



Technical

Discussions



Washington, D.C.  
September 1981

INDEXED

Provisional Agenda Item 24

CD28/DT/1 (Eng.)  
17 July 1981  
ORIGINAL: ENGLISH

SANITARY CONTROL OF FOOD

## CONTENTS

	<u>Page</u>
1. INTRODUCTION . . . . .	1
2. CHALLENGE . . . . .	1
2.1 Food availability, distribution and consumption . .	1
2.1.1 Production and losses . . . . .	1
2.1.2 Distribution . . . . .	2
2.1.3 Consumption . . . . .	4
2.2 Public health implications . . . . .	4
2.3 Food industry . . . . .	5
2.4 Food control . . . . .	6
3. STRATEGY . . . . .	9
3.1 General comments . . . . .	9
3.2 National food policy . . . . .	9
3.3 National food control service . . . . .	10
3.3.1 Quality assurance . . . . .	10
3.3.2 Long term objectives . . . . .	10
3.3.3 Organization and coordination of governmental services . . . . .	11
3.3.4 Working philosophy and managerial policy . . . . .	12
3.3.5 Legislation . . . . .	13
3.3.6 Administration . . . . .	14
3.3.7 Inspection and compliance . . . . .	16
3.3.8 Analytical services . . . . .	17

CONTENTS (cont.)

	<u>Page</u>
3.4 Manpower development . . . . .	20
3.4.1 Training of leaders . . . . .	20
3.4.2 Projections of human resources . . . . .	21
requirements over the next ten years . . . . .	22
3.4.3 Regional training centers . . . . .	24
3.4.4 Recruitment and working conditions	
3.5 "Good manufacturing practices" and self-inspection in industry . . . . .	24
3.6 Community participation and education of the public . . . . .	25
3.7 Financial considerations . . . . .	27
3.7.1 Government financial policy . . . . .	27
3.7.2 Self-financing of national food protection programs . . . . .	28
3.8 Role of international organizations . . . . .	29
3.9 Technical Cooperation among Developing Countries (TCDC) . . . . .	31
Bibliography . . . . .	32
ANNEX: Compilation and analysis of data from countries visited	

## SANITARY CONTROL OF FOOD

### 1. INTRODUCTION

Food may serve as the means by which people are exposed to different agents capable of causing disease or injury. Food may become contaminated with biological, chemical or physical agents at many points during its production, transportation, storage, distribution and preparation for consumption. The extent of this contamination is related to the methods of production, including handling and processing.

The governments of the hemisphere have noted that millions of people were being made ill or poisoned by contaminated food and that the ability of health services to discharge their duty of protecting the public from health risks was limited by a shortage of laboratory and institutional-support resources.

These and other constraints still exist as will be noted from the information on the current situation in a few countries of the Region as documented in the annexed tables.

The topic "Sanitary Control of Food," chosen for the Technical Discussions at the XXVIII Meeting of the Directing Council of PAHO, provides Member Governments an opportunity to identify program components for accelerating the promotion, planning, coordination and development of food sanitation services.

The information that follows has been prepared to aid representatives in their discussions. It outlines the current situation and a number of strategy considerations which if implemented may help to reduce the hazards associated with food from its production to consumption.

### 2. THE CHALLENGE

#### 2.1 Food availability, distribution and consumption

##### 2.1.1 Production and losses

By 1975, the world population was 4,000 million and growing at 1.8 percent each year. In Latin America the growth is now 2.9 percent a year and, at that rate, the population is expected to double in 26 years. Almost half of the population lives in developing market economies having the most acute food problems.

The Ministers of Health of the Americas, in their Third Special Meeting, held in Santiago, Chile, in 1972, examined the situation with respect to food quality control and pointed out that spoilage and contamination resulting from inadequate conditions of transportation,

processing, refrigeration, storage and distribution, are responsible for the loss of a large amount of food destined for the consumer.<sup>(1)</sup> The reports of the Inter-American Development Bank (IDB) and the Andean Pact Group (Cartagena Agreement) estimated those losses at more than 30 per cent for those countries.

Although food losses are enormous they can be reduced, and in many cases prevented altogether. The large-scale wastage of food which countries can ill afford continues to be accepted as commonplace. The developing countries are producing less protein, principally animal protein, than they could because of poor practices and management and traditional systems ingrained in centuries-old habits. The consequences for health, nutrition, and economic growth are evident.<sup>(2)</sup>

Progress in the marketing of agricultural products has not been sufficient to offset the losses incurred in this process, which run as high as 25 percent among perishable products.<sup>(3)</sup>

In Latin America, the growth in the farm sector gross domestic product (GDP) has been lower than the growth in food demand. This is partly explained by the fact that population growth has outpaced the rise in domestic food production (Table I). For this reason, imports of staple foods have increased considerably, thus placing a significant economic stress on domestic resources.

Agricultural production also falls short of the requirements of raw material for the food processing industry. This situation has resulted in an uncontrolled increase in imports of products such as wheat for the production of flour; corn and sorghum for the production of balanced foods; crude oils and oilseeds for the preparation of refined oils; and powdered milk and butterfat for making a wide variety of dairy by-products.

### 2.1.2 Distribution

As is the case of food losses, only limited information is available on the storage, transportation and distribution of food.

A major deficiency is the lack of storage facilities for perishables as well as grains and oilseeds. Moreover, a high percentage of the homes in Latin America have no cold-storage equipment and are therefore obliged to purchase food in small amounts, which places a burden on the capacity of retail marketing outlets and raises their costs.

In most less developed countries of the Region (LDC's), legislation dealing with food distribution is inadequate to provide satisfactory protection to the consumer. The standards and regulations governing the composition, quality, hygienic conditions and labeling of the final products, when existent, are not being regularly enforced.

Food is generally transported under very unsanitary conditions. Most of the vehicles used for this purpose are not properly equipped and are also used to transport other commodities. The use of refrigerated trucks for the distribution of food is very limited. Carrying of chemicals such as pesticides on the same vehicle as food has led to incidents of food poisoning.

These adverse conditions are made even worse by a shortage of electricity at a reasonable cost to the retail marketing systems.

With very few exceptions, the majority of food consumed from the domestic markets of the less developed Member Countries originates from subsistence agriculture which is independent of the limited transport systems. Only when farmers enter the marketplace do transport systems become important. During the past 20 years, the World Bank and IDB have loaned hundreds of millions of dollars for improved agriculture production and for farm-to-market roads. While this accounts for a significant part of the increase in agricultural exports, unfortunately, there are too few such loans in Latin America which contribute to improvement of the domestic food commodity markets.

Storage is another crucial element in any marketing system. The shortage of storage facilities in traditional agricultural societies contributes to wide seasonal fluctuations of as much as 100 per cent in a given year. Adequate storage facilities for food of animal origin are frequently absent and it is held in unrefrigerated open areas for long periods of time, thus contributing to decomposition and wastage and in turn foodborne illnesses.

Lack of adequate storage with temperature and moisture control for cereal and other grains leads to the growth of molds that produce mycotoxins, some of which, such as aflatoxins, are among the most potent carcinogens known. These toxins can affect humans directly through the consumption of grains and indirectly if affected animals are consumed.

Apart from bacteria and molds, pests are the most common cause of losses in the distribution and marketing systems. Flies, roaches, rats, mice, cats, dogs, and flying birds are the usual vectors for transmitting disease and filth through food. The insects contaminate more food than they consume and, unless such food is thoroughly washed or cleaned, the insect parts and eggs are included in the processed product. Many insects can affect the quality of raw food and of stored and finished products.

Rodents damage foods in many ways other than by ingestion. Rodent hairs, droppings, urine, nests, foreign matter, dead animals and filth, can be in portions of foods consumed. A pair of rats consumes about 27 pounds of food in 6 months and voids 25,000 droppings and 1-1/2 gallons of urine.<sup>(4)</sup>

However, it must not be overlooked that humans can also contaminate crops as well as food. Use of untreated waste water for irrigation is one example of such contamination.

### 2.1.3 Consumption

Food consumption patterns indicate the selection and quantity of the foods used by a population (Tables II, III, IV). In developing regions a large part of the population suffers from lack of food, which is often imbalanced to the point that the requirements for nutrients, particularly proteins, are not met. Cereal and leguminous grains, particularly corn and beans, contribute the greatest proportion of calories and proteins to the diet. The second largest source of calories is tubers, followed by sugar.

After grains, the second largest source of proteins is meat, particularly beef, followed by milk and fish.

Although Latin America accounts for 25 per cent of the world trade in meat and meat products, the population consumes large quantities of cereals and starchy foods. The very limited consumption of protein, principally protein of animal origin, contributes greatly to the health problems. When food of animal origin is available, it frequently is contaminated, thus providing the perfect material for rapid growth of microorganisms which in large doses during ingestion (unless they are destroyed by cooking) will cause foodborne illness.

A major handicap limiting the availability of wholesome animal protein is the lack of adequate distribution mechanisms. More than 60 per cent of the beef production in South America is in the southern-most state of Brazil (Rio Grande do Sul), and in Uruguay, Paraguay and Argentina.

## 2.2 Public health implications

The public health implications of contaminated food supplies are difficult to assess accurately due to the lack of sensitive epidemiological surveillance systems. Moreover, there is a general lack of information exchange between the various governmental sectors which deal with food supply. Frequently epidemiological information gathered from disease outbreaks is not shared with food inspection personnel and vice versa.

Nevertheless, the presence of particular communicable diseases is certainly documented in Latin America. Some of these diseases are:

Typhoid fever	Salmonellosis
Brucellosis	Shigellosis
Paratyphoid fever	Viral hepatitis
Tuberculosis	Parasitic diseases
Dysentery	Staphylococcosis
Streptococcal disease	

Periodic outbreaks of these diseases occur, usually as a result of multiple interacting factors. Food is only one of the vehicles through which these diseases are transmitted. Water is another, as well as lack of proper waste disposal facilities and poor sanitary practices.

The extent of the problem over the last ten years can be noted in Table V.

Such diseases are particularly important because of their high mortality and morbidity rates among the more vulnerable population groups, and also because they represent a very large proportion of the cost of medical care and hospitalization.

The most vulnerable group affected by the above-mentioned diseases, such as shigellosis, as well as by diarrheas caused by other organisms, are infants and children. There is in the Region a vicious cycle of diarrhea-malnutrition-diarrhea which accounts for high infant mortality and greatly affects the physical development of the survivors. A PAHO publication<sup>(5)</sup> describes diarrheal disease as by far the greatest single cause of death among children.

Added to these problems is the growing threat of chemical contaminants such as pesticides and potentially harmful food additives, which are not controlled because of inadequate legislation or enforcement mechanisms.

### 2.3 Food industry

The developing countries of this Region are essentially producers of fresh, unprocessed raw materials for food and processors of food. In more recent times, most have become importers of food.

One of the characteristics of the food industry in the past has been its fragmentation into a large number of small establishments. There has been a trend towards concentrating firms into nationally and internationally scaled industrial groups and complexes which exert greater pressure to increase development of agribusiness, often without regard to the establishment and implementation of food control policies.

The multinational companies are generally quality conscious because it is good business and it reduces waste. It is the small, medium and large local firms that have the most difficulties. They do not utilize up-to-date technologies and processing equipment. In many cases imported technologies are utilized with no effort to adapt them to the cultural, socioeconomic, climatic and sanitary conditions of a particular country.

Few firms make capital investment improvements in equipment, nor do they maintain sanitary conditions at the facilities where food is processed. Expenditures for sanitation are of low priority.



There is considerable emphasis on the distribution of foods in small outlets, with great importance attached to ambulatory sales. This is a reflection of cultural patterns and social problems which makes food protection problematic. These cottage-type operations are the most difficult to identify and control.

#### 2.4 Food control

Consumers have confidence in the quality and safety of foods when they are protected by an effective food control service. Such services can help ensure a supply of safe, nutritious and well-served food.

Most of the developing countries of Latin America and the Caribbean have some type of food control service. However, in many cases they have insufficient capability in technical and administrative components to reasonably approach the problems of food contamination, food losses and health risks.

The two main levels of administration of the food control infrastructure, central and local, can be found in only a few countries. In some instances, responsibility for sanitary control of food is fractionated among several ministries and governmental agencies. Even in cases where the Ministry of Health had responsibility for food control, it was found that in very few countries were the inspection and laboratory services integrated in one unit. Usually they were spread over different departments or divisions of the Ministry.

Most countries of the Region have no explicit food control policy, and only few governments have, in the last decade, implemented national food protection programs with adequate legal, political and economic support to ensure real and effective control of food quality.

Likewise, only in a few countries has it been possible to extend international technical cooperation in the strengthening of specific elements of a food control service, including analytical services, inspection and enforcement.

In many countries there exists some kind of legislation consisting of basic law (normally as a part of a general health code), general and specific food regulations and, in some instances, obligatory food standards. However, such legislation usually is not keeping up with advances made in the food industry. In some countries there is new legislation in preparation, but efforts to put it into effect have been difficult.

Enforcement of existing legislation is usually quite spotty. Shortage of human and material resources, such as transportation, is often blamed for this deficiency. However, it must be pointed out that part of the problem is related to inadequately trained inspectors who are poorly paid (Table VI).

Field experience with food inspectors generally reveals the following:

- (1) lack of systematic approach, e.g. not following the work flow;
- (2) lack of standardized records for inspection;
- (3) not using previous inspection records to focus on priority areas;
- (4) devoting equal time to critical and non-critical areas of the operation (unaware of hazard analysis and critical control points);
- (5) lack of or insufficient equipment, e.g. thermometers;
- (6) lack of knowledge in the field, so that dialogue is limited to enforcement actions rather than positive guidelines for technical corrections;
- (7) lack of supervision, especially to ensure adequate follow-up of recommendations.

In summary, many time-wasting, inefficient inspections are being performed which are not effective in improving food handling practices.

As far as laboratories are concerned, there is a great diversity, ranging from those well equipped and staffed, general or specialized in certain areas, central or local, to establishments which are laboratories in name only. Most of the official laboratories are in the public health sector. A variety of equipment and techniques are employed, which are often obsolete. Instrumentation for modern contaminant determination, such as pesticide residues, is rare and the absence of maintenance and repair facilities is commonplace. Because of that, the presence of such contaminants frequently goes undetected.

Information on budgets assigned to laboratories is difficult to obtain. Available data indicate that funds destined for official food control laboratories per country per annum ranged from US\$10,000 to \$5,417,000 in the public health sector; \$602,000 to \$1,259,000 in agriculture; and \$576,000 to \$3,683,000 in other sectors (universities, customs, finance, industry) where these were designated as official laboratories. It must be kept in mind, however, that in certain cases figures given represent a total allotted to food control, with no breakdown available among administration, inspection and laboratory.

Staffs in central laboratories in the health sector are fairly equally balanced between professionals and non-professionals; in provincial and other local laboratories non-professionals usually predominate. In agriculture and other sectors, the majority are generally professionals.

Other information that proved difficult to obtain in connection with laboratories was the number of samples analyzed annually and, surprisingly, the work area available.

Where some data on number of staff, work area, number of samples analyzed and budget were available, it was estimated that the useful area per person ranged from 3.7 to 17.6m<sup>2</sup> (10-14m<sup>2</sup> usually being considered as a recommended minimum), cost of analysis per sample between US\$4.00 and \$106.00, and number of samples analyzed per person per annum between 16 and 994 (in one case, the cost per sample was figured as low as US\$0.74 and in two cases the number of samples per person per annum as high as 1,526 and 2,250, but these cannot be accepted as realistic or reliable) (Table VII).

There is a lack of scientific research in general at Latin American universities and other institutions, and when some research in the field of food is reported it usually is in the fields of nutrition, food science and food technology, and not specifically in food protection (i.e. analytical methodology, surveys of contamination, etc.). There also seems to be little support from international organizations and foundations for relevant research projects.

In the countries for which data are available the percentage of the national budget allotted to health ranges from 2.3 and 9.65 (in most cases it is around 3-5%). The proportion of the budget of the Ministry of Health utilized for food protection can only be ascertained from the few available data, which indicate figures of 0.28, 0.29 and 0.30%, and in one case 2.14%.

Poor information on appropriations can be explained in part by the lack of a clear breakdown in budgets for this item. Usually it is hidden within the overall budgets of other health related units.

On the other hand, funds earmarked for food control within the budgets of Ministry of Health represent in some cases only part of financing of official food control activities. The rest are covered by other government departments such as agriculture or local authorities, or by fees for services such as analyses prior to registration of processed foods. However, in some countries food control activities are financed by the central government in their totality.

A large number of countries do have a significant concentration of human resources engaged in official food control activities within the Ministry of Health. As mentioned in the case of laboratories, the majority of the staff at the central level is professional, whereas at the local level non-professionals predominate. There is a heavy emphasis on

veterinarians. This is especially true of the inspection branch, but a good proportion are also found in laboratories. Most of those described as microbiologists are in fact veterinarians (Table VIII).

In education and training efforts are being made to incorporate food hygiene in various curricula at the universities, and most food control services report some sort of training activities, both on the job and by means of courses for their own personnel. Some staff have obtained fellowships, usually provided by international organizations (with PAHO leading the field) for training abroad. However, there is little effort devoted to organizing courses for food handlers, and few countries have education programs directed to the consuming public on the sanitary practices applied to food. Food handlers have generally very little knowledge of elementary rules of sanitation and, therefore, are unable to apply them in their trade.

Finally, in those countries which possess some food control services, coordination between them and the epidemiological surveillance of the health services does not exist. The results from laboratory analyses of the food sampled never arrive at the disease reporting section of the Health Ministry.

Epidemiological surveillance is a vital tool in improving the sanitary control of food. Results of epidemic investigations can be extremely useful in focusing control activities on national priorities.

In summary, the survey of food control services and activities in the countries for which data were available revealed few, if any, effective sanitation food control programs. This is a situation that requires action because, with ever increasing populations, the loss of food and the nutritional value it represents can ill be afforded.

### 3. THE STRATEGY

#### 3.1 General comments

Government leaders are becoming more aware of the economic and technological alternatives available to assist in the development of a strategy to remedy the present complexities of the sanitary control of food. Health authorities alone cannot solve the problem; they will require a national commitment and the collaboration of all ministries and agencies--those concerned with agriculture, finance, planning, and commerce--plus selected representatives of industry.

#### 3.2 National food policy

Within its own legal, social and economic framework, each country will have to establish the proper system for ensuring a safe food supply

for the consumer. In the past, Member Governments have attempted to accomplish this objective by legislation, regulations and a variety of food control services. Unfortunately these efforts have achieved less than adequate control over the quality of food supplies. Also the absence of an overall national effort by all ministries concerned in the production and distribution of food has led to a diversity of activities, but very little real control over the problems. It is therefore essential that a national health policy be adopted as the basis for long-term planning and continuous support for food safety.

### 3.3 National food control service

#### 3.3.1 Quality assurance

Quality assurance is necessary because it projects confidence in the consumer that foodstuffs are not only nutritious and safe but hygienically acceptable. This will necessitate establishing international and national criteria and standards which must be legislated and enforced by the governments. By employing reciprocal arrangements between countries regarding good manufacturing practices, it is possible to achieve acceptable quality assurance standards on a regional basis.

Any quality assurance effort unit requires an infrastructure for implementation. Such a unit must operate on a high level, involving a number of related disciplines, and must maintain close working relationships with counterparts in industry and government.

In many countries, quality control in food production by the private sector has been neglected, while government facilities have been handicapped by the sheer growth of the food processing industry and the imported food trade. One strategy for improving this situation would be to ensure that all food processing plants have adequate quality control facilities either on site or through commercial laboratories. Also governments may consider providing facilities for routine testing on a commercial basis as an additional source of funding.

With regard to private laboratories, government agencies should maintain surveillance over their work by establishing a proficiency testing program and a licensing system.

#### 3.3.2 Long-term objectives

The national food control services entrusted with food quality assurance will have the following long-term objectives, among others:

- to assure, at national level, satisfactory quality of foods, preventing the distribution of food which is unhygienic, contaminated, spoiled or adulterated, harmful to health, or labeled in such a way as to mislead consumers;

- to minimize food losses during the stages of production, processing, storage, transportation and marketing;
- to accelerate improved nutritional levels;
- to foster an adequate development of food industries;
- to foster increased food production and an adequate utilization of raw materials, products, and by-products having an economic value;
- to assure that imported products comply with international standards, as a means of protecting the country's industry and consumers, and that exported foods do likewise, as a means of generating significant amounts of foreign exchange for the country's economy;
- to contribute to national development and the improvement of the general health and welfare.

To reach these objectives, it will be necessary, among other things:

- to improve and expand food inspection and analytical control services;
- to strengthen food control through a systematic coordination of all government services active in the sector at the national, regional and municipal levels;
- to promote the interchange of international information on food problems;
- to provide for the training of skilled workers for the governmental and private sectors associated with the production, marketing and control of foods, and to promote the dissemination of information useful for the development of these activities.

### 3.3.3 Organization and coordination of governmental services

Proper functioning of the national food programs is directly dependent on a suitable organization and coordination of the government services involved in their implementation.

In view of the wide disparities among the administrative systems of the various countries, it is difficult to establish a single basic organizational model for governmental food control services. However, three recent FAO/WHO publications provide most of the essential information. (6,7,8)

In this and the following sections an attempt will be made to establish the basic principles that should underlie the organization of a national food control program in order to reach the objectives presented in the preceding section.

Adapting these principles to the particular characteristics of the country, its system of government, and socioeconomic and cultural conditions will be for each government to decide. Also it will have to determine how the available resources are to be applied in setting up a system of its own which can effectively guarantee the supply of wholesome food to its population.

In order to be effective, a food control service must be supported by appropriate legislation. This basic legislation should be supplemented by extensive, detailed and constantly updated regulations, and by adopting food standards.

Suitable technical and administrative structures, with qualified staff, supported by analytical laboratories, training centers and other facilities, are needed for the application of such laws and regulations. Governmental food control services must also enjoy the support and confidence of the public, as well as the backing of the courts so that, whenever necessary, enforcement action can be taken by the government.

#### 3.3.4 Working philosophy and managerial policy

Just as important as the organizational structure of the official food control services and the establishment of their long-term objectives is the definition of a basic action philosophy and a sound managerial policy.

Food control embraces seven major action areas:

- Legislation and standard setting
- Administration
- Inspection and sampling
- Analysis
- Certification of approval
- Legal actions
- Education of food handlers and consumers

In many countries, food control is equated with its monitoring aspects alone and with the exercise of the government's enforcement powers because of the favorable reception accorded to such action by public opinion. However, food control goes far beyond monitoring. It covers a much wider range of activities, which, in fact, even makes it a valuable instrument of marketing policy that reaches into important areas of the economy and technology.

Food inspection involves a series of continuous activities carried out along the production lines through the entire process of manufacture in a logical sequence that goes from the stage of reception of raw materials to the production of the finished product ready for distribution. Therefore, inspection covers the conditions of facilities and equipment, environmental health, personnel, the collection of samples and the writing of technical reports on production. An inspection imparts a desirable preventive connotation to control programs as a result of the guidance and technical assistance provided to the industries inspected, which enables them to correct any failings at the source.

### 3.3.5 Legislation

To be effective, a food control system must have a firm but flexible legal basis. Such flexibility is needed to deal with problems which become apparent with increasing scientific knowledge as well as with changing techniques of modern food processing. It is best achieved by the adoption of different components of legislation: a basic food law, a prerogative of the legislative power of the country, which is an enabling act giving the executive agency responsibility for administering the law; and the authority to enact food regulations. Another part covers food standards whose elaboration and updating may be the responsibility of a specific technical institution or a committee on which the government, the food industry, the food trade, the scientific community and the consumers are represented. The food standards may constitute part of the regulations, or be separately enacted. In no case should they or other detailed regulations such as hygienic provisions, list of food additives, chemical tolerances or fees for registration and analysis, be included in the basic law, because this will make it cumbersome and unyielding.

The law should include only broad general principles and provisions of control, including the organization and procedures of enforcement, leaving regulations sufficiently adaptable to make possible prompt revisions which may become necessary because of changes in scientific knowledge, progress in technology or emergencies. Such changes can be made much more expeditiously by executive agencies than by legislative bodies.

The food law governs the production, handling and marketing of foods and should protect both the health of the consumer and his limited resources by protecting him against fraud. Together with properly implemented regulations and standards, it will also protect the reputable manufacturer and dealer against unfair competition, and thereby stimulate development of the food industry and trade in wholesome foods. However, before a modern law is introduced, a question must be asked whether the nation is in a position to effectively apply it and the government to provide the necessary resources for enforcement. Unenforced legislation is almost as bad as no legislation.



In 1979, FAO published a detailed study describing the structure, principles and main provisions of a proposed food law.<sup>(9)</sup> A Model Food Law prepared on the basis of that study was recommended and incorporated as an Appendix in the already referenced FAO/WHO "Guidelines for Developing an Effective National Food Control System".<sup>(6)</sup> The same model was endorsed by the Coordinating Committees for Asia, Africa and Latin America and was included in the reports of their meetings, which in the last case was the report of the Joint FAO/WHO Food Standards Regional Conference for Latin America in Mexico in 1978.<sup>(10)</sup>

The food law should give the implementing agency the power to prepare comprehensive regulations. It should cover, to the extent that the country needs it, rules for the administration of the act, including those for the elaboration of food standards and regulations, food hygiene, additives, contaminants, labeling, packaging, advertising, pesticides residues, irradiated foods, as well as nutritional considerations and compositional standards.

Uniform food standards are helpful for the orderly marketing of foods and for the effective application of food control laws. Intellegently applied, they promote trade to the eventual benefit of producers, processors, traders and consumers. They are helpful to inspectors and essential to food analysts, as well as to the courts which have to judge whether a given food violates the law.

Trade between countries is greatly facilitated by international food standards such as those being elaborated by the Codex Alimentarius Commission of the Joint FAO/WHO Food Standards Programme. Every nation can benefit from working within its framework, even if it is only through submission of written comments and proposals. For the developing countries with limited resources, the additional benefit of the Codex standards is that they can take advantage of the contributions made by governments, food industries, scientists and consumers of other countries to develop their own sound national standards, even if they do not adopt those of the Codex outright. An outline of the work and procedure of the Codex Alimentarius Commission and its auxiliary bodies is given in reference<sup>(6)</sup>. Further details of its work are considered in Section 3.8.

### 3.3.6 Administration

Effective quality assurance programs must rely upon competent administrative leadership and support.

Experience has shown that the best arrangement is to have a central food control administration at a fairly high government level with an overall responsibility for the implementation of the food law and the exercise of supervision with suitable delegation of powers to local bodies.

A unified national administration allows the governments to speak with one voice concerning food control policies and interpretation of food laws, avoiding rivalries among agencies. Divided responsibilities among ministries or other entities may work contrary to consumer protection and create confusion among industries.

Furthermore, for uniform enforcement and effective planning the inspectors and the analysts of the national enforcement agency should be parts of the same unit under single supervision. This applies to services at the central, regional or local levels.

The central administration should have the following powers and responsibilities:

- to define policies and develop the strategy for the national food control programs;
- to develop and review the food regulations and standards;
- to coordinate and supervise the operational activities of the decentralized administration;
- to approve proposals of establishments engaged in the production and marketing of foods, and to register and authorize food and related products;
- to approve the budgets and define the human-resource policy of the agency, in keeping with the qualitative and quantitative requirements, as well as the policy on training, salaries, and utilization of personnel, at central and local levels;
- to establish relations with other national agencies, scientific bodies, consumer groups, etc. and with foreign organizations and governments.

The local or decentralized administrations, linked directly to the central organization, should have the following powers:

- to plan the activities for inspections and for collection of samples within its area;
- to monitor food inspection and control work;
- to recruit and train personnel;
- to collaborate in the budgetary programming of the operational food control activities;
- to collaborate in the formulation and revision of food legislation.

Well planned mechanisms should be established for interdepartment cooperation and coordination.

The Food Law should contain a statutory provision for a central advisory and coordinating body with membership of various governmental and other concerned agencies. Such an Advisory Board might include, in addition to officials of the food control service, representatives of the Ministries of Health, Agriculture, Industry, Trade and other national agencies involved in standards and food quality activities as well as members of industry, consumer groups, universities and other scientific institutions.

The Board would perform an advisory role to the unit implementing the food law, and at the same time assure coordination of activities related to food control.

The chief objectives of such coordination should be to define the responsibilities and authority of each agency involved, the limits of its work, and to assure harmonious operation of the official institutions, in the interest of objectivity and efficiency in the national food control programs.

### 3.3.7 Inspection and compliance

The purpose of the surveillance-compliance programs is to ensure that food sold to the public is free of adulterants, as well as of chemical and biological contaminants, that it is in compliance with any existing compulsory standards of quality and that its composition agrees with the statement on the label. When surveillance sampling discloses a contaminant or adulterant in food production or processing, the specific problem must be identified so as to accumulate evidence to support regulatory action.

Premises of institutions involved in the production, processing, storage or distribution of foods and feeds must be inspected, with follow-up investigations should problem areas be identified.

Inspection activities must be well planned and coordinated, without duplication by various agencies, but at the same time be flexible. The inspectors occupy a key position in the food control service and must therefore be well trained, impartial and immune to corruption. At the same time they must be paid adequate salaries and be given professional recognition commensurate with their responsibilities and special training, as well as the necessary facilities and resources, such as sampling and inspectional equipment and especially transportation, to carry out their duties. Furthermore, they must receive adequate supervision and there must be provision for continuous communication between them and their superiors and vice versa.

Food inspection takes the dual form of inspection of various types of food establishments for compliance with sanitary requirements and hygienic practices and collection of food samples for laboratory examination. However, the inspector should be trained to detect obvious signs of decomposition or unfitness in foods by sight, odor and possibly taste, and have the authority in specific cases to suspend their sale or seize them without the necessity of resorting to the laboratory.

Although his job is ultimately to detect, collect and transmit evidence of violations of legal dispositions applying either to premises or to products, his role should not be conceived as that of a policeman, but rather, primarily, as that of an adviser. He should be able to instruct food producers and handlers in good manufacturing practices and hygienic handling and encourage voluntary compliance. Education and guidance should be the principal task, and more severe sanctions resorted to only when all other measures have failed.

For the inspection of premises, in many countries it has been found useful to design "score cards" on which points on a fixed scale are awarded for various aspects of compliance with existing regulations and instructions given for specific improvements needed, together with time limit for their introduction. In subsequent visits implementation of those instructions is checked and new total score compared with the previous one to ascertain any overall improvement or otherwise.

Likewise, some food control organizations have developed manuals which provide the inspector with the latest information on their work. Guidance for the preparation of such a manual can be obtained from available documents, such as that of the Food and Drug Administration (FDA) of the United States<sup>(11)</sup> or Part 5 of FAO's "Manual of Food Quality Control" (still in preparation at the time of writing). Inspection systems for some specific food products destined for export are described in Part 6 of the same FAO Manual.<sup>(12)</sup>

Some developing countries have determined that they cannot afford to have inspectors devoting their time exclusively to food inspection in all parts of the country and are using "polyvalent" sanitary inspectors for surveillance of food handling premises and collection of samples for analysis, or use inspectors dealing also with other commodities such as drugs. In such situations, it is nevertheless essential to have a central cadre of food inspection specialists to conduct more complicated inspection and train the "polyvalent" or dual purpose inspectors.

### 3.3.8 Analytical services

As mentioned in the preceding section, a food inspector should be able, in certain cases, to detect foods unfit for consumption by sight, odor or taste, i.e. on the basis of so-called organoleptic or sensory

examination. However, many contaminations, adulterations or deteriorations of quality, often dangerous to health, cannot be detected by senses. Examples are the botulinum toxin, pesticide residues, destruction of vitamins in processing and numerous others. Their detection is only possible by means of chemical or biological analysis in a well-equipped and staffed laboratory.

The laboratory and the inspection service constitute the two indispensable technical arms of a complete national food control service, which must work in close cooperation and be acquainted with each other's problems and procedures. For that reason, analysts should occasionally accompany inspectors on their tours and the inspector should visit the laboratory to get a better understanding of why certain procedures have to be followed in the course of sample collection. For the same reason, it is advisable to have the inspection and laboratory service under the same director and if possible, in the same building.

However, laboratories are expensive and it might be desirable to make a start by identifying and utilizing, by means of suitable agreements, the existing laboratories operated by public health, agriculture, customs or other agencies. The same might apply to existing private laboratories and independent analysts that can be accredited by professional bodies and contracted by national or local authorities to act as official laboratories, as is the case in the United Kingdom. They can also provide useful service in analyzing foods for food manufacturers and advising them whether or not they are in compliance with national or manufacturers' own standards.

When a national food control service decides to establish its own laboratory, a start should be made with the most basic routine determinations and gradually upgrade it to more sophisticated work. In the interim, groups of smaller neighboring countries should consider pooling their resources and establishing common regional and subregional laboratories for the purpose of training, advice and carrying out more advanced analysis, such as those for vitamins or pesticide residues. However, for prosecution purposes, the laws of the country may require analysis in a national laboratory.

While the laboratory staff in a developed country may consist entirely or almost entirely of professionals (university graduates), with little unskilled or semi-skilled labor obtainable for simpler tasks such as glassware washing, the reverse situation may be the case in developing countries. In those situations a desirable mechanism would be to work in analytical teams or units consisting of a professional, a laboratory technician for routine operations, and a laboratory aide for more menial tasks.

Frequently, it is necessary to locate laboratories in existing and not very suitable buildings. When a new building is planned, its location should be carefully considered from the point of view of origin of most samples, suitable environment which does not interfere with analytical operations, and convenience to inspectors and administrative staff. The design and layout should be planned in close collaboration among the architects, mechanical engineers and future users.

A serious shortcoming of many laboratories is lack or inadequacy of ancillary services such as workshops, instrument repair facilities and libraries. Frequently, services of electricians, plumbers and carpenters must in theory be obtained from some central service of a ministry, while in practice they are virtually unobtainable or only with considerable delay. Air conditioning service is one of the most noteworthy examples.

Equipment should normally be obtained from firms that can provide servicing and repairs locally. However, often no such firm exists in the country for a specific type of equipment, or a local representative who purports to be a service engineer is in fact nothing more than a salesman. For these reasons, it is essential to have at least one staff member with some background in electronics and well trained in instrument maintenance and repairs. Much of equipment in the laboratories is often standing idle and deteriorating for lack of such a person. Also adequate provision is rarely made for acquiring a set of recommended spare parts at the time of purchasing the main instruments, and operation manuals are frequently lost shortly after their acquisition.

Another necessity often neglected is literature, which for the laboratory should be of two kinds: a well-run library with modern analytical texts, periodicals and reference works, as well as analytical manuals for daily use on the laboratory bench. The latter should be considered part of the laboratory equipment and not of the library because of the continuous need to have manuals on hand.

The laboratory must have well-established procedures, referring both to general laboratory operations and analytical methods.

By general laboratory operations is meant the system of sample receipt and registration, their flow through the laboratory, storage and disposal, reporting of results, analytical quality control and similar operations. They, together with general principles of laboratory design, administration, functioning and safety, are well described in Part 1 of the already mentioned FAO "Manual of Food Quality Control," while the analytical methods are described in Parts 2, 3 and 4 respectively.<sup>(12)</sup> FDA has also its own well-developed procedures. General principles for the organization and methodology of food control laboratories were summarized in the report of a WHO conference on the subject.<sup>(13)</sup>

With regard to analytical methods, it would be desirable to have both quick screening methods and accurate reference methods to resort to when a possible violation is indicated by the first method. While Codex Alimentarius has been developing its own reference methods, the most comprehensive and most used set of methods world-wide, evaluated in collaborative studies between many laboratories, is that of the Association of Official Analytical Chemists (AOAC).<sup>(14)</sup> Supplements with approved changes of the AOAC methods are issued annually and new editions published every five years.

Finally, to maintain the professional quality and interest of the laboratory staff it will be necessary to devote a certain proportion of time to research in analytical methodology and other problems which may have arisen in the course of the laboratory work. Publication in scientific journals whenever possible should be allowed and encouraged and professional advancement ensured by sponsoring attendance at scientific conferences and meetings as well as refresher and upgrading training courses and contacts with scientists at other similar institutions. As with inspectors, adequate salaries competitive with industry should be paid in order to attract and retain high-quality individuals, and promotions granted on merit.

#### 3.4 Manpower development

##### 3.4.1 Training of leaders

A nation's success in the expansion and improvement of its food safety system will depend in large part on its ability to prepare a substantial number of people who understand national goals and objectives, are well trained in food technology and safety, and are oriented to acting in an expeditious manner.

One of the keys to a successfully coordinated quality assurance program is effective training at all levels of management, in which new concepts, new approaches, and new techniques are presented.

There is a strong need for the technical personnel to understand information systems, probabilities, alternatives, decision making and the specific quantitative tools used in modern problem solving and implementation. Knowledge of the basic principles helps to generate a necessary attitude, objectivity and cooperation among the members of the management teams, resulting in a greater chance of implementation for cost reduction.

Those being trained in food safety must understand the interdisciplinary input to problem solving and have the ability to work with the medical and paramedical scientists, planners and economists among others. The health people should be educated to talk in terms that are simple enough for these other disciplines to understand, accept and include in their plans.

### 3.4.2 Projections of human resource requirements for the next ten years

Food control, because of its complexity, requires the utilization of skilled personnel, qualitatively and quantitatively attune to the country's needs. This personnel will have varied educational background and experience and will consist essentially of two major groups:

Professionals: veterinarians, sanitary engineers, food technologists, chemists, microbiologists, epidemiologists, legal experts, administrators and biostatisticians.

Non-professionals: inspectors, inspection aides, agricultural technicians, laboratory technicians, laboratory aides, and administrative and clerical staff.

Over the next ten years, the implementation of national food control programs will require a massive effort to train professional and non-professional personnel. In addition, the governments will have to provide economic and administrative incentives in order to retain this personnel.

In the professional area, a minimum of 3,000 persons will have to be trained in the next ten years, according to projections made by PAHO.<sup>(15)</sup> Based on the estimates, the number of professional and non-professional inspectors that will need to be specially trained for food control activities in the Region in the next three years is estimated at 23,000. These figures include only future governmental officials. They do not cover the need to provide information for skilled workers, food handlers and the general public. In the latter groups, training will have to be provided to at least 200,000 people in the next ten years, counting only those forming part of key groups representative of the Latin American food industry. This task is critical, since the present deficit is qualitative as well as quantitative.<sup>(15)</sup>

Training and recruitment are primarily the responsibility of the administration at the central and local level but inspectors and analysts can often be used to advantage in both activities. Trained analysts and inspectors should be used to train others. In fact, the main training system employed successfully in many countries is in-service training. Under such a system, the future inspector or laboratory worker is trained under the direct supervision of an experienced professional, who monitors the work daily.

According to the already quoted "Guidelines"<sup>(6)</sup>, food inspectors should have sound education in subjects related to food control such as food science and technology, sanitary engineering, food microbiology, toxicology-pathology, veterinary science or other related subjects. They may be given on-the-job training in subjects such as food law and regulations, food standards, food labeling and sampling techniques. They may also be given intensive short courses at the university level in



subjects such as food technology, food hygiene and sanitation, control of food additives and pesticides, and the sources and effects of microbiological contamination. Often they must be sent abroad for such courses; this is where Regional training centers can play a significant role. The efficiency and the integrity of the food inspection service will depend on the qualifications and training of food inspectors and, of course, on the terms of their employment.

On-the-job training may be supplemented by seminars, workshops and demonstrations. All experienced inspectors should be expected to train the less experienced. Microbiologists on the analytical staff can demonstrate techniques such as how to collect aseptic samples and properly protect them during delivery to the laboratory.

Analytical chemists and microbiologists should hold university degrees and preferably have had further postgraduate training in the complex specialized analytical procedures for food analysis. Analysts should be sent to universities or other laboratories, when possible, to learn new methods or improve and standardize their techniques. As in the case of inspectors, those having such training will always be expected to train other analysts and also participate in the training of laboratory technicians.

### 3.4.3 Regional training centers

Although most of the Latin American and Caribbean countries have some limited activities for the training of food inspectors and some food analysts, they all agree on the inadequacy of those facilities and the need to adapt and strengthen the training efforts in this area. This is perhaps the highest priority task for the national food control programs in an attempt to rationalize governmental action in this field, since the success of these programs rests largely on the proper training and utilization of human resources.

Training of human resources, based on the demand and particular characteristics of the national food control programs, is a task essentially within the purview of each country. Nevertheless, many of them do not have the resources to establish permanent national training centers in the many specialities required in food control. One alternative would be to supplement them with regional centers established through a pooling of resources among countries with technical and economic assistance of international organizations. However, Latin America and the Caribbean areas have so far had relatively few regional training centers to support their food control activities. Among those that have been used as regional or subregional centers are the following:

- Regional Educational Program in Food Protection (PAHO project) providing regular courses in food inspection at the School of Public Health in Medellín, Colombia;
- Unified Food and Drug Control Laboratory (supported by PAHO and UNDP) in Guatemala City, Guatemala, which has provided on-the-job training in food analysis techniques;
- Institute of Nutrition of Central America and Panama, also in Guatemala, affiliated to the United Nations University (UNU) Food Hunger Program, which provides undergraduate and postgraduate training in nutrition and food sciences;
- West Indian School of Public Health in Jamaica, training meat and other food inspectors;
- Caribbean Epidemiological Center (CAREC), in Port-of-Spain, Trinidad, which provides courses for food handlers and food analysts.

A total of 750 professionals and 220 non-professionals have participated in 48 courses sponsored by PAHO under its regional training program in the past six years, according to the program's reports. These figures, while impressive, are insufficient to cover present and future needs.

Establishing more such regional centers and strengthening of the existing ones is needed. They should operate in conjunction with the national training centers and in accordance with the interests of the countries of the Region. Their basic functions should be:

- to provide technical support to the national training centers in their tasks relating to the planning, training, and utilization of human resources for food control;
- to collaborate in the planning of the physical infrastructure for the national human resource training centers;
- to collaborate in adjusting the curricula of universities, schools for the training of middle-level technicians, and specialized training centers, seeking, whenever possible, a Region-wide standardization of criteria;
- to develop educational technology through the modernization of teaching methods and the production of instructional materials, suited to the needs of the Region, for the national training centers;

- to collaborate in the training of professors, instructors and high level personnel involved in the training of human resources and the administration of national food control programs, endeavoring to utilize the multiplier effects of such training for further training in their own countries;
- to organize courses and seminars on specific topics and to conduct such activities in the national training centers.

An overall responsibility of the regional centers should be to advise and assist the governments in their own human resource training efforts, specifically for food inspectors, laboratory workers, and administrative staff involved in food control activities.

#### 3.4.4 Recruitment and working conditions

The effectiveness of food control services will depend, primarily, on the ability of their staff members and, particularly, on their working conditions. As already stressed, inspectors and analysts must receive pay, professional recognition and opportunities for advancement commensurate with their training and responsibilities if they are to be retained in the food control services. They should work full time and not be obliged to have a second job, or even permitted to hold it if it involves a conflict of interest, such as working in any branch of the food industry that the department of which they are members is supposed to control.

Frequently professionals are utilized for tasks that could be performed by technicians or aides, a practice which represents an obvious waste of highly trained personnel. This situation necessitates having a qualitatively and quantitatively balanced team of professional and non-professional officials.

#### 3.5 "Good manufacturing practices" and self-inspection in industry

Governmental inspection does not release food manufacturers and merchants from their social responsibility of producing and distributing foods of good quality. Good manufacturing practices (GMP) should prevail with or without government inspection.

The private and public sectors engaged in the production, processing and serving of foods can greatly assist the government and the consumers by carrying out its own control of its products and operations.

Codes of practice and standard specifications for foods should be used by the government as a means of improving the standards within the food chain for a particular food industry. Standardization provides the reference norms for the other food control activities. Standard definitions or specifications, in addition to involving important aspects of public health safety, may lead to a retention of home markets or, at the other end of the scale, to reliance on foreign suppliers.

Governments should require that the analysis and tests made by industry must be made in accordance with uniform procedures and standardized analytical methods, so that the objectivity and accuracy of the findings can be assured.

The issuance of a certificate of approval by a government attests to the degree of technical proficiency achieved in food control, since a certified product can reach even the most sophisticated markets in either domestic or international trade. However, if the national food control services are inadequate it may be necessary for certificates to be issued by private or foreign firms. This may not only be contrary to the national interest, but also represent a loss in the balance of payments abroad.

While the primary responsibility for supplying harmless and healthful food lies with industry, the governmental control services should make a continuous effort to verify that the official standards and regulations are being followed and sound manufacturing processes are being applied. Because of the limited availability of material and human resources and the growing number of food processing and commercial establishments, it is impossible for the government to exercise continuous vigilance over every segment of that industry. This makes it necessary to establish action strategies that can assure the greatest possible reliability in food control work. This must include preventive inspection at the production lines, the promotion of good hygienic standards, proper laboratory testing of statistically valid samples and scrupulous enforcement.

### 3.6 Community participation and education of the public

The preceding sections of this document have dealt mainly with building up an infrastructure at the government level to improve food safety. However, participation of other groups of society like the food industry, and those at the community level (primary health workers) and others, is also essential to convey to the people at risk the basic principles of food safety. Any government action can only reach food in commerce, but not, for instance, homegrown foods. Furthermore, it can do little to influence faulty food handling practices in the homes of people which, quite frequently, are responsible for foodborne diseases.

From the socio-cultural point of view, most people in Latin America and the Caribbean practice food habits that can contribute to a greater health risk. This is related mostly to the lack of sanitary control and poor choice of food. It is aggravated by the lack of any community pressure to implement food protection programs, and of active participation by the organized or underserved community in such programs. Community education to change the sanitary habits of the public has received minimal administrative support. In the countries of the Region, the public should become the first and primary controlling element in the quality of the food that is consumed.

Incorporation of the population in this task should be effected through an organized community--namely journalists, workers in social communications systems, political, religious, and union leaders, industry economists, social workers, and those in the social forefront such as primary health care workers and neighborhood leaders. These and the mass media, such as the press, radio and television, can help to educate consumers, although the prime source of information should be the food control people. Success will only be possible if the community learns of, understands and participates in program organization and application.

Special attention should be given to legislative bodies such as parliaments and municipalities, because they are in a position to assure continuity, efficacy, and effectiveness of activities in this field.

An effective food protection chain begins with the application of food protection principles at the source of the food's production--on farms, ranches, or at sea--and it must continue with the consumer. Any program aimed at advancing the level of knowledge needed to achieve better food protection must address itself to the entire population, as well as to the specialized personnel involved in the various facets of the food industry and services, especially food sellers and handlers.

Consumer education should also be considered as an important function of food control organizations and inspection services. The benefits derived from a food control service will depend to a large extent upon the degree of consumer participation and support. Pressure from consumers, individually and through consumer organizations, can be a great help for government officials seeking to induce legislators to enact or modernize food laws, harmonize food standards and upgrade control services.

Consumers should be made aware of their rights, privileges and responsibilities under the food law. They should be encouraged to advise food control officials whenever they notice unsanitary conditions or unhygienic practices in food establishments, or when they encounter contaminated, adulterated, spoiled or mislabeled foods.

One of the most intractable problems in urban areas of the Region, and yet one for which the main remedy could and should be consumer pressure, is that of ambulant street sales, usually in the most unsatisfactory hygienic conditions. And yet it is this type of food (and not that industrially processed, sold in supermarkets and served in supervised restaurants), that a sizeable proportion of urban population consumes.

The main reasons for this situation are unemployment and immigration into cities from rural areas, and the fact that food is cheaper in the street than at regular commercial stores. Some of the strategies proposed to deal with this situation are as follows:

- to group the street vendors in special places like markets and provide basic sanitary services and municipal sanitary inspection and control;
- to stimulate formation of cooperatives among vendors;
- to encourage the incursion of the private sector into mini-markets with adequate basic sanitary conditions;
- to provide permanent and intensive education of the ambulant food vendors and handlers.

Consumer education, which is of recent origin even in developed countries, faces a scarcity of qualified teachers. Problems relate to the low literacy rates, multiple languages and the lack of effective communications through the mass media mechanisms. In such areas it may be best to work initially through established village or tribal leaders or through cooperatives, unions or similar local organization including primary health workers.

### 3.7 Financial considerations

#### 3.7.1 Government financial policy

The overall financial picture affecting the sanitary control of food involves to a great extent public consumption expenditures and the limitations of overall government revenues. In Latin America and the Caribbean, public consumption expenditures have been increasing at almost the same rate as the gross domestic product (GDP). At an average of only 11% of each country's GDP allocated to all public consumption expenditures (PCE) in these countries, it is not difficult to understand why very little goes for food protection programs. In developed countries, the figure is 22% of the GDP for PCE. The limited nature of the overall government tax revenues is one of the reasons for the low PCE.

Accordingly, it must be kept in mind that health programs are cost-incurred elements of the country, with practically no contribution to the GDP or the balance of payments. Therefore, the government fiscal policy in regard to food production, distribution, quality control and consumption must be directed toward cost savings through better organization and elimination of corruption and innovative approaches to commodity marketing, lines of credit and incentives to the producer and the industry. With an effective food protection program, economic savings are realized by reduced physician and hospital costs; reduced absenteeism from work, increased profits by private distributors, warehouses and the industry; and, hopefully, lower costs to the consumer.

Health authorities must consider these economic advantages of substituting efficacy, safety and economy for the symptomatic and curative procedures of dealing with foodborne illnesses.

The financial planning process of the government could provide a great service and assistance toward ensuring the wholesomeness of food. Government credit sources can improve credit markets by introducing another element of competition. Guaranteed credit by a government can make capital investment money available to the suppliers, processors, distributors and vendors of food. If this financial development is combined with market planning, the result could be more wholesome food available throughout the year and not just at harvest time. This system provides incentives to development of processing facilities, and their presence alone will influence introduction of new crops or products.

### 3.7.2 Self-financing of national food protection programs

Virtually all the governments of Latin America and the Caribbean are faced with serious problems of public revenues, which is an important obstacle in the financing of national food quality control programs. These programs, because of their complexity and high cost, and the continuing need to expand and improve them, pose a real challenge to public administrators.

A mere expansion of social security collections does not appear to constitute a satisfactory solution to this problem, in view of the low incomes of the population of the Region. Normally, the Ministries of Health and related food control organizations have little or no control over the collection of these taxes. On the other hand, employers generally pass the payroll tax expense on to consumers by raising the prices of their goods and services. Such price increases put a substantial burden on the low-income stratum of the population.

These problems indicate that the search for alternative sources of financing for public health programs should be a prime concern of administrators of food control programs in Latin America and the Caribbean. The self-financing of food control activities, complete or at least partial, through the levying of taxes and charges on the direct users of these services is a practice which is still underutilized in the Region. However, it should be pointed out that very often the inadequacy of administrative mechanisms to collect the charges and monitor their proper collection and the proper application of funds can nullify the benefits of this source of funds.

Experience has shown the need for rigorous monitoring of such collection in order to prevent tax evasion. The sums collected should preferably be placed in special accounts under the supervision of the Ministry of Health itself or related agencies, and the funds should be used exclusively for the financing of food control programs.

The levying of charges on users of food control services, including fees for registration and licensing of establishments, for approval of labels and packaging, for the registration of foods and other products,

for laboratory analysis, and for other activities, does not release the government from the responsibility of financing part of the cost of these activities.

The potential benefits resulting from an adequate financing of official food control services include larger tax collections resulting from increased production based on a better utilization of raw materials and a reduction of the wastage caused by poor technology, as well as on greater ease of collection in the industries and commercial establishments subject to control.

### 3.8 Role of international organizations

The main specialized agencies of the United Nations that engage in activities of providing guidance and assistance in the fields of food control, consumer protection and food safety are FAO and WHO on the global scale and PAHO on the Regional scale in the Americas. In addition, they have other closely related activities, such as nutrition, animal health, and food production.

These organizations have extensive programs, which include various types of assistance to individual countries. Experts and consultants can be provided for short or long terms to help in planning a new food control program or improving its existing inspection and laboratory services and training of national counterpart officials. Training is also provided through individual fellowships for studies abroad, by organizing training seminars and workshops and, in some cases, through the setting up or assisting the national, subregional or regional training centers on a comparatively long term basis. Some such centers in the Region are mentioned in Section 3.4.3. Specialized equipment, supplies and literature can also be provided.

Financing of such assistance may be forthcoming from FAO and WHO out of their own budgets, by individual governments, national ("funds-in-trust") or other funding arrangements, including various foundations and international funding organizations such as United Nations Children's Fund (UNICEF) and United Nations Development Program (UNDP).

During the 1970's, the UNDP provided the health sector in the Latin American and Caribbean countries with slightly more than \$35 million, which accounted for 57% of the total assistance granted. However, this figure is small in comparison to the actual requirements of the countries in the Region, and of course food protection was only part of this support.

In addition, it is important to note the trend in the UNDP and other agencies to reduce the funds devoted to international cooperation in Latin America and the Caribbean. Furthermore, several international



agencies have shifted their priorities from the financing of food-related activities to programs of scientific and technological development and the solution of energy problems.

Assistance from bilateral agencies can also be affected by changes in policy or general reduction of funding, particularly with changes of government.

Outside of direct assistance to countries, the international organizations are engaged in other types of activities, which comprise setting up of food standards, developing codes of hygienic practice and microbiological standards, safety testing and evaluation of food additives, setting tolerances for pesticide residues and developing methods of chemical and microbiological analysis. Compilation of data for these purposes and their evaluation is usually done by the Expert Committees of FAO, WHO, IAEA (International Atomic Energy Agency), and UNEP (United Nations Environment Programme).

Preeminent in the field of food standards elaboration at the international level is the already mentioned Codex Alimentarius Commission and its subsidiary committees. Other international bodies that are involved in standards setting to a greater or smaller extent and collaborate or at least maintain contact with the Codex include the International Standards Organization (ISO), International Commission on Microbiological Specifications of Foods (ICMSF), United Nations Industrial Development Organization (UNIDO), and the General Agreement of Tariffs and Trade (GATT), as well as such regional and subregional bodies as COPANT (Comisión Panamericana de Normas Técnicas) and ICAITI (Instituto Centroamericano de Investigación y Tecnología Industrial). In 1966-1967 PAHO itself produced a set of some 400 recommended food standards at the request of the Central American countries, which proved useful to the Region before many of the Codex Alimentarius Standards had been prepared.

While the FAO/WHO Codex Alimentarius had its origin in the Codex Alimentarius Europaeus, in recent years its member countries established Coordinating Committees for Asia, Africa and Latin America for study of problems common to those regions and for elaboration of common regional standards and legislations. The Committee for Latin America has so far had two formal meetings described as such, the first one in Mexico City in September 1978 and the second one in Montevideo in December 1980, as well as a Joint FAO/WHO Food Standards Regional Conference for Latin America in Mexico City in September 1978.<sup>(10)</sup> Since the scope of these meetings has covered practically the whole gamut of food protection and control and not only standards, in line with the recently greatly expanded coverage of the Codex Alimentarius itself, it is highly desirable that national food control programs in the Region should establish closer collaboration with the Coordinating Committee of the Codex for Latin America and stimulate the continuation and further expansion of the work of such inter-American conferences as those that have already taken place.

Finally, among the activities of the UN agencies in the field of food protection mention must be made of the Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme, which is one of the components of the Global Environmental Monitoring System (GEMS). Laboratories in three Latin American countries-- Guatemala, Brazil and Mexico, (in the order of their inclusion)-- now form part of its network of laboratories engaged worldwide in monitoring of contamination of food with principal pollutants. It would be desirable that more countries in the Region that have or could bring their food monitoring services to the required level should be included in the program.

### 3.9 Technical Cooperation Among Developing Countries (TCDC)

It is necessary to establish cooperative programs between countries on an international basis for ensuring the safety of food and feed commodities, including the exchange of information on problem foods which may be imported by unscrupulous individuals, or which may have been internationally distributed and later found to be defective.

Technical cooperation among developing countries is the identification and facilitation of new forms of cooperation among governments, among scientific groups, and among the financial assistance agencies. Analysis of each national strategy and development in the health sector, specifically in food commerce and safety, will make it possible to identify intercountry strategies and cooperation. The joint action by several countries in setting common food standards and procedures of analysis to guarantee the quality could establish free trade of food commodities throughout a subregion, including the availability and distribution of critical inputs within a subregion such as consultant services, training fellowships, analytical services not yet available in individual countries, and finances. Such subregional international cooperation should be based on analysis and national programming of those requirements to guarantee wholesome food.

The national training programs may be strengthened by awarding grants to enable officials previously selected in accordance with suitable criteria to receive training abroad. Exchanges among the countries of the Region in the field of human resource training are greatly expanding.

Countries that are more developed in this field should include recipients from other countries in the Region in their inspector and laboratory worker training courses.

In view of this, a system of intraregional information on training opportunities for food control officials should be instituted, and the provision of study grants from international, bilateral or national authorities should be facilitated.

BIBLIOGRAPHY

- (1) Ten-Year Health Plan for the Americas. Final Report of the III Special Meeting of Ministers of Health of the Americas, (Santiago, Chile, 2-9 October, 1972), Official Document No. 118, Pan American Health Organization, Washington, D. C., January, 1973.
- (2) Horwitz, A. Worldwide Perspectives on Animal Disease Losses, and the Impact on Nutrition, Health and Development. In: Animal Disease Prevention in Developing Countries: Its Relationships to Health, Nutrition and Development. Scientific Publication No. 380, Pan American Health Organization, Washington, D.C., 1979.
- (3) Bertassi, M. The Agricultural Situation and Measures Being Taken to Increase the Food Supply in Latin America. In: VI Inter-American Meeting on Food-and-Mouth Disease and Zoonoses Control (Medellín, Colombia, April 1973) Scientific Publication No. 281, Pan American Health Organization, Washington, D.C., 1974.
- (4) Dykstra, W. A. Rodent Filth in Food, Pest Control 22 (7), 9, 1954.
- (5) Puffer, Ruth R. and Serrano, C. V. Patterns of Morbidity in Childhood, Scientific Publication No. 262, Pan American Health Organization, Washington, D.C., 1973.
- (6) Guidelines for Developing an Effective National Food Control System. FAO Food Control Series No. 1. WHO Food Control No. 1. Food and Agriculture Organization of the United Nations - World Health Organization, Rome, 1976.
- (7) Guidelines for Establishing or Strengthening National Food Contamination Monitoring Programmes. FAO Food Control Series No. 5. WHO/HCS/FCM/78.1. World Health Organization, Geneva, 1979.
- (8) Report of the FAO/WHO Consultation on Food Control Strategy, Geneva, 16-21 December, 1977. HCS/78.1. World Health Organization, Geneva, 1978.
- (9) Gérard, A. An Outline of Food Law (Structure, Principles, Main Provisions). Legislative Study No. 7. Food and Agriculture Organization of the United Nations, Rome, 1975.
- (10) Report of the Joint FAO/WHO Food Standards Regional Conference for Latin America, Mexico City, 5-11 September, 1978. CX/Latin America 78/12, November 1978. Food and Agriculture Organization of the United Nations, Rome, 1978.

- (11) FDA Inspection Operations Manual. Food and Drug Administration, Washington, D.C., 1981. Reprinted Oct. 2, 1980.
- (12) Manual of Food Quality Control. 1. Food control laboratory. 2. Chemical analysis: ingredients, contaminants, techniques. 3. Chemical analysis: commodities. 4. Microbiological analysis. 5. Food inspection. 6. Food for export. FAO Food and Nutrition Paper No. 14. Food and Agriculture Organization of the United Nations, Rome, 1979-1981.
- (13) Report of the Conference on the Organization and Methodology of Food Control Laboratories, Copenhagen, 24-28 October, 1977. WHO Regional Office for Europe, ICP/ FCP/003, Copenhagen 1978.
- (14) Horwitz, W., editor. Official Methods of Analysis of the Association of Official Analytical Chemists. 13th edition. AOAC, Washington, D.C., 1980.
- (15) Personal communication, Regional Educational Program in Food Protection, Pan American Health Organization, Washington, D.C., 1980.

CD28/DT/1 (Eng.)  
ANNEX

COMPILATION AND ANALYSIS OF DATA  
FROM COUNTRIES VISITED

TABLE

ST. SUMMARY

## LATIN AMERICA

PRODUCTION  
PRODUCTION  
PRODUCCION

1000 MT

	1974	1975	1976	1977	1978	1979
<b>TOTAL CEREALS</b>	<b>78198</b>	<b>80316</b>	<b>86028</b>	<b>86256</b>	<b>85193</b>	<b>84667</b>
WHEAT	13474	14971	19336	11539	14833	14699
RICE PADDY	12218	14073	15420	15141	13453	14323
MAIZE	39426	38050	37218	43789	40261	40748
BARLEY	1249	1556	1883	1399	1766	1484
<b>ROOT CROPS</b>	<b>44534</b>	<b>45205</b>	<b>44682</b>	<b>45460</b>	<b>46451</b>	<b>46162</b>
POTATOES	9969	9261	9741	10119	10856	11168
<b>TOTAL PULSES</b>	<b>4656</b>	<b>4776</b>	<b>3935</b>	<b>4613</b>	<b>4665</b>	<b>4912</b>
<b>VEGETABLES AND MELONS</b>	<b>14358</b>	<b>14523</b>	<b>14697</b>	<b>15357</b>	<b>15862</b>	<b>16311</b>
<b>FRUITS</b>	<b>48226</b>	<b>48319</b>	<b>51335</b>	<b>52978</b>	<b>54178</b>	<b>59674</b>
GRAPES	5389	5038	5766	5379	4890	5703
CITRUS FRUIT	12202	13012	14035	14474	15679	18629
BANANAS	17161	16822	17575	18375	18386	19320
APPLES	1296	1090	1207	1328	1512	1735
<b>TOTAL NUTS</b>	<b>123</b>	<b>126</b>	<b>146</b>	<b>141</b>	<b>170</b>	<b>192</b>
<b>OIL CROPS (OIL EQUIV.)</b>	<b>4220</b>	<b>4393</b>	<b>4689</b>	<b>5358</b>	<b>5222</b>	<b>5756</b>
SUGAR (CENTRIFUGAL, RAW)	24518	23812	25967	27256	26979	26602
<b>COCOA BEANS</b>	<b>477</b>	<b>481</b>	<b>454</b>	<b>436</b>	<b>504</b>	<b>544</b>
<b>COFFEE GREEN</b>	<b>3094</b>	<b>2915</b>	<b>1941</b>	<b>2587</b>	<b>3023</b>	<b>3264</b>
TEA	44	52	44	47	39	45
<b>VEGETABLE FIBRES</b>	<b>2572</b>	<b>2260</b>	<b>1933</b>	<b>2433</b>	<b>2270</b>	<b>2263</b>
COTTON LINT	1857	1512	1332	1823	1725	1682
JUTE AND SUBSTITUTES	77	92	110	102	87	97
<b>TOBACCO</b>	<b>676</b>	<b>675</b>	<b>715</b>	<b>746</b>	<b>803</b>	<b>797</b>
NATURAL RUBBER	24	25	26	30	31	36
<b>TOTAL MEAT</b>	<b>11182</b>	<b>11722</b>	<b>12479</b>	<b>13011</b>	<b>13388</b>	<b>13292</b>
<b>TOTAL MILK</b>	<b>28683</b>	<b>30925</b>	<b>32720</b>	<b>32876</b>	<b>34867</b>	<b>33714</b>
<b>HEN EGGS</b>	<b>1705</b>	<b>1813</b>	<b>1887</b>	<b>1932</b>	<b>2015</b>	<b>2072</b>
<b>WOOL GREASY</b>	<b>291</b>	<b>294</b>	<b>300</b>	<b>305</b>	<b>325</b>	<b>342</b>

ADAPTED FROM: 1979 FAO TRADE YEARBOOK

TABLE 2

FOOD SUPPLY: CALORIES PER CAPUT PER DAY - NUMBER

05/27/80

## GRAND TOTAL

## VEGETABLE PRODUCTS

## ANIMAL PRODUCTS

	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77
<b>N C AMERICA</b>	<b>3135</b>	<b>3188</b>	<b>3201</b>	<b>3215</b>	<b>2048</b>	<b>2097</b>	<b>2147</b>	<b>2195</b>	<b>1087</b>	<b>1091</b>	<b>1053</b>	<b>1020</b>
BAHAMAS	2446	2478	2382	2299	1589	1581	1505	1440	857	897	878	860
BARBADOS	2923	3039	3082	3172	2305	2252	2263	2365	619	788	819	807
CANADA	3296	3336	3364	3346	1853	1856	1896	1930	1442	1480	1468	1416
COSTA RICA	2330	2400	2417	2477	1980	2041	2057	2044	349	358	360	433
CUBA	2399	2567	2652	2636	1879	1975	2061	2053	520	592	591	583
DOMINICAN RP	1976	2023	2101	2107	1720	1759	1844	1861	256	264	257	246
EL SALVADOR	1891	1845	1914	2075	1601	1636	1703	1831	230	209	211	243
GUADELOUPE	2544	2601	2555	2578	2111	2118	2034	1971	433	483	521	607
GUATEMALA	2144	2233	2200	2166	1940	2024	1996	1955	204	209	204	211
HAITI	1922	1970	2036	2040	1795	1847	1908	1913	127	122	127	127
HONDURAS	2208	2216	2065	2074	1953	1945	1809	1830	256	270	256	243
JAMAICA	2299	2479	2625	2463	1927	2058	2188	2218	372	421	437	445
MARTINIQUE	2651	2702	2710	2683	2198	2204	2171	2096	452	498	539	587
MEXICO	2653	2610	2628	2668	2359	2304	2297	2314	293	305	331	354
NETH ANTILLE	2448	2488	2474	2636	1763	1745	1702	1862	686	744	772	773
NICARAGUA	2527	2471	2409	2453	2130	2035	1983	1986	397	436	426	467
PANAMA	2441	2517	2322	2357	2054	2113	1934	1952	387	405	388	405
TRINIDAD ETC	2484	2564	2557	2684	2074	2151	2145	2243	411	413	412	441
USA	3393	3481	3507	3537	2027	2103	2172	2237	1366	1378	1335	1300
<b>SOUTH AMERIC</b>	<b>2535</b>	<b>2559</b>	<b>2530</b>	<b>2565</b>	<b>2069</b>	<b>2092</b>	<b>2073</b>	<b>2077</b>	<b>466</b>	<b>467</b>	<b>457</b>	<b>488</b>
ARGENTINA	3257	3372	3290	3359	2257	2378	2356	2302	1000	994	934	1057
BOLIVIA	2028	2110	2103	2134	1720	1785	1773	1829	308	325	331	305
BRAZIL	2506	2511	2478	2522	2139	2139	2093	2105	367	371	386	416
CHILE	2742	2695	2694	2644	2279	2221	2233	2215	463	473	461	429
COLOMBIA	2145	2166	2235	2255	1789	1811	1900	1909	357	355	335	347
ECUADOR	1991	2048	2064	2109	1640	1699	1728	1767	351	349	337	342
GUYANA	2358	2312	2296	2431	2025	1972	2012	2143	334	340	284	288
PARAGUAY	2643	2770	2713	2779	2097	2228	2249	2269	546	543	464	510
PERU	2284	2312	2303	2286	1926	1958	1959	1967	358	353	344	318
SURINAME	2457	2466	2361	2286	2190	2179	2101	2057	266	287	260	229
URUGUAY	3061	3169	3039	3098	1883	1934	1967	2001	1178	1235	1072	1096
VENEZUELA	2301	2380	2349	2480	1916	1966	1913	1954	385	414	437	526

ADAPTED FROM: 1979 FAO TRADE YEARBOOK

TABLE III

## FOOD SUPPLY: PROTEINS PER CAPITA PER DAY - GRAMMES

GRAND TOTAL VEGETABLE PRODUCTS ANIMAL PRODUCTS

	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77
<b>N C AMERICA</b>	92.3	93.0	92.6	92.7	35.8	35.8	36.1	36.2	56.5	57.2	56.5	56.5	56.5	57.2	56.5	56.5
ANTIGUA	52.7	55.3	54.0	56.3	22.9	21.8	22.7	23.7	29.8	33.5	31.3	32.5	29.8	33.5	31.3	32.5
BAHAMAS	74.0	72.1	67.9	62.6	26.1	24.8	23.1	23.5	47.9	47.3	46.7	46.7	47.9	47.3	46.7	46.7
BARBADOS	69.2	78.6	77.2	79.3	33.6	34.8	32.8	32.8	37.6	37.6	44.4	44.4	37.6	37.6	44.4	44.4
BELIZE	57.9	59.7	60.1	64.1	35.6	36.5	34.7	32.7	22.3	23.3	25.4	31.5	22.3	23.3	25.4	31.5
BERMUDA	105.5	104.3	98.5	96.8	28.8	28.6	28.1	27.5	76.7	75.7	70.4	69.3	76.7	75.7	70.4	69.3
CANADA	97.2	98.4	99.4	101.3	33.7	34.0	35.1	35.6	63.4	64.4	64.5	63.6	63.4	64.4	64.5	63.6
COSTA RICA	58.0	58.2	54.5	58.4	35.0	34.5	31.4	31.1	22.9	23.4	23.1	27.4	22.9	23.4	23.1	27.4
CUBA	61.5	67.9	65.2	68.8	32.2	34.3	36.1	35.1	29.3	33.6	33.0	33.6	29.3	33.6	33.0	33.6
DOMINICA	52.1	55.4	54.3	58.5	29.4	29.9	29.6	29.2	25.5	25.5	24.7	21.2	25.5	25.5	24.7	21.2
DOMINICAN RP	43.0	43.5	43.6	42.8	26.8	26.7	28.3	28.2	16.2	16.0	15.4	16.7	16.2	16.0	15.4	16.7
EL SALVADOR	50.6	49.8	50.5	54.5	34.8	34.9	35.8	38.5	15.7	16.9	14.7	16.0	15.7	16.9	14.7	16.0
GUADALOUPE	53.0	60.1	57.3	77.3	41.4	41.8	39.5	32.8	28.9	28.8	35.1	29.3	28.9	28.8	35.1	29.3
GUATEMALA	59.7	61.8	59.6	57.8	45.9	47.6	45.9	43.4	13.8	14.2	13.7	14.4	13.8	14.2	13.7	14.4
HAWAII	45.9	47.2	48.8	49.1	39.4	40.5	41.5	42.0	6.4	6.7	6.9	7.1	6.4	6.7	6.9	7.1
HONDURAS	58.7	58.4	52.5	53.5	43.3	42.3	37.0	38.5	15.3	16.1	15.5	15.0	15.3	16.1	15.5	15.0
JAMAICA	42.2	66.3	69.9	70.5	32.8	35.9	38.2	38.0	29.3	30.5	31.8	32.5	29.3	30.5	31.8	32.5
MARTINIQUE	73.4	74.8	76.3	78.0	38.2	37.1	36.6	35.2	35.2	37.6	39.6	42.5	35.2	37.6	39.6	42.5
MEXICO	66.4	65.8	66.3	66.1	48.6	47.5	47.0	45.8	17.8	18.3	19.3	20.3	17.8	18.3	19.3	20.3
METH ANTILLE	67.6	69.9	70.9	78.8	27.4	25.7	25.9	26.2	48.2	48.2	45.1	48.0	48.2	48.2	45.1	48.0
NICARAGUA	72.9	73.5	68.5	70.4	47.4	45.9	42.0	40.8	25.5	27.6	26.6	28.0	25.5	27.6	26.6	28.0
PANAMA	60.8	62.3	56.8	59.5	37.3	36.3	30.0	31.6	23.5	26.1	26.9	27.9	23.5	26.1	26.9	27.9
ST KITTS ETC	46.7	46.5	47.4	51.3	26.2	24.1	24.4	24.9	20.6	22.4	23.0	26.4	20.6	22.4	23.0	26.4
ST LUCIA	49.2	54.5	55.0	56.2	25.4	26.9	27.0	27.3	23.8	27.7	28.1	28.9	23.8	27.7	28.1	28.9
ST VINCENT	48.8	53.2	54.3	49.9	30.9	31.5	31.8	29.6	17.9	21.8	22.5	20.2	17.9	21.8	22.5	20.2
TRINIDAD ETC	63.3	65.5	65.6	69.9	36.0	38.7	38.5	40.0	27.3	26.7	27.1	29.9	27.3	26.7	27.1	29.9
USA	104.1	105.3	105.3	106.2	33.0	32.9	33.2	33.5	71.1	72.4	72.1	72.7	71.1	72.4	72.1	72.7
<b>SOUTH AMERIC</b>	68.1	67.1	65.2	66.2	39.9	39.0	37.7	36.8	28.3	28.1	27.5	29.3	28.3	28.1	27.5	29.3
ARGENTINA	105.0	106.4	101.1	110.2	38.2	39.7	39.4	38.9	64.7	64.7	61.7	71.4	64.7	64.7	61.7	71.4
BOLIVIA	53.4	54.2	55.4	56.3	38.2	38.5	38.7	39.3	15.1	15.7	16.7	17.0	15.1	15.7	16.7	17.0
BRAZIL	64.4	62.8	61.4	61.2	43.5	41.7	39.7	38.0	20.9	21.1	21.8	23.2	20.9	21.1	21.8	23.2
CHILE	73.0	70.1	73.2	70.3	47.3	44.9	46.2	45.4	25.7	25.3	26.9	27.7	25.7	25.3	26.9	27.7
COLOMBIA	50.6	49.8	48.6	49.0	27.4	26.8	27.1	27.3	23.2	23.0	21.5	21.7	23.2	23.0	21.5	21.7
ECUADOR	50.8	50.5	48.4	49.7	32.3	31.9	29.6	29.9	18.5	18.7	18.8	19.8	18.5	18.7	18.8	19.8
FR. GUIANA	69.9	73.6	69.5	69.5	34.6	34.6	32.9	31.9	35.3	39.1	34.6	37.5	35.3	39.1	34.6	37.5
GUYANA	59.5	58.0	54.0	59.2	34.9	32.5	32.9	37.4	24.7	25.6	21.1	21.8	24.7	25.6	21.1	21.8
PARAGUAY	73.8	76.8	75.4	78.5	40.0	43.8	46.6	48.4	24.7	29.6	28.8	30.1	24.7	29.6	28.8	30.1
PERU	62.6	61.5	59.6	58.7	40.9	40.9	39.1	34.8	21.6	20.6	20.5	19.9	21.6	20.6	20.5	19.9
SURINAME	60.6	60.6	55.2	50.9	36.4	34.7	33.4	31.7	24.2	24.1	21.6	19.2	24.2	24.1	21.6	19.2
URUGUAY	92.9	95.6	90.3	92.4	32.7	34.2	34.3	34.8	60.2	61.4	61.4	56.0	60.2	61.4	61.4	56.0
VENEZUELA	59.1	61.5	60.0	65.6	33.6	34.2	31.3	31.6	25.5	27.3	28.7	33.4	25.5	27.3	28.7	33.4

ADAPTED FROM: 1979 FAO TRADE YEARBOOK



TABLE IV.  
FOOD SUPPLY: FAT PER CAPITA PER DAY - GRAMS

	GRAND TOTAL				VEGETABLE PRODUCTS				ANIMAL PRODUCTS			
	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77	1966-68	1969-71	1972-74	1975-77
<b>N C AMERICA</b>	127.3	130.6	130.2	129.7	44.1	47.0	50.0	52.8	83.2	83.6	80.2	77.0
BAHAMAS	76.9	83.6	83.9	84.7	10.0	12.8	14.2	13.4	66.9	70.8	69.7	71.4
BARBADOS	73.0	89.3	92.6	91.7	26.8	29.0	29.5	30.0	46.3	60.3	63.1	61.7
CANADA	143.6	148.6	150.8	148.5	26.1	26.3	29.3	32.8	117.5	122.3	121.6	115.8
COSTA RICA	56.0	59.2	57.0	62.6	33.1	32.1	34.2	34.6	22.9	23.1	22.8	28.0
CUBA	52.6	55.5	56.3	54.2	18.6	17.7	17.4	16.3	33.9	37.8	38.9	37.9
DOMINICAN RP	47.4	49.2	50.1	49.5	32.0	33.2	33.3	32.9	15.4	15.9	16.9	16.6
EL SALVADOR	40.4	39.0	40.9	44.3	24.4	24.9	26.4	27.6	16.0	14.1	14.6	16.7
GUATELCOPE	50.1	53.1	57.0	64.1	21.1	21.0	22.1	22.9	29.1	32.1	35.0	41.2
GUATEMALA	38.7	40.2	40.7	40.2	25.0	26.3	27.2	26.6	13.6	13.9	13.5	13.6
HAITI	28.5	29.3	29.6	29.5	18.6	20.4	20.3	20.2	10.0	9.0	9.3	9.2
HONDURAS	42.4	43.3	41.4	40.8	24.0	24.1	23.3	23.6	18.4	19.3	18.2	17.2
JAMAICA	54.8	59.8	60.7	64.0	31.7	32.8	33.0	35.7	23.1	27.0	27.8	28.2
MARTINIQUE	53.1	57.5	62.3	65.1	24.9	26.3	27.8	27.5	28.2	31.2	34.5	37.5
MEXICO	56.7	56.0	56.9	60.2	36.6	35.3	34.2	35.5	20.2	20.7	22.6	24.7
NETH ANTILLE	79.6	82.1	83.5	79.8	33.0	31.2	29.6	27.3	46.6	50.9	53.9	52.5
NICARAGUA	51.8	53.6	52.7	56.2	23.1	21.6	20.9	21.9	28.7	32.0	31.8	34.3
PANAMA	52.3	54.9	53.6	54.8	23.8	26.0	26.8	26.2	28.5	29.0	26.9	28.6
TRINIDAD ETC	61.9	62.8	62.6	62.7	36.0	36.9	37.2	34.9	25.9	25.9	25.3	27.8
USA	156.1	162.1	163.0	163.8	51.2	56.1	61.1	65.4	105.0	106.0	101.8	98.3
<b>SOUTH AMERIC</b>	57.7	58.6	57.9	58.9	24.1	24.7	24.7	23.6	33.6	33.9	33.2	35.3
ARGENTINA	112.1	114.9	112.4	117.2	40.6	44.1	45.7	41.9	71.6	70.8	66.7	75.3
BOLIVIA	39.4	42.3	42.8	41.2	13.9	15.2	15.6	16.9	25.5	27.0	27.2	24.3
BRAZIL	48.6	48.9	49.7	50.2	21.9	21.5	20.9	19.4	26.6	27.4	28.8	30.7
CHILE	58.5	60.4	56.9	56.1	25.3	25.8	25.1	25.9	33.2	34.6	31.7	30.2
COLOMBIA	41.1	44.5	44.2	45.9	17.5	20.8	21.5	21.3	23.6	23.7	22.7	24.5
ECUADOR	44.2	46.3	45.4	45.4	19.2	21.6	21.8	21.7	25.0	24.7	23.6	23.7
GUYANA	47.8	48.4	45.0	43.5	27.2	27.5	27.2	25.6	20.6	20.9	17.8	17.9
PARAGUAY	69.5	72.9	67.0	72.2	28.0	31.3	32.2	33.1	41.4	41.6	34.5	39.1
PERU	47.4	48.2	47.7	46.4	20.7	21.6	22.3	23.2	26.7	26.5	25.5	23.2
SURINAME	52.6	55.6	53.9	55.2	38.4	39.3	39.3	42.1	14.2	16.2	14.7	13.1
URUGUAY	113.6	117.3	106.7	110.1	21.0	19.2	23.6	25.5	92.5	98.0	83.1	84.6
VENEZUELA	53.7	53.6	55.4	63.1	27.3	25.3	25.8	27.1	26.4	28.3	29.6	35.9

ADAPTED FROM: 1979 FAO TRADE YEARBOOK

TABLE V  
NUMBER OF HOSPITAL DISCHARGES DIAGNOSED FOOD-BORNE ILLNESSES  
IN TEN COUNTRIES OF THE AMERICAS, 1975

	TYPHOID		PARATYPHOID AND SALMONELLOSIS		BACILLARY DYSENTERY AND AMEBIASIS		DIARRHEA DISEASE SYNDROME		STREPTOCOCCOSIS		INFECTIOUS HEPATITIS		HELMINTHIASIS		FOOD ILLNESSES	TOTAL DISCHARGES ALL CAUSES	% OF TOTAL DISCHARGES
	NUMBER OF CASES	DAYS HOSP	NUMBER OF CASES	DAYS HOSP	NUMBER OF CASES	DAYS HOSP	NUMBER OF CASES	DAYS HOSP	NUMBER OF CASES	DAYS HOSP	NUMBER OF CASES	DAYS HOSP	NUMBER OF CASES	DAYS HOSP			
BARBADOS	—	—	2	—	9	—	114	—	17	—	17	—	6	—	165	12,982	1.2
BOLIVIA	241	13.8	392	8.8	4	8.8	1,088	6.3	8	7.5	37	8.9	266	21.2	2,036	46,289	4.4
CANADA	132	18.2	1,069	13.8	496	12.4	61,364	6.8	1,703	5.5	4,297	12.2	1,163	7.4	70,224	3,634,706	1.9
COSTA RICA	57	—	101	—	282	—	11,270	—	429	—	959	—	1,787	—	14,885	213,475	7.0
CHILE	5,921	—	721	—	488	—	35,611	—	343	—	734	—	1,632	—	45,450	869,755	5.2
ECUADOR	2,796	—	3,527	—	1,263	—	14,331	—	5	—	488	—	3,246	—	25,656	287,572	9.0
HONDURAS	386	8.4	57	6.8	1,380	8.1	5,917	6.3	6	5.3	352	13.5	1,193	15.6	9,291	88,742	10.4
PARAGUAY	32	—	1	—	72	—	754	8	—	—	22	—	1	—	882	31,236	2.8
USA	—	—	—	—	—	—	329,000	4.2	—	—	—	—	—	—	329,000	31,627,000	1.0
VENEZUELA	45	19.7	19	17.8	1,603	14.2	19,046	7.7	7	8.1	1,020	15.2	987	15.2	22,757	261,204	8.7
TOTALS	9,610	15.0	5,889	11.8	5,597	10.8	459,449	6.5	2,518	6.6	7,926	12.4	10,281	14.8			

\*Average number of days  
\*\*Total discharges all causes

**Table VI.**  
**FOOD INSPECTION SERVICES**  
**SELECTED MEMBER COUNTRIES**

	Central Government	State Government	Municipal Government	Totals
<u>Inspection Personnel</u>				
Professional	879	147	274	1300
Sub-professional	2507	1671	1402	5580
Establishments Inspected (1)	119,510	243,899	188,277	551,686
Seizures (2)	1559	146,796	26,006	174,361

(1) Includes processing plants, markets, commercial outlets, restaurants (last year reported).

(2) Expressed in thousands of pounds (corresponds to same year as (1)).

**Table VII.  
OFFICIAL FOOD ANALYSIS LABORATORIES  
SELECTED MEMBER COUNTRIES**

	<b>PUBLIC HEALTH<sup>1)</sup></b>	<b>AGRICULTURE<sup>2)</sup></b>	<b>OTHERS<sup>1,2)</sup></b>	<b>COMMENTS</b>
Number of countries with laboratories	14	7	10	Some countries all analytical services under health.
Number of laboratories	202	30	80	
Samples analyzed annually	205,252	75,455	112,148	
Personnel Professional Technical	506 592	128 156	197 335	Does not include office clerical staff
Work Area (total M <sup>2</sup> ) (Range)	60-2,636	160-1564	120-3000	Includes central and regional laboratories
No. of samples analysed p.a./laboratory worker	16-994	60-994	71-259	
Work Area (M <sup>2</sup> per worker) (Range)	3.7-17.6	7.7-19.3	7.3-17.6	
Cost/Analysis US\$ (Range)	\$20-\$106	\$6-\$60	\$5.5-\$139	
Budget US\$ (Range)	\$9,523-\$5,417,126	\$601,580-\$1,259,387	\$576,600-\$3,682,776	Some countries may be total budget, including laboratory.

1)-Central and Regional

2)-University, customs, finance, industry

**Table VIII.**  
**HUMAN RESOURCES IN FOOD CONTROL**  
**SELECTED MEMBER COUNTRIES**

	PUBLIC HEALTH		AGRICULTURE		OTHERS		TOTAL
	Central	Subsidiary	Central	Subsidiary	Central	Subsidiary	
<u>PROFESSIONAL</u>							
Chemists	42	70	11	34	158	42	357
Microbiologists	41	24	37	37	42	-	181
Veterinarians	82	327	176	621	37	11	1254
Engineers	23	49	8	-	25	-	105
Others	26	21	16	4	-	-	67
<u>SUB-PROFESSIONAL</u>							
Technicians	88	860	173	1828	92	305	3346
Auxiliaries	655	912	115	-	83	-	1745
Administrators	101	135	312	-	227	27	802
Others	97	32	9	-	77	1	216
<b>TOTAL</b>	<b>1155</b>	<b>2430</b>	<b>857</b>	<b>2524</b>	<b>741</b>	<b>386</b>	<b>8093</b>
	14.3%	30.0%	10.6%	31.2%	9.2%	4.7%	100.0%