operations -- that the technician will say that the increased animal production will be barely capable of keeping up with the population increase. In this case, the per capita consumption will not go up, and the high demand resulting from a high per capita increase will not be satisfied. From the economic point of view, since supply does not meet demand, the price of meat will rise, which will lead the consumer to spend more to consume the same quantity of animal products (supply and demand adjustment).

From the nutritional point of view, the per capita calorie level being sure to rise because of the predicted improvement in staple food supply, and the protein level being unable to exceed that of the base year, there will unavoidably be a degradation of the calorie and protein dietary balance in the target year. In nutritional terms, this will appear as reductions of the protein calorie level, the net protein utilization (NPU), the net calorie percentage of dietary protein, and as a reduction in the percentage of animal proteins in the total proteins.

To avoid this degradation of the diet and increase, at least possible cost, the level of protein calories, the nutritionist can propose two solutions, either simultaneously or separately:

- Accelerate the shift from root and tuber consumption to cereals;

- Increase the consumption of legumes.

It is possible, for example, that the agronomist will be able to produce legumes in excess of the projected demand. This potential production will materialize only if prices are supported, that is, if the demand grows and is capable of absorbing the production surplus. For example, nutritional calculations will show that it is necessary to double the consumption of legumes to avoid the degradation of the protein calorie level. Econometric calculations will also show that to reach this objective, the coefficient of elasticity of these products, which in terms of demand was 0.4, must go to 1.0 to satisfy supply. In this case it is implied that legumes should have the same appeal for the consumer that meat has. This is very unlikely.

In this way, it is possible to estimate the degree of realism of the structural changes that are being considered for the nation. The constraints to be inflicted on the consumer to make him accept modifications in his spontaneous behavior will be all the greater, the greater the spread between the observed elasticity of demand and the desired elasticity needed to satisfy supply. If one wishes to meet this ambitious objective, it will be necessary to modify drastically the consumer's behavior by special measures (publicity campaigns, subsidies), to propose new appealing forms of the product to improve its acceptability (food industries), and even eventually to consider coercive measures to force consumption in devious ways without paying attention to acceptability. This is what a planner does when he decides by decree to introduce 10 percent cornmeal into wheat flour intended for bread-making. If these diverse measures are thought to be too restrictive for the consumer and too costly for the budget, the objectives of supply will have to be revised downwards.

We see, then, that a series of adjustments and alternatives outline a nutrition policy in which the nutritionist plays an active role. He will estimate whether spontaneous improvements brought to bear on the dietary

structure because of changes in consumer behavior (linked) to income changes) are sufficient or not. He will suggest increasing or reducing the consumption of certain products to reduce the nutritional deficits that show up between supply and needs. He will then be able to sort out the elements of a nutrition policy, which, if they are accepted, will aim to promote consumption or to introduce constraints in consumer behavior to modify the demand in the desired direction so that it will adjust to the projected supply for the target year.

Consequently, nutrition policy can be defined as the sum total of legislative, economic, and educational measures designed to reconcile the projected demand levels with available food supplies and nutritional needs. The planner attempts to integrate into a coherent whole the information furnished by various disciplines. We have attempted to show here how the nutritionist contributes to this joint approach within the framework of the Indicative World Plan.

II. SUBSISTENCE CROPS AND IMPORTS

The second point we have been asked to discuss with you concerns the question of subsistence crops versus industrial export crops. In its study of Africa south of the Sahara, the Indicative World Plan made an analysis of this problem. We will only outline its main points.

A. Main Aspects of Vegetable Production

In 1962, in 24 countries harvested lands were distributed approximately as follows:

- Cereals and starch crops: 43 million hectares, that is, 67 percent of the total;

- Commercial and industrial crops: 21.3 million hectares, or 33 percent of the total.

However, more than 60 percent of this vegetable production is autoconsumed. It is estimated that of the 40 percent marketed, 20 percent goes to export markets and 20 percent to local markets, either directly or after industrial

processing (6 percent). Possibilities for state intervention in such rigid production are thus limited. Export prices and home consumption escape control.

The agricultural development of Africa has taken place as if only the degree of capitalization of a market economy separated the two production systems. But African peasant society, if it was not unacquainted with trade, could do without it. In the traditional system, land, labor, and products have no monetary value. Money itself is not a commodity. The distribution of rural spaces, the organization of labor, and the assignment of chores are often made according to community criteria, which is to say that initiative, savings, and private investment in the Western sense, etc., have not much meaning at the individual level. Finally, the African agrarian civilizations are concerned at the same time with the survival of men, and with family and community solidarity. In the ecological and historical context where they occur, they must effectively grant an absolute priority to subsistence crops, and this is what they do in terms of available land, population density, and group needs.

The main obstacles presented to development by the traditional African agricultural system are as follows:

- The techniques are very rudimentary;
- The vegetable material of African origin is itself limited;
- There is complete separation between agriculture and stock-raising;
- Crops are often movable (itinerant);
- The production factors (inputs) other than labor and land are little known; yield depends mostly on atmospheric conditions, and the harvested areas on the limits of available human energy -- limits which are rapidly reached, especially since the nutritional level is often inadequate.

B. Characteristics of the Past

However, within these severe boundaries, the traditional farmer has proved himself innovative and adaptable. For certain commodities, increased productivity has been spectacular, especially during the last 15 years.

Total African Production, of Certain Crops, 1950-1965
(tons)

Commodity	1950	1965
Coffee	280,000	1,000,000
Cocoa	500,000	1,200,000
Cotton fiber	600,000	1,000,000
Peanuts	3,200,000	5,400,000

This increase applies essentially to exports; it has allowed Africa, in spite of its lack of technical means at the start, to take its place on world markets.

The evolution of vegetable subsistence cropping intended for domestic markets is less satisfactory. Even though African farmers have until now been more or less able to keep up with population growth, local and seasonal problems are beginning to appear in some rural areas; cities in particular, tend to depend on regions outside Africa for an increasing part of their supplies. Qualitatively, approximately 50 percent of foodstuffs purchased in African urban markets have been imported. From 1950 to 1960, in all intertropical Africa, wheat imports have gone from 260,000 tons to 630,000 tons, rice imports from 96,000 tons to 300,000 tons, etc.

The African farmers have responded positively to external and internal demand incentives:

- By adopting technical innovations placed at their disposal;

- By rational economic behavior (for example responding to guarantees for prices and outlets): wheat production has doubled in Kenya and Tanzania over a period of 5 years; the rapid increase in rice production in Ivory Coast indicated that national needs will soon be met;

- By a considerable mobility of the labor force;

- By human investments representing a very high capital investment and which have been largely responsible for the development of plantations and irrigation.

This adaptability of peasants encourages us to be optimistic as regards the future response potential of African agriculture. If this response has been positive for export commodities, it will be so also for subsistence crops when they are in part commercialized. Except for a few countries where a mining economy prevails, all others have owed their first growth phase to the development of export vegetable cropping, that is to foreign demand.

Foreign demand alone was the incentive to progress. Although 67 percent of cultivated land is devoted to subsistence cropping, domestic demand, still largely dominated by autoconsumption (80 percent of consumers are also producers), has not been a determining factor. It has been met under traditional production conditions without sizable investments. Supply was easily able to keep up with domestic demand as long as the urbanization percentage remained very low; a very small increase in vegetable production was then sufficient to supply the cities. This small increase in productivity was obtained either from a slight extension of cultivated land per producer or by some limited technological progress.

C. Future Evolution and Production Policy

African producers, however, find themselves from now on faced with a rather exceptional situation characterized by a two-fold rapid transformation of demand. From the domestic point of view, this transformation will be characterized during the whole period by:

- A great global population increase: the region will have 304 million consumers in 1985, as opposed to 169 million in 1962.

- A large increase in urban population: the number of persons in urban zones will go from 30 to 92 million, and the demand will be all the greater that the standard of living will rise faster in cities than in rural zones.

- Urbanization, industrialization, large mining, lumbering, or civil engineering enterprises will bring about a change in dietary habits which is already underway in large cities.

When we consider international demand, we see that its evolution will be essentially characterized by the following points:

- The rate of increase of demand will tend to diminish for many products, as saturation phenomena begin to appear;

- Because of increased competition, or improvements in substitute items (oils, cotton, rubber, sisal) lower prices can be expected in many products;

- Preferential market prices, which still benefit most countries for some products, are on the way out;

- With competition between suppliers, importers will become harder to please as to product quality, standards, processing, etc.;

- The deterioration of commercial terms runs the risk of being detrimental to all agricultural or industrial products from developing countries, unless the mechanisms of the market and of a "free" economy are deliberately corrected.

- The market will then undergo important transformations: the rate of growth of customary exports may go down, and on the whole the outlook for

world prices is not very favorable. On the other hand, the domestic market will develop rapidly.

Faced with these rapid changes, we must recall some of the factors that will influence the evolution of supplies. First of all, the rural population will continue to grow at a rapid rate (1.9 percent per year) during the whole period under consideration. The number of rural dwellers will have increased by 50 percent by 1985. This is a noteworthy phenomenon: the modernization of Western agriculture went hand in hand with an absolute reduction in the number of farmers, which allowed an increase in the size of farm operations. The African peasant class is going to have to undergo its transformation with a sizable increase in the number of its producers, which will operate as a limit on the margin of productivity increase per person. However, this productivity must double by 1985 to meet the urban demand.

In view of this rural population expansion, a look at the available tillable land leads one to think that in the present system of itinerant cultivation, three-fourths of the nations will have no more unexploited land by 1985. There are zones where permanent subsistence is far from being guaranteed the producer. Migration, then, remains the only possible solution.

Limits to the agricultural development model also appear when subsistence crops are abandoned and replaced by industrial crops and imports of foreign food commodities. The typical case is that of Senegal, where to be able to export $3 worth of peanuts, $2 of foodstuffs must be imported. These limits are especially visible in the supplying of African towns which are increasingly dependent on the older metropolitan areas for their food supplies. Until now, little effort was put into furnishing regularly and at competitive prices local products prepared or processed to agree with the new dietary habits. Moreover, foreign imports have not been particularly discouraged. Finally, we must already point out the limits to diversification of products suitable for export.

Outlining the different factors characteristic of foreign and domestic demand underlines the considerable

difficulties which African countries and their officials will have to face. It is necessary to produce better, and at lower cost, export commodities destined to a market where competition is ever more intense. At the same time, it is imperative to supply, still at very low prices, the domestic urban markets, which are themselves subjected to competition from expansive foreign agricultural commodities produced at low cost (wheat, milk, corn, soybean oil and other oils, meat, sugar). But arable land is often limited, and some of it must be reserved for those in the coming generations who will find employment only in agriculture. The extension of the average size of exploitations therefore should not be adopted as a general means to increase per capita productivity. This productivity increase is indispensable, however, to insure nourishment for the 90 million city dwellers and also to raise farmers' individual income -- both essential goals and conditions of development. There must be a greater productivity at lesser cost and a higher income, and this within a scheme which can no longer in the end be extensive agriculture.

Sociologically, it seems possible in some regions to achieve the management of village common land and the organization of agricultural labor in an economic system much superior to the Western style family farm. (One could, for example, avoid parcelling and overequipment.) Subsistence crops, peanuts, and cotton, seem to lend themselves frequently to such a scheme.

Technically, a number of successful operations prove that yield intensification is possible, that permanent cultivation is attainable with some improvement in the soil.

Economically, the problem will in some cases be formidable; for price reductions will place a heavy burden on vegetable production at the very moment when intensive cropping will raise production costs, since intensive cultivation will require monetary inputs: pesticides, fertilizers, tools. The search for maximum daily labor output, a constant of the traditional economic system, will probably have to be abandoned for the search for maximization of the net annual income. This is truly a sign of the change from a subsistence economy to a profit economy.

In this way, in spite of considerable constraints, African vegetable production will be able to meet the demand, assuming modernization of methods and means of production. It would however be illusory to believe that natural evolution will lead to achieving the desired goals. Only specific programs will give the economic constraints.

III. IMPROVEMENT OF MEANS AND TRAINING

At the present time, although the Ministry of Agriculture is of all government agencies the one with the main responsibility for food problems, it does not play this role as actively as would be desirable. Too frequently, as has already been underlined, officials of the Ministry of Agriculture consider that human nutrition and the solution of related problems are the prerogative of the Ministry of Health. But solutions to food problems must be worked out on the initiative of agricultural specialists in agreement with the Ministry of Finance and Economy on whom depend planning and the execution of development programs.

To insure a dialogue, it seems urgent, therefore, to set up nutrition services within ministries of agriculture or to ascertain that specialized sections of nutrition institutes are organically linked to officials responsible for agricultural development.

Universities and colleges of agriculture have already added to their curricula courses on the biochemistry and physiology of animal nutrition, on food chemistry, and on the composition and economic aspects, and to complete it, to insure that nutrition will from now on be an integral part of agricultural education.

In recent years, FAO has lent its assistance to make sure that agronomists received nutrition training (for example in Peru at La Molina University, soon in Morocco at the National Agronomic Institute), and, with the help of UNICEF, it has initiated training programs for nutritionists (for example in Nigeria at the University of Ibadan). Every other year, FAO organizes in Rome agricultural planning courses for economists. Finally, FAO nutritionists participate at Dakar, Bangkok, Santiago de Chile, in

courses organized by the United Nations Economic Development Institutes.

The concept of nutrition, then, is in the air and is making progress. Much remains to be done, but in the near future it will be a driving idea, and a question of political significance urgently in need of solution; for, as Michel Cépède wrote, "We have reached the hour of impatience," and there is only barely enough time to act, if the well-fed world does not want, one day, to repent "having carelessly allowed the underfed to harvest the grapes of wrath."

GENERAL DISCUSSION

Dr. Lakhal (Algeria): I thank Dr. Périssé for the information he has given us concerning economics. We always meet with difficulties when we talk to persons connected with economics and finance. Consider, for example, the nutrition surveys done in Madagascar and in Tunisia. There is no doubt that surveys are necessary to establish a starting point, but one may wonder how to justify their high cost when the results are quickly out of date because of the rapid urbanization of our society. These studies require enormous manpower which we do not have and which we must request from others, and yet are soon to be superseded. We are acquainted with this problem in Algeria; it started during the war, it accelerated at the time of independence, and it will continue. We have to deal with transplanted rural persons who are out of their balance. Their food problems are financial ones, when they were used to a subsistence economy. How does one settle these uprooted persons?

In Europe, urbanization problems coincided with the industrial development which created a demand for labor. In our countries, urbanization is taking place before industrialization and may well become a brake on industrial development itself, since the countryside is abandoned and the land is not cultivated. What we need is to develop more food commodities and fix populations where they are. What we see in people is an ever greater desire for some types of goods and for access to what is available in cities, especially modern housing. It seems to me that what we must do is try to satisfy these aspirations in the countryside itself so as to encourage rural persons to stay put.

Mr. Adandé (Gabon): I should like to comment about the problem before us, which is the choice between industrial and subsistence crops. It cannot be maintained that industrial cropping brings more earnings to agriculture than subsistence cropping, when we take into account the constant drop of industrial commodity quotations on the international market and the present state of agricultural techniques. The real problem is that of productivity as

well as distribution. If the growers were organized, the problem would be rather easily solved; but an individual farmer is incapable of coping with technical advances and mechanization. What is needed is an increase in productivity, not by increasing the land areas under cultivation, but by improving agricultural methods to increase yields. We are aware that we must produce and market locally products which are now imported. It is up to us African countries to stimulate the peasant, for we all know the principle that the state will take over when there is no private initiative. And we know that private initiative is greatly lacking. It is up to us African countries to spur this initiative and encourage the farmer to cope with the exigencies of trade, notably through the use of agricultural credit.

NUTRITION AND CHILD FEEDING

Presented by Dr. Mohamed Seffar
Director of Cabinet, Ministry of
Public Health, Morocco

A poorly-fed country cannot have the necessary dynamism for economic and social development. Undernutrition and malnutrition have, in fact, very unfavorable repercussions on the physical and intellectual output of adult workers. Wherever deficiencies occur and the improvement of the food situation would require an expansion of agricultural and industrial activities, errors of consumption put a brake on production by lowering the productivity of labor.

The government of His Majesty the King, aware of the seriousness of this problem, subscribed to a basic agreement with the specialized agencies of the United Nations, in particular FAO, as early as March 28, 1957, the goal being to implement a nutrition and food education program in the Kingdom. Another equally important agreement was arrived at between the Government and UNICEF on July 31 of the same year.

In opening up a new line of projects, the Government wanted first to raise the standard of living of the population by a long-term improvement of the nutritional state of the whole population. The means to achieve this end were:

1. The establishment of a food policy integrated into the over-all cultural, social and economic development plan of the country;

2. The initiation of an action program to improve productivity, distribution, and utilization of foodstuffs of high nutritive value.

Nutrition surveys by the Ministry of Public Health had shown that many school children were in mediocre or poor general condition. Primary school children were

therefore chosen to be the first beneficiaries of this new policy. The first efforts of the Government were then naturally directed to the school canteens, since through the school lunches a direct action was possible on the health of children; this would at the same time favor the educational process and help establish good nutrition education and food habits.

It turns out that the presence of school canteens in elementary schools is a help to attention spans, to stability, and to school performance. Attendance at rural schools is dependent on the existence of school canteens to offset the long distances some children live from school.

In early 1963, a coordinated program was initiated by the ministries of Agriculture, Education, Public Health, and Economy. The Office for Food and Nutrition Education was organized within the Ministry of National Education on April 13, 1963. Staff personnel selected from dynamic and qualified school principals were then trained in nutrition and food practices and became "school feeding advisors" at each of the Ministry's provincial offices. Three successive series of lectures were organized and 360 hours of nutrition training were given to the participants. This training was reinforced by four colloquia with a total of 117 hours of lectures and several foreign visits for a few officials.

From that time on, having qualified personnel at our disposal, it has been possible to initiate an action program with the following projects:

SCHOOL CANTEENS

The administrative reorganization of school canteens appearing to be necessary, the Government called on the collaboration of an FAO nutrition expert. The problems of kitchen installations, food storage facilities, food preparation, and menu planning were studied and solved. A sizable contribution of material by UNICEF allowed us to expand the number of school canteens and the number of beneficiaries.

At this time, 1,980 canteens spread over the whole kingdom in proportion to the school population serve 200,000 students. The children are served a hot meal at noon, including on the average 900 calories, 15 percent of which are protein. Conditions permitting, some canteens serve a hot glass of milk to children when they arrive in the morning. The system is in operation 100 days per year.

Since 1965, the World Food Program has contributed to the improvement of the nutritive value of meals served and to the introduction of good food habits by supplying highly nutritive foodstuffs to 30,000 children in the northern zone of the country (Tangier, Tétouan, Al Hoceima). The foods contributed are powdered milk, canned meat, powdered eggs, oil, butter, wheat flour, cheese, and beans. Since 1957, the United States Catholic Conference (USCC) has assisted the school canteen program by supplying the necessary flour, oil, and powdered milk.

SUPPLEMENTATION

We saw in the nutrition report from Morocco that the Moroccan diet is cereal-based. But it is known that cereals are poor in some amino acids and completely lacking in lysine, for example. But amino acids can only be normally utilized if all essential amino acids are present in suitable amounts. If one of them is only present in small amount, it becomes a limiting factor to the utilization of the others. The use of supplementary foods is an attempt to obtain the optimum biological value for a better balance of amino acids.

Morocco currently uses the following supplementary foods:

a. Fishmeal

This flour is produced in Morocco starting from sardines, which are subjected to cooking, heat under pressure, drying, and degreasing with a solvent to remove the natural flavor. Fishmeal is a remarkable protein concentrate: The protein content is 84 percent, 8 percent of which is lysine; it also contains calcium, phosphorus, iron, and niacin.

The necessary dose to improve the diet of a 12-month old child is 10 to 12 grams, and 20 grams for a school age child. The cost of 20 grams of the produce is 0.04 dhirams and it supplies as much protein as 100 grams of meat, or ½ liter of milk; it is therefore a valuable substance from both the nutritional and the economic point of view. It can be given to children from the age of 7 months on in strained foods. It is also used at the time of weaning; and is in use by the MCH centers to restore the nutritional health of children suffering from deficiencies.

Unhappily, although the level of acceptability is good among young children, it is much less so among school age children; objections arise also due to family food habits and due to the fishy odor. Attempts are being made to remove this odor by changes in the manufacturing process, and the school canteens have stopped their experiment of adding fishmeal to wheat flour in the making of bread.

b. Legumes

Legumes are very much in use and very much recommended.

c. Superamine

The formulated flour currently being manufactured by our neighbor, Algeria, is of great interest to us. The acceptability tests soon to be started will allow us to spread its use as a weaning flour, and later an analogous flour will be manufactured in Morocco based on products available in our country. We are studying a flour to be based on wheat, chick-peas, and sunflower seeds. Its formulation is 35 percent wheat, 35 percent chick-peas, 12 percent sunflower meal, 10 percent skimmed milk, 7 percent sugar. It is enriched with vitamins D, A, B_2, and C, as well as with niacin, iron and calcium.

Supplementary foods will certainly contribute to the solution of nutritional problems.

NUTRITION EDUCATION

If, as was just said, school canteens are most frequently thought of as the means to insure school attendance, attention, stability, and performance, they must also contribute to the improvement of the children's health and to having them adopt good food habits and help the introduction of these ideas into the families. As a first step, it has then been necessary to train school officials and teachers responsible for the operation of school canteens to insure their effective and active participation in the implementation of the program. A start was made with the food advisers, with the help of the FAO nutrition expert, and the Office of School Feeding and Nutrition Education. Training was given at 79 three-day seminars attended by 2,264 persons.

A "Guide to School Canteens," recalling the essential aspects of rational feeding and the fundamental principles of good management, has been prepared and distributed to all schools equipped with canteens and to the regional teacher training schools. The first edition of 3,000 copies has been exhausted; a second printing of 1,000 copies in Arabic is being issued. A color film entitled "A Better Diet for Better Learning" covers the development of the World Food Program.

It seemed desirable to introduce principles of nutrition in the classroom, and a basic text has been prepared for the use of elementary school teachers who may find themselves responsible for this instruction. Intended for the first and second years of middle schooling, the book is entitled "Lessons in Human Nutrition." Twelve thousand copies have been printed -- 6,000 in Arabic and 6,000 in French.

The necessary teaching material to accompany these lessons was developed in collaboration with a UNESCO expert residing in Morocco, and according to the teaching techniques employing audio-visual aids. This material includes on the one hand posters and separate drawings illustrating the lessons in human nutrition, and on the other individual booklets employing the same illustrations, with a commentary adapted to the basic vocabulary and intended for use

by the children. In this fashion, nutrition principles may be able to reach the families.

All these documents have been tested in the urban and rural schools of a provincial sector. The investigating committee supervising the tests included an elementary education inspector, a school principal, a school feeding adviser, and the FAO nutrition expert.

The teaching material is being printed. The various published brochures were prepared and edited with the help of UNICEF.

In October 1970, after polishing up the nutrition education teaching method at a session for elementary school inspectors and officials of the Office of Food and Nutrition Education, in collaboration with the Division of School Activities,* 200 elementary schools equipped with canteens, gardens, and farm operation, and 100 vocational schools will introduce nutrition in their science classes as a last experiment before the program is generalized to the whole of elementary schooling.

A publicity campaign has been launched by the Ministry in collaboration with the Public Health Department to sensitize the population to nutrition problems. Educational programs were telecast during the year (March 1965 - March 1966) at the rate of two 20-minute programs each week. These illustrated lectures met with vivid interest among the viewers.

APPLIED NUTRITION

Parallel to the nutrition education program, school gardens and farm operations for the raising of small animals are being organized to reinforce the educational impact of principles of nutrition and feeding. These associated

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* The Division of School Activities is the agency responsible for the training of school personnel, the development of curriculum, and pedagogic research within the Ministry of Primary Education.

activities permit guidance of the children to the production of those food items necessary to a good diet, and their initiation to modern farming methods. This will help the country's development by rationalizing consumption. Active operations consist at this time of:

- 207 gardens, of which 100 are pilot projects containing a variety of crops: vegetables, orchards, dry crops, etc.

- 30 stock-raising units: laying hens, chicken, rabbits, goats, cows, bees.

- 70 similar centers being set up for the school year 1969-1970, the necessary equipment having been donated by UNICEF.

The farm centers are efficiently operated by qualified trained teachers. The Ministry of Agriculture, conscious of the value of this program in popularizing modern crop cultivation methods, gives its constant support both in terms of equipment and the collaboration of specialists in refresher courses organized for school teachers (14 from 1965 to 1970). During refresher courses, the educational aspects of practical agricultural work were presented by elementary school inspectors, and by the technical agricultural school inspector. These lectures were followed by model class presentations. In addition, two sessions on apiculture introduced 16 teachers to the management of beehives. The school feeding advisers who had been introduced to horticultural methods and to stock-raising during a 21-day training course at the Meknès National Agricultural School* have been put in charge of the supervision of this program which completes the action begun with school canteens.

The experimental school gardens and stock-raising centers which were initiated according to the objectives of

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* The National Agricultural School at Meknès is an institution under supervision of the Ministry of Agriculture for the training of applied agricultural engineers.

the 5-year plan contribute to adapting the primary schools to rural conditions. They make the rural environment attractive and allow it to play its social and economic role while making sure that everyone acquires the basic knowledge necessary for students who are preparing to take jobs as well as for those who will go on to secondary schools.

SUMMER CAMPS

To complete the nutrition education given in elementary schools, an extension of the World Food Program to include the 7,000 school children who attend summer camps has been requested. To the benefits of a stay in the fresh air of a good climate, whether seashore or mountains, will be added the benefits of a good diet and a reinforcement of the good food habits which are more easily acquired in community living.

COORDINATION OF NUTRITION PROGRAMS

To insure constant coordination between the different ministries and the Planning Division in matters concerning food and nutrition education, a coordinating commission was established in June 1966 upon the initiative of the Ministry of Development and Planning. The purpose of this commission is to develop a national food policy and action programs in the field, and to formulate the food and nutrition goals taking into account the general development plans. The commission may meet as often as necessary upon request of one of the participating ministries.

FUTURE PROSPECTS

The importance of this program, the happy effect that school canteens may have on children's health, and that school gardens and stock-raising operations may have on the economic and social development of the country, especially in rural areas, have led officials of the Ministry of Primary Education to consider the following steps:

1. To spread nutrition education progressively to the totality of elementary schools in the Kingdom;

2. To introduce nutrition education and applied nutrition into the curriculum of regional teacher training schools and regional centers for the improvement of teaching techniques;

3. To increase the number of school canteens and the number of their beneficiaries while maintaining the nutritional value of menus and taking into account budgetary limits;

4. To promote the development of school gardens and small-scale stock-raising centers. The present plan of action is to start, with the help of UNICEF, 150 new gardens and 150 stock-raising centers so that in 1973 there will be 350 school gardens and 250 stock-raising centers.

To improve the nutrition and feeding of the young generation, births must be controlled. This problem is common, I believe, to all African countries. The need is for a family planning program. The Moroccan Government has given it priority, since our economic development would not keep up with the present population growth.

The growth rate of the Moroccan population is currently 3.2 percent, one of the highest in the world; and this creates an unfavorable demographic situation, not only because of the rate of increase, but also because of the structure of the population pyramid, where dependent persons constitute an important proportion of the total population. The less numerous adult population is then called upon to feed and maintain ever increasing young generations, which places a heavy burden on the economic development and nutritional state of the country.

Aware of the importance of this problem, the Moroccan Government in 1966 initiated a pilot project for family planning and created a Population Commission. Therapeutic abortion legislation has been liberalized; the restrictions on advertising and sale of contraceptive products have been lifted.

The goal of the program is to lower the birth rate by 50 or 45 percent by the end of 1972. This is being accomplished by:

- Information
- A choice of methods being made available to the people
- The complete and general equipment of the department of Public Health
- The training and information of involved personnel

This program is underway, and in spite of difficulties of all kinds which everyone is aware of, positive encouraging results have been obtained. Between 1966 and December 1969, 29,763 intrauterine devices were installed at 129 family planning centers, and it is estimated that 20,000 cycles of oral contraceptives per month are sold in drug stores. All this is done with the financial and technical collaboration of certain international agencies like USAID.

It seems to me that the method of integrating the fight against malnutrition is very judicious and not very costly. The fight against malnutrition being integrated into the normal activities of the Ministries of Education, Agriculture, Economy, Planning, and Public Health, etc., the administrative and financial problems are greatly reduced. If the Interministerial Commission does an effective job of coordination, this will be the best system:

1. The Ministry of Agriculture is responsible for experiments and studies in the field of agriculture and stock-raising and tends to improve the quantity and quality of the foodstuffs that it attempts to offer the consumer at the lowest possible prices.

2. The Ministry of Planning conducts evaluations and consumption surveys.

3. The Ministry of Public Health carries out nutritional surveys and fights malnutrition by education and rehabilitation.

4. The Ministries of Primary, Secondary and Higher Education act along the same lines.

We thus find ourselves with a truly state-wide organization with great powers, and its work is that much easier, the results that much better. Only this type of organization can establish a nutrition policy and implement it. In Morocco, the Royal Decree of May 8, 1959, establishing the Interministerial Commission for Food and Nutrition takes a high interest in this problem and indicates the Government's understanding of its vital importance.

It should also be noted that international assistance can only be coordinated by the beneficiary country; there must be no competition and the recipient country should not try to instigate it. It is therefore necessary for the Government itself to determine the nature of aid, its timing, quantity, delivery, and the type of aid, whether goods, material, or technical personnel. International assistance projects must complement each other. Only the Government seems capable of coordinating aid and allocating it.

The international agencies find a valuable counterpart in the Interministerial Commission, which must indicate to the potential aid agency the kind of aid, and the time and location that will be most profitable. For example, if commodities are offered which it is impossible to store or to transport where they are needed, this would be a complete waste.

Preschool children generally present fewer problems than young children and are not controlled so closely. In Morocco, however, they are in principle followed by MCH centers from birth to school age. Since this work is integrated into programs of Public Health, medical and paramedical assistance is available through clinics and health centers to evaluate the nutritional health of the

child and refer him if necessary to the appropriate agency where he and his mother will be cared for either by diet rehabilitation or nutrition education.

These children are also taken care of at nursery schools and rehabilitation centers operated by the Moroccan League for the Protection of Childhood, as well as at community centers and home economics centers of the Ministry of Social Affairs.

In the countryside, traveling male nurses, who are the best able to communicate over the rural distances, must take advantage, as is done in the clinics, of every vaccination or therapeutic function to present principles of nutrition education. The integration of activities has the great advantage of being economically feasible. Personnel receive a multipurpose public health training and are able, for example, to cure, vaccinate, educate, advise, etc.; the common aim remains the development of individual health.

The necessity of training specialists is not forgotten. High-level nutritionists are needed for the central offices of the ministries and the provincial offices. Nurses specialized in nutrition are needed for the home economics centers, community houses, rehabilitation centers, health centers, clinics etc.

GENERAL DISCUSSION

Dr. Gody (Central African Republic): Concerning the subject discussed by our colleague from Morocco, I have two comments to make, the first concerns the Maternal and Child Health centers, and the second has to do with contraception. As to MCH centers, I have already lamented their inadequacy in the Central African Republic. One of the most important roles of MCH centers is to follow a child from conception to school age; after that period, the child is under the care of the school medical services. Unfortunately, the centers are poorly staffed and organized so that the followup of women and children leaves much to be desired.

Concerning contraception in Africa, we have, in the Central African Republic, 617,000 square kilometers for only 3 million inhabitants. The acute problem for us is not food, of which we have enough, but organization and education. The people are not well-informed about nutrition. We do not need to spend time regulating births. It is not useful to us in the Central African Republic; it is a concept of interest only to developed countries. At this point, I think that there is no need for us to discuss this problem at length.

Dr. Buyoya (Burundi): May I ask the honorable delegate from Morocco whether he can reassure us as to the percentages of rejections or accidents of any kinds occurring following insertion of intrauterine devices. I must say that unhappily we have recorded many accidents, the knowledge of which does not remain within the confines of the clinic. Women talk about them. Even when a woman has difficult pregnancies, or has had many children, or is sick, when you suggest inserting a device, she is not willing because she has heard discouraging rumors. Women are willing to be sterile for 3 or 4 years but not forever. Sometimes they ask if they can have a child at 50! They want to have a child any time as long as they are the ones to determine it. That is why I am asking the delegate from Morocco if he can tell us about how much antibiotics have been used to prevent infections.

Dr. Seffar (Morocco): Family planning was begun in Morocco, as I said earlier, because we have a population problem. I gave you some figures: we are predicting 26 million inhabitants in 1985. According to our experts, there would then be a serious economic problem. In answer to the delegate from Burundi, I can give him the statistics since 1966. From 1966 to December 1969, we inserted 29,763 intrauterine devices (IUD's). As I mentioned, there were 1,712 reinsertions, that is, 1,712 devices did not remain in place and had to be replaced. We have observed 401 pregnancies in spite of the devices. As to accidents, we have nothing really noteworthy except a few metrorrhagias. Generally, this goes away after a while. Concerning antibiotics, we try to place the IUD in a rather clean uterus, that is, there is a medical examination before the insertion of any device. As a precautionary measure, especially in rural areas, we sometimes inject 600,000 units or 1,200,000 units of extenciline.

Dr. Dziri (Tunisia): In the name of Tunisia I would like to congratulate Morocco for its efforts in the field of nutrition education, since Morocco has only recently started activities in this area. If I remember correctly, on my last visit to Morocco in 1963 I noticed that nutrition education was totally neglected. You have placed much emphasis on audio-visual means, and that is a great help. We have been using the same methods since about 1952 or 1953. My feeling is that you are well caught up. This is probably due to your energy and your conceptual framework, and more especially to your interministerial coordinating agency. You still have to train high-level personnel to stabilize this nutrition education program and secure its position in the university departments and institutions of higher education responsible for the training of your technicians. We only just recently created a coordinating agency in this National Institute of Nutrition, which after all was a long time being born. You will find that education has a secure position in our programs.

Our coordinating Institute was born May 19, 1969. You see that it is only 1 year old. It was an attempt to regroup all the sections scattered in different ministries. You are on the right track, and it is in my capacity as

Chief of Nutrition Education in Tunisia that I express to you my thanks and my admiration for what you have accomplished.

Dr. Meke-Me-Ze (Cameroon): I have asked to speak to express my concern along the same lines as our colleague from Burundi. I think that if Morocco engages in family planning, it is for a good reason. Because it has, as the honorable delegate pointed out, a serious demographic problem. I do not know whether Burundi has reached that point; but in my country, we have decided not to attempt or even to consider the question of family planning, because we believe that we are rather in need of population. Cameroon has an area comparable to that of France with its 60,000,000 inhabitants, whereas Cameroon has barely one tenth of that number, or 6,000,000, and we are formally opposed to employing family planning. Besides, it is important in our countries where we still need to increase the population, not to start a fad. There are women who would request this kind of intervention because they are of dubious morality and want to avoid conception. Finally, I think that we do not all have the same population pressure that exists in North Africa.

Dr. Raba (WHO): I think that at this point I could clarify what is meant by "family planning." Although this phrase has been in use for a long time, and in particular for the past 4 years at the sessions of the General Assembly of the World Health Organization, I believe that it is poorly understood. The World Health Organization is already helping quite a few governments to set up family planning programs.

People always think that these programs aim at limiting the number of children per family. This is wrong. It depends on the conditions in each country. The final goal depends on the country. It is absolutely certain that spacing of births in a family, no matter what the desired number of children, is indispensable from the health point of view. Everyone knows that one of the major reasons for children's diseases, and especially for kwashiorkor, is precisely that children are born too near one another. In Africa, in particular, the mother lacks the necessary time to recover both nutritionally and physiologically. Family

planning gives parents the possibility of choosing when they wish to have a child, with due consideration to health and of other factors.

In conjunction with properly carried out nutrition and health education, a family planning program aimed at spacing births can lead to a larger number of children for countries that wish them, because these programs tend to reduce infant and child mortality. This has not been completely understood by many departments of health in African countries. It is also quite possible through these planning programs to reduce the sterility of some women and permit childless families to have children.

Dr. May (United States): I would like to add something to what our colleague Dr. Raba has said. Concerning family planning, I have an opinion which I give you as my own; it is not necessarily that of the United States Government. For me, family planning is closely linked with the lowering of infant mortality rates. I believe that with such a complex problem touching upon the deepest emotional facets of human life, a solution should not be limited to mechanical means. I believe that we must first consider what motivates human beings to reproduce themselves. It is certain that most people want to reproduce themselves to insure an extension of their beings; it is a kind of social security; it is the wish to see continuity in the family; it is also often a religious feeling. All these things are essentially noble in themselves. If you could guarantee to a young couple that they would keep all the children to whom they give life, I think that they would much more willingly accept the advice they might be given about spacing their children. Doctor Raba, in my opinion, is right: the question is one of the health of the mother and one of resources. But for me, family planning must begin by a sustained effort to reduce infant and child mortality so that we can have valid reasons to suggest to the families the technical means for spacing their children.

NUTRITION AND EDUCATION

Presented by The Honorable François Kisamare
Minister of Education, Burundi

I. THE NEED FOR EDUCATION IN FOOD AND NUTRITION

The question whether it is useful or not to devote so much effort to food and nutrition education can only be resolved after examination of the consequences of inadequate feeding and of the possibilities of improving the situation thanks to an educational campaign. The Director General of the Food and Agriculture Organization (FAO) as well as the participants in the Ninth FAO Conference in 1959 were so much aware of the urgent necessity for such education and of its chances of success that in 1960 they launched the war on hunger. This campaign had two main objectives: a) to inform the populations on the problems of hunger and malnutrition with all the suffering that they entail for humans and the threats they bring to bear on peace and progress; and b) to create a climate of opinion favorable to the search for national and international solutions to these problems.

The war on hunger relates to nutrition education in the larger sense of the term, and that is how it is to be interpreted. It is addressed to all, at all levels of national and international hierarchies. It is aimed not only at informing, but also at inciting to action.

In his introduction to one of the basic studies of the war on hunger entitled "Malnutrition and Diseases," the Director General of the World Health Organization (WHO) asserts that malnutrition is one of the most serious health problems in the world and thus confirms that the medical profession shares the concerns of persons interested in food and agriculture. At this time, the extent and repercussions of malnutrition are more evident than ever.

The situation is now marked by the frightening problem posed by the necessity to increase the production

of food commodities to keep pace with an increasingly expanding world population. This problem has now become an obsession for the whole world and is being studied in all its aspects. Let us recall quickly a few main points.

In the 1963 FAO State of Food and Agriculture publication, it was estimated that by 1975 the world food resources would need to have expanded by 35 percent simply to maintain the current level of consumption, insufficient as it is. Production should increase by 50 percent during that period to insure sufficient food for all. By the year 2000, food resources should have quadrupled to correspond to needs. These estimates have a quantitative character; the nature of the deficit is even more important.

You might think that nutrition education has little chance to influence this situation, but this is far from true. Nutritionists have as their first task to lead Governments to an understanding of the urgency of including a food and nutrition policy in economic planning. They must make sure of the cooperation of agricultural, health, education, and social services in implementing this policy. They must then help these services to present to the public an educational program on foods, nutrition, and the best methods of using available resources. As far as resources are concerned, it is important to note that if the growth in food resources required by the constantly growing needs must largely result from increased productivity, appreciable results can also be obtained by a reduction of losses in food commodities. These losses are particularly sensitive in developing countries where food shortages are the most serious. As a remedy, better methods of warehousing, of food storage, and of protection against insect damage must be adopted. A first consequence of this waste is malnutrition.

Protein-Calorie Deficiency

The protein-calorie deficiency observed mostly among infants and young children is frequent in almost all countries still insufficiently economically developed. Its manifestations go from growth retardation to a distinct classical deficiency syndrome characterized by low weight

in proportion to age, edema, dermatitis, as well as the very symptomatic apathy and cachexia. At an advanced stage, death occurs, unless the illness has been well-treated; and even then, mortality may reach 30 percent. Many different local names are used to identify severe classical protein-calorie deficiency, but kwashiorkor is the one generally adopted.

In countries where the child is breast-fed for a long time, protein-calorie deficiency appears generally from one to three years after weaning. It is triggered by the interruption of breast-feeding associated with a diet poor in protein and both qualitatively and quantitatively deficient. Other factors play an important role: diarrheas and infections aggravate the deficiency; the trauma of weaning often leads the child to refuse to feed himself.

A large number of investigators have noticed that the deficiency in protein and calories frequently occurs in countries that are supplied in protein-rich foodstuffs but where habits, taboos, and plain ignorance have contributed to exclude these nutrients from the diet of young children. This is unhappily the case in my own country.

In countries where weaning takes place early, a different syndrome is more often seen: marasmus is a type of starvation always accompanied by a deficiency of protein and calories. Marasmus frequently attacks children under 18 months. It is associated with the decrease or interruption of breast-feeding and its replacement by food that is insufficient and poorly adapted to the needs of the young child. It is also often accompanied by diarrhea due to food contamination by polluted water, by dirty bottles and dishes.

According to present knowledge, it seems that marasmus is more common in many countries than classical kwashiorkor. It is not possible to evaluate how many children in the world suffer from some deficiency of proteins and calories. But public health experts estimate that from the point of view of public health this deficiency is the most serious problem facing the world at this time. The same experts think that for each child exhibiting severe protein-calorie deficiency many more suffer from it, though

less visibly, and are in constant danger of plunging into severe malnutrition.

To prevent this disease, we must first of all furnish the families enough goods containing the required amount of proteins at accessible prices. This is a task for the officials responsible for nutritional, agricultural and economic policies. But it is also important to lead parents to give this food to their young children in an appropriate form, avoiding contamination, and modifying the ancestral habits that contribute to the creation of malnutrition by ignorance.

If the policymakers and the power structure of a country are not aware of the importance of good nutrition, they will do nothing to promote an improvement in this domain. The professional nutritionists must therefore take on the responsibility for taking steps to educate government officials as well as simple citizens.

In informing the whole population, one must not try to teach everyone to eat in the same way, nor should one impose on a social group the habits of another group; the people must rather be helped to feed themselves in the best possible way within the framework of their cultural and economic environment.

Malnutrition and Infectious Diseases

The fact that malnutrition and disease are mutually aggravating takes on great importance. It was emphasized in a recent study of this question that the simultaneous presence of these two factors in man always creates a more serious morbid state than would be expected by the sum of the two conditions. When diet provides only a barely sufficient quantity of a given nutrient, disease will frequently trigger deficiency diseases such as kwashiorkor, nutritional anemias, and vitamin A deficiency diseases. Inversely, a severe state of malnutrition reduces resistance to most infections. During a study of the causes of child mortality in a Nigerian village, one of many investigators, Morley, noticed that many children contracted kwashiorkor following communicable diseases like measles, diarrhea, whooping cough, and tuberculosis. He pointed

out in addition that the common childhood diseases, like measles and whooping cough, were more serious in that region than in developed countries, which may be a consequence of a defective nutritional condition of the children.

Others say that a close connection exists between malnutrition and diarrhea in the period following weaning. In the less-developed countries, acute diarrhea, called gastroenteritis, regularly appears among the five first causes of death in children, and in some countries it is even in first place. This illness affects mostly infants and young children between 6 and 18 months and occurs at the time of weaning. At the same time that the child is deprived of his mother's milk, he is exposed to new microorganisms in food or in his environment when he begins to crawl. In the majority of cases, however, it is not possible to detect a specific infectious agent.

In the WHO report on nutrition and disease, it is indicated that malnutrition is the true cause of death for children in the 1 to 4 year age group in developing countries, although many deaths at least partly due to malnutrition are often ascribed to other causes. Recently, a committee of WHO experts, in preparing a report on the relationship between nutrition and disease, adopted the term "synergistic" to express the effect of mutual aggravation. This committee concluded that the results of experiments now available confirm the clinical and epidemiological observations according to which severe protein-calorie deficiency and generalized malnutrition increase the receptivity of a subject to a great number of infectious diseases, and that certain vitamin deficiencies, A and C in particular, are synergistic with most diseases.

Nutrition and Economic Development

Having briefly reviewed the consequences of malnutrition in children, let us now consider economic development. In the long run, economic development brings about a rise in standard of living and an improvement in diet. But it frequently happens that the introduction of a new cash crop or of salaried employment has the effect of lowering the level of nutrition in the affected region.

To earn money, the men of rural families leave for the city or go to work on commercial plantations, which upsets the agricultural cycle or the division of labor at home. Often, the men's wages are insufficient to allow them to marry; or, if they are married, they are unable to take along their wives and children when they emigrate.

The more intensive commercial crops may deplete the soil because ancient conservation methods are abandoned. Production destined for family consumption is reduced, and there is less time to prepare and preserve foodstuffs.

Thanks to the construction of roads and railroads, it cannot be denied that villages can receive from the city a wider variety of goods; but the goods so transported have less nutritive value than local products. Trade also takes place backwards, and the vegetables, fruit, and other marketable goods with real nutritive value are shipped to the city instead of being consumed at home. Often, city workers who do not enjoy high incomes get no benefit from this trade, because the goods are now sold at such high prices that they cannot afford to buy them.

The thinning out of available tillable land or the impossibility of making a decent living from farming forces men to leave for the city, with or without their families. These men are then faced with serious food problems, especially since they are subject to long periods of unemployment. In addition, when people who have been accustomed to a subsistence economy have to buy their food, they find themselves in a situation where it is no longer possible for them to depend upon their traditional food habits. They then make their food selections in great part as a function of available goods, prices, and sometimes on account of the prestige attached to the items they purchase. The situation is complicated by the fact that many are not equipped or do not have access to adequate facilities for cooking their food.

The immigrant is not acquainted with the way of life in the city where he settles and sometimes risks being scorned. He may be illiterate and unable to apply for a good job or to obtain advancement. When he has found work,

he is often under obligation to send home money or goods for his parents or to help support the younger members of his family who come to live with him. If he emigrated alone, there is often no one to prepare his meals.

One of the first effects of urbanization on nutrition, one that invariably occurs, is to reduce the length of time that infants are breast-fed. This poses serious problems for the feeding of young children, problems which nutrition specialists and hygienists will face more and more frequently in the future. Early weaning may be ascribed to the wish to imitate others, to questions of status, to wrong information, or to various other reasons.

Thus, a worker who moves to the city runs the risk of subjecting himself and his family to a very insufficient diet. In the semi-urban zones where the influence of the city has begun to be felt, a number of changes may indirectly have an unfavorable influence on nutrition.

Repercussions of Food and Nutrition Problems on Economic Development

Although development can sometimes lead at least temporarily to malnutrition, the process itself, that is, the slowing down of development caused by food shortages and malnutrition, perhaps presents an even greater problem. The development of the economy creates more work possibilities for the population, but to work more people must consume more energy foods; and if a population is not adequately fed, it is incapable of the necessary effort. This vicious circle is what we must fight to arrive at a harmonious economic development.

The reduced capacity for work is not the only repercussion of malnutrition on economic development. It has been proved that diet deficiencies among the young may affect the central nervous system and reduce intellectual, psychological, and neuromuscular capacities.

We must also take into account the burden that poor health of the population places on the economy of a country. Independently from the load placed on the economy, at least

in part, by insufficient nutrition, development is often slowed down by the fact that agricultural production is not capable of meeting the increased demand for food commodities arising from increased income. This demand is a function of the percentage of their increased income that people are inclined to devote to the purchase of food commodities, as well as a function of population growth.

These facts are ample proof that most food and nutrition education programs must aim at promoting the national production of food crops and an increased consumption level.

How to Raise the Standard of Living and the Level of Nutrition

As long as the supply of staple foods is not assured, land will be used primarily to produce them. Once this goal has been reached, it is possible to exploit the soil and other resources to improve nutrition and raise the standard of living. Changes in the allocation of resources are mainly dictated by the structural evolution of demand. As the economy progresses, demand is rapidly directed to protein-rich foods and more varied diets. However, the effective demand may vary with the social strata. To bring about a general rise in nutritional norms and standard of living, special policies and programs are imperative, some of them being in the field of education.

It is desirable above all to achieve a rapid increase in the consumption of protein-rich foods, especially among the young who suffer from protein malnutrition. This calls for a substantial expansion of all the classic sources of protein, and in particular the national herd of livestock. This also calls for accelerated research effort on new sources of protein and a rapid application of results. It is urgent to adapt and perfect the infrastructure necessary to the processing, storage, and marketing of food commodities, to establish a policy of affordable prices, and to initiate the population to the use of the new techniques and facilities.

Once the supply of staple foods is assured, the rural exodus will end. Thus, one of the big problems of

developing countries is to create jobs for the young in the rural sector. This problem is made more complex by the absence of organized social and economic services in rural areas.

The need is for education for mental reconversion, which is why it must begin with mothers and families.

II. EDUCATION OF MOTHERS AND FAMILIES

Given the rather high number of illiterates in Burundi, we are using all possible means to reach the intellectual level of the population. Action is being taken by several agencies.

- Department of Women's Development

In the Department of Women's Development, social workers teach classes in health and nutrition education to any girl or woman who has not had the benefit of schooling, and therefore is lacking in training to contribute to social progress. Outreach social workers help women who wish to attend home economics centers but are prevented from it for some reason. They give educational talks followed by practical demonstrations on dietetics and the content of the classes, or on other subjects suggested by the participants. In an attempt to reach the greater part of the population, the Department of Women's Development also gives talks on national radio.

The Department thus employs three approaches to inform the masses -- especially mothers, the custodians of customs and national traditions -- of the role of good and poor feeding habits and their physical, mental, and intellectual consequences; women are taught nutritive values, the better combinations of foods, and the importance of good nutrition to the most vulnerable persons: pregnant women and children.

The Department has decided to fight malnutrition in children and to spread preventive and curative nutritional education by insisting on a balanced diet which every Murundi woman can manage using local cooking utensils and

the agricultural products habitually consumed in Burundi. For example, the instructors at home economics centers and the outreach workers at hilltop dwellings demonstrate how peanut milk and soybean milk can be made to replace cow's milk for those who do not have any. They show how to make a mush of sorghum and millet, peanut cakes, etc. At rural community organization centers and home economics centers, social work instructors and outreach workers inform the people and show them how to increase the productivity of nutritive foods; this is within reach of everyone by planting vegetable gardens and orchards and improving the breeding of small domestic animals. Later, social workers follow up on their instruction by visiting the families at home to encourage them, give advice on the spot, and evaluate the results of lessons already given.

In this way, the Department of Women's Development is working toward the main objective of the fight against hunger in Burundi, which is to develop information and education of the public to harmonize agriculture and improve nutrition.

To be successful in its education effort, the Department is collaborating closely with other services concerned with the economic and social development of the country to sensitize the population to the value of steps taken to overcome any reticence in obtaining the active participation of all in this common endeavor.

- The Organization to Fight Hunger

In the broadcasts of OLUCOF,* we insist on the participation of women, knowing well their importance in fighting hunger. A woman cooks, she feeds the children; she handles milk and its products. A woman is everything, and everything must go through her.

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*Organisation de Lutte Contre la Faim.

- The Ministry of Public Health

The Ministry of Public Health is sparing no effort to educate mothers. For example, at prenatal clinics, women are told their needs and those of the fetus. If necessary, vitamins are distributed and the various deficiencies are taken care of. At baby clinics, women come to follow the weight and health development of their children. They talk together and exchange criticisms, which gives the stimulation necessary to create a spirit of competition. Medications are distributed against the parasitic diseases that may cause growth retardation. Milk is even given out to needy families.

- The Barundi Women's Union

The Barundi Women's Union has as its main objective to bring the Murundi woman out of her ignorance and to put her on the same social plane as men. In radio broadcasts and at meetings, an attempt is made to demonstrate how the participation of women is necessary to economic and social advancement.

III. RELATIONSHIP BETWEEN NUTRITION EDUCATION AND CURRENT FOOD PROGRAMS

Within the framework of the maternal and child care program integrated in the development program of basic health services, the Ministry of Public Health, in collaboration with WHO and UNICEF, is working with the Ministry of Agriculture and Stock Raising, the Ministry of National Education, and the Ministry of Social Affairs on the following projects:

A. Nutrition Education of Mothers

This activity takes place at prenatal clinics, baby clinics, and examinations of malnutrition cases at government health centers. The whole population is reached by radio and at party meetings.

B. Teaching of Nutrition Education

School teachers, social workers, and rural extension workers are reached when they attend refresher courses or periodic seminars. Student nurses and medical technicians learn health and nutrition education as a main subject in their curriculum. There are now some 30 health centers and clinics providing this form of education and four schools directed by the Ministry of Public Health in which health and nutrition education is taught. The Ministry of Social Affairs sponsors the training of social workers as part of the women's development program in cooperation with the Ministry of Public Health. The Ministry of National Education is concerned with the integration of nutrition into the curriculum at the elementary and secondary levels. The Ministry of Agriculture and Stock-Raising sponsors the nutritional training of students of the Agricultural Technical Institute of Burundi at Gitéga and of the Official Professional Agricultural School at Karuzi.

IV. MEDIA EMPLOYED IN BASIC EDUCATION AND TRAINING

The most direct means of information and the most in use is radio listening. Every week one hour and fifteen minutes of radio broadcasting are devoted to farm news and to OLUCOF as well as to women's development and public health. Newspapers do not reach the expected maximum number of people because of the high number of illiterates but are nevertheless useful. Party meetings and meetings of the Rwagasore Revolutionary Youth offer an opportunity to publicize the programs. The same is true of administrative committee meetings.

V. EVALUATION OF NEEDS

In evaluating needs, it must be said that the lack of means of transportation is the major handicap of the program. To this is added the inadequacy of audio-visual materials to compensate for the lack of literacy. Posters and films have to reach that portion of the population which is unable to read newspapers and leaflets. A literacy campaign must be conducted, but the necessary

instructional material is still to be found. Ignorance is the ally of hunger.

Home economics centers everywhere do not have adequate housing for the nutritional programs expected to take place, such as cooking demonstrations. There is also need for suitable booklets for the use of the instructors or even to be handed out to the students if this seems desirable.

The insufficient development of road networks toward the interior of the country prevents us from reaching the whole population. Some areas remain inaccessible.

VI. CURRENT REGIONAL AND INTERNATIONAL PROGRAMS

There are various agricultural development projects to increase and diversify food production. The resettling of people from overpopulated areas into the less populated regions is projected. The maternal education project continues to grow. The first two projects are financed by UNDP and EDF,* the last one receives aid from UNICEF.

VII. THE ROLE OF EXPERTS IN HOME ECONOMICS AND OF RURAL COMMUNITY ORGANIZERS IN THE FIGHT AGAINST MALNUTRITION

Our specialized services take care of the nutrition education of mothers when they attend prenatal clinics, baby clinics, and malnutrition clinics held at the government health centers. Specialists participate in the training of women and young girls at home economics centers and at various socially-oriented schools. In addition to what has been said of nutritionists, their role must include making an inventory of available resources and of possible improvements. They must also lead the population to accept a varied and rational consumption of local and imported products.

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*European Development Fund.

VIII. CONCLUSIONS

The lack of material means, of funds and of qualified personnel, the limited number of schools and of health centers, the insufficient development of roads in the interior of the country, are the principal causes of our difficulties. No one can overestimate the dietary help provided by the specialized agencies of the United Nations to countries that submit valid projects. Bilateral aid is also significant. This is how several agricultural and community development projects have been financed. But all this still does not reach the goal. We are not going to depend on food contributions to solve our nutritional problems. Aid to all forms of production enterprises must be increased.

As you know, today's children are tomorrow's citizens. I do not have to tell you how worthwhile it is to sacrifice funds, time, strength and energy so that these future citizens of tomorrow may become strong men and women, more intelligent, more capable of building the Africa of tomorrow. These millions of children, their elders, young men and women, all those of the vulnerable group, to whom I add the agricultural workers, their parents, are calling upon your wisdom, so that all together we may find valid practical solutions to the problems of child malnutrition during this conference.

GENERAL DISCUSSION

Dr. Kobozo (Central African Republic): Nutrition and medicine are two very difficult sciences. You have just told us, Mr. Kisamare, that social workers teach nutrition and health education in rural areas. I would like to know how much training these young women have had and what qualifies them to teach nutrition and hygiene. I would also like to know whether it is possible to supplement cow's milk adequately with peanut-based products.

Mr. Kisamare (Burundi): As far as our rural social workers go, it is obvious that they do not pretend to be nutritionists. They have taken courses for 4 years at the School of Medicine and Social Work. They are surrounded by other specialists, by physicians who advise them regularly and who organize symposiums and refresher courses to keep them up to date. If they are not as competent as professional nutritionists, they are sufficiently competent to help farm women.

In answer to your second question, I am not myself a specialist in food composition, but according to qualified persons it would seem that soybean milk or other products with a legume base also contain substantial nutritive qualities, even if -- and this is yet to be shown -- these nutrients do not have the qualities of cow's milk. Perhaps we have here physicians or nutrition specialists who could speak on this point. I mentioned this experiment because it has been tried in our country and has given good results.

Dr. May (United States): I think that one can reply in the affirmative to the delegate of the Central African Republic. Milk can successfully be replaced by legume-based products. There are even many great advantages in doing this in underdeveloped countries. Unless it is handled with an extremely advanced technology, milk is a dangerous product: its use implies an advanced state of veterinary knowledge, perfect bottling conditions, refrigerated transportation, and so many factors associated with industrial development that you can say that to drink good quality milk other than

from the mother's nipple is a sign of superdevelopment rather than underdevelopment. In my opinion, milk for everyone must be considered the end point of development and not its starting point.

I read by chance this morning the French translation of a Food Composition Table for use in Africa prepared by FAO in collaboration with the department of which I am a member. On the first page, I read that the conversion factor of nitrogen to protein is 6.38 for cow's milk, and 5.71 for soybean milk. You see that the difference is minimal. There are 3.8 grams of protein in 100 grams of milk, and peanuts have 5.1 grams of proteins per 100 grams. Legumes are marvelous products. And it is my humble opinion that in developing countries the future lies in processed leguminous plants rather than in milk.

Dr. Périssé (FAO): First let me say that in underdeveloped countries, the problem of milk production is tied to the structure and the condition of the herd. We cannot expect, just because we want to drink milk, that the supply will equal the demand. Actually cows are animals with a long cycle, and the possibility of adapting to the demand is not very elastic. It seems that in the next 20 years it will be extremely difficult for production to keep up with the population increase. This means that per capita milk consumption will not go up; and we think that the emphasis in international aid will have to shift from cereals to essential products such as milk, of which the developed countries probably have surpluses -- If they are to provide food aid, let it be in this manner, which seems more appropriate than in the form of cereals.

As to legumes, it is obvious that operating with the constraints that we do in regards to meat production, meat production will not be capable of meeting the demand. It is imperative that in cereal-consuming countries, the consumers eat more legumes than they would like. This is a food policy problem that appears essential, for the reason that legumes have a lysine-rich protein structure and are capable of providing not only the protein requirement but certain amino acids which, added to the amino acids of plant proteins, make a nutritious diet. You are

aware of the biological complementation of these two types of proteins.

When we talk of peanut milk, I would like to know what Mr. Kobozo means by peanut milk? Is this peanut butter, that is, does it contain all the oil? I am not a pediatrician, but I think that this may cause problems of acceptability, because the enzymatic equipment of the child is not such as to digest a high level of fats. On the other hand, if the peanuts were defatted, useful foods might be obtained.

But from the point of view of economics it is obvious that it is best to think of a formulated food such as the Algerian Superamine (a product that supplies inexpensively the essential proteins) and to refine the biological value by adding to it high biological quality nutrients such as milk casein, or fish flour, or other nutrients, even eventually synthetic amino acids such as lysine.

Ten years ago, peanuts were the hope of African countries, but they are now of secondary interest because of the outlook for other legumes like soybeans and beans, and because of the 1960 discovery of accidents due to the presence of aflatoxin. I am referring to the Brazilian peanuts used in England to feed poultry, young chicks, and ducklings, and which led to the nearly complete destruction of flocks. It was rapidly discovered that there was a toxic substance in the feed, and it was identified that it originated from Brazilian peanuts. It was a mold that manufactured aflatoxin, a highly carcinogenic substance for animals which it is feared may have toxic effects on man. You are aware that some authors have even connected this fact with the classical observation that many Africans suffer primitive forms of liver cancer, at least with a higher rate of occurrence than exists in European countries. Some have wondered about food pollution and in particular about the presence of aflatoxin in peanuts. As long as we are not equipped to deal with this biological contamination, therefore, I think there is need for great caution.

Dr. Miladi (Tunisia): I would like to call the attention of the delegate from the Central African Republic to

certain protein-rich foods, which are also weaning foods and contain peanuts. For example, a product called Arlac is marketed in Nigeria. It is made of peanuts and powdered skim milk. In Rhodesia, another product, called Nutresco, is made of corn, fish flour, peanuts, soybeans, and powdered skim milk. The experts of the Food Technology Institute of Mysore, India, have done much research in this field and have developed several peanut-based products, among which is the Multi-Purpose Food.

An international specialist who has published extensive work on peanuts is Dr. Max Milner who is with UNICEF in New York. Unhappily, aflatoxin is a serious problem. But it must be noted that aflatoxin is also found in other nutrients, in particular wheat flour. Toxins have even been found in cow's milk, probably arising from their feed.

Dr. Phaka (Congo): My remarks are going to be in favor of the use of legumes as described by the Minister of National Education of Burundi. As I said the day before yesterday, although our country has plenty of plains and pasturelands, we do not have much food. We have cows, but they do not give enough milk -- 1 or 2 liters per day -- so that we have based our food supplementation policy on the use of legumes. In one of the provinces of the Congo, the National School of Agriculture has launched a campaign to plant soybeans. To persuade the regional officials, the Minister of Agriculture supported us by asking that we experiment with the treatment of malnourished children. We took kwashiorkor patients from the pediatric wards and treated some of them with cow's milk and some with soybean milk. We found that the children who were given cow's milk had many more complications than those treated with soybean flour: they had diarrhea, and we did not get good results. On the other hand, with soybean flour mixed with manioc or corn, all the edemas had disappeared in a week, while the child treated with cow's milk was still down with his edemas. To treat kwashiorkor, personally I prefer soybean flour to milk.

Dr. Kallal (Tunisia): I would like to give you my opinion on this question of milk and legumes. I think that we have to forget the idea of toxicity at this time. Toxicity can

be found in many food products. I noticed for example that lentils -- a crop which is more and more forgotten in Tunisia, I don't know why -- have the same lysine content as milk and meat, etc. And to avoid toxicity in lentils, one only needs to know how to cultivate, protect, store, use, and process them.

We still hope that milk will one day be abundant, but there is a more important physiological problem. We will not get the greatest benefit from milk by giving it at once to our people who are not used to it, because milk requires an adaptation which has not yet taken place. There is certainly an enzymatic phenomenon recently studied in Switzerland, and this indicates that you have to be a milk drinker to get the enzyme adaptation. But I think that the combination of a small addition of milk to legumes could catalyze the action of amino acids and improve the assimilation and biological utilization of legumes. In my opinion, and here Algeria has excelled, a small dose, 5 to 10 parts per thousand, of skim milk added to a combination of legumes could round off the essential amino acids. It would thus not only increase the number of amino acids, but by biological phenomena would improve the absorption, assimilation, digestive coefficient, and all the criteria by which we evaluate the biological value and the effect of a food item.

Obviously, I think that we must try to apply notions of food hygiene to all edible products and we must start from the assumption that any product may be toxic, even milk. In fact, in Switzerland and Scandinavia, persons who drink much milk have metabolic diseases because of this milk, even when it is skim. You see that proteins are not only a problem of quality or of quantity. The two sometimes go together.

Dr. May (United States): Assuming that a large quantity of peanuts contain a dangerous amount of aflatoxin, is it preferable to die now from kwashiorkor, or perhaps in 20 years from a hepatoma?

Dr. Muremyangango (Rwanda): I have said that our financial resources were insufficient for us to solve our malnutrition problem. If we tried to solve it with powdered skim milk,

we would spend half our national budget. That is why I prefer the idea of using legumes and soybeans. In the Belgian Trust era, soybeans were introduced in the country, but because they were difficult to cook and to digest they were rapidly rejected by the population. After independence, when the question of malnutrition arose, we had to look for solutions. For the last 3 years, we have been using soybean milk and we are successful in treating marasmus and severe kwashiorkor. We have even had to force feed it to restore digestion and intestinal metabolism in seriously ill children, which is to say how nutritive these plants are.

I am glad that the Minister of Education of Burundi insisted on the importance of nutrition education and on the role of women. In Rwanda, as everywhere else, women are the ones who take care of children; their emotional and intellectual development depend upon their mothers. The mother is also the one who handles food, whether it is milk or something else. Therefore we have decided that our policy must first of all be to sensitize mothers and make them understand the methods of food preparation and the principles of balanced nutrition.

In addition, I feel that we must educate children. Structural modifications, whether economic or concerned with food habits, and the acceptance of new ideas are always a delicate matter. They may be poorly received. We should therefore take advantage of the psychological fact that a child is willing to receive information, to make changes, to accept anything. And now, when knowledge is passed on to parents by those who can read, children are the ones who can encourage change in food habits, in agriculture, and in social behavior.

Mr. Kobozo (Central African Republic): If I am back in front of you it is to complain somewhat about the international agencies. Since they have from the very start taught us that cow's milk was the best food for children, I am surprised that now attempts are made to discredit milk and to say that peanut milk is better. Actually, I am glad of it, because in the CAR children begin to eat peanuts very early. But I believe that as of now UNICEF has already

sent to African countries more than 1 million tons of skim milk which was stored somewhere.

Dr. Meke-Me-Ze (Cameroon): I would like to add something to the reply the Minister of Education of Burundi made to the first question of the delegate from the Central African Republic concerning the competence of social workers in education. I think that this question of personnel is a difficult one. If you have access to collaborators like well-trained social workers, you should be pleased. When can we expect to have the required well-qualified specialized personnel? I don't think this will happen tomorrow. What we must do is utilize what is available. In Cameroon, everyone gets into the act; we use all the existing agencies. Women's organizations, social workers, rural extension workers, and teachers are already semi-specialized. A number of intermediate-level agencies can help us with education. What we need is to prepare a simple program easily understood. In Cameroon, we have set up practical training courses in nutrition education and health education. The rural extension workers are given simple nutritive recipes to demonstrate. We insist on cleanliness in the villages, on supplies of safe drinking water, etc. The rural workers and the agents of the various organizations apply the program in the field, supervised as much as possible by the appropriate government services. I only want to point out to you that we cannot have all the desired means at our disposal from one day to the next, but in the meantime something has to be done.

Dr. Raba (WHO): I don't believe Dr. May meant to say that since milk is in short supply in Africa, it should be replaced by peanuts or soybeans. Certainly, milk must be handled with great care, especially at the ambient temperatures of tropical areas, and the means to preserve, sterilize and transport milk are not always available, especially under the living conditions of Africans. But having said this, precautions can be taken, and powdered milk can be kept at home several weeks. And if mothers knew how to reconstitute it and to use it, it could, and should, be used for the very young child. Milk is still the contributor of the most complete proteins. The problem is one of hygiene. If you use powdered milk, milk that has been

concentrated in any manner, you must know how to reconstitute it, how much water to add. Having said this, milk remains and will always remain an essential food.

There are reactions to milk, to lactose in particular, in Africa. They exist, but we will have to admit that they are special cases and do not justify the total rejection of milk. In addition, milk and its derivatives are still and will long remain the most frequent treatment for kwashiorkor. If you have had problems in the Congo with treatment of kwashiorkor with milk, it could be that the caloric and protein proportions were not respected. Infections may have been superimposed. Because after all, according to the work done at Kampala in particular, milk is still the most rapidly effective food for the treatment of kwashiorkor. One must be careful, of course, to add the appropriate things -- water, if the milk is used pure, or some corn mush or some fats and oil, to increase the calorie count. Very good results are obtained with kwashiorkor.

At least I wanted to say, for the sake of UNICEF who has distributed so much milk, that milk, which is a nutrient for very young children mostly, is an essential food, one that is difficult to replace, even with soybeans, although they have particularly well-balanced amino acids, but whose protein content is still not that of milk.

Dr. Phaka (Congo): I am acquainted with the benefits to be had from cow's milk, but I am not in favor of this milk for the following reason. I often talk with women who use the milk. They say, "The milk is too concentrated," or "The milk is too diluted," etc. After hearing a high percentage of such comments, I have become hostile to cow's milk. I always recommend maternal milk. I believe that "each specie has its own milk," the cow gives cow's milk, the mother gives mother's milk. A mother who is not able to nurse her baby is a different case: then, I prescribe cow's milk. I prescribe it as follows: when the child first begins artificial nursing, I give a 7 percent dilution; after 2 or 3 days, I go to 10 percent. I stop there for a normal infant. For a child with kwashiorkor, I sometimes go to 12 or 13 percent concentration. We have compared kwashiorkor patients treated with cow's milk with

others treated with soybean flour. The results obtained with soybean flour were much more rapidly conclusive. I am not, however, opposed to milk. In fact, we are soon going to submit to FAO a project proposal for milk distribution in kindergartens.

Dr. Lowenstein (Observer): I just want to ask a question of Dr. Phaka concerning his experiment. Did the children who were given soybean milk and were compared to children given cow's milk have the same diarrhea, or had they perhaps begun to lose their diarrhea before the others, which might explain the results?

Dr. Phaka (Congo): We do not use soybean milk, but soybean flour, to treat our patients. Those we had in treatment were children. Kwashiorkor is often classified in categories; our experiment dealt with children in the third category. Our preparation or set up may not have been good -- that is why I outlined it -- and in this case I would be glad to be corrected; but our results were as I gave them. Our children had diarrhea while they were on milk, and the children given soybean flour had no diarrhea.

Dr. May (United States): One last word. I am not opposed to cow's milk as long as it is sterilized, stored in a sterilized carton, and drunk under hygienic conditions. Since these conditions are not realized in Africa as yet, I believe that there is less danger in serving a formulated product based on leguminous plants than in giving milk under the prevailing conditions. Milk itself is not dangerous; the danger resides in the dirty water and in the microorganisms that are put into it. As long as we have not found a means to guarantee the sterility of milk in developing countries, I continue to think that legume-based products are preferable.

NUTRITION AND THE FOOD INDUSTRY

Presented by Dr. Samir Miladi
National Institute of Nutrition, Tunisia

Nutrition is inseparable from the food industry, since more than 70 percent of the products we consume may have gone through industrial processing and more than 80 percent of our calories and proteins come from foods manufactured by industry. Wheat is processed into flour and eaten as bread, macaroni, or couscous. Oils, like soybean oil, olive oil, and cottonseed oil, and sugars from sugarcane and beats are processed products; so are canned fruit and vegetables, milk, and dairy products.

The association of nutrition with the food processing industry arises also from the fact that certain foodstuffs require extraction or purification, as do sugar, oil, and flour. From sugar beet, which contains other nutritive elements, only sugar is extracted. From olives we extract only oil, neglecting the wealth of calcium and iron, and the protein that comes from the olive pit. In fact, the refining of virgin olive oil entails the loss of alpha tocopherol, or vitamin E. The bolting of wheat flour causes the loss of vitamins (thiamine, riboflavin, and niacin), of minerals (iron and phosphorus), and of amino acids (especially lysine). When milk is made into cheese, it loses an important fraction of its proteins, lactalbumin, which has a higher biological value than casein.

But it is a fact that the food industry, with its preservation methods, gives us the advantage of storing our food resources to make them available all year and in all regions, at the same time that it avoids losses in times of peak production, notably of fruit and vegetables, etc. The consumer can find a wide range of prepared products; jams, cooked foods, etc.

It appears that the food industry presents advantages as well as disadvantages for nutrition. On the one hand, we lose nutrients, since the processed products we

eat are purified and lose more or less of their nutritive value; but on the other hand, we manufacture valuable foods to offer the consumer in a shape he enjoys and throughout the year. From the economic point of view, the food processing industry has raised food costs and made purchases more difficult for the consumer who is used to finding foodstuffs in their natural form at lower prices. But the processed products are always available, and their prices remain steady, rather than varying with the season as natural food prices do.

This has a direct impact on nutrition and on the malnutrition we began to be aware of only at the beginning of this century. The world population explosion makes this problem increasingly acute. Before 1800, the population of the earth was 1 billion. In 1968, it reached 3.5 billion, and it is estimated that this figure will be doubled by the end of the century. Can this population obtain the animal proteins recommended by nutritionists?

Taking Tunisia as an example, meat costs $1.20 per kilogram, which means that 1 kilogram of meat protein will cost $6. A liter of milk costs $0.16. Assuming 35 grams of protein in 1 liter of milk, a kilogram of milk protein will cost $4.57. In addition to their high cost, animal proteins are not available in sufficient quantity on either a national or international basis.

The main reason for the high cost and the inadequate supply of animal proteins is that animals transform vegetable proteins into animal proteins with only 10 to 20 percent efficiency, and we must wait 1 to 3 years, depending on the animal, before they can be utilized.

In stock-raising, the protein component of animal feed rations comes from powdered skim milk, soybean flour, cottonseed meal, fishmeal, dry yeast, and wheat germ. Urea and cellulose are another source but not very efficient and not suited to the needs of the animal.

Going back to the question of food processing, we notice that the food industry offers us the possibility of transforming these pure vegetable proteins with an effective

yield of 80 to 90 percent rather than the 10 to 20 percent yield of an animal, and this in a very short time which cuts a lot of expenses. But obviously, to obtain a protein with quality similar to animal protein, one must add the essential amino acid and the fat content to give the proper taste and smell to the product. The addition of vitamins, mineral salts, color, and egg albumin will give the appearance of the final product its similarity to natural meat.

When we consider the case of oilseeds, we find that after extraction of the oil, the world production of "defatted seeds" is 63 million tons, containing approximately 50 percent protein, that is, 31.5 million tons of protein. If these proteins are used in stock-breeding feeds, they yield between 3.15 and 6.30 million tons of animal protein. Using the same quantity of "defatted-seed protein," industry would supply us with 25 to 28 million tons of protein.

We are naturally conscious of the importance in the world of stock-raising, which, besides quality protein, provides us with valuable products, such as leather and wool. But we owe it to ourselves to notice and to appreciate the soaring progress of the food processing industry, which give us, for example, as much or more margarine than cattle-raising gives butter.

We have discussed one method to solve the protein problem. Other methods are under study, like the "single-cell protein" being studied at the Massachusetts Institute of Technology in the United States and at the University of Tokyo in Japan. Research is under way on the possible extraction of proteins from algae and petroleum.

We must not forget either the enrichment of food commodities, especially cereals, which constitute more than 60 percent of the world's protein resources. These proteins are considered poor because they are deficient in one or two essential amino acids. Today, some of these amino acids are manufactured industrially at acceptable prices and are used in the enrichment of cereal flours. Lysine costs about $2 per kilogram. To enrich a kilogram of flour, 3 grams of lysine are needed at a cost of 0.6¢. This question has

been discussed in detail by Dr. Altschul as well as the question of enrichment with vitamins and mineral salts. Where there is a lack of proteins, there is also a lack of vitamins and mineral salts. Here again, industry offers a possible weapon against malnutrition.

We now arrive at the problem of food formulation starting from the staple products of the country. One example is the mixture of lysine-poor wheat flour with lysine-rich but methionine-poor soybean flour. The addition to the mixture of a small quantity of fishmeal or of powdered skim milk will increase its biological value and correct its deficiencies. Wheat flour can be mixed with vegetables or powdered skim milk according to what is available in the country. The synthesis of food calls for much research and in depth study before the product is introduced on the market.

To make a protein-rich food or a weaning food, we must first carry out a nutrition survey to identify deficiencies, their degree of severity and their distribution within the population. The formula food must be such as to eradicate these deficiencies.

- The raw material must be studied from the point of view of its nutritive qualities and its hygienic purity. It must be free from pesticide and fungicide residues; not infected by molds like Aspergillus flavus, a source of aflatoxin, a liver carcinogen; free from the residues of solvents and natural toxins, like anti-trypsin in the case of soybeans, and gossypol in the case of defatted cottonseed.

- Technologically, the effect of heat and of the preservation method on the biological value of the product must be considered.

- Bacteriological work will allow avoiding the presence of pathogenic bacteria (salmonella, E. coli, staphylococcus, Clostridium botulinum).

- Biological research will be conducted on animal subjects to determine the biological value of the

proteins contained in the formula food. Using rats, determination of protein efficiency ratio (PER) and net protein utilization (NPU) will be made. Studies on man will establish growth rates, nitrogen equilibrium, serum albumin, and enzyme concentrations in plasma.

- The acceptability of the food item is expressed as whether it meets acceptance or not, and the average quantity that can be consumed by a child per day.

In general, a food must insure satisfactory growth, prevent certain diseases, and lower child mortality. It must be suitable for use among a large proportion of population suffering from malnutrition.

The following table presents a list of protein-rich foods also used as weaning foods and consumed by a majority of the population.

Commonly Used Manufactured Protein-Rich Foods

Product Trade Name	Protein Source	Consumer Nation
Incaparina	Cottonseed meal, soybeans, corn	Columbia
Incaparina	Cottonseed meal, corn torula yeast, lysine	Guatemala
Pro-Nutro	Peanuts, soybeans, fish-meal, wheat, corn, yeast	South Africa
Superamine	Wheat, lentils, chick-peas, powdered skim milk	Algeria
Saridele	Soybeans	Indonesia
Arlac	Peanuts, powdered skim milk	Nigeria

Commonly Used Manufactured Protein-Rich Foods (continued)

Product Trade Name	Protein Source	Consumer Nation
Nutresco	Corn, fishmeal, peanuts, soybeans, powdered skim milk	Rhodesia
Vitasoy (beverage)	Soybeans	Hong-Kong
Saci (beverage)	Soybeans	Brazil
Kaira baby food		India
Fafa	Teff (millet), chick-peas, powdered skim milk	Ethiopia

Here is also a list of some private industrial firms in the United States which are now studying the introduction of protein-rich foods in developing countries.

U. S. Food Companies Working in Developing Countries

Country	Company	Protein source
El Salvador	Pillsbury	Sesame seed, wheat germ
Brazil	Krause Milling	Corn, soybean
Brazil	Monsanto	Soybean
Brazil	Swift	Soybean and powdered skim milk
Brazil	Swift	Soybean and other items
Tunisia	International Milling	Wheat

U. S. Food Companies Working in Developing Countries
(continued)

Country	Company	Protein source
Kenya	Del Monte	Soybean and proteins from oil-bearing seeds
India	Dorr-Oliver	Cottonseed
Pakistan	General Mills	Soybean and cottonseed
Thailand	Archer-Daniels-Midlands	Soybean
India	Swift	Soybean and cottonseed

The U. S. Food for Freedom program has introduced in some developing countries foods like CSM (corn-soy-milk) and WSB (wheat-soy-blend). Some protein-rich foods are at a research stage, others are already out of the laboratory and finding industrial application. An example is Laubina, a formula of the Nutrition Department of the American University in Beirut, Lebanon, which is made of wheat flour, chick-peas, and powdered skim milk.

Other enrichment programs are taking place in some other countries. For example, Modern Bread is an industrially-developed product of Bombay, India. This bread contains the same amount of protein as ordinary bread but it is higher quality protein, being enriched with the essential amino acid, lysine, and various vitamins and minerals. In Peru, following a law issued in 1968, bread is also enriched with the essential amino acid, lysine. The success of such a program depends on the national publicity media and direct contacts with the population in various regions to familiarize them with the new food.

Living in a world where industry takes on an increasing role, where means of communication are more and more rapid, we hope that these possibilities, together with

the constant progress of agriculture and national efforts in the fields of education and public health, will permit us to struggle more effectively against the problems of hunger and malnutrition in the world. Let us hope that our gathering at this conference is a step in this direction.

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GENERAL DISCUSSION

Dr. May (United States): I would like to ask Dr. Miladi to give us his ideas on the most practical way to lower the cost of these manufactured products. We all know that they have great advantages, but one of their problems is cost, and they must be brought within reach of the most modest budgets. What philosophy, what method, what doctrine does he suggest to lower prices in Tunisia as well as elsewhere?

Dr. Miladi (Tunisia): The question of cost, like the problem of proteins and malnutrition, cannot be resolved by one country alone, in my opinion. Important technological progress is now at our disposal. In our various industries, we now use modern means, based on mechanization. This must be the approach to food processing also. Unhappily, this field is not yet developed. The food industry is neglected; one forgets that this science has standards, laws, characteristics, and theories to deal with industrial problems.

In answer to your question, Professor May, we must first of all benefit from the experience of others. As an example, let us consider Algeria and Tunisia. Algeria has made an experiment: it has introduced a weaning food with the help of UNICEF and FAO. We Tunisians are not so very different from Algerians. We eat the same things: olive oil, flour, couscous, bread. Everything is about the same, even the national dishes. In Algeria, the price of a can of Superamine weighing 300 grams is 16¢, that is 80 Tunisian millimes. Here in Tunisia, a similar manufactured or imported product costs 3 or 4 times as much and does not have the same nutritive and biological value as the local product manufactured by the Algerian agency.

To reduce cost, countries have to collaborate with the international agencies which have technology at their disposal. From the point of view of financing, they are ready to finance a city: for example, if you offer them land, they will offer you construction materials. With the materials donated, production cost is reduced.

Consider milk: someone has conducted an investigation and has observed that a country like Tunisia has a deficiency of vitamins A and D. To solve this problem, economists and planners may suggest a two- or three-year procedure to increase the intake of vitamins A and D. But the problem can be solved in 5 minutes. We have experimented with this: we have tried enriching milk with 1,500 international units of vitamin A and 400 international units of vitamin D. The additional cost for 100 liters of milk is 0.5¢ or 2.4 Tunisian millimes. When this is applied to the total national consumption of 20 million liters, the total cost becomes $1,000. The vitamin A and D problem can then be solved for $1,000.

The technological approach is quite different from the statistical or economic approach. I can mention several other similar examples with local products. In Tunisia, we have another experiment that may find application in Algeria, Morocco, or other countries. What is our number one food industry? Olive oil. But all by-products of the olive unhappily are not consumed by either humans or cattle. They are used as fertilizers, or sometimes, in special cases, they are fed to camels. So I have tried to investigate the potential uses of these by-products. Why have they not been used before now? I have studied the various parts of the olive, beginning with the olive pit. This is a product containing 22 percent protein, almost the same amount as meat and 6 or 7 times as much as milk. It is rich in vitamin A and very rich in calcium. The amino acids are well-balanced, but the composition is better than that of soybeans. I have wondered why this product had not been consumed before now, and I found that it contained an inhibitor blocking its use as food. But, by a very simple extraction procedure, this inhibitor can be removed. The product has been tested biologically, and we have had better results than with soybeans.

Dr. Dziri (Tunisia): I would like to ask Dr. Miladi a question regarding the food industry. It is all very well to create a food industry and put it at the service and within reach of modern man who is always so busy and thinks that 24 hours are not enough in a day, but I would like to raise a question: isn't there need to provide the consumers

with certain safeguards? This eventual consumer will consume a product in which quite a number of food additives have been introduced, whether they are food colorings, preservatives, flavorings, or spices. I would like Dr. Miladi's opinion on these food additives, which, by the way, are very much controlled in industrialized nations. We must not go from the frying pan into the fire and give consumers industrially formulated products capable in the long run of giving rise to certain pathologies that would be regrettable both for the consumer and for the future of our people.

Dr. Miladi (Tunisia): This problem is difficult, vast and complicated. I mean to say that in our African countries, the food industry is the number one industry. However, it has not had the advantage of the same scientific and technological progress as other industries. Neither do we have the sophistication of the food industry in developed countries. To the consumer, the only thing that does not matter is the composition of what he eats. While he knows about wool, hides, automobiles, etc., he knows nothing about what he eats. Yet the greater part of average African incomes is spent on food. On the other hand, industry is a business: the industrialist wants to earn money. Regulations and specifications reduce his profits by increasing his costs.

The power of publicity and advertising is enormous, as shown by Coca-Cola, which is just water, sugar, flavoring and, regrettably, sometimes phosphoric acid. Yet this has become a world-wide business because of advertising, although the consumer does not know what a Coke contains and even dislikes the medicinal taste the first time he drinks it. There is no doubt that a Codex Alimentarius is needed and that we should protect the consumer while permitting the very important and useful food industry to develop.

NUTRITION AND COORDINATION

Presented by the Honorable Chedli Ayari
Secretary of State for Planning, Tunisia

The relationship between coordination and nutrition seemed so self-evident to me that I found it hard to discuss it for four to seven pages. It might be useful before we speak about coordination in general to underline the Tunisian Government's interest in nutrition by presenting some statistics which may define not only the importance of past action but also the importance of future plans.

In their plans, economists attempt to implement in practice their theoretical systems. They want to achieve a very simple thing to which we must all be sympathetic, that is the economic and social well-being of their country within a time span of 4 years, 5 years, 10 years. This objective can be expressed as the maximization of per capita consumption of a range of specific goods and services. More concretely, it is expressed as the growth through higher and higher consumption patterns, until one reaches the pattern where an individual worries about cholesterol and an excess of calories. Between these two patterns -- the subsistence level on the one side, and the fear of cholesterol on the other -- there are intermediate levels of consumption. At the lowest level there is an important priority, that of meeting the nutritional needs of every citizen. The quantitative and qualitative nutritional equilibrium can be stated as the consumption of a given calorie ration, protein ration, vitamins, calcium, etc., all in qualitative balance with one another.

This double requirement of quality and quantity is not always met in Tunisia and elsewhere for many reasons. To understand why there are nutritional deficiencies, one must call upon a complex of causes; to treat them, a coordinated policy is necessary, since the causes of nutritional deficiencies are many. It is certain that among these causes is an insufficient level of food production, which is linked to insufficient agricultural production,

which is in general connected to the rate of population increase, because everything is connected. But that is not all. There is also a problem of poor distribution of available supplies, poor distribution both at the national and international levels, poor national distribution because of low prices. The price policy which it is possible to follow in a country such as Tunisia does not allow the optimum distribution of resources among the different strata of population. (I shall come back to this question later.) In fact, the purchasing power is such that even when goods are available commodity distribution is not adequate.

On a larger scale, international distribution is the guiding factor: it is possible to have food surpluses in storage all over the world, but for various political, diplomatic, commercial, or economic reasons not to have them well-distributed. Another cause of food shortage is the small number of studies, research projects in agriculture, nutrition, dietetics, medicine, and economics from which one might perhaps discover how to increase the food supply for a given country and how to substitute for the classical well-known foodstuffs other yet unknown nutrients that might have the same energy and nutritive values. Isn't this a research topic for the nutrition laboratories working on development problems? Which is to say that we are faced with a whole series of causes for food shortages which may only be correctly inventoried by making a detailed balance sheet of all causes -- a regional balance sheet, a national balance sheet, and even an international balance sheet.

These balance sheets are often not known. Nutritional deficiencies manifest themselves only by their pathologies. Let us take a look at Tunisia. It was while preparing for the present 1969-1972 Development Plan that the consumption survey, whose author is among us today, was made. This survey was an important turning point in the determination of consumer needs. A National Sub-committee for Malnutrition was created to help prepare the Plan, and finally the National Institute of Nutrition was founded. Thanks to Dr. Kallal, to other research and to projects carried out by the Faculty of Agronomy, by physicians, and

by dietitians, a quasi-balance sheet was established, and at least a first attempt has been made at the food and nutrition problems of Tunisia. Thanks to these data, the nutrition goal is going to have top priority in the next development plan. I do not know whether 1980 will be the time for food self-sufficiency, as the planners were thinking a few years ago. I am somewhat pessimistic and think that we should push back the target date by about 10 years. What is certain is that we will plan for a 10-year or 15-year target that should provide each Tunisian with an adequate quantity and quality of nutrients.

First let us examine the food supplies, before we consider the nutritional balance. Food supplies are linked to agricultural production. Without burdening you with statistics and figures, I can say that the first deficit appears in the surveys conducted from 1962 to 1968, and especially in 1968. From year to year, the overall deficit is of the order of 20 percent as compared to our needs.

The second important deficit is in sugar, where we have a 90 percent deficit. This may be improved by 1 or 2 percent, but in my opinion we will probably always be sugar importers for 90 percent of the demand.

The third important deficit is milk, which is also a staple food. The few available figures seem to me to be optimistic; I must say that all these figures should be considered minimum values, and not maximum -- I am presenting them with caution. Our milk deficit is on the order of 40 to 50 percent.

The other foodstuffs, like oil, fish, and even fruit show up in the statistics as production surpluses. In fact, Tunisians obtain most of their calories from oil. The production varies by a factor of 2, but since the Tunisian demand is met by local production, there is no deficit. However, for commercial reasons, soybean oil is sometimes substituted for Tunisian olive oil, because olive oil brings foreign exchange earnings whereas we are able to obtain soybeans from American surplus. Fish plays no part in the ordinary diet of most Tunisians.

There are important differences between the deficits. A sugar deficit, for example, is inevitable: Tunisia cannot help being a sugar importer. But the cereal and milk deficits are due to factors amenable to control; this may sometimes be a poor harvest, but also -- and this is the place to take action -- insufficient capital investment in the agricultural sectors. Actually, when we examine the distribution of agricultural investments in Tunisia, we notice that their emphasis does not favor the production of goods arising from livestock and dairy operations, so that everything cannot be blamed on nature and on the poor quality of soil. The increase of food supplies is in large part related to encouraging the direction of capital investments in agricultural enterprises. In the future, it is my intention to alter this orientation to take needs into account.

How do we compensate for the deficits? The only means is imports. In 1968, imports of food commodities accounted for 80 percent of the total imports in the agricultural sector and consisted mainly of cereals. It is certain that if these purchases had had to be made with strong currency under the usual trade conditions, the Tunisian balance of payments could never have stood it. Our food needs were met under very favorable terms, thanks to United States Law PL 480, that is thanks to the American food surpluses. I expect that a number of countries represented around this table have had experience with PL 480 concerning cereals and fats. But everything is not a gift with PL 480. One part is gift, one part is a long-term loan, and one part is to be paid back in dollars. Therefore, one must be aware of the subtleties. It is an excellent operation, and certainly preferable to trading on the open market, but it is also a debit on the Tunisian balance of payments, and it should not make us forget the food self-sufficiency I referred to earlier.

I believe that the situation was more serious in 1969 than in 1968. Tunisia's cereal deficit in 1969 was 40 percent, that is 20 percent higher than in 1968. This was mostly due to the very poor 1969 harvest. In 1970, happily, the situation will change; the agricultural outlook is much better; we are anticipating a good harvest, assuming

no unforeseen difficulties; and we expect to be cereal exporters in 1970. However, I think that this surplus harvest, although it creates storage problems during the inter-season, must be thought of as a favorable factor within a basically unsound situation. We should be careful in a good year not to lose sight of the generally negative trend since 1962.

We have made projections for 1971 and 1972. In 1971, we expect a very good agricultural year -- especially a good olive oil harvest -- but in 1972 we anticipate a reduction of agricultural production to levels which, though not catastrophic, will still be very low; and in 1973 we do not know what will happen. So that the food balance sheet is still very delicate; and although 1970 will give us a breathing spell, Tunisia will continue to have problems in meeting its cereal needs. I am also sure that the supply of sugar and dairy products will continue to be difficult to obtain, because we will have a milk deficit of 40 to 50 percent this year and the next, that is until the end of the present development plan.

I conclude that with a negative food balance sheet we cannot help but have a negative and unbalanced nutritional balance sheet. There may not be a cause and effect relationship, but if your food balance is negative, there is a strong possibility that you are also unable to maintain the nutrient equilibrium of diets.

A few figures on nutritional balance. Let me first say it is my feeling that the agricultural statistics have been somewhat inflated, and that we should examine them with caution and take the figures as indicative. It appears that the per capita caloric supply increased by 210 units between 1962 and 1968, that is, by about 10 percent in 6 years. Since the population has grown by 14.6 percent in the same period, the total caloric potential for the nation increased by 24.6 percent, or an increase of 3.7 per year. This would provide Tunisians with 2,340 calories out of the usual standard minimum of 2,600, that is, a 90 percent coverage of needs. I would, however, be inclined to admit that the per capita calorie increase has been lower. I am not certain that Tunisia takes care of

90 percent of its caloric needs. This is still to be determined. In any case, it can be said that the situation has met with some progress yet to be defined in a precise manner. What is more important is that this improvement, if it has taken place, is essentially to be ascribed to the increased consumption of olive oil. Physicians and dietitians will tell you whether a calorie increase by olive oil is better or worse than if it were obtained from other sources. This may be a serious nutritional imbalance.

The protein intake seems to have gone from 62 grams per capita in 1962 to 65 grams per capita in 1968, for an increase of 4.8 percent due to increased consumption of cereals and animal products. The ratio of animal proteins to total proteins now seems to be 22 percent. Our research has also shown that there is a great difference in available protein supply between rural and urban populations. It seems that the protein and calorie deficiency is more pronounced in rural areas. For example, there seems to be a calorie deficit of 700 units in rural areas, which is far above the urban calorie deficit. Again, the ratio of animal proteins to total proteins appears to be 17 percent in rural areas against 20 percent for the whole country and even more in urban areas.

There is a 12 percent increase in thiamine intake, but there remains a 15 percent deficit compared to needs. Vitamin A shows a 26 percent increase with the greater consumption of leguminous vegetables.

I am presenting these figures as they appear in the preliminary reports. The studies and figures indicate that Tunisia is more and more interested in these nutrition questions, and that there is an obvious need for surveys, studies, and more intense research, before we can have exact documentation of the state of nutrition in Tunisia. The 1966 preliminary consumption survey certainly was a turning point in the Tunisian Government's awareness of the nutrition problem. The second way in which these figures are of value is that they effectively demonstrate, not only the progress made but the magnitude of the problem to be solved. In 1970, 10 years after independence, we are still

far from having achieved a standard physiologically balanced diet for every average Tunisian. Which means that economic development may be bypassing one of the major goals of development, that of insuring each citizen the means for an adequate standard of living.

What shall we do then? A while ago, I mentioned that the present 4-year plan, 1969-1972, has set 1980 as the target date for food and nutritional self-sufficiency. I do not know whether this target date will be maintained. What I can say is that in preparing the next plan, which will extend from 1973 to an as yet undetermined date, we will include among the main objectives, agricultural and nutritional objectives.

Certain steps have to be taken. Which ones? First of all, we must reorient agriculture to the short-term production of foodstuffs. Without going into the details of agricultural investments, we may wonder why Tunisia has spent so much on dams, on infrastructure, on collective agricultural equipment, and so little for the direct exploitation of agricultural land and the encouragement of the food industry. I would simply like to point out that among agricultural orientation steps to be taken in the future there will be an increase in capital investment in the sectors directly connected to the production of foodstuffs.

As an example, I may cite the case of livestock-raising, which for various reasons has been the poor relation of the Tunisian agricultural sector and has had little attention paid to it. At this time, I believe that livestock investments will be increased in an amount still to be determined. Stock-breeding is not only important for the food it supplies, but it is also one of the most profitable enterprises from many points of view, including employment and yield per hectare.

This is not the only case; there is also a direction of investment toward new agricultural products and perhaps toward new combinations of agricultural products.

If my first priority is the selection of new investments, the second step in this action strategy concerns prices. Here we have an extremely complex field. A given agricultural or food potential may provide a different economic, social, and nutritional benefit, depending on the use of price strategy A or strategy B. At this time it appears that at the national level the agricultural price policy, hence the food price policy, is poorly adapted to the prevailing conditions. We must therefore revise the whole price structure from the producer to the consumer. What is paid to the farmer-producer, and what is the price of the same product when it reaches the consumer? The prices paid at the production level are now low, whereas the prices paid at the consumption level are high. Under these conditions, it is vain to hope for an increase in agricultural production. The whole price structure must be reviewed and a price policy established capable of encouraging higher productivity and in this way a more adequate distribution of commodities.

In Tunisia, the most typical example is the price of wheat. The price of wheat has not changed in Tunisia in the last 10 or so years. A hectare of wheat yields from 4 to 5 dinars; and this has been the case for many years, although the purchasing power of other prices has changed and even the price of bread has gone up. This is a price problem and marketing problem as well, because prices depend on an adequate marketing structure. This is an important problem, since the setting up of markets depends on the distribution of goods, which itself depends largely on means of transportation, on the existence and location of stored commodities, and handling and processing facilities. The solution to the price problem will be the result of a liaison strategy between the producer and the consumer. Pricing, warehousing, transportation, distribution of goods, preservation problems -- all these, in my opinion, are extremely important and underline the need for effective coordination.

The third point I would like to emphasize is the importance of research and investigations. Nutrition surveys are not purely medical or chemical, they are also economic inquiries. There is first the technical study

proper. I mentioned it earlier, and will remind you that the Institute of Nutrition is concerned with this, as are some researchers at the University. The needs of the average Tunisian must be precisely determined, and the available resources to maintain a qualitative and quantitative equilibrium established. But more than that, there must be economic studies, marketing analyses, and analyses of the relationship between consumer demand and prices, income, and other parameters. When a Tunisian's income goes up by 1 dinar, what does he do with this dinar? We have some data on this subject. The consumption survey I referred to earlier gave some figures on the demand. But here again I believe there is work to be continued, because to be sure of the demand one must predict it over a period that may vary from 4 to 10 years. We are not able to unify the agricultural sector and meet the demand, if we cannot say how a Tunisian reacts to an increase in income.

All this shows the diverse, interdisciplinary novelty of the action to be taken. Close coordination is needed within a coherent framework that may act as the effective focus for the various disciplines, a focal point for consultation and for the confrontation of the scientific contributions that have a bearing on nutrition, whether it be close or distant. I do not intend to argue here for an Institute of Nutrition as we have created it, nor to say that the Institute must be connected to the development plan or to a particular ministry, this is not my intention. I simply wish to say that it needs to be coordinated with other institutions to function along the basic lines assigned to it. I think that the Nutrition Institute should not be rigidly attached to any administrative entity with its own prejudices and its own outlook. I believe that the Institute must be granted the necessary flexibility for its interdisciplinary role, and must be funded with the human and financial means to carry out its role.

From the manpower point of view, it needs a permanent staff connected on some ad hoc terms with other departments, either for the preparation of the development plan or for discussions of the equipment budgets of one or another ministry. For human resources we must call upon

Tunisian brainpower -- which happily is not lacking in these fields -- and upon foreign expertise, which has generously been offered to our Institute.

From the financial point of view, the Institute must dispose of adequate means to finance meetings, to purchase equipment, to organize rather speedy missions; this is more important than to discuss the relative status of the Director, the Assistant Director, and the department heads, who may change from one year to the next or from one project to another. In my opinion, the question is to provide the Institute with sufficient funding to operate. The salaries of Institute members are only one consideration. I just want to say that this center must remain open-ended both internally and externally since it has to be grafted onto permanent scientific contributions in this field.

As the official responsible for the Plan, I want to assure the Institute of our help and confirm that we will spare no effort to enable it to carry out its mission.

GENERAL DISCUSSION

Dr. Kallal (Tunisia): I have to admit that last night, when I read Mr. Ayari's paper, I thought, "He is not dealing with the subject of nutrition and coordination." I have just heard him, and I realize that the very development of the topic is a typical example of coordination. He has referred to consumer surveys and to the work of a sectorial committee composed of a physician, an economist, and an educator, etc. He has spoken of the calories provided by olive oil, and whether this is beneficial. This is a question that only several disciplines can answer and he wondered whether experts would agree on the quantitative or qualitative value of such an element in the dish. During this presentation, we have heard about prices, diseases, public accounting, agriculture, diets, technology, and industry. Is this not a beautiful lesson in coordination?

Coordination, then, we all agree, is necessary: but what kind of coordination? We need coordination, but also balance; even our formula has drawbacks as well as advantages. One advantage is that the Ministry of Foreign Affairs and the international agencies have a focal point of contact for their multidisciplinary projects, and no longer have to hunt among the many government agencies for the one interested in a particular project.

A second advantage, a corollary of the first one, is that we have grouped in the same building various specialists who do communicate with each other several times daily instead of once a year around a committee table. Dr. Miladi, Dr. Dziri, and Mr. Jaouadi work much more homogeneously than if they were at different institutions.

The third advantage of our system is that we have laboratories. We are thus able to do applied nutrition and research, which cannot happen in the backrooms of offices. We are also not dependent on outside help to solve problems or set up local projects.

The inconvenience of such an institute as ours is that, deprived of their direct involvement in nutrition, other government departments lose interest and no longer concern themselves at all with the nutrition question. The Institute will always have to take the initiative in contacting these agencies to present them with problems or ask them whether they have any to solve. The general orientation of this Institute might also change with the field of specialization of its director.

If it is easy to state the problems of coordination, it is difficult to solve them. Even in the United States, I am told, coordination does not exist. Much effort and much money is wasted.

One of our first tasks is to develop the vital area, of food technology. The food industry, which accounts for about 40 percent of Tunisia's industrial production, should not be lacking a supporting technological organization. We would like our export products to carry a trademark of quality.

As Mr. Ayari wishes, our future program will include research in all the fields where a need is felt, and we will facilitate his planning by providing him with the facts he needs.

In conclusion, let me thank Secretary of State Ayari for the support he has given our Institute and for the generosity with which he agreed to elevate our discussions by his presence.

Mr. Adandé (Gabon): Malnutrition certainly remains one of the major concerns of our time, and I think that the last report of Mr. David Morse, Director General of the International Labor Organization (ILO) is relevant. In this report, Mr. Morse emphasizes that 30 to 50 percent of the human population is undernourished. He adds that whatever the causes of this impoverishment, remedial measures will stimulate economic development. A poorly fed man is incapable of normal work. We have heard it here again.

The speaker has stressed the necessity of coordinating action in all fields: political, social, economic, and health. I will add that it is also necessary to coordinate at the financial and planning levels.

To get back to the presentation by the Minister of Planning for Tunisia, I would like to say that a country's infrastructure can be an important cause of malnutrition. The lack of a serviceable road network can be just as effective in throttling the growth of our production as deficits in food and other agricultural output. In some of our countries, some regions experience a production surplus; but the flow of goods to consumer markets is impeded by the lack of surface communications.

I would also like to ask Mr. Ayari a question regarding prices. Price structure is a question of interest to us and of concern to many African nations. In general, two methods are used to determine prices: the first method consists in starting from market prices and backtracking to production prices; the second method is obviously the reverse. We have met with many difficulties with the second method, mostly variations in the timetables of farm work and of the investments made by the farmers. These problems are complicated by the lack of bookkeeping in small enterprises. Has Tunisia already developed a method to determine the correlation between prices of local products and the prices of imported commodities? For example, the price of game meat is often related to that of imported meat; I can see no reason for that.

Dr. Seffar (Morocco): I assume your planning takes into account the population increase. I have also been led to believe that a family planning program exists in Tunisia. I would like to know whether targets have been set.

Dr. Périssé (FAO): It seems to me that in this conference we have made great progress in comparison with past nutrition conferences. I think this is the first time that the Minister of Planning of a country has taken part in this kind of discussion, and I thank the Secretary of State for having done so.

We have here the example of a country, Tunisia, which has decided to give a high priority to its nutrition policy as part of its development plan. The methodological concerns presented to us are similar to the ones we have at FAO and that I attempted to describe to you yesterday. But as opposed to the other countries with which we have worked out international comparisons, Tunisia has been able to provide itself with the necessary tools by executing, on its own, and with its own technicians, a national consumption and budget survey to provide basic data.

It may be necessary to extend this survey to include data by age groups in order to permit the accurate planning of children's needs. I am sure that the Nutrition Institute will be able to handle this. This issue is of particular interest to UNICEF. You are aware that most surveys give average data per family both for budget structure and consumption levels; but, unhappily, this is inadequate, since we cannot know what expenditures are actually made for the child nor the consumption level by sex and age bracket.

The answer to this question requires a complex methodology that has resulted in only a limited number of families being investigated. It is not possible to extrapolate these data to the national level and this is why I think that the development plan cannot make use of them. What we need is not scattered studies, but integrated operational studies with statistical validity. It is in this vein that I would like to reply to the question raised yesterday by the delegate from Algeria. What is needed are surveys capable of quantifying phenomena from a nutritional and economic point of view, so that the plan can take them into account. This is how we intend to engage in dialogue with economists.

EURATOM and the French Atomic Energy Commission carried out a consumer survey of 9,000 households in the six Common Market countries. This survey was made to study radioactive contamination of the food chain. This classical study gives average results per family consumption level and budget. Mr. Ledermann recently developed a very complex mathematical model. From it, and by means that I will not

explain because I am unable to, one may obtain, starting from the average family consumption, a rather good approximation of consumption levels by sex and age brackets. This is an interesting development that should lead some day to better planning for the needs of childhood.

When you analyze the results of a consumer survey by families, what you get is an average. But, since the father often takes the greatest portion, it is important to know whether the children receive their share. To arrive at a reasonable plan, one must have this kind of information. The mathematical model is not rigorous, but it allows the identification of a qualitative and quantitative consumption level.

The last two pages of Tunisia's report on their consumption and budget survey include an outline in which Mr. Kamoun has tried to show how to quantify the weaning phenomenon; but I believe that with this more modern model we may arrive at a still better quantification of these problems.

Mr. Wamba (Congo): We have been impressed by the brilliant presentation of the Tunisian Secretary of State for Planning; we have also appreciated the clarifications given by Dr. Kallal of the Institute, and we would like, in this area as in others, to make a contribution. Unhappily, our government, involved in other priorities, in particular the very creation of the state, has not yet had the time or even the idea of creating a national nutrition agency. We would like, however, to hear the African countries who have solved the question of balance and coordination tell us of their own experiences. This will help us to create and launch such an agency in our own country.

Mr. Djimé (Chad): Does Tunisia expect to revise its price policy on its own, or is it counting on foreign assistance?

Mr. Ayari (Tunisia): To the first question asked by the delegate from Gabon as regards pricing and whether one must go upstream or downstream, my answer is that one must go both ways. The first thing to study is the structure of production costs. On the average, accounts are kept to

within 10 or 15 percent on all organized farms; this is enough to establish the cost per ton.

The route from the consumer to the producer is certainly also important. The problem boils down to that of intermediate costs. How many intermediates must we tolerate in the circuit? In Tunisia, we have allowed the producer to sell his products himself, except for wheat. For tomatoes and other food commodities, commercial circuits are different and can be more liberal. But wheat is sold in large quantities and must go through the Office of Cereals.

To the second question, asked by the delegate from Chad, my answer is that price policy is a domestic question, except for citrus fruit where we are tied to world prices, but this has no effect on domestic prices. Nothing stands in the way of the Tunisian government revising prices autonomously.

To the delegate from Morocco, I will say that family planning is "a pain in the neck." We had expected in 1960 that the next 10 years would see an annual rate of increase of 1.6 to 1.7 percent; but now we find that the rate has risen to 3 percent. The effectiveness of the family planning policy has not yet been evaluated, although it has been applied in some countries for 10 years. I have asked this question of AID as well as of the World Bank, and was told that 30 years may be needed for this evaluation. It seems to me, however, that in 10 years some indication at least might be available.

What rate of population growth should we use for our planning? There are two schools of thought: 3.0 percent, to have a margin of safety; or 2.5 percent, to be closer to probability. This is important to enable us to predict the labor market. It seems prudent to me to be prepared with two alternatives: one for a 2.5 percent increase per year; and the other for 3.0 percent.

COMMITTEE REPORTS

COMMITTEE ON NUTRITION AND HEALTH

Chairman: Dr. Julien Mezu (Gabon)

Rapporteur: Dr. Leon Phaka (Congo)

Members: Dr. Outel Bono (Chad)
Mr. Pierre Djimé (Chad)
Dr. Hadj Lakhal (Algeria)
Dr. Bernard Meke-Me-Ze (Cameroon)
Dr. Bonaventure Muremyangango (Rwanda)

Advisor: Dr. J. Montedonio (WHO)

Recommendations

The Committee recommends:

1. That in the elaboration of economic and social development plans, governments take account of the fact that malnutrition constitutes a brake on the development of their countries.

2. That governments determine, through multidisciplinary surveys, the real extent of the problem of malnutrition in order to render preventive and curative programs as precise and effective as possible.

3. That governments reinforce organisms for coordinating food and nutrition activities when they exist and that they proceed with their creation when they do not exist in such a manner as to place at the government's disposal a tool for coordination and economic action.

4. That programs of continuing education in nutrition be created according to needs, taking into account the priorities peculiar to each country; that this continuing education place the accent on practical nutrition problems of mothers and children.

5. That governments encourage the intensification of research on the role played by nutritional factors in the physical and intellectual development of the infant.

6. That governments develop with objectivity educational programs of a sort to influence the health of the family.

7. That governments develop nutrition education activities integrated into health education, preferably within the framework of basic health services.

8. That food and nutrition be recognized as determining factors in shaping the effectiveness of physical and mental effort.

9. That mother and child health centers (MCH) emphasize the nutritional aspect of their programs, always taking into account the existing correlations between malnutrition, infection, infestation and environmental hygiene.

10. That the weaning period be given special attention and that the development and distribution of protein-rich foods be seriously considered.

11. That governments ask for and use foreign assistance to reach their goals in the field of food and nutrition.

COMMITTEE ON NUTRITION AND AGRICULTURE

Chairman: Mr. Abdelmoula Berrada (Morocco)

Rapporteur: Mr. Tahar Jaouadi (Tunisia)

Members: Mr. Jean Ntawe (Burundi)
Mr. Romain M'Bewa (Congo)
Mr. Jean Kassir Nicolas (Chad)

Advisor: Dr. Julien Périssé (FAO)

Recommendations

Considering the worrisome situation concerning food and nutrition in our countries, and the necessity to envisage the formulation of policies adapted to realities in this field, the Committee on Nutrition and Agriculture:

1. Recognizes the primordial role of agriculture in the solution of nutrition and food problems.

2. Recommends to the governments of our respective countries to spare no effort in creating nutrition services capable of sustaining dialogues with the agriculturalists, whether these services be attached to the ministries of agriculture, or whether they be attached to agencies maintaining working relations with all the interested departments.

3. Insists on the urgency and imperativeness of developing nutritionists among the agriculturalists and agro-economists, and thus the necessity to introduce or to generalize, as the case may be, the teaching of human nutrition and food economics in agricultural education institutions at all levels.

4. Recognizes that in addition to activities in the field of applied nutrition, improvement of the general food and nutrition situation - especially in our countries, where the general vocation is agriculture - is to be conceived within the framework of planning, especially in agricultural development plans.

5. Along this line, the Committee recognizes the interest in promoting national consumption surveys which integrate economic and nutritional information. Such investigations permit:

a. Establishment of more realistic food availability balance sheets;

b. Response to the queries of the planner;

c. Provision of the prospective analytic elements necessary for projecting food consumption trends;

d. Elaboration of a more adequate food policy.

6. Recognizes that agriculture in Africa has made marked progress in the domain of industrial crops, often to the detriment of food crops, with the result that food imports are on the increase. The Committee wishes that governments would accord to food crops all the interest they merit and that they would undertake efforts to intensify and diversify production so as to satisfy an expanding market resulting from population increase and the accelerated phenomenon of urbanization.

7. Notes that recent genetic research has permitted the development of more productive vegetable and animal strains. However, it appears necessary to encourage in our countries applied agricultural research so as to adapt these strains to the ecological conditions and to make them more responsive to nutritional objectives. This research could be envisaged in a regional framework so as to reduce the cost.

COMMITTEE ON NUTRITION AND CHILD FEEDING

President: Dr. Mohamed Seffar (Morocco)

Rapporteur: Dr. Frank Lowenstein (USA)

Members: Mr. Lamrani El-Ghali (Morocco)
Mme. Tangour (Tunisia)

Advisor: Mr. Paul Biron (UNICEF)

Recommendations

The Committee recommends:

1. That good nutrition be assured to all infants and children since it is one of the conditions of socioeconomic development in our countries.

2. That activities to prevent infant malnutrition be included in the programs of all departments having a social role.

3. That maternal and child health centers and nutrition rehabilitation centers be created.

4. That food policies capable of insuring necessary food availabilities be instituted.

5. That a better identification of the levels of food consumption in relation to nutritional needs of the different age groups of children be made by means of appropriate surveys and that programs to fight malnutrition which are instituted as a consequence be subjected to regular periodic evaluations.

6. That maternal breast-feeding be encouraged at least until the child reaches the age of 6 months, while seeing to it that breast-feeding is supplemented as soon as necessary by other indispensable foods so as to prepare

the child progressively for weaning, which should not be brutal.

7. That child spacing be promoted in order to permit mothers the necessary physiological recuperation; and that parents be encouraged to adjust the number of children to their resources in order to avoid malnutrition and all its consequences.

8. That programs of health and nutrition education for parents be instituted so that they can learn to feed their children correctly while respecting the rules of hygiene in the use of water and other foods. The programs ought to accord the importance merited to foods rich in proteins for the preparation of a balanced diet. Such foods ought to be made available to parents and at a price compatible with their purchasing power.

9. That supervision of the nutritional state of the infant by the preventive medicine services be extended until school age (7 years).

10. That a school health service, charged with insuring food hygiene and the good composition of school menus, taking into account the nutritional needs of children and adolescents, be created.

11. That school lunches be established wherever possible since they constitute a determining factor in the performance of the students and attendance at school and since they represent, above all, an essential element of all nutrition education programs. In rural areas, the benefit of school cafeterias could be complemented by gardens and small animal projects.

12. That nutrition education be introduced into all school programs.

13. That international agencies be asked for assistance to successfully carry out programs in the fight against infant malnutrition and that such aid be coordinated as well as possible.

COMMITTEE ON NUTRITION AND EDUCATION

Chairman: Mr. François Kisamare (Burundi)

Rapporteur: Dr. Abderrahman Dziri (Tunisia)

Members: Mr. Jean-Marie Kobozo (Central African Republic)
Mr. Roger Mavoungou (Gabon)
Miss Consolata Mukankiko (Rwanda)
Mrs. Carmel Sinodinos (Central African Republic)

Recommendations

Conscious of the nefarious consequences of underfeeding and malnutrition to the health of man and his intellectual, social and economic productivity in a world menaced by famine, which is intensified by an acute demographic push and the production of food crops in a quantity clearly insufficient to cover the needs of the inhabitants of the developing countries, the Committee on Nutrition and Education:

1. Recommends that no effort be spared to strengthen nutrition education by all possible methods so as to allow each country to solve its nutritional problems with its own resources and within the framework of its own institutions.

2. Recognizes that, in the light of analytical studies carried out in several countries, in particular those of the third world, the cause of undernutrition or malnutrition is most often lack of information about the requirements of an adequate diet meeting the physiological needs of the consumers, notably the most vulnerable (infants, children, adolescents, pregnant women and nursing mothers), and that nutrition education constitutes the most sure and the least onerous means of improving all the states of undernutrition and malnourishment.

3. Recommends, so as to meet the most important needs, the establishment of nutrition education in favor of the most

vulnerable groups, representing the society of tomorrow and its future. This education addresses itself to:

a. Women in MCH centers, social welfare centers, centers for the promotion of women, rural community development centers, maternity wards and hospital services specializing in nurseries and kindergartens;

b. Students of the primary cycle, in the course of their last two years of study;

c. Students of the secondary cycle, on the occasion of lessons in natural science and general hygiene.

4. Observes that, in order to assure the desirable success of nutrition education, it is necessary to form responsible nutrition educators who will be assisted in their work by the staffs of the medical and social services and by the teachers. A nutrition education program should be included in the curriculum to be followed by medical and social services personnel as well as by students in teachers colleges.. Brushup courses should be organized to complete and enhance competence in nutrition education of existing working personnel.

5. The recommended means for undertaking this education can be divided into two groups:

a. Didactic means: books, brochures, folders, posters, slides, conferences, talks, seminars, flannelgraphs, etc.

b. Applied nutrition methods: elaboration of menus, school and factory cafeterias, vacation camps, school gardens, small animal projects, etc.

6. Recognizes that for the general public, popularization remains the most effective means for informing the public about nutrition problems with the aid of:

a. Folders

b. Demonstrations: at home, at fairs, at markets, etc.

c. Shows: movies, radio, television, etc.

7. Observes that in order to facilitate and sustain the setting and application of nutrition programs, it would be desirable to establish at the core of each country a study and coordinating group animated by a staff of superior quality.

COMMITTEE ON NUTRITION AND FOOD INDUSTRY

Chairman: Dr. Samir Miladi (Tunisia)

Rapporteur: Mr. Daid Ali (Algeria)

Members: Mr. Berber Brahim (Algeria)
Dr. François Buyoya (Burundi)
Dr. Nicolas Kabamba (Congo)

Recommendations

After exchanging points of view through the conference discussions regarding research conducted to date and the results obtaining, the working group on nutrition and the food industry recommends as principal objectives and by order of priority:

a. The manufacture of a weaning food; and

b. The fabrication of protein-rich food products.

Starting from this objective, the group recommends:

1. An inventory of the food resources of the country.

2. The institution of laws - ordinances, decrees, orders - permitting regulation of food products and control of quality and price.

3. The training of technicians specialized in the manufacture, quality control and marketing of food products (with the participation of international organizations).

4. The creation of automatic and modern industrial assembly lines permitting manufacture of food products at the lowest possible price and assuring a constant superior quality.

5. The popularization of products by modern techniques of commercial promotion - direct contacts with all those who,

because of their function, can influence consumption habits.

6. The utilization of the by-products of food processing for nutritional or other ends in order to reduce the cost of valuable foods.

7. The continuity of research efforts towards the improvement of different manufactured products, their diversification and maximum diminution of their sale price.

COMMITTEE ON NUTRITION AND COORDINATION

Chairman: Dr. Abdessatar Grissa (Tunisia)

Rapporteur: Dr. Joseph Gody (Central African Republic)

Members: Mrs. Immaculée Hakizimana (Rwanda)
Miss Elizabeth Hilborn (USA)
Mr. Mohamed M'Rabet (Morocco)
Mr. Jean Felix Adandé (Gabon)

Advisors: Mr. Mir Khan (UNDP)
Dr. André Raba (WHO)

Recommendations

Considering the multidisciplinary character of nutrition; considering that several ministries and agencies interested in this problem have dispersed activities; considering the absence, in many countries, of a concerted national policy on nutrition; and considering the absence, in most of the African countries, of committees or institutes of applied nutrition research, the Committee on Nutrition and Coordination recommends:

1. That a national organism to coordinate the activities of the different ministries, departments or other agencies occupied with nutrition be created.

2. That this organism be allocated a separate line item operational budget.

3. That this organism be furnished with technicians capable of elaborating programs intended for different ministries.

4. That this organism be charged with:

   a. Defining national policy regarding food and nutrition;

b. Establishing coordinated action programs and defining priorities for improving the nutritional state of the country;

c. Distributing the responsibilities between the interested ministries and services, taking into account their respective assignments.

d. Coordinating and stimulating applied research in the field of nutrition.

e. Evaluating programs and the results of research and promoting the application of these results;

5. That, moreover, this coordinating organism:

a. Undertake an inventory of food availability;

b. Establish, through surveys of all age groups, social strata and regions, the nutritional needs and the levels of consumption of the population as a whole;

c. Develop, as a consequence of the results of these surveys, a nutritional plan, taking into account the needs thus revealed;

d. Encourage and organize necessary research in the field of nutrition to help influence socioeconomic and agricultural development plans.

6. That this organism facilitate the integration of nutrition into the daily activities of the various interested agencies.

CLOSING CEREMONIES

The Honorable Pierre Djimé (Chad): Mr. Chairman, Government Ministers, Honorable Delegates, it is my awesome but pleasurable privilege to give the closing remarks in the name of the delegations to the Third African Conference on Nutrition and Child Feeding. This is an awesome task because following 5 days of highly technical presentations and discussions by brilliant and accomplished lecturers, it seems difficult for a layman like myself to render wholly and faithfully everyone's feelings at the conclusion of these sessions. I shall simply say that the Third African Conference on Nutrition and Child Feeding has been a success all along the way. We will return to this point.

At this time, let me say that the honor you have given me by asking me to make the closing remarks is also a pleasure, and it gives me great joy that through me you have wanted to honor a sister nation the Republic of Chad, and its chief, President François Tombalbaye. I am infinitely grateful for your confidence which I will express to the party, the Government and the people of my country.

As I said, already, the Third Conference has been a complete success. The planning of conference details handled by Dr. Kallal for the Tunisian Government and by Professor May for the United States Government has been faultless. Technically, the conference operated at a very high level, and the fruit did not fail to live up to the promise of the flowers. The welcome given us by all has been unforgettable, and for this we thank Dr. Kallal, the Tunisian Government, and the people who expect to welcome in a few days the Supreme Fighter, His Excellency, President Bourguiba. Our thanks go to the organizers of the Third African Conference on Nutrition and Child Feeding and to the United States Government for the valuable help it has given in successfully bringing this conference into being.

Mr. Biron (UNICEF): My colleagues in the international agencies have asked me to congratulate you in their name and to thank the conference organizers for the high level

of debate maintained during these 5 days of discussions on problems to which our agencies attach great importance. It is comforting to see that in this area where we have been pioneers we are not alone at work, and that we are not preaching in the desert, but that nutrition and the fight against malnutrition are a constant concern of your governments, as they have demonstrated by the quality of the delegates they have sent to this gathering.

I also want especially to thank the Tunisian and American organizers for the remarkable technical aids they provided for us. I think it is particularly important on the occasion of this conference, the third one in Africa, not to forget the distinguished Professor May, thanks to whom it has been possible to cover the whole African continent. I think that a fourth conference will be justified to evaluate and confront the results of the first three. It is to Dr. May that we must pay hommage, since it is thanks to his persistence and his efforts that it has been possible to hold these meetings. I invite you then to express your warm appreciation to Professor May.

Dr. Seffar (Morocco): I want to thank everyone and mention especially Professor May who so effectively arranged our meetings. I would like him to transmit our gratitude to the United States Government and especially to USAID, and I express the wish that our recommendations will be read with very close attention by the appropriate government officials.

ANNEX

CEREAL ENRICHMENT

presented by Dr. Aaron Altschul
Special Assistant to the Secretary of Agriculture, USA
During the Delegates' Visit to the
Tunisian National Institute of Nutrition

I am very grateful to Professor Kallal, Director of the Nutrition Institute for having given me the honor of participating in this afternoon's ceremonies. I am equally thankful to Dr. Jacques May, convener of the conference, who invited me to make this presentation.

The purpose of my talk today is to tell you about an already on-going project which is being sponsored jointly by the National Institute of Nutrition of Tunisia and the United States Agency for International Development. This project may have a revolutionary influence on the quality of diets in Tunisia and the consequences could be of great interest to you all.

An intervention of great scope is taking place at the moment with the wheat flour resources which supply a certain number of villages in Tunisia. This flour is going to be enriched with vitamins, minerals and an amino acid: lysine. We propose to measure the consequences of this enrichment on the well-being and health of the populations of these villages and on the rates of mortality and morbidity. The physical activities of the population will also be studied. I will not burden you with the details of the program, but I can tell you that it is regarded as one of the most intensive efforts of its kind in the world.

What is the scientific basis of this operation? Modern science now permits us to convert cereals and other sources of energy into complete foods. This can be done in two ways: genetically or by the addition of missing nutritive elements. In the case of wheat flour, this will be done by adding the amino acid lysine, vitamins and minerals It is thus possible to intervene in the most important food supply of a given country at a cost low

enough to furnish to everyone the best possible nutrition. In the years to come, with the progress of development, the countries in question can utilize broader means of assuring adequate diets, but for the moment these countries can improve the nutritive value of their cereals at a cost equal to less than 5 percent of the price of the cereals themselves.

The Tunisian experiment has three principal objectives:

1. To establish the mechanism for fortification. The addition of new ingredients at a convenient place at the mill in the effective quantities needed, the problems involved in delivering flour thus enriched to the populations which need it, the degree of alteration resulting from cooking, all these are problems which must be resolved in the best interests of the consumers.

2. It is not the object of this experiment to verify the validity of the nutritional concept on which it is based. We know what happens when we enrich wheat; clinical and animal experiments have taught us this. But we do not know what happens in the real conditions of the villages; maybe other interventions will be necessary in order to reach the point where unquestionable improvements in public health are apparent. This is why these tests must be made under real life conditions.

3. To construct an island of modern technology as a bridgehead where the Tunisians can utilize their own genius and give their impetus to future development is also one of our aims. At the rate and to the extent that these experiments develop in the villages and reveal what can and cannot be done, Professor Kallal and his colleagues will modify the techniques adopted in order to make them compatible with the limits of the villages and the needs of the

Tunisian population. In the very near future, this project will be a purely Tunisian undertaking and can develop with the speed which the Tunisians desire.

This is not the only experiment in process; there are others in the world. The enrichment of rice is being carried out in Thailand on an experimental basis, as is the enrichment of corn in Guatemala and the improvement of manioc flour in Brazil. Moreover, the Government of India has adopted the principle of enrichment as a national policy and has developed an atta based on peanut flour. In Japan one-third of the school children eat enriched bread made out of flour similar to the proposed Tunisian enriched flour, and in India "Modern Bread" is fortified in the same way wheat flour will be in Tunisia.

I wish, however, to insist on the fact that no one method is a panacea capable of eliminating malnutrition or resolving all the problems of nutrition. It is necessary to establish a program in which special foods and education are combined. All these methods have their importance and you have already discussed them in the course of this conference. The contribution which this project can make is that of an intervention at the base, to which other efforts will add their benefits.

Since the 1st of July 1969, I have divided my time between international and domestic food problems. As you undoubtedly know, a certain number of our citizens also suffer from malnutrition and we intend to eliminate this condition. The method which I have just outlined for you is now considered in the United States as part of our strategy for combatting malnutrition in our own country. We have a program of food distribution which furnishes to consumers protein-enriched macaroni; numerous food companies have announced that they are going to enrich all their bakery products; a wheat identical to that which we are going to distribute in Tunisia is already sold on the market in Chicago and is being submitted to tests preliminary to its inclusion in our food distribution program.

We are also making exceptional efforts to furnish more foods for the improvement of our child feeding

programs and to assure better diets for pregnant women. We are enlarging the scope of our school lunch program and we are adding nutrition education. It is these combined efforts which form the strategy for eliminating malnutrition in our country. The Secretary of Agriculture, Mr. Clifford M. Hardin, has clearly expressed his intention to eradicate malnutrition caused by poverty and to raise the nutritional level of all Americans who do not actually have satisfactory diets.

Many among you have important positions and make decisions concerning nutrition policy in your respective countries. Without doubt, you have presented for consideration some of the many possibilities open to you. Perhaps you consider that you have already done enough and you do not envisage any new programs. If, on the contrary, you want to do more for your children and the nutrition education of your compatriots, you will certainly await with great interest the results of the work now in progress in Tunisia and elsewhere. Perhaps, also, you will want to undertake yourself in your country the experiments necessary to shorten the inherent delays in all national adaptations of foreign experiences.

There was a time when I worked in the laboratory as a biochemist and I believed that my work was most stimulating; in fact, at that time I worked on the frontiers of enzymatology and protein chemistry. Now I must confess to you that the work I do at present, which leads me into the field, is even more interesting. The principal reason is that I realize how modern technology can offer to governments the means for eliminating malnutrition as an ailment resulting from poverty. What could be more thrilling!

And now, Dr. Kallal, I thank you again for your generosity in inviting me to this session.

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