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DRAFT ASSESSMENT OF THE CURRENT SITUATION AND PROJECTION OF
THE FOOD AGRO-INDUSTRIES IN THE LATIN AMERICAN REGION ^{1/}

by

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I N T R O D U C T I O N

In 1977 a "Draft World-wide Study on Agro-Industries 1975-2000" has been prepared by the Sectorial Studies Section of the International Centre for Industrial Studies. It examined in depth the evolution of the sector, world prospects for its development, its role in the economy and particular constraints confronting its development, prospects and suggestions for their removal.

This was made to implement, regarding Agro-Industries, the Declaration of the Second General Conference of UNIDO, held at Lima, Perú, in March 1975, that in view of the low share (13%) of developing countries in total world industry production, their participation should be increased to the maximum possible extent and as far as possible to, at least 25 per cent of total world industrial production, by the year 2000.

The second step is to prepare regional papers connected with the above World-wide Study on Agro-Industries, putting emphasis on the situation of the food processing industry and of some selected sub-sectors in different regions, indicating the major variables influencing the development of the important sectors, in each separate region and giving future outlooks regarding every region, in this particular field of industry.

The Latin American Region Study has been trusted to two Latinamerican professionals, specialized in food science and technology, with a wide experience in industrial processing, university teaching, food research, industrial factibility and food industry development and promotion, particularly in the Latinamerican area.

Nevertheless, it is necessary to emphasize that only the seniority of the Consultants made possible to assess this wide area, in a very short time.

Travels were accomplished separately by both Consultants. The following countries were visited during last month: Argentina, Brazil, Chile, Colombia , Uruguay, Costa Rica, Ecuador, Guatemala, Mexico, Panama, and Venezuela.

As regard the rest of the countries, very recent data and information were available. Specific trips were avoided for this time.

In any way, the previous studies made on the subject - some of very recent data - were consciously perused and its concepts actualized or modified according to the Consultants personal experience or information (1).

Strong efforts have been laid out to produce a comprehensive, fair balanced and accurate assessment of the true situation of food processing industry in Latin America. We hope to have accomplished this task in spite of the huge economical, level of development, cultural, technological, infrastructural and financial differences existing among the 27 countries of the area and in spite also of the heterogeneity of the agro-food industries in every country.

(1) See References 4) and 3).

- 3 -

P A R T A

REGIONAL ASSESSMENT
ON THE
AGRO - FOOD PROCESSING
INDUSTRY

I.- THE AGRO INDUSTRIES IN THE FOOD SYSTEM
SITUATION OF THE FOOD PROCESSING INDUSTRY IN LATIN AMERICA

1) Structure, role and importance of the Food Processing Industry

The few comprehensive surveys or assessments issued regarding the food processing industries in Latin America, have emphasized perhaps excessively the weaknesses or short-comings which have braken, until few years ago, the promising development of this activity, and have ignored the substantial efforts carried out in several countries of the Region, intended to put an end to this stagnation, in benefit of a more adequate, balanced and less expensive nutrition of their inhabitants, or with the purpose to increase the national inputs through the foreign marketing.

It is not our purpose to make an exhaustive description of the contributions of advanced food technology to the food processing industry of Latin America; this would be too long and boring. The objective is only to give a general view of the contributions that can be easily detected at the food industries' plants today, we can quote: improvement of quality and availability of raw materials; partial modernization of machinery and equipment; growing utilization of chemical and biological additives; use of new methods of sterilization, processing and preservation; more efficiency in the control of physical, chemical and biological causes of damage or spoilage of foods; increase of productivity through industrial efficiency and decrease of costs; retention or fortification of the nutrient and organoleptic factors; application in some factories, of quality control, starting from the different unit operation of the process; utilization of new packaging materials and new types of packages; larger application of the hygienic

principles and industrial safety and a wide improvement of the channels of distribution. Perhaps the more important factors incorporated to the new structure of Latin American food processing industry, is the certainty of the major part of the entrepreneurs that science and technology are the only proficient tools to overcome the practical problems shown-up during their industrial operations.

Also the development of genuine and adapted technologies are of very great importance in the development of food industry in Latin America.

The above only means that the Latin American food industry is superating actively the stumbling blocks which are disaccelerating its progress. But still there are several important problems which are increasingly requiring solution. Among others, the following can be quoted:

- a) Irregularity in the typification of the products; the same can, box, or bag with the same label specifications, sometimes the same harvest and origin of production, differ substantially in its characteristics. Standardization of the products is generally lacking.
- b) A more intensive and eager application of modern quality control systems, at factory level, is required.
- c) Trained medium-level workers of the food factories are very scarce; usually large companies are obliged to send few people for training abroad. Schools to train these workers at national levels practically are non-existent, with the exception of Brazil, where the UNICAMP has programme for medium-level food technologists. Their role is so decisive, in an efficient operation, that steps must be taken to repair this default.

- d) The importance granted usually to the economic impact produced by low quality of raw materials, is surprisingly low. The utilization of low quality rejects from the fresh market, or low price opportunities of small lots of irregular products is deemed as a saving, instead of as a factor of lowering down the quality and rising the price.
- e) Not much has been done regarding the adequateness of raw agricultural products to the industrial and processing needs of the industry. If an industrial variety is lacking, instead of introducing it, efforts are made to substitute it by other available local products, very often with poor industrial characteristics. Naturally the quality is pushed down with this procedure.
- f) In their effort to utilize materials manufactured in the country, several companies are using tin and aluminum plates and other packaging materials of a defective quality. This eventually means a saving of foreign currency, but usually means also, a decrease in the quality of the product to be sold, which is particularly unsatisfactory if it is intended for export.
- g) Enforcement of the commercial standards and types, by qualified inspectors, is necessary.
- h) Information systems, organization and management of food processing industries must be in general, substantially improved, and this is one of the main tasks for the development of Latin American food industry.
- i) An effective link to co-ordinate agriculture and industry must be established.

- j) Transport of raw products from the farm to the factory must be improved to avoid physical damages, wastage and delays.
- k) The domestic markets for processed foods, are generally insufficient.
- l) Access to markets in some developed countries is usually restricted.
- m) Insufficient management and operational skills prevail for operating economically existing processing plants.
- n) There is a shortage of raw materials of acceptable quality in some of the countries.

Further and deeper references to these defaults will be made in Chapter A-III. iv) Constraints to Development.

ii) Presence and Role of the TNC's in the Region

This subject has worried U.N. particularly concerning its impact in the integration process of Latin America.

The United Nations Conference on Trade and Development (UNCTAD) jointly with the United Nations Centre for Transnational Enterprises and UNDP, convened 12-16 June 1973, a Round Table at the Andean Junta Headquarters, to define the link existing between the requirements of the Latin American Economic Integration process and the Transnational Concerns. (1)

For several years the economic integration processes and the commercial interests of the transnational enterprises coincided, stimulated by the phenomenon of availability of technology and capital in Latin American countries.

(1) Andean Group, Bulletin 11, August 1973.

The problem of Transnational Companies has been dealt with by the Andean Group, also creating the views on the member countries, that the concept of integration cannot be separated from the need to establish rules for the fair distribution of the benefits and the participation of transnational concerns in integration schemes.

Much has been said about the role of foreign capital as the creator of dependencies among countries, and Governments have taken concrete measures to regulate activities related to it; however, this has not been done with technology, as witnessed by the lack of effective Government measures which would control this factor of production. Technology is a creator of dependency, is equally or more important than financial capital; we could even say that technology is the key to producing capital. (1)

Countries are not rich because they have raw materials, but basically because they have technology (Japan is an excellent example); in general, technology plus raw materials is what is being sold, with emphasis on technology rather than vice-versa.

Transnational companies are giving to developing countries the fish and not teaching them how to fish. Studies performed in countries of Latin America show that many of the contracts supplying capital or technology include restrictive clauses, imposed by the owners. Technology-granting firms presently have much stronger bargaining power than the customers in Latin America, and have been able to insert clauses in the contracts tying capital, technology, supply of machinery, intermediate goods, and raw materials, prohibiting exports incorporating

(1) There is a Chinese proverb that says: "it is better to teach a man to fish than to give him a fish" (the first alternative gives independence).

the acquired technology, and preventing many activities basic to the development and independence of Latin American countries. (Luis Soto Krebs)

All what has been said about technology also applies to marketing of processed foods in the developing countries and export to developed nations. There is a very big competition fight with national companies, in a way to keep the export markets for the T.N.C. Usually the TNC only import from developing countries the raw materials, avoiding the importation of manufactured products. Chocolate is a good example. Developing countries, which produce the cacao bean, have only 10% share of the processed chocolate in the world market.

It has been stated at the Andean Junta (1) that it is not possible to leave industrial development exclusively to the criteria of the market. Transnational companies could not be left to have the last word. There are common interests and a need to establish co-operation mechanisms, so that both the transnational companies and the countries obtain adequate, equal and fair benefits.

For Latin America integration task the contribution of transnational concerns is required. And not only to provide capital, but also technology and better systems for external marketing and business administration. However, developing countries have the right to consider options in the development strategies, in order to make the best use of available resources, provide a higher growth rate, more jobs and, above all, the growth of a national and regional productive system for greater self-sufficiency in production and a greater share in the handling of their economic decisions". (1)

(1) Luis Barandiaran, at the inaugural meeting of the Andean Junta (12 June).

"In participating in an integration process of any kind, the transnational companies have the advantage of acting legally within the international commitments assumed by the states. In this way, concessions granted, assignation received, mechanisms foreseen for compliance with integration plans, have the guarantee of the state and are not therefore subject to subsequent changes due to short term political needs". (1)

The need that the transnational companies participate closely in the economic integration of Latin America is deeper regarding the processed foods, as this is a vehicle of interchange and of inter-supply among the countries of the area. Moreover, there are several transnational companies such as NESTLE, that have food processing plants in almost all the countries of the region.

In 1975, the developing countries contributed only 13% to world production of the food processing industry. Almost the half of the industry production was contributed by the multinational enterprises, which dynamic growth is astonishing.

According to the statement of Alberto Jimenez de Lucio (2) the United Nations Centre of Transnational Enterprises has three objectives leading only to enforce this participation (3):

- To achieve a better understanding of the political, social, economical and legal effects resulting from the activities of transnational enterprises.

(1) Luis Barandiaran, at the inaugural meeting of the Andean Junta (12 June)

(2) Associate Executive Director of the United Nations Centre of Transnational Enterprises.

(3) Industrial Development Board, Twelfth Session, 19-26 May 1975. Report by the Executive Director (page 14).

- To promote the creation of mechanisms and agreements, which regulate the activities of these enterprises, in order to make the most of their positive effects and minimize possible negative effects, and
- To increase the negotiation capacity of developing countries in their relations with transnational enterprises.

The Centre believes, added Mr. Jimenez, that one of the most effective measures developing countries can use to improve their negotiating capacity, is through regional groups, which can negotiate jointly with transnational enterprises.

These international Consultants, at the request of the Andean Group, prepared reports on the role of transnational enterprises in the Latin American process: Constantino Vaitzos, Ernesto Tirone and Business International Corporation. They were discussed at the Andean Junta Headquarters (12-16 June 1973)

iii) Major Important Sub-Sectors of Agro-Industry and major producing Countries.

By studying the characteristics of the Latinamerican Region, such as: climate, existing agriculture and husbandry, political situation, interrelation with neighbouring countries, traditions, etc., it was decided to divide the Region in the following Sub-regions:

1. México
2. Central America: Guatemala, Nicaragua, El Salvador, Costa Rica, Honduras, Panamá
3. Andean Region: Bolivia, Ecuador, Perú, Colombia, Venezuela
4. Brazil
5. Argentina, Chile and Uruguay - (South Cone)

The remaining countries of Latin America were not very important food suppliers, neither have very promising future as processed food producers.

MEXICO - Starting with Mexico, it is very important to note that this country has already occupied 75% of its arable land. The country is facing a very serious problem of how to feed its own population. Last year Mexico has been importing several food products, such as: Kidney beans, corn, edible oil, wheat, milk, which are the most important products of the Mexican diet.

Mexico appears as a meat exporter, mainly to U.S.A. North region of Mexico has been exporting meat because it receives a very good price for its product, but nevertheless, mexicans are lacking animal protein in their diet, which is only 19 grs. per person, per day. Low income mexicans are not able to buy meat as a regular item of their diet. Strong efforts should be made in order to increase their poultry and pork husbandry, which can transform the best animal feed and do not need too much space for this kind of activity.

This sub-region is also appearing as an exporter of frozen strawberries, which can be well grown in their north part in irrigated land. This is one way of improving their national trade balance.

Mexico production of meat is relatively low, since the amount of 1,136,000 M.T. is very low as compared with their 61 million inhabitants. A high meat producer as Argentina has a total amount of 3,511 M.T. as compared with their 25 million people.

Looking at cereal production figures in Mexico, it can be noticed that this country is a very high cereal producer, but this production is entirely devoted to its own needs, besides importing significant amounts of corn and wheat.

The alternative for this country is to dedicate its maximum efforts to increase cereals productivity by using better varieties, good fertilization and irrigation techniques, as well as good weed, pest and disease control. This country is also an important potatoes grower and consumer. Very important items in Mexico's production record are coffee and cacao, production of which appears to be 242 thousand tons for coffee and 34 thousand tons for cacao beans. These productions bring to Mexico's economy a very meaningful amount of dollars. It seems like this country will have a good future in the production of good coffee and cacao, since the production is efficient and the quality of prepared beans is very good.

CENTRAL AMERICA - Traditionally these countries are important coffee growers and the first in banana export. Their coffee is all planted under shade and hand harvested only red fruits, as a result, their product is of first choice. Coffee production in Central American countries reaches 546 thousand M.T., which appears to be higher than Brazilian production in last years.

Banana production in Central America is 5,049 thousand M.T. which represents one fourth of Latinamerican production, but it is interesting to note that most of its production is of exportation quality, while most of the Latinamerican production is not of export quality, good only for domestic market, which is not so restrictive. Besides these two products, very little can be expected from these countries. They are very high importers of milk, wheat and soybean.

Central America has been a very high meat exporter, nevertheless, it has a deficiency in animal protein injection, which is around 15 grs. per person, per day, with exception of Nicaragua, Costa Rica and Panamá, which have more than 25 grs. per person, per day. Their export of meat is high because they get high international prices and local people have very low income to afford buying meat for their diet.

ANDEAN COUNTRIES - This group of countries is tied-up together by an international pact, which is governed by the "Junta Acuerdo de Cartagena" which has their main office in Lima, Perú.

These countries have great potentialities regarding cacao, banana, sugar, coffee and cotton. Their trade balance in 1975 was as follows:

Export	US\$ 2,124 million
Import	US\$ 1,311 million

From these amounts, around 17% is allocated as food products, it is interesting to note that all countries from Central America and Andean Region are exporters of raw tropical products, with exception of sugar which is partially processed locally as raw sugar. All the other items are shipped as raw materials: coffee, cacao, banana, which represent all together, around 30% of their agricultural production. Imports amount of food products in these countries is very important and it is growing in the last five years; it was multiplied by four between the years 1971-1974.

The major deficiencies are regarding milk, edible oil, wheat and meat.

This Sub-region produces cereals in 4 million hectares, which represents 19% of the cultivated land in those countries. The imports of these cereals in 1975 represented 42% of total imports in these countries under agricultural label.

If we compare cereals production in Andean countries with Latin America, we can see 100 kg./capita in the Andean Region and 270 kg./capita in Latin America.

Under the heading oils and fats the Andean countries have imported around 20% of their total consumption.

Coffee alone represents 50% of total exportation of agricultural products from those countries. If it is added to coffee the exportation of fish products, this figure goes up to 96% of total agro-products exported by the region. (1)

It is very important to mention again that exported products are raw materials and mainly tropical products. All these countries are deficient in sub-tropical and temperate climates products, such as: cereals, milk, edible oil, meat.

The region must do its best effort to increase cultivated area, export processed foods and beverages.

BRAZIL - Brazil is one of the major food producers in Latin America and one of the main potentialities for future increase of production. The major sub-sectors in Brazil, are: Coffee, soybeans (oil and defatted cake), orange juice concentrate, sugar, vegetable products, cereals, frozen meat (equine, bovine, swine, poultry), fruits (banana, pineapple, cajew, brazil-nuts, oranges), oils

(1) Situación del Sector Agropecuario en el Grupo Andino - 1970-1975.

(soy, ricinus, peanut, linen, cotton) canned meat (bovine) sugar molasses, tomatoe paste, alcohol, heart of palm. On the other hand, Brazil is importing yearly around:

- 2 million tons of wheat
- 24 thousand tons of meat
- 70 thousand tons of fish products
- 24 thousand tons of dried cod
- 15 thousand tons of dried milk

Moreover, we can foresee Brazil as a big producer of:

1. Instant coffee and green coffee
2. Sugar (refined and raw)
3. Soybean oil and defatted cake
4. Orange juice concentrate
5. Corn and processed corn
6. Manioc starch
7. Ricinus oil
8. Canned meat
9. Sugar molasses and alcohol
10. Cacao butter, chocolate powder
11. Asparagus (canned)
12. Tomatoes concentrate
13. Heart of palm (canned)
14. Coconut, cajew nuts

Brazilian food industry has grown tremendously in these last five years and it is very difficult to figure out how it is going to grow within the next 10 or 20 years. The country can answer with astonishing quantities of prepared foods when foreign markets ask for it. Just look the significant increase in the production of soybean oil and defatted cake and frozen orange juice. In

the last fifteen years Brazil grew up in orange juice from 10 thousand to 250 thousand tons (650 brix) and in soybean oil from 10 thousand to 1,600 thousand tons. Something similar happened with instant coffee, frozen meat, canned fruit and vegetable. The country has very good conditions for the growth of agro-food industry.

There are good storage facilities, roads availability, water and electricity, training facilities, research and development facilities.

The following is needed:

- a) Larger export market demand
- b) Co-operation from T.I.C.
- c) Demand for processed foods
- d) Extension service, practical work in research institutes
- e) Training of medium level expertize
- f) Development of raw materials suitable for processing
- g) Increase in availability of tin plates.

SOUTH CONE REGION - These countries have tremendous potential for the temperate climate products: meat, milk, cereals, fruits, vegetables, wine, juices.

Argentina is one of the biggest meat exporters and also one of the largest consumers of meat. Animal protein consumption in Argentina is 67.2 grs. per day per capita. It is a traditional exporter of wheat, fruits, concentrated orange juice and vegetables.

In the last ten years under Government regulation, the country started using national orange juice in their soft drinks and this decision transformed completely the situation of orange juice exports. Now Argentina uses most of its orange juice in the domestic market and very little for export.

We can say that Argentina has tremendous potentialities in production of meat, milk, wheat, barley, corn, rice, soybean, apples, pears, grapes, plums, oranges and peaches.

Chile is very promising for the production of fruits and vegetables (wine, cherries, grapes, apples, pears, peaches, plums) leguminous seeds (dry beans, chick peas, lentils), roots (potatoes, onions).

Chile makes one of the best wines in the world, since its climatic conditions are very favourable for grape growing. The country is a traditional producer of leguminous seeds and is using some of them in school luncheon programmes.

Chile has a well developed canning industry, specially processing fruits and vegetables (peaches, pears, green peas, tomatoes, apricots, cherries) and convenience foods. Potatoe flour is a common item in supermarkets, which shows the importance of time saving for housewives. Cost of living in Chile is high and housewives prefer to work outside than spend their time cooking. Convenience foods are taking a very important role in the Chilean uses and customs.

Uruguay has promising outlooks regarding wheat, meat and some subtropical fruits (oranges, apples).

II - OUTLOOK BY MAJOR SUB-SECTORS

1) Production and Consumption of Processed Foods

The main indicative figures on production of food products are expressed in Annex No.10. These figures represent the total amount of production, including raw materials and processed food. It is very difficult, almost impossible to obtain trustable figures on processed foods. Information is poor and separate references are not available in most of the countries of the region.

We can figure-out approximate percentages of total raw materials which are processed.

Meat - In the case of meat, around 30-90% is processed and the degree of industrialization is in most of the cases primary for domestic consumption, second we can say roughly 70% of those primary processed meats are frozen and the rest is processed as canned, cured, saussages, salamis, ham, etc.

Most of the domestic market uses only refrigerated fresh meat, with exception of large towns and during winter season, when availability of meat becomes short due to different factors, including climatic conditions.

Milk - Milk is in shortage all over Latin America, with exception of Argentina, which has over-production. Most of the milk psoduced in Latin American countries is refrigerated at the collecting stations close to the farms. Cows are milked only once a day in early morning with few exceptions of twice a day. The milk is collected in 50 liter drums by trucks, and transported immediately to the collecting station, where it is refrigerated and kept in insulated tanks. From these collecting stations the refrigerated milk is transported to processing plants, where it is pasteurized and most of it is packed in polyethylene bags of one liter.

Very small quantities of milk, most of it with an advanced Dornic (15-20 Dornic) goes for butter manufacture and cheese making.

It is very interesting to note that in the last ten years a tremendous amount of yoghurt started to be processed at dairy plants. These yoghurts are flavoured with natural and artificial flavours: strawberry, pineapple, peach, pear, plums, etc. The reason for this tremendous increase is that milk price is limited by the Governments at low values, but processed milk: yoghurts, ice-cream, cheese are not, and then the dairy plants can make much more money on these processed products.

Because of shortage in milk in all Latinamerican countries, it is allowed to reconstitute part of the milk from dried milk. Most of the countries allow 30 to 50% of the milk to be "reconstituted" for the fresh market. Dried milk is very small in percentage and it is dried only during the summer season, when excess of milk exists. During that season, dairy plants pay a much lower price for the milk exceeding the normal amount supplied during the short season. By doing this it is possible for the plants to pay the cost of drying and reconstitute it during the winter season or selling it for ice-cream factories or in the supermarket.

Milk quality in Latin America is of poor quality, since the climate is usually hot, roads are not so good, distances are very large. In some places it is common to find raw milk arriving to the dairy plant with total counts of $10^6 - 10^7$.

Cereals - Large volume of corn goes for animal feed (pg.83) The corn which goes for animal feed is first grinded. Corn which goes for human consumption is usually degerminated and the germ is sold to oil factories and mainly to TNC, which processes all the corn in all possible products and by-products.

National companies are very small and they separate the germ by soaking the grain in water and then removing the skin and germ.

The degerminated grain is grinded in "hammers" mills and a corn flour is produced with different mesh types. Some of the corn flour is pregelatinized in order to facilitate its use in cooking activities. These are practically all the processing of corn, which is being done in Latin America.

Mexico is the only country which processes the corn a little bit further. They do a soaking and alkaline treatment to the corn and then it is heated in order to make it suitable for "tortilla" processing. Right now there are some industries in Mexico drying the treated corn and then making a flour ready for preparing "tortillas" at home.

The T.M.C. process the corn to make: corn starch, corn syrup, glucose, corn oil, corn steep liquor, etc. They keep their process as a secret and the size of these factories is prohibitive for national companies to compete in the market, with TMC.

Wheat is partially produced in the countries and partially imported from the U.S.A., Canada, Argentina, U.R.S.S. Extraction yield is around 72-75%. Milling is done by national and TMC with no competition, since the wheat is subsidized and controlled by Government. Most of the wheat flour is used for bread making and **pastas**. By-product from wheat milling goes to animal feed formulation. Bakeries are spread all over the countries and most of them process around 1 to 5 sixty kilos bags of flour into bread per day. Very few bakeries process more than 100 bags per day. **Pastas** are becoming part of Latinamerican foods. Most of the families eat **pasta** once a week. In Mexico it is a very common dish. These **pastas** are prepared from hard wheat, usually imported from Canada.

Another item very important for wheat demand are the biscuits and **waffles** usually processed by large factories, as well as the **pastas**.

Barley is used mainly for beer and whisky production. It is mainly produced in Argentina, Chile, Uruguay, Europe and U.S.A. Very small quantities are produced

in the rest of the Latinamerican countries. To make beer and whisky, most of the starch comes from corn and rice, while the barley is used only to furnish the enzyme for the saccharification of the starches.

Rice is a very important cereal all over Latin America. Processing of rice consists only on peeling and polishing the grain. Around 95% is processed like this. Very small amount is parboiled and people are very unfamiliar with the taste, given by the boiling process before removing skins. The oil industry started to use the rice bran for oil extraction and there are several oil plants working with 50 to 100 tons rice bran per day. The problem of acidification of rice oil during storage was solved by extruding the rice bran as soon as it comes out of the polishing machine.

Fruit and Vegetables - Probably fruit and vegetables are the items which are mostly lost in the field, transportation and marketing, because they are very delicate. rural roads are bad, distances are large, climate is warm and humid, hand labour is very illiterate. Most of the products are produced for the fresh market. Agronomists have been working for years in genetics and improvements of varieties, to improve:

- a) yield
- b) resistance to pest and diseases
- c) appearance

It was forgotten the development of industrial varieties. Industry is suffering from the lack of adequate fruit and vegetables for processing. A strong effort should be put on the adaptation and improvement of industrial varieties.

The main processed products in Latin America are:

Tomatoe concentrate and pastes

Orange juice concentrate and other concentrate citric juices

Canned fruits: peaches, pineapples, pears, prunes, figs, cherries,
fruit salads

Canned vegetables: green peas, carrots, beets, green beans

Pickles: olives, onions, cucumber, potatoes, cauliflower

Fruit nectars: papaya, peach, banana, guaya, passion fruit, cajew

Fruit juices: passion fruit, cajew, pineapple, grape

Fruit marmalades: guaya, quince, figs, banana.

Sugar - This product is processed in very modern plants.

The main producers of cane sugar in Latin America are, Brazil, Cuba, Perú and Colombia. The main producers of beet sugar are: Chile and Argentina. This product is one of the most important export items in Latin America.

Yield in factory is around 100-120 kg. sugar per ton of sugar cane. Quality is very good, since the process used is standard and well known by all sugar factories. Normal size of sugar factory in Brazil is 1 to 4 million bags per season. Season is only six months, the rest of the year is used for maintenance of equipment.

Importers usually prefer raw sugar, which is cheaper. Latin America could make higher earnings if developed countries would import refined sugar. All internal consumption in Brazil, Argentina, Chile and Uruguay, is in the refined form. In Colombia, Perú, Bolivia, Ecuador, Venezuela and Central American countries, use part of their sugar as raw. In Colombia it is called "Panela". Because of cost of production in small factories is very high, Colombia started to mix refined sugar with molasses to make "Panela".

OILS AND FATS - Latin America has great potentialities for oil seed production. Right now, it was observed a rapid increase in soybean production in Brazil and Argentina. In 1974 Argentina was producing 400 thousand tons of soybeans and in 1978 this production went up to 2,300 thousand tons. The same happened with Brazil, which increased its production up to 12,000 thousand tons and is expected to have in 1979 a production of 13,000 thousand tons.

Brazil's actual capacity in oil extraction is in the range of 3-10 million tons of soy per year, with an average capacity per plant, of 1,000 tons per day, with a minimum of 500 tons and a maximum of 4,000 tons per day. A lower capacity than 500 tons per day is uneconomical for Brazil standards of production.

Most of the plants are very well equipped with solvent extraction already manufactured in the country.

Refineries also exist with capacities up to 200 tons of edible oil per day in only one line.

Characteristics of refined oil are similar to the best quality oils in Europe and U.S.A.

The same plants are used to extract oil from cotton seeds, peanuts, corn germ, sunflower, etc.

In Argentina and Chile there is a very important production of grape seed oil and sunflower oil, besides linen oil, tung oil.

Mexico, Venezuela and Colombia are very large producers of sesame seed oil and cartamus oil.

There are several plants in Brazil, Colombia, Mexico, Chile, Guatemala, producing texturized vegetable protein, using as raw material the defatted oil cake. The main usage for T.V. P is in the extention of meat products. Installed capacity in Brazil for T.V.P. production is 100 tons per day.

There are several oil production by-products, which are not well utilized in Latin America, such as: lecithin, vitamin E, defatted soy flour bread.

The main use for the defatted cake is for animal feed production, since it contains a minimum of 45% protein of very good quality. Brazil is the largest soy meal exporter in the world and Argentina is becoming one of the major exporters.

Latin America's production of soybeans compete very well, in the international market, because the crop comes in between the harvesting seasons of U.S.A.

ANIMAL FEED - This item is becoming very important for the tremendous boom in chicken and pork husbandry which is happening in Brazil, Chile, Perú, Venezuela, Mexico and Argentina.

This industry is complementary to almost all the other food industries, since it uses most of their by-products.

The sugar industry contributes with molasses.

The cereal industry has: cereals bran, broken rice grains, wheat germ, corn steep liquor.

The oil and fat sector has defatted oil seed meals, crude lecithin, recovered liquid from deodorizer scrubbers.

The fruit and vegetable industries supply fruit seeds, dried fruit and vegetable residues, peels and bagasse.

Meat industry supplies: blood flour, feathers, tankage, bone flour.

Milk industry supplies: residual milk powder, roller dried milk powder. All these residues are very important for their transformation from low cost materials into valuable animal proteins.

Most of the Latinamerican countries entered the field of animal feed, but the above mentioned ones are already using computers for the formulation of their products, and very modern and sophisticated equipment.

Coffee residue is very large in hand harvested coffee cherries processed by moisture process. This residue is very rich in sugars, but it is not used yet and efforts should be made on the research for the utilization of it. On dried basis, this coffee residue represents the same amount as the country's green coffee production. ICAITI and INCAP in Central America, are conducting research on the utilization of the dried pulp of the coffee cherry for animal feed. This task is well advanced and adequate machinery is being designed for this purpose.

11) Consumer's demand

It is very common to see in the market, food products which keep exactly the original characteristics used in the country where their company is established; in other words, food products in Latinamerica are exactly the same as they are in the U.S.A or Europe. This is due to the wrong policy followed by T.I.C. subsidiaries in Latinamerican countries, which import from their home office all know-how, process, product characteristics, formulation and even equipment to process them and technical staff to direct all operations.

It is not difficult to understand that Latinamerica, with different habits, under different climatic conditions, would have different preferences for their foods.

Latinamerican house-wives are being forced to change their habits, which means a very important constraint to the difussion of processed foods in developing countries.

Product and process development should be carried out in the country where the final food product is going to be sold and used. Technical people should also be from the respective country, in order to know country habits and peculiarities, which a foreigner does not know and even does not learn easily. By using this policy, would not be only very good for the food product success, but also for the development of technology know-how in developing countries, using national technical people, which means: "teach how to fish and not giving us the fish".

Due to the continuous increase in the cost of living, more and more house-wives are starting to work outside home, which was very uncommon few years ago.

These obligations forces the house-wife to look for prepared food, since her time at home is much less, which means an increasing demand for prepared foods in developing countries; in other words, a market for convenience foods.

Another constraint for the development of porcessed food industry, is the high cost of products on the shelves. This is due to the fact that Latin-American food industries are working at very low productivity, slow production lines, inadequacy of raw materials, with higher percentage of by-products and very difficult to handle. These facts increase the cost of final product and decrease its utilization by house-wives.

illning countries, such as: Chile, Bolivia, Perú, Colombia, Ecuador, strongly need an increase in processed food production, convenience foods, since the working population is far away from natural food production areas and it needs ready-to-eat food. (convenience food) in its working place.

iii) Technological Problems

a) Identification of genuine technologies, low capital investment.

Latinamerican countries lack facilities for the dissemination of genuine, low capital investment technologies throughout the region. A great effort is needed in co-operation with Latinamerican countries, by increasing the information and documentation facilities. During this mission several genuine technologies were identified in some countries:

- a) Production of corn starch, for the manufacture of "tortillas"
- b) production of ready to use "Atole" starch
- c) Production of ready to use "chicha"
- d) Low cost manioc flour production
- e) Low cost nutritive product (maiso)
- f) Fried banana flakes
- g) Low cost soy milk of good acceptance
- h) Low cost equipment for soy milk production
- i) Production of pregelatinized corn flour
- j) Production of cheese bread with manioc starch
- k) Production of dried beef "charque" by solar energy
- l) Utilization of solar energy for dehydration of cereals, vegetables and fruits.
- m) Production of "Panela"

It would be very boring to continue the list of genuine technologies which are not spread out all over Latinamerica and why not state it, in all developing countries, which could be using in a better way their tropical products with low capital investment technologies. Again we should strongly recommend the need

for written know-how and production of catalogues, increase of information facilities, aggressive marketing facilities for these techniques. This information should be easily available and in a digested form, since small industries, owned by low capital entrepreneurs of low skill level, need a practical information with no basic science, but simply necessary tool for the starting-up of low capital investment industries.

b) Transference of Technology

The problems derived from the transference of technology had worried for several years the Governments, Industrial Enterprises and Development Centres of the Region.

Possibly a good case of this preoccupation is shown by the ICAITI (Institute for Central America of Research and Industrial Technology) which has established in its Division of Scientific and Technological Development, a permanent project "Programme of Technology Transference" (P.I.T.) under the sponsorship of AID-ROCAP (1). Representatives of this programme have been working on the subject with institutions and enterprises of different countries of Central America. The first evaluation of the project has been satisfactory.

UNIDO has contracted with ICAITI the development of a project regarding "Mechanisms for transference of technology in Guatemala", particularly connected with food industries, textiles and building materials. Substantial advances have been recorded.

Transfer of technology within the Latinamerican countries is very much tied-up to the contract which governs the transfer of technology. Right now, the contracts made by Latinamerican countries and developed nations are not in an equity basis. As a general rule these contracts are real constraints for the development of Latinamerican countries. In a study of 150 contracts in Bolivia, Colombia, Ecuador and Perú, it was found that more than two thirds of these included restrictive clauses. One of the most characteristic clauses ties the supply of technology or know-how to the supply of raw materials or intermediate goods. A survey of those contracts and real cases of sale of raw materials

(1) AID - Agency of U.S. for International Development, ROCAP is the Regional Office of the AID for Central America and Panama.

and intermediate goods, showed that the subsidiaries of foreign companies in Latin America overbilled, by an average of 155%, and national companies overbilled by 19%. As an overall sum, the money spent for these items by these countries was six times the total paid in royalties and 24 times the earnings declared by some companies. This method of overbilling is what has allowed foreign companies to remove money from Latinamerican countries, while declaring lower incomes, thus avoiding payment of the corresponding taxes.

c) Food Machinery Origin.

The major part of the machinery presently in use in the food processing industry in Latin America, has been manufactured in the U.S. and/or in Europe (particularly in England, France, Italy, Germany, Spain, etc.).

In several countries, factories of limited capital and production capacity, have been, for the last twenty years, manufacturing food machinery, under previous order, specially not very complex machinery, such as soakers, washers, sorting belts, preparation tables, drum dryers, peas sheller, steam jacketed kettles and so on.

But in the last ten years in some countries like Argentina, huge companies have been established for the manufacture of food machinery, for domestic and international supply.

Some plants were visited in Mendoza and in Santa F . In Mendoza presently, seven large plants are functioning (1) and two are active in Santa F .

For obvious reasons, the name of the enterprises will be avoided, but the concern visited at Santa F  has a plant with an area of 4,000 sq.mts. under roof, where 150 specialized workers carry out their professional work.

Its Foreign Commerce Department is composed by an Engineering Section, specialized in projects and design of plants and equipment, civil engineering foreign commerce, financial and legal studies, and so on.

It can be stated that this industry manufactures a large diversity of equipment and machinery apt to cook, cool, pasteurize, or concentrate any kind of food products.

(1) See list on page 38.

Among the machinery produced by this concern, we can quote the following: press filters; scraped surface heat exchangers; aroma recoverers; different type of pumps; automatic control panels; compressors; tanks of stainless steel; towers for the cooling of water; hygienizer centrifuges; deodorizers for milk and cream; homogenizers; can washers; fillers, kettles of double wall; chemical cleaners for plant equipment; balance tank; retention valves; steam valves; pneumatic action valves; rotative dehydrators; bagasse dryers; stamped plate filters; steam concentrators, and so on.

The firm also takes responsibility for particular evaluation of projects (process selection, determination of plant size, cost and price estimates). Preliminary projects (equipment specifications, equipment lay-outs). Engineering projects (Flow sheets, operation manuals, equipment design and construction). Plant hand-over (starting-up, efficiency tests, training of operators, after sale technical services). They provide also, upon request, complete "turn-key" plants.

They have exported complete plants already to the following countries; Bolivia, Brazil, Costa Rica, Chile, Cuba, Guatemala, Paraguay, Perú, Venezuela. For example, a citric processing plant with a capacity of 10 M.T. per hour (15 processing lines) was sold to "Cuba Citricos" of Cuba. A plant of 6 M.T. per hour capacity for citrics, pineapple and manioc was installed for the enterprise "Faros S.A." in Santa Cruz, Bolivia. A plant for concentration of apple juice, 6 M.T. per hour, was sold to the Chilean "Corporación de Fomento" and installed in the south of Chile.

The equipment to manufacture the food machinery is up-to-date, and only few old fashion type presses show up. A very modern lathe of Italian brand (Graziani), commanded by an Olivetti computer, testify the modern approach of the factory.

In Argentina they have provided: 1,500 pasteurizers (for milk, juices and wines) and the 90% of the heat interchangers used by the food industry of that country, the other 10% is provided by Alfa Laval and other foreign manufacturers.

It is out of the question that the supply of machinery in the Region itself, instead of importing it from overseas, is a tremendous advantage for the food processors of Latin America, for its lower price, sometimes 35% less than the similar overseas machines; for the easy availability of parts and replacements; for the production capacity more adequate to the local needs or availability of raw materials and so on.

In Latin America the large food factories have equipment and machinery sophisticated, automatic, high production capacity and continuous operation, but a large amount of small factories have remained impervious to modernization and continue to use obsolete, high cost of operation, or antique machinery.

Only very few industries stop to consider machinery and equipment as a permanent investment non-apt to be changed if usable yet. The high cost of operation and the low productivity, does not usually provide a good reason to change the obsolete machine for other of higher economical yield.

The modernization of the machinery is a must, if the development of food industry is the goal to get.

In Brazil there exists several food machinery and equipment suppliers. Most of the food industry equipment is now designed, calculated and constructed in the country. Usually the designs are of genuine technology and the capacities of equipment are suitable to Latinamerican countries' conditions. Equipments are very simple and not so sophisticated automated. Still the salaries in Latin-america and other developing regions are low and unemployment very high. We should use their hand labour.

Food equipment is very difficult to be manufactured in satisfactory conditions, hygienic, economical, simple and durable. Latin American countries are tied-up with imported equipment, since developed countries sell their technology and know-how together with their equipment. Most of food industries use American and European equipment, such as: Alfalaval, APV, Waukesha, FMC, Pfgaudler, Charles Walker, Tito Manzini, Bertuzzi, Luwa, BÜchler Miag, De Smet, Rossi Catelli, Gasquet, Padovan, etc. This situation is mostly dependent of the facilities these foreign companies offer to the Latin American industrialist, such as: a long period (8-10 years) to pay the equipment; b) low interest and free for the first two or three years; c) free feasibility studies; d) description of entire process; e) characteristics of raw materials, yield, flow sheet, industrial costs, description of equipment, characterization of final product, etc.; f) pre-project be made free for the use of it in obtaining financial support; g) easiness of buying full package of equipment from only one supplier.

Since Latin America has right now plenty of research and development institutions and universities, which can grant all the services offered by foreign companies, besides having several food equipment suppliers, mainly in Argentina and Brazil, the situation is changing and we start to see Latinamerican equipment all over these countries.

There is still a lack of marketing effort from the food equipment suppliers, which means: catalogues in colour, description and specifications of their equipment, good technical salesmen, aggressive visits to food industrialists and very competitive work as compared with foreign companies.

The quality of the food equipment made in Brazil and Argentina is very good and they have a very good performance also. Costs of these equipments are

competitive and lower when Latinamerican countries provide protection laws for national products, against imported from overseas.

Below a list is given of food equipment suppliers, in Argentina and Brazil:

List of some large food machinery manufacturers of
Argentina and Brazil

Perhaps due to semantic reasons the food machinery manufacturing concerns are called "Talleres Metalúrgicos" in Argentina. This is a little bit misleading particularly for foreigners.

1. Talleres Metalúrgicos "Condor"
Batistini S.A.
Perito Moreno 704, G.C.
Mendoza
2. Talleres Metalúrgicos Silvestrini y Barbier S.A.
Figueroa Alcorta 1010 G.C.
Mendoza
3. Francisco López Carrillo
Sargento Cabral 145
San José - Guaymallen
Mendoza
4. Talleres Metalúrgicos Rouselle
Beltrán 473/560 G.C.
Mendoza
5. Rossi Arquimides
Construcciones Metalúrgicas
e Industrias Químicas
25 de Mayo 1689, San José, Guaymallen
Mendoza
6. Gasquet Sudamericana S.A.
Tito Lacia 580, Villanueva
Mendoza
7. Inquimet S.A.I.C.A.
Primitivo de la Reta y Progreso G.C.
Mendoza.

8. Meitar Aparatos S.A.
25 de Mayo 2767
3000 Santa Fé
9. S.E.I. Ingenieria
Lavaise 1445
3000 Santa Fé

BRAZIL:

1. ICMA - Máquinas Alimenticias S.A.
Km. 114 - Via Anhanguera Sumare
Sao Paulo
2. Brasholanda S.A.
Londrina - Paraná
3. Alfalaval
Av. Marginal Tiete - S. Paulo
4. APV do Brazil S.A.
Sao Paulo
5. Westphalia - S.A.
Campinas - S. Paulo
6. O.I.C. Organizaçao Internacional Centenario
S.Paulo
8. Krupp do Brazil Campo Limpo
S. Paulo
9. De Smet do Brazil
S. Paulo
10. Mario Dedini - Ind. Metalúrgicas S.A. Piracicaba
S. Paulo Sao Paulo
11. Industrias Metalúrgicas NORDON S.A.
S. Paulo
12. FIVES LILLE DO BRAZIL S.A.
RECIFE - Pernambuco
13. Babcock Do Brazil S.A.
Sao Paulo - S. Paulo
14. Stork - Inox S.A.
Sao Paulo - S.Paulo
15. Holstein-Kappert do Brazil S.A.
Sao Paulo - S.Paulo

iv) Status of Research and Development Activities

The marketing of fresh foods and grains, without not even a primary processing, in the domestic and foreign markets, was, until ten years ago, easy and profitable. There was a weak conviction about the food losses and regarding the expensive freight paid for inert and unvaluable materials, particularly water, but this was insufficient to stimulate the development of food industry and the food research to find out adequate ways of processing, to industrialize the agro-products.

Perhaps the only exceptions were the transnational companies processing food, which have incorporated new foreign technologies, but they guarded it jealously, they renewed it or discontinued it without spreading it locally.

The growing struggle to conquer foreign markets, made compulsory the need to adequate the agricultural foods to the characters of modern life and the planifiers, educators and entrepreneurs opened widely their minds to the need to introduce advanced technology to the food processing.

Suddenly, then appeared in the last few years a large amount of initiatives regarding food technology and food industry. Practically in every country of the region, an organization or sometimes several institutions are now responsible for food technology, education and training, food research or food industry development or promotion.

The impact of this food processing make-up, has been naturally deeper in those countries which are large producers of agro-products, such as Brazil and Argentina. In Brazil there are presently 43 institutions of teaching and research, food science, food technology and food engineering (1). Argentina has 21

(1) See the list attached as Annex Nbrs. 4, 5, 6.

organizations of that kind (1), Chile has 20, Colombia 15, Perú 11, Uruguay 9, Bolivia and Ecuador have 6 each, Dominican Republic has 4, Guatemala and Uruguay have 3 each. There are also centres of this kind in Costa Rica, Salvador, Honduras, Jamaica, Nicaragua, Panama:

There exist also very progressive centres of regional character as the ICAITI and the INCAP, both physically situated in Guatemala, but with responsibility for the whole Central American Region.(2)

In spite of the fact that several of these organizations have made positive contributions to their countries, regarding food research and food industry development, not always this initiative has been successful. There are several Institutes stagnant or busy working on basic research which is expensive and a luxury, for countries which have urgent need to solve practical problems of research and development.

But this is not the general case and as an example of the efficiency and usefulness of the work carried out by several of these institutions, some of the projects of applied research and industrial promotion, presently accomplished or still under development, in several countries of the region, are quoted below:

Composite flour to make bread and fortified noodles (Institute of Technological Research I.I.T.), Bogotá, Colombia. Formulation of low cost processed foods rich in proteins (Instituto de Nutrición de Central America and Panama) Regional organization, located at Guatemala.

Fungal protein production on agro-industrial wastes; Chemical changes and fruit quality during the ripening of tropical fruits (Central American

(1) See Annex No. 6.

(2) ICAITI - Instituto Centroamericano de Investigaciones y Tecnología Industrial
INCAP - Instituto de Nutrición de Centro América y Panamá.

Institute of Research and Industrial Technology ICAITI), Regional Organization located at Guatemala. Native products based on corn processing (Laboratory of Food Technology), Managua, Nicaragua. Fish sausages (Direction of Technological Research), Lima, Perú. Strawberry juice dehydration by the "foam" method (Department of Food Technology National Agrarian University) Lima, Perú.

Texturization of vegetable proteins and low cost weaning foods.

Development, design and construction of food equipment, such as complete line for tomatoe concentration and complete line for soy milk production, in F.E.A. UNICAMP - Campinas.

Fermentation design for effluent treatment and food industry residues in Centro de Estudios Avanzados - Instituto Politécnico Nacional - Mexico.

Metallic contaminants - Hg, Pb and Cu of processed foods (Essays and Analysis Laboratory, Ministry of Industry and Commerce), Montevideo, Uruguay. Food Preservation through irradiation (Chilean Commission of Nuclear Energy) Santiago, Chile. Growing and Processing of the Gracilaria algae (Department of Nutrition and Food Technology, University of Chile) Santiago, Chile.

Applied Thermobacteriology. Enzymatic browning of tropical fruits (Faculty of Food Engineering F.E.A. University of Campinas - UNICAMP) Campinas, Brazil. Definition of Industrial Problems and co-ordinated applied research planning - Ripening of tropical fruits at an atmosphere physically and chemically controlled (Institute of Food Technology ITAL) Campinas, Brazil. Quality Control and Normalization (Research and Development Centre - CEPED) Camaçari, Bahia, Brazil. Enzymatic clarification of citric juices (Food Technology University of Tucuman) Tucuman, Argentina. Industrial Utilization of Bananas (National Institute of Agropecuarian Research INIAP) Quito, Ecuador. Programmes of the same technical level are underway in almost every Latin American country.

v) Market and Trade Relations

A serious obstacle to increase trade of processed food, between developing economies, is the shortage of hard currency existing usually in some of the countries belonging to this level. Due to that, an enterprise that exports processed goods generally prefers to sell to an industrialized country to get hard currency rather than to another developing country.

The insufficient domestic markets and some artificial restrictions put for the access to the markets of some developed countries, are some of the constraints to a more satisfactory trade increase.

Restrictions on the characteristics of national products are very often constraints for the export of processed food from Latinamerican countries.

Developed countries usually import raw materials from Latinamerican countries. cocoa nuts, raw sugar, coffee beans, oil seeds, crude oil, and do not import processed foods. This attitude limits the development of national food industry and currency income for the developing countries.

There is a promising possibility for Latinamerican countries to export exotic foods to developed countries and centrally planned economies, such as: mangoes products, passion fruit juice, cajew apple juice, banana products, papaya nectar, krill sticks, caper bush, etc.

vi) Resources.

a) Raw Materials

The differences regarding ecology, soils, climate, topography and so on, existing among the 27 countries which make up the Region, are reflected in the variety of production of its agriculture and cattle growing and determine the abundance or scarcity of the different raw materials required by the food industry.

Side-by-side with countries such as Brazil, Argentina and Mexico, which have a sizeable agricultural and cattle production suitable for industrialization, we find others (like Bolivia, Paraguay and Haiti) that fall far short of supplying the consumer needs of their rising food industry. All the countries of the Region have a substantial potential for increasing their supplies of raw products for the food industry.

The wide diversity of its agricultural output for industrialization is another characteristic of the Region.

The largest producers of fruit cultivated in a temperate climate (including peaches, pears, cherries, prunes, apricots, citrics and apples), are Argentina and Chile. Conditions in Colombia, Guatemala, Perú and Uruguay, to a far lesser extent, are also suitable for this type of production.

In production of tropical fruits for industrialization (pineapples, bananas, mangoes, papaws, passion fruits, etc.) Brazil has the largest supplies and best prospects for expansion. Mexico, Colombia, Venezuela, Ecuador, Puerto Rico, Perú and some of the Caribbean countries are also important producers of these raw products and their extensive potentialities are in the process of being developed.

The largest supplier of citrus fruits is also Brazil; next in importance are Argentina, Chile, Mexico, Ecuador and Paraguay.

Argentina is the largest exporter of cereals (wheat, corn and others) equalling the levels of the United States, Canada or Australia (1).

Regarding soybean, Brazil and Argentina (2) are the largest producers.

Brazil is one of the largest cacao producers of the world. This item is also produced, on a much lesser scale, in Ecuador, the Dominican Republic and other countries.

Leaders in livestock production, particularly meat and subsidiarily milk, are Argentina, Brazil, Colombia, Mexico and Uruguay (3). Most of the remaining countries fail to cover their own consumer needs.

(1) Argentinean export of grains and its world supply participation:

<u>Cereals</u>	<u>Export</u>	<u>Percentage of the world market</u>
Corn	4 million M.T.	8.97%
Wheat	2.9 " "	5.84%
Sorghum	3.2 " "	28.60%
Oats	0.209 " "	14.16%
Barley	0.158 " "	1.42%
	0.093 " "	5.76%

(Source: Mercado 24/8/78)

(2) In Argentina the increase of production is substantial.

1970	26,200 M.T. of Soybean
1974	500,000 " "
1978	2,300,000 " "

(Source: Mercado 24/8/78)

(3) In 1962-66 the eleven countries of the ALALC (Latin American Association of Free Consumers), produced 5,331,000 M.T. of meat, the following was the share by country:

Argentina	43%
Brazil	27%
Colombia	7%
Mexico	7%
Uruguay	6%
The rest including: Bolivia, Chile, Ecuador, Paraguay, Perú and Venezuela	10%
	<u>100%</u>

(Source: ALALC)

Generally speaking, the quality of raw material is usually low in the major part of the countries. The agricultural products are not grown for the specific purpose of industrialization, consequently varieties showing good industrial characteristics are practically non-existent, with the exception of tomatoes which industrial varieties are grown to supply the processors. Uniformity of the products is generally lacking (particularly regarding shape, colour, solids average, size, ripeness, etc.) this falls naturally into the quality of the final products.

New varieties of vegetables, grains and fruit must be introduced in the major part of the countries, with the specific purpose to improve the production of raw materials for processing. Also the quality of raw materials must be significantly improved at the level of processors acceptance.

The economical success and the technical efficiency of a food industry, depends seriously on the efficiency and soundness of the agricultural growing which supply it of raw products. The adequate selection of varieties must be made not only from the industrial viewpoint, but also from the precocity or late ripeness to permit scalation of supply: the growing practices, such as fertilization and pest control; means and ways of harvesting; the previous treatment to the processing; handling and transportation, and so on. All these additional factors have substantial influence in the quality of the final product, in the processing costs, in the volume of the production and over the productivity of the industrial plant.

The integration of Agriculture and Industry is required.

b) Energy and sources of power.

The Economic Commission for Latin America (CEPAL) with the co-sponsorship of the Latin American Institute of Economical and Social Planning (ILPES) convened a simposium (Santiago, Chile, September 1974) to examine the rebounds of the present world energetic situation in the Latin American countries. In it were mainly analyzed : the crisis of energy; the financial and economic rebounds of the problem over the fuel oil deficitary countries of Latin America; basic options allowing these countries to confront the high price of the world petroleum; impact of the energetic crisis over Latinamerican specific industries, and several other key problems connected with an economical assessment of that crisis.

The world crisis of the energy has made a deep impact in Latin America, where in 1973 (starting year of the crisis) there were 19 countries net importers of petroleum and only five were net exporters. The Governments of both groups are presently facing very difficult decisions, as a consequence of the repeated rise of the international quotation of crude petroleum.

The evolution of the different types of energy, used in Latin America, and the huge impact recorded from 1950 of the liquid fuel over the whole consumption of fuels, can be appreciated in the following table:

Consumption of Energy according to the source in Latin America (1)

P E R C E N T A G E S			
	1925	1950	1965
Solid fuels	37.6	13.0	6.4
Liquid fuels	55.0	73.2	70.9
Natural Gas	4.2	11.0	19.5
Hydroelectricity	1.6	2.7	3.2
TOTAL	100.-	100.-	100.-

Degree of dependence of some Latin American Countries of the external import of raw petroleum - (1972) (2)

Argentina	6.3 %
Bolivia	-
Brazil	73.6 %
Colombia	-
Costa Rica	100.- %
Cuba	96.4 %
Chile	66.0 %
Ecuador	-
El Salvador	100.- %
Guatemala	100.- %

(1) Source: J. Damstadter - Energy in the World Economy, Johns Hopkins Press, Baltimore 1971.

(2) Source: CEPAL on the base of official data.

Guyana	-
Honduras	100.- %
Jamaica	100.- %
Mexico	4.5 %
Nicaragua	100.- %
Panama	100.- %
Paraguay	100.- %
Perú	29.1 %
Uruguay	100.- %
Venezuela	-

The higher price of crude petroleum recorded in the international market, since the end of 1973, has distorted substantially the outlooks of economical growing of the Latin American countries. The review of the outlooks not only is valid for the 19 deficitary countries, but also for the five exporter countries

The main difficulty facing the deficitary countries, in a very different degree of course, consists in finding the way to avoid the danger threatening production (including food processing) and the domestic employment due to the drainage of exchange reserves to pay the import of petroleum. The sensible way-out, would be to reduce the unnecessary imports of petroleum, leaving only the extrictly necessary.

On the other hand, the rise of the world cost of petroleum has altered deeply the frame of factibility for several secondary industries, creating opportunities to the industries, like the food processing, which are intended to substitute imports and to grant essential supplies.

Latin America consumption of Electrical Energy
in different activities (1)

Sector	P E R C E N T A G E S		
	1958	1970	1973
Industrial	29.9	36.6	44.0
Residential and Commercial	36.0	23.1	28.7
Other	14.6	13.1	11.1
Losses	17.5	17.2	15.2
TOTAL	100.-	100.-	100.-

The incidence of the petroleum crisis is larger or smaller depending on the situation of every Latin American country. The case of Venezuela for instance, shows us an important exporter of petroleum, which is at the same time a large food importer. At the other extreme, a large part of the Central American countries depend on the imports to satisfy their energy needs and of the agricultural sector to get the main income of foreign currency.

Regarding the main raw material for processing, the agricultural products, the consequences of the fuel oil crisis are of three different types: First, in a short time a deceleration of economic development can show-up. This problem is particularly critical in the case of basic products such as meat and milk processed product, which demand elasticity is relatively high. Second, the effect of the crisis over the cost of production would be very severe in the case of some basic raw materials, such as corn, bananas and sugar, which depend substantially

(1) Source: CEPAL on the grounds of official data.

of insulos based on energy. Finally, in those cases in which the energy crisis affects some basic products as synthetic fibers, which compete with those of vegetable origin, will tend to increase the competitiveness of the last.

The following are the main options for the Latin American countries concerning energy: In the short run: hydroelectric expansion; import of hydroelectricity; production of coal; land and marine petroleum resources; geothermic resources; nuclear energy and solar energy. Medium run options: liquefaction and gasification of coal; bituminous schists; bituminous gritty; solar energy and nuclear energy. Some countries (like Argentina, Brazil, Chile, Mexico and Venezuela) have a wide variety of options. The major part of the other countries of the Region have more limited options. The more meaningful options would be: development of petroleum resources in the land (Bolivia, Colombia and Perú); development of petroleum resources at the sea (Argentina, Chile and the Caribbean countries); liquefaction of coal (Chile and Colombia); bituminous schists (Brazil) and bituminous gritty (Venezuela and Colombia).

Latin America as a whole shows a solid basis of energetic resources, but individually the countries are liable to energetic crisis of short or medium magnitude.

c) Manpower availability and skillness.

The Region has several centers for training technical personnel at different levels. The most common training facility is at the B.S. level. We can point out, among others, the following schools in Latin America:

- 1) Faculty of Food Engineering - UNICAMP - Campinas, Brazil.
- 2) Instituto de Investigaciones Tecnológicas - Bogotá, Colombia
- 3) Universidad de Chile - Santiago, Chile
- 4) INCAP and ICAITI - Guatemala, Central America
- 5) I.A.A. - Instituto de Investigaciones Agroindustriales - Lima, Perú
- 6) Instituto Politécnico Nacional - Mexico, D.F. Mexico.

The Annexes 4, 5, 6, show all the Latinamerican facilities for training. We found a lack of schools for the preparation of medium level people. These schools are very necessary, since the high grade technologists need a technical infrastructure to carry out physically their recommendations and instructions. It would be very difficult to have an army with only generals and no soldiers and sargents.

The low skill labour availability in Latin America is very large, as can be demonstrated by the work: PREALC (OIT) The employment problem in Latin America and in the Caribbean: Situation, **prospection** and policy. Santiago, November 1975. This study concerns: Argentina, Brazil, Colombia, Chile, Mexico and Venezuela. Economic active population is as follows:

Total:	61,471 thousand
Agriculture:	22,041 thousand
Urban :	38,330 thousand

Under-utilization of hand labour in these countries was 20.4% distributed as 10.3% unemployed, 42.7% unemployed in agriculture and 39.4% unemployed in urban

areas, which in physical numbers are respectively: 3,367 thousand, 7,583 thousand and 6,330 thousand. (Ref. 76).

Annex No. 11 , shows the distribution of economic active population in 20 Latinamerican countries divided in urban and rural areas in the year 1975 and projection for the year 2000. (Ref. 76).

The industrial hand labour in Latinamerica registered a certain growth tendency. This shows the marginal influence of this sector in manpower utilization. From 1950 up to 1960 this increase was 2.7%, from 1960 to 1970 it was 3.8% and in the first three years of this decade it was around 4.0%.

The participation of the industrial occupation in the total employment also varied very slowly, from 14.7% in 1960, to 15.4% in 1970 and it was estimated to be around 17% in 1973. (Ref. 76).

Concerning the preparation of medium level workers for food industry in Latin America, a strong recommendation is made to the National Service of Medium Level Education (SENA, SENAI, SENATI, etc.) to start teaching food technology, unit operation in the food industry, food machinery maintenance, quality control, etc. at these schools. At present they are only concerned with mechanics, textiles, electronics and nothing about food industry.

d) Participation of Women in Industrial Activities.

The World Conference of the International Year of the Woman, held in Mexico in 1975, made an official statement declaring that "the conditions of the woman can not be desentia! from the development process". It also recognized that the present situation of women from the political, economical, social and cultural viewpoints, hinders the whole utilization of the human and material potential in the development process, thence it deemed compulsory to find out the means to transform the existing conditions for women in the Latin American Region.

Really the unevenness in which lives a large portion of the women population of Latin America is closely linked to the problem of under-development. A discrimination exists, as a natural product of traditions and prejudices centuries old, and also women show usually in the Region a lower educational level regarding men. The same happens concerning technical and cultural level. All these factors limit substantially the joining of women to the work, particularly at executive level.

Latin America has a high rate of unemployment (Argentina, Brazil, Colombia, Chile, Mexico and Venezuela, show an unemployment of 5.5%) and sub-employment (L.A. 23.4%). This event is particularly large in the case of women. The rate being in some countries three times larger than that of the men of the same age. (1)

In the particular case of Food Industry, in the major part of Latinamerican countries, a considerable amount of women are incorporated to the hand labour, in no qualified assignments and as manual workers, secondary employees or in charge of sanitation of the factories. Very often women are object of discrimination and exploitation, regarding work conditions, salary level and enrollment practices.

(1) Reference No. 24.

The food industry employing a larger number of women is the Canning Industry, where special dedication and ponderation attitude is required, particularly for classification, quality control, hand preparation and other tasks. In the milling, sugar, coffee, cacao and oil as well as fats industries, women are very scarce.

A resolution recommending the approval of a "Plan of Regional Action for the Women integration to the Economical and Social Development of Latin America" as well as the measures intended to its practical application, was issued at the Regional Conference for the Women Integration to Economical Development in Latin America (La Habana, Cuba, 13/17 June, 1977).

The situation is improving every where, slowly. A more accelerated policy incorporating women to development is required to really make a contribution to the rational development of the Food Agro-Industry in the Region.

vii) Investment situation and Development Projects.

The investment in Latin America industry during the first years of this decade, was very low, if it is considered the industry as a whole. This problem, common to all the economical activity sectors, constitutes an important obstacle for Latin America's development. Considering all regions, the total investment as percentage of total internal products went up 13.9% in 1969, 19.6% in 1972, which means an annual increase of 7.9%.

The coefficient saving/investment in the region (financed investment with internal resources) was 25%. Argentina, Brazil, Chile, Mexico, Perú and Venezuela self-financed about 85% to 100% of their total investments.

The fact that the increase in internal savings was 6% and investment 7.6% shows clearly that Latinamerica continues depending on foreign contribution. Argentina, Perú and Venezuela were the countries which received less foreign contribution.

The investment in machinery and equipment in the different countries in relation to the total internal product varied from 4.0% to 10.0%.

The lack of information about the fixed investment in some countries, specially Brazil, with such an important participation in regional internal total product, shows some inconvenience in taking out average values for the region, but at least we could conclude that the total investment in the industrial sector was higher than the 7.6% for the total investment in the region.

The information on industrial financing in Latin America is also scarce. CEPAL studies show that in the last years industrial financing was kept at a low level, concerning internal resources from companies. The result of this study

also shows that in general, Latinamerican funds coming from internal sources of industry are in a lower proportion of the total funds intended for their capitalization or enlargement, as compared with Europe and the U.S.A companies. Perhaps, Argentina is one exception in regard to the above mentioned facts.

The Bank system of each country, represented the major source of financing during the first years of this decade, with special reference to the Official Banks of Development. As an example we can mention: BNDE in Brazil, which in the period of 1970-72, increased the credit percentage to the industry from 59.7 to 64.7% of its total operation. The same can be said about CV-CFI of Ecuador, NAFINSA of Mexico, COFIDE of Perú, Corporación Andina de Fomento in the Andean Region, and Central American Bank of Economical Integration in Central America.

The investments and loans from abroad have been one of the major sources of industry investment and finance in the last decade. Under these foreign loans and investments, we should divide them into Official Foreign Financing and Private Foreign Financing, which comes from Equipment suppliers, as example. This latter system of financing has been the major form of Latin America's industry to buy machinery and equipment from abroad.

The oil crisis occurred in the first years of this decade, was responsible for the lowering of external financial support in Latin America.

Regarding the foreign official financial support it was found that it decreased in the last years and prospectior for the next years has also declined. On the other hand, Multilateral financial support to Latin America region, has shown an increase. This is true for the World Bank. In 1969-1973 the World Bank granted operational support to the Latinamerican industrial sector in the total amount of 96.4 million dollars.

In 1972 this amount was of 27.0 million dollars. Also the BID - Interamerican Development Bank was of great assistance to Latinamerican industry in these last years. Of their total loan operations given to the industry and mining, the percentage was 7.3% in 1970, 7.4% in 1971, 19.3% in 1972 and 19% in 1973.

It was also noticed that in last years the foreign public financial system started to separate their loans from the origin of equipment or machinery. In other words, it was common to finance only imported equipment with foreign public loans, but now it is possible to buy domestic equipment with this kind of loan.

The other form of financial support for the development of Latin America's food industry, would be the Transnational Companies, which could invest more in the region, but with "morality", observing the development needs of the region, creation of employment, increase in purchase power of hand labour, payment of real income to the country government, creating technology and products in the Latinamerican countries.

Last, we should mention the possibility of joint-ventures among T.N.C. and national companies. The National company or group would provide, raw material, infraestructure, some existent genuine know-how, knowledge of domestic market and the T.N.C. would provide capital, export marketing, advanced technology consultancy.

viii) Social implications and effects of Food Processing Industries

In this chapter will be discussed the problems which arise when the new installed food industry has to deal, in their social contacts, with suppliers. location and organization of the enterprise, resulting from the rural social structure; the necessity for the new hand labour to adapt to the industrial work, as well as the degree of instruction and professional formation in the organization of profitable food industry. .

The difficulty starts when the food industry has to create a Purchasing Department to supply their raw material needs, which must be constant, homogeneous and with good processing qualities. It is very difficult to find prepared hand labour for this purpose in rural areas. In the rural area, the new created need for a raw material supply, can make significant transformations in the normal, already existent division of work among sexes and among family members.

The low instruction level of the rural population is a real problem for the development of good raw material quality and homogeneity. The food industry should be located close to the raw material production, since in Latin America roads and transportation conditions are usually not good, also they should influence the suppliers to use their technological know-how, in order to produce better raw material for their requirements.

Since the food industry does not produce only for export market, but also for domestic market, true information on the domestic consumer needs and habits should be well studied by food industry.

The use of social ethnological methods is strongly recommended, in order to carry out marketing studies in rural zones, as in the case of acceptability tests for food products.

In considering the problem if food industry to be established should be based on capital factors or hand labour factors, it is important to know the social structure of the region, when the unemployment or sub-employment have high indexes, it is more convenient to localize the food industry considering the hand labour factor better than the region factor. It is also adviseable to start food industry where the hand-craft is more developed, since this kind of hand labour can easily be adapted to food industry needs. There the food industry can also profit from the genuine initiatives of this kind of people.

It is interesting to note the low productivity of the new scarce and unstable hand labour in the new rural areas. Usually this phenomena is found in developing Latinamerican rural zones, during the first years of new installed food industry, when the recruitment of agriculture hand labour is necessary. Another difficulty is the adaptation of wage earners to continuous work for months and years, which differs so much from the work in the farm tasks. Another item to be observed is that industry hand labour should not compete with agriculture hand labour, since harvesting season is at the same time the most difficulty time for the food industry, when they are in most need of hand labour.

The school preparation of hand labour should not be neglected, since only in this way food industry will have future success. Not only at primary school but also medium level and college level personnel preparation.

ix) Production Projection 1985-2000

Comparative analysis of three scenarios -

Based on the "Draft World-wide Study on Agro-Industries: 1975-2000" in the Chapter: Global Prospects: three scenarios for the world agro-food industry in 1985-2000, it was analyzed the same three scenarios for Latin America as compared to the rest of developing countries of the world.

As the statistical data availability on processed food is very scarce, the total amount of food raw materials were taken into consideration.

Annex No. 10 was prepared with 1975 figures for the eight major food sectors in Latin America.

In order to foresee a food production trend in this region, the following premises should be considered:

- a) Consumers demand in developed countries are not supposed to increase very significantly in quantity, but more significantly in quality. It is supposed that these consumers are already satisfied in their nutrition necessities, as per their protein and calories intakes. By analyzing this point, it is sensible to say that Latin America could supply very important quantities of tropical and exotic products to developed countries.
- b) Only the food products which could be produced at lower costs will find a market, in the developed countries, as compared with their costs in developed countries, such as U.S.A and those of Europe.
- c) To improve consumers demand in Latin America it is necessary to increase consumers income and decrease unemployment and sub-employment.

- d) Latin America as per its low utilization of land for agriculture, can easily increase food production.
- e) To industrialize food production, it is necessary to make heavy investments, which should count on T.N.C.
- f) By looking the trend of urban areas increase in Latin America as compared to other developing countries, it is easy to conclude that Latin America consumer demands for processed food will increase significantly more than other developing regions.
- g) Consumers purchase power in Latin America is higher than in other developing regions.

All these premises plus the study developed by CEPAL, lead us to prospect a higher participation of Latin America in the developing countries' food production for the years 1985 and 2000.

According to CEPAL, it is possible to prospect an annual increase in Latin America's agro-food industry of 7.2 to 7.6%.

By using the scenario No. 1, based on trends, the prospection for Latin America will be an annual increase of 6.2%, which is higher than the 5.2% for all developing countries together.

The following Table can be constructed based on all premises and CEPAL studies for Latin America.

Estimated growth of the World and Latinamerica
Agro-Food Industry on the basis of three Scenarios

A r e a	Annual growth rate during the period 1975-2000		
	Scenario 1 (trends)	Scenario 2 (stationary)	Scenario 3 (normative)
Market economy			
developed countries	4.0	1.0	3.0
Developing countries	5.2	2.0	7.3
Latin America	6.2	2.5	6.2/7.6
Countries with centrally planned economies	6.0	3.5	3.0
World (1975-2000)	5.0/5.1	2.1/2.3	3.3/4.2

T.N.C. role in development of Latin America's food production, must be very significant in the marketing aspect, since a considerable increase in food production will need an extra effort in the commercialization of it.

III.- FUTURE OF THE FOOD PROCESSING INDUSTRIES IN THE REGION
(Evaluation of the major sectors for the future)

1) General Evaluation

For technical, economical and practical reasons it is better to separate the Region, for this analysis, in two sub-regions. In this way the large difference between the numerous countries integrating the Region, can be grouped at least regarding some very specific similarities.

a) South America -

Cereals

The four main exporter countries of wheat: U.S.A., Canada, Australia and Argentina only assign to their domestic consumption of wheat the 44% of its production and those countries provide jointly the 72% of the world wheat exports. Consequently, the production and export of wheat of those countries influence deeply the world wheat market.

As a whole, Latin America will continue to be a net importer of wheat. Being the principal importers Brazil, Perú, Colombia and Venezuela. Brazil shows a definite tendency to increase the domestic production of wheat. The hypothetic net import of South America will reach by 1980 from 2.8 to 3.3 million M.T.

Wheat is a raw material for the agro-industry, but its large consumption, as a processed food, all over the world, is widely indicated by its production and export.

Beef and Calf meat

The international commerce volume of these products was duplicated during the last 20 years and its increment was accelerated during the last ten

Revenue gotten with the wheat export in South America and
Projection figured out for 1980

Countries	Revenue in millions of US\$			Annual proportion of increase percentages		
	Minimal 1980	Medium 1980	Larger 1980	Minimal 1970/1980	Medium 1970/1980	Larger 1970/1980
Argentina	965.8	1,212.7	1,357.5	3.5	5.9	7.1
Bolivia	2.5	4.2	8.4	-	5.2	12.8
Brazil	129.8	193.3	226.8	2.6	4.6	6.3
Colombia	83.7	100.4	125.5	3.9	5.8	8.2
Ecuador	4.2	8.4	9.2	-	-	-
Paraguay	34.3	46.9	53.6	0.5	3.7	5.1
Uruguay	163.2	188.3	225.1	1.3	2.8	4.6
South America	1,413.5	1,754.1	2,006.1	3.1	5.3	6.7

years. South America has been for several years the major world exporter of beef and calf meat, providing only Argentina 22% of the world market. (1)

The domestic consumption of meat in Argentina has decreased, under a specific policy of the Government of Argentina, intended to stimulate exports. A study of the Great Buenos Aires (one third of the country's population), shows a significant reduction of consumption per person, from 85.6 kgs. in 1969 to 60.7 in 1971.

Uruguay, Paraguay and Brazil are the other important exporters of beef and calf meat and if their development projects are carried out successfully, their share of export will grow between 3.5 to 7.1% per year. (2)

Cacao

Generally speaking, the volume of cacao consumed in production countries is very small. In Brazil for instance is 22,000 M.T. per year. An increase is expected during these 10 years. The larger part of export will continue to be as cacao-seed, in spite of the fact that during the last years the enlargement and new installation of processing plants, at the producing countries, will increase substantially the export of semi-processed products, which presently represents the 10% of the total volume of the cacao exports. The net world export of cacao will increase in 2.4 per cent annually starting from the base of 1970 (1.77 million M.T.). In South America the increasing index will reach 3.2% annually. If the increase of production follows the outlook expected, the South American share of the world export will increase from 18% in 1970 to 21% in 1980.

(1) See References 21)

Citric Fruits

The consumption of citric fruits as processed product has increased substantially during the last ten years in U.S.A. Today, more than the 28% of the world citrics are consumed as processed food: juices, concentrates, sections, etc. In 1970 the equivalent of fresh fruit shipped as juices and citric canned fruits reached to 1.9 million M.T. equivalent to 26.2% of the whole citrics commerce (in 1965 was only 21.8%).

The South American exports of citric has increased considerably in the last years. Three South American countries are net and the largest exporters of citric fruits: Brazil, Uruguay and Argentina. Brazil would provide the largest export volume, reaching to 85% of the amount contributed by Southamerica in 1980. This figure is conservative if we think in the enormous Brazilian production of concentrate juices (250,000 M.T. 650 Brix). If Brazil reaches the figures projected for 1980, the export excedents arriving to 722,000 M.T. of citrics will increase in 700,000 M.T. by 1980. Nevertheless, in comparison with the world level of the projected demand for oranges, the excedent (1.8 million M.T.) according to projections, will represent around 2.5% approximately of the production.

b) Central America (1)

The restrictions suffered by the Agro-industry development in Central America have been substantial. First the insufficiency of the demand inclusively into the frame of the Common Market and secondly, the rigid target fixed to the Agro-industries in the sense to substitute imports.

(1) See Reference 20.

The demand problems have their origin mainly in the under-employment which tendency is to be increased. Also the decreasing of the acquisition power of the largest part of the population.

Some characteristics of the industrialization itself are also responsible, such as: the use of techniques requiring high investments, sometimes leading to excessive capacity of production of the factories with the relevant rise of costs. Other times an unreasonable dependence of imported insumes restraining the use of local manpower and regional raw materials. Two factors which usually constitute the reason for the industrialization.

From the Region point of view, well defined and systematic policies to promote the food industry development are lacking. Only recently the need to adopt policies and programmes of regional character have been emphasized.

The following outlook of development have been figured out by SIECA/FAO (1)
Dairy Industry.

It has been figured out that the regional demand of dairy products in 1990 will be 3.2 to 3.9 million metric tons (in terms of whole milk). This means two and a half to three times the present volume of the demand. To get this result it is necessary to plan the development of milk cattle growing in Central America, with zonification according to the ecological conditions. The integration of sources for animal feed, the processing plants and the distribution systems.

(1) SIECA - Secretaria Permanente del Tratado de Integración Económica Centro Americano.

See Reference 20

Concerning the industrial installation, it is considered feasible to increase substantially the production of the five largest existing plants: Asunción Mita (Guatemala), San Pedro Sula (Honduras), Matagalpa and Managua (Nicaragua) and San Miguel (El Salvador). Two new plants are also considered which will start operations in the next ten years.

For the total substitution of the imported milk powder and satisfy the increase of regional demand, to manufacture 42,000 M.T. yearly will be required till 1990. The investment required for this purpose between 1970 and 1990 will be around US\$ 36 million.

Beef meat Industry

The consumption of beef meat in the Region in 1970, has been estimated in 119,000 M.T. (in Caracas). The demand could increase to around 286,000 to 296,000 M.T. in 1990. A substantial increase of the processing plants' capacity will be required, introducing the relevant equipment for refrigeration, freezing and storage. For that purpose an investment of US\$ 42 million will be required.

Fruits and Vegetables

The rational expansion of this industry in Centro America would require an integrated plan and a specific regional policy, not existent now. The assignment of a working group to define these aspects, has been proposed by FAO.

ii) Sectorial demand for food processing industries

Extensive reference was made regarding export market, and urban demand in the former chapter. The rural demand overlaps and/or alternate with the urban and export demand, in such a degree, that it is practically non-feasible to show definite lines regarding this demand. Moreover, generally rural acquisitions are made through the farms canteen supplied by the urban sector.

111) Food processing Industry at Rural
Development Projects

The Agro-Industry system demands a rationalization of the production process, from the agricultural raw material up to the final consumer.

The agro-industrial system makes reference to the production integration, which includes all insures for agriculture production and one or several of the following steps:

Conservation

Transformation (at one or several levels)

Marketing and Distribution

Consumption

Criteria for the definition of Agro-Industry.

- a) The agro-industry should be located preferently in the rural area.
- b) The agro-industry system involves both, the small and medium farmers.
- c) The agro-industry system has as objective the increase in production and productivity as well as to stimulate the global efficiency of the system.

It is recommended to give high priority for the production of food, without excluding other agro-industry sectors, the agro-industry must be taken as a means to develop the primary sector, making **optimal** use of the available resources as a way to recuperate the agricultural vocation of the countries, the agro-industry must drive to the intersectorial economic integration.

As a good example of agriculture and food industry integration, we can present the Brazilian group SADIÁ-Concordia S.A. ANNEX No. 3.

iv) Constraints to Development

In every study, survey or report made regarding the situation of the food processing industries in Latinamerica, extensive references are made concerning the defaults, shortcomings or constraints hindering the development of the food industry.

Complementing what has been already said in the chapter structure, role and importance of the food processing industry, some of the more fundamental constraints are stated below:

1. Lack of communication and co-ordination between the Institutes of Food Science and Technology. Repetition of the same research is usual, Exchange of information, joint execution of research projects are necessary.
2. Scarcity of specialized human resources in each country.
3. The transference of technology between the T.N.C. and local industry, is nil.
4. Products intended to improve the population's nutrition are usually defeated by the excellent publicity, the distribution organizations and the agressivity of the companies marketing products commercially attractive but without nutritive value.
5. In spite of the wide market for qualified food technologists at the food industry, the harsh competitive attitude of these professionals may often derive in personal misunderstanding and professional struggle, spoiling the development of international co-operation and sometimes inclusively national co-ordination.

6. Usually the industries are lacking of adequate facilities for quality control and of laboratories to carry out any kind of applied research or development programmes.
7. Low quality of raw materials and often inadequacy for industrialization. Very often the rejects of the fresh market are used by the industry instead of producing special crops exclusively intended to provide the industry. The varieties of fruits and vegetables usually are not adequate for industrialization.
3. High production costs.
9. Low productivity of the machinery, equipment and processing lines.
10. Lack of adequate communication between research and teaching local organizations and food industry.
11. Inadequacy or insufficiency of promotional methods for good quality manufactured foods.
12. Disco-ordination with the packaging industry and with the marketing and distribution sector.
13. Lack of co-operation between farmer and the food industry for the production of better raw materials.
14. Practical extension work to introduce the findings of research studies is not easily available.

v) Government Intentions regarding Food Processing Industries

Practically every country in Latin America has specific plans of economic development and have established institutions in charge of the production promotion. Always agro-industry, in both development plans and production promotion, has top priority. Only in some scarce examples agro-industry has had second priority after extractive agriculture.

Inclusively, the largest agricultural producers and exporters like Argentina and Brazil, are trying to create a national agro-industrial complex, to avoid the continuance of their rather strange situation of simple exporters of agricultural raw products, with the clear consciousness that to be an important producer of food and agricultural products in the near future, the establishment of a large and proficient food industry is highly required. Government of course, has been always sponsoring this type of action.

In the impossibility of making a picture of the intention of numerous Governments of the Region, regarding food processing industries, the general scope and the objectives had in mind by the Government of Costa Rica on the subject, is given below: (1)

I - Scope

- 1) To grant credits favouring agro-industries using at least a value of 35% of national raw materials.
- 2) Integration of efforts of agriculture and industry.
- 3) Training of technical personnel of agro-industrial projects, in food research and technology locally.

(1) See references 12, 13 and 13.

- 4) Creation of a Consultancy Commission of Food Industry (ICIA).
- 5) Promotion of large Agro-Industrial projects.
- 6) With the collaboration of the Governments of Israel and Netherlands, establish the basic lines of the "National Plan of Agro-Industries development of Costa Rica".
- 7) Create the Sectoral Office of Industrial Planning with an important sector of Agro-Industries.

II - Objectives

- a. Decentralize the industrial activities, with the purpose to reduce the inequality of income between the rural and urban populations; avoiding besides, the rural exodus.
- b. Generate new working opportunities in the rural media.
- c. Improve the nutritional level of the low income population.
- d. Location of industries in the rural media.
- e. Promote export of non-traditional products and substitute imports.
- f. Utilize natural resources in the rural areas.
- g. Grant priority to agro-industry in the National Plan of Development 1978/1982.
- h. To carry out a co-ordinated, systematic and cohesive action, regarding all the activities, which affect in one way or another, the agro-industries sub-sector (Institutional Organizations, credit, research, technical assistance, insurance, incentives, etc.)
- i. Integration of the aspects: insumes, agricultural production, processing and distribution.
- j. Promulgate the Act of Rural Industry Promotion.

- k. Review and establishment of stimulus to promote and develop the agro-industry.
- l. Transference of technology and reinforcement of applied and basic research.
- m. Adequate utilization of national and foreign technical assistance.
- n. Integration of the support relevant services through the National Centre of Distribution of Food (CENADA).
- o. Research on the marketing possibilities.
- p. Systematic quantification of the present and future demand for raw materials of agro-industrial origin.

vi) Issues proposed for discussion at future Consultation Meetings

Having in mind the major problems that Latin America must face to get a balanced development of its Food Industry, the following issues are proposed:

1. Information and interrelation among Latin American countries should be increased, in a manner to permit transfer of technology from one country to another, as well as consultancy.

In order to concretize this issue, an information and documentation bank should be devised with available technical people in all developing Latinamerican countries, with their specialities, existing technical know-how, genuine or adapted, extension service for the food industry very aggressive, taking the digested information to the entrepreneurs, in their own industries.

The net of bank branches should be used to make the extension service, not only in the technical part, but also in advising entrepreneurs about finance facilities, accounting, management, marketing, distribution, storage, refrigeration facilities for internal markets and for exports.

Apart from a fairly limited number of food industrial enterprises, with appropriate facilities and up-to-date management methods, there exists in Latin America a very large number of enterprises with inadequate facilities, having no rational sequence in selection and control of their process, and often with very low standard of hygiene. Such enterprises have no (systematic) method of collecting, storing and using information. They generally keep as guarded trade secrets their experience and many improvements they may have made, even though such know-how in other environments most often is well within the public realm, if not long surpassed by more appropriate measures, which are likewise generally accessible. Most of such enterprises have little or no contact neither with food technology institutions nor with information systems.

2. Food research and development institutes should create an extension service very aggressive, for their activities and services.

It is very common to find most of research institutes not operating their laboratories or pilot plants, because of lack of practical work. The aggressive marketing service of the extension department of all institutes and universities should contact entrepreneurs and enterprises in the field of food industry, in order to find and identify their problems, show them the facilities existing in their institutes.

At the same time, technical people from universities and institutes should share the food industry problems and not work in their laboratories and pilot plants doing academic work with very little practical results when any in most of the cases.

When the food industry finds the answer to their problems, existing laboratories and pilot plants will not be enough to carry out all the work which is going to be necessary to be done.

3. Support for the development of genuine technology and adapted technology for Latinamerican conditions.

Usually, developed countries sell to developing countries complete packages of technology know-how, which includes process, product characteristics, equipment, auxiliary equipment designs, technical assistance, consultancy, training of personnel, etc. This normal system is not the adequate one, because conditions in developed countries are completely different from those of developing ones, which generally are located in tropical climates, with different fruits and vegetables varieties, different transportation conditions, moisture, temperature and volume of crop to be processed per hour. All these differences are to be added to the difference between manpower and skill in developing countries, which has lower level education, as primary school and illiterate workers, and also a difference in medium and high level education personnel.

In order to support issues 1, 2 and 3, regarding finance, it is suggested to use as example a donation from developed countries to developing countries, based in a percentage of the unbalance of manufactured products trade between those nations according to the following items:

a) Objectives. The developing countries which will receive financial support from developed countries, in order to carry out scientific and technological activities, will have to channel the relevant results through national institutions and using sub-regional, regional or inter-regional co-operation mechanisms in order to promote oriented individual or combined programmes, in development of genuine or adapted technologies, development of local engineering capacity, design and construction of processes, equipment and instrumentation for the innovative technology, development of local capacity for utilization of generated technology or imported and adapted technologies.

b) Calculation of financial support.

Lets call A = Developed country

S = Developing country

then $X_{A-S} - S-A = D$

where: X_{A-S} = manufactured exportations from A to S

X_{S-A} = manufactured exportations from S to A

D = unbalance of commercial balance of manufactures between A and S

Then: $N_{A-S} = X \frac{D1 + D2 + D3 + D4 + D5}{5}$

Where: N_{A-S} = theoretical financial support for the technological development from country A to country S

X = percentage, variable and to be defined

D1.....D5 = Annual unbalances for five years period.

These calculations will be repeated for each country with whom some balance trade of manufactures exist. All the N values will be added and this amount will constitute the financial support from developed countries to each developing country.

For each country it will be necessary to add a distribution factor which would correct the unfavourable condition of the least grown developing country as compared with the most grown developing country.

The attached Table 1, shows an example of calculation, by using a percentage of 2% of the manufactures trade balance between countries of Latinamerica and developed nations.

4. Food Industry in Latin America should put more emphasis in tropical Products production and marketing.

The potentiality for production of tropical products in Latin America is almost untouched. Transnational companies should help developing countries probably in a joint-venture system, to market finished food products, as example:

Refined sugar alcohol, refined molasses, chocolate products, cocoa butter, banana puree, banana flakes, refined soy oil and other edible oils, concentrated fruit juices, canned fruits, soluble coffee, processed meat, dried fruits, dried eggs, frozen chicken and other animal products, etc.

5. Fortification of infant dainties and soft drinks with protein, minerals and vitamins.

Children consumption of dainties and soft drinks is very wide in Latin American countries, as it is in other regions, and the ingestion of adequate nutrients during childhood, have demonstrated that it is physiologically more advantageous than at older ages. By fortifying soft drinks and dainties with these nutrients, consumption of balanced proteins, minerals and vitamins would be large enough to promote normal growth and healthy children.

Coca-Cola Co. already conducted an experiment on fortifying soft drinks in Latin America, by using soy milk proteins, casein, or cheese whey protein, but these experiments diminished in later years due to the national governments discouragement, by not granting taxes exemption for relevant nutrient concentrates, inducing the company to desaccelerate these developments.

The Government should promote and incentivate these positive actions in benefit of well balanced nutrition of their national population.

6. Integration of raw material production and agro-industries.

A close interrelationship must exist between the agricultural production of raw material and the processing industry, covering production, handling, transport and delivery to the plant.

The points of confluence of Agriculture and Food Industry are:

- a. Food Industry contributes to increase the agricultural production, providing a greater and regular market to the agro-products.
- b. Food industry must stimulate the growing of industrial varieties, able to bear successfully the different steps of processing, without loosing its natural characteristics.

The efficiency of the processing plant depends largely on what happens at the plantation; the correct collection of the product; the uniformity of size, form and texture; the concentration of sugars; the resistance to pests; the qualities for marketing and processing; the yield of processed food per ton of raw product; the total percentage of solids, its organoleptic characteristics and other factors, are determinants for the success of processing, from the industrial and from the economical points of views.

- c. Other interrelationship refers to the growing practices. The sowing opportunity; the distance between the furrows, the separation between the plants, the irrigation practices, type and system of application of fertilizers and pesticides, are factors inciding directly on the requirements of the food processing.
- d. The harvest methods, the storage and the handling before the delivery of the products to the factory, are factors of high influence over the quality of processed foods.
- e. Industrialization absorbs the production of agricultural excedents and permits the regulation of market and prices.

A practical system for the co-ordination of Agriculture and Industry must be found and recommended to both parties, to promote rationally the development.

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P A R T B.

REGIONAL PAPERS ON SELECTED SUB-SECTORS

I - CEREAL AND ROOT CROPS PROCESSING INDUSTRIES

Cereals consumption as human food in developing countries is very important if we analyze the following table:

Estimated Cereals consumption in developed and developing countries

Countries	1970 (Million tons)	1980	1990	Increase 1990/1970
<u>Developed countries</u>				%
Human consumption	160.9	163.1	164.6	2.3
Animal feed	371.5	467.9	565.7	52.3
T o t a l	532.4	631.0	730.3	37.2
<u>Developing countries</u>				
Human consumption	467.3	609.6	772.5	65.1
Animal feed	50.9	99.6	166.3	220.3
T o t a l	518.7	709.4	938.8	80.4
<u>World total</u>				
Human consumption	628.7	772.6	937.1	49.0
Animal feed	422.4	567.5	729.0	72.6
T o t a l	1,051.1	1,340.4	1,666.1	58.5

Ciencia y Desarrollo Vol. II, No. 12 - January-February 1977 - Mexico.

Developed countries use one quart of developing cereal consumption as human foods and four and a half times more for animal feed.

Projections for the year 1990 are 164.6 million tons as human food in developed countries while in developing countries the consumption will be 772.5 million tons. During that same year animal feed will be 565.7 million tons in developed countries as compared to 166.3 million tons in developing countries.

Considering total vegetable production in Latinamerica as 100%, cereals represented 25.7% (corn 13.6%; rice 6.5%; wheat 5.5%) and root crop 6.3% (cassava 3.2% and potato 3.1%).

Latin America: Cereals and root crops Annual Harvest,
1969 - 1976

(Millions of Metric tons)

	1969	1970	1971	1972	1973	1974	1975
Wheat	12.4	11.0	11.3	12.3	11.1	13.1	15.4
Rice	10.2	11.5	10.0	10.0	11.5	11.3	12.3
Corn	33.2	33.1	33.1	35.2	37.5	33.9	40.0
Barley	1.3	1.2	1.4	1.3	1.6	1.3	1.7
Sorghum	5.5	7.1	5.0	5.0	3.3	10.1	3.5
Cassava		34.9	35.0	33.1	31.4	34.3	35.0
Potatoe		0.7	0.7	3.6	3.3	0.3	3.0

Source: Estimatives from Agro-Division CERAL/FAO.

CORN - Corn is the first biggest cereal crop in the Region and it is almost self-sufficient in this cereal. Corn is one of the main sources of calories and proteins in the Andean Region, Central America and Mexico. Since the time of Incas, Mayas and Aztecas, corn has been the most important food for these countries. In Central America it is said that the man is made out of corn (El hombre de maiz). Brazil is the largest corn producer with 19 million tons, followed by Mexico with 10 million tons, importing 900 thousand tons.

All Andean countries together produce 2.9 million tons and import 210 thousand tons.

Argentina and Chile produce enough quantities for their needs. (0,100 thousand tons).

In Central America, Mexico and Andean Region, there exist a large quantity of corn dishes and use as food: Tamales, tacos, tortillas, arepas, choclo, nixtamales, chichas, atoles, etc. Some of these products are already industrialized by using genuine technology and low capital investment.

In Mexico, the Government owned company CONASUPO is processing corn flour prepared for tortilla production at home. This process uses a humid hot alkaline treatment of corn, which pregelatinizes the starch and makes the flour suitable for the instant preparation of tortillas, by just mixing small quantities of water and then molding before toasting.

In Colombia, the "Instituto de Investigaciones Tecnológicas" is studying the possibility for industrializing "Arepas".

In Bolivia the corn is already processed for the production of "Chicha" at home. This process is based on extrusion, by using a very low cost equipment.

Varieties of corn cultivated in the Andean Region, Central America and Mexico are much softer than varieties cultivated in Brazil, which produces hard grains hybrids. Probably this explains why Brazil uses much less corn as human food as comparing with those countries.

In Brazil corn is used to produce a corn flour, named "fubá", which can be used for making cakes, "polenta", bread, "vatapá", fried rolls, "manguoca", "acaragê", etc. Also it is used to soak the corn in water and then degeminating it, to process a degeminated flour, which is dried over a hot plate (corn flour). This product is used for "cuscus", "pankaque", "pirão", "farofa", "pirau", etc.

During part of the year a lot of corn is consumed at its green stage of maturity when sugars did not transform yet in starch. During all this stage corn is soft and is used as sweet corn to process: canned corn, "parmonha", "curau" soups, corn cream, cake, "crecream" puddins, corn on the cob, etc.

Because green corn has much more varieties of usage, strong efforts should go for the development of large industries to process it in canned or frozen form.

It is advisable to develop genuine technologies to process corn in the different Latinamerican countries in order to save time to housewives, decrease the price, increase availability during all year around.

It is expected to have an increase in corn consumption if availability of processed and convenience forms become more important as food iters develop by agro-food industries in Brazil, Mexico, Central America and Andean Region countries.

With the increase of poultry and pork husbandry, which has become very important food industries in Brazil, Perú, Chile, Colombia, Venezuela, Mexico and Argentina, it is expected to have a tremendous increase in demand for corn, as this cereal is the most important item in animal feed formulations.

The increase in corn demand for the year 1990 in animal feed, is supposed to be around 200%.

The T.N.C. as usual, are in the business of corn industrialization all over Latin America. The most important company is CPC from U.S.A. They process corn into several products: corn starch, corn syrup, dextrose, caramel color, corn steep liquor, corn oil, corn meal, etc.

The capital investment for this type of industry is very large and competition with CPC is almost impossible.

Soft drink manufacturers only buy caramel from C.P.C. (Coca-Cola, Pepsi Cola, Royal Crown Cola).

The increase in corn industrialization of this kind, should continue with T.N.C., but the contracts with national Governments should be honest and T.N.C. should really contribute to the development of Latinamerican countries.

Considerable amount of corn is used in Latin America to process alcohol for the production of alcoholic beverages.

In Brazil the amount of alcohol processed per year from corn, is 15 million liters with 96% concentration. The quality of this alcohol is very good and it is mainly used for whisky production by blending it with imported or national malt.

Technology was developed in Brazil and is based on enzyme - enzyme process and the micro-organisms are grown in semi-solid mediums.

WHEAT - Wheat is the second largest cereal produced and consumed in Latin America. The main producers are Argentina, Mexico and Brazil. The region has a shortage of this cereal. Brazil and the Andean countries are the biggest importers with 2 million to 2.2 million tons each, respectively.

Argentina and Uruguay have a surplus of wheat and Chile has enough for its consumption. Central America is dependent on imports.

Brazil has increased very significantly its wheat production, but even if it can achieve self-sufficiency, the importation will be always necessary, since Brazilian wheat is soft and of poor gluten quality. It is necessary to blend imported wheat from U.S.A., Canada, Russia, to improve baking quality.

Mexico has become self-sufficient in these last five years. Wheat is used for bread, pastas, waffles and biscuits mainly. The highest amount goes for bread making, since Latin Americans are heavy bread consumers. Pastas consumption is increasing significantly in Latin America.

Wheat milling is done by large companies and they are located mainly in the ports, since up to few years ago, more than 90% of wheat was imported from abroad and transportation was by grain ships.

Most of the milling plants have German equipment(Bühler-Flaig) and they can mill more than 100 tons per day.

Transnational companies are also in the milling business, but national mills are in the same situation and they compete fairly well in the market.

Most of the countries have all the wheat distribution controlled by the Government and as a result the price of wheat for the milling companies is the same all over the country. Since the milling process is a well known technology, there is no possibility for competition.

Extraction yield in Latin America is between 72 and 75%. All by-products (25-20%) goes for animal feed production.

RICE - Rice is the third cereal in importance in Latin America. Brazil is the biggest producer, followed by the Andean countries and Argentina. In Latin America all the rice is consumed as polished rice.

Agro-Industries for the processing of rice are mainly in rural areas or in towns close to the plantation. Most of the Rice plants are of medium and small size. From 5 tons up to 100 tons per day. There are much more Rice plants than wheat plants.

Less than 5% of rice produced in Latin America is processed by the par-boiled process. People does not like the taste and odor of parboiled rice. Losses of by-products in parboiled rice processing is much lower than in polished rice processing.

In the processing of rice the bran is around 10% and broken ends are around 10-15%. Bran is used for animal feed and started few years ago to be used as edible oil raw material. (12 - 16% oil content).

The problem of using bran for oil extraction is the is the high lipoxigenase action which increases very fast the total acidity by liberating fatty acids. After rice is polished, bran starts to oxidize at a rate of 1% per hour. Stabilization is done in Brazil by extrusion, which inactivates enzymes and also pelletizes the bran as a pre-preparation step for solvent extraction. Rice broken ends are used mainly for beer manufacture, the same happens with corn gritz. Rice and corn are the main raw materials for beer manufacture in Brazil, Mexico, Colombia and most of Latin American countries. There is no production of minute rice in Latin America.

Very small quantities of rice flour are produced for children consumption.

All the rice husk is not used and it is becoming a serious pollution problem, since it has to be burned in order to get rid of it. There are some pilot studies in Brazil to produce formaldehyde from it, and also conglomerated boards, which need too much resin for its production.

Very small amounts of sake, miso and other Japanese foods are processed in Latin America.

T.N.C. are not present in the rice processing business in Latin America.

BARLEY - Barley is produced in Argentina, Chile, Andean Region, Mexico and very little in Brazil and Central America. It is mainly used for beer and alcoholic beverages' production.

Brazil imports barley for industry needs, mainly alcoholic beverages. T.N.C. control most of breweries in Latin America and barley trade is mainly done by T.N.C.

SORGHUM - This cereal is being planted in places where water is a limiting factor. Mexico is one of the biggest sorghum producers. It is also cultivated in Argentina (5,200,000 tons) and the Andean Region. Very small quantities are produced in Brazil and Central America.

The usage of sorghum in Latin America is in substitution of corn. Places that cannot grow corn are suitable to be used for sorghum production.

Advantage of sorghum plantation is the facility to use normal cultivation and harvesting machines, common for the cultivation of wheat and soybean. Its cultivation is very recent in Brazil and prospect for further increase is promising. Andean Region imports more than 600 thousand tons of this cereal.

QUINUA - Quinoa is a kind of cereal, which has been cultivated since the pre-colombian era by the Indians in Peru and Bolivia. Protein quality of this cereal

is very good. Quinoa is grown only on high altitude regions, such as the Andean Plateau at 2,000 m. to 3,000 m. altitude. Productivity of this cereal still is very low and production is around 25 thousand tons. There is no industrialization of Quinoa and pilot studies have been conducted at F.E.A. UNICAMP and IAA - Lima. The problem is to remove the saponins, which are in very large concentration in this cereal.

CASSAVA - The main producers of Cassava in Latin America are Brazil and the Andean Region. There is an international research institute in Cali, Colombia for the study of cassava agriculture.

Brazil produces around 60-80 million tons of cassava per year and is increasing significantly in last years. One of the reasons for the increase was the possibility of using it as raw material for alcohol production for gasoline substitution. Government installed production plants for cassava alcohol production, but calories balance was negative and it seems that Brazil postponed this project.

The main food use of cassava in Brazil is as a raw flour or as toasted flour. Technology was developed in Brazil and industries are of small and medium capacities. T.M.C. does not participate in the processing of cassava flour.

In the North-east of Brazil and Colombia the use of cassava flour is heavy.

Big industries are processing cassava starch and most of its production is for export (30-35 thousand tons).

Meat industry uses cassava starch as a binder for their sausage products. Brazilian law allows the use of 2-3% cassava starch in sausages.

Brazil and Colombia also export dried cassava pellets to U.S.A. and Europe and there the starch is extracted.

Cassava culture produces almost the same amount of starch as corn, but with the difference that cassava has no protein in its composition, besides having 75 to 90% water to be removed, and difficulty in storage of this raw material.

POTATOES - Potatoes were originated in the Andean Region and they have been used for centuries by the Indians, the same as happened with corn. Potatoes have very good protein qualities and they are used mainly as a culinary raw material.

Most of the potatoe production is used "in natura" by housewives in Latin America. Very few industries are drying potatoe puree. In Chile, Argentina, Brazil and Mexico, it is possible to find in supermarkets dried potatoe puree in 500 grs. or 1 kg. package.

T.N.C. are processing this kind of product and usually by drum dryer.

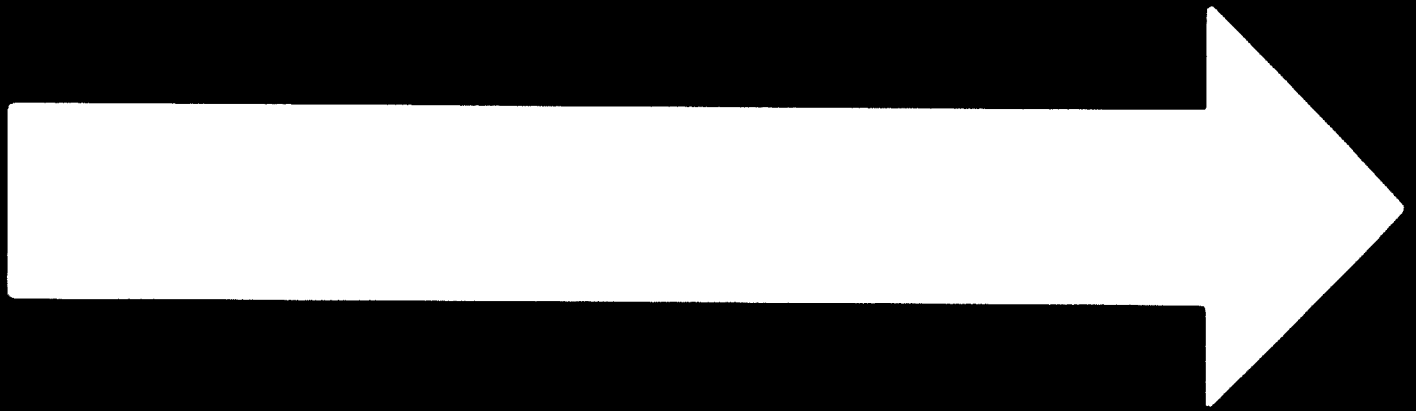
Consumption of potatoe is increasing significantly in Brazil, Mexico, Andean Region, Argentina and Chile.

In recent years the industry started to market in all Latin America packed potatoe chips and this has been done by T.N.C.: Kellogs, Standard Brands, General Foods.

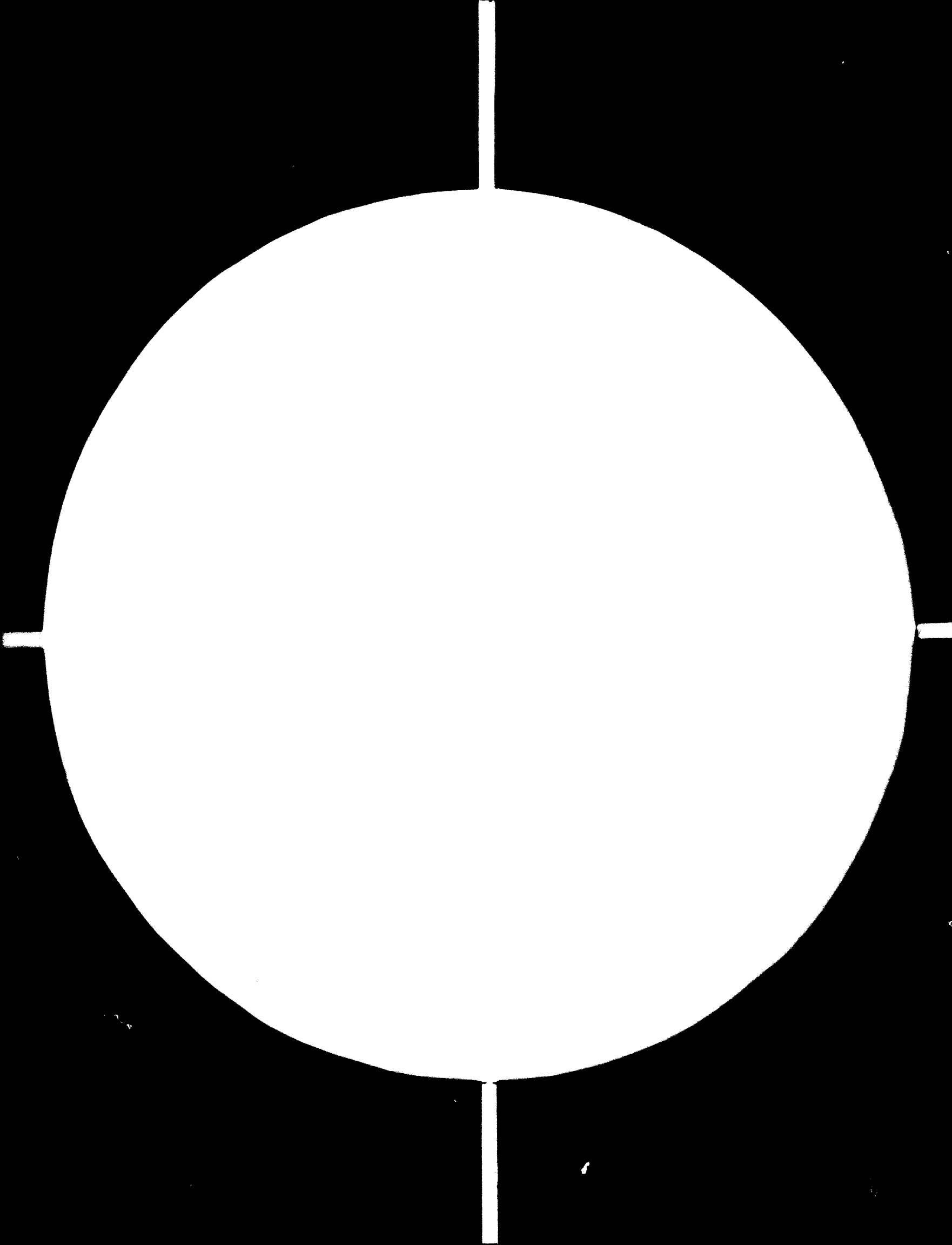
New chain of ready to serve foods, as sandwiches, juice, milk shakes, are marketing tremendous amounts of french fried potatoes. Some of them have a central plant in each important capital and potatoes are peeled, cut and pre-fried. Immediately the pre-fried potatoes are refrigerated and kept at 00 C. for distribution.

At stores only a final frying is done or even only a heating by infrared lamps. This market is becoming very important in all Latin America and also is

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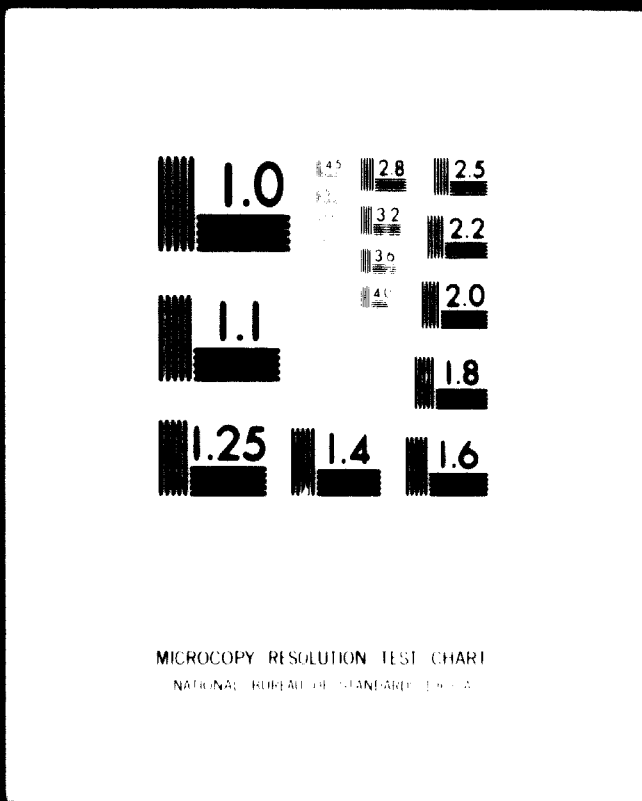


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inducing housewives to increase, at their home, french fried potatoes use. There is no available statistics on the amount of processed cereals in Latin America.

General Comments on the Cereal Sub-Sector Industry

Equipment - Most of the equipment for cereal milling is produced outside Latin America in all cereal industries. Marketing power of Food Equipment companies is very aggressive and base their defence on their company tradition as cereal mills suppliers.

Brazil, Argentina and Mexico can supply this kind of equipment for all Latin America, but they find a resistance from milling industry, because of foreign company traditions.

Referring to baking industry, the equipment is entirely manufactured in Latin America. The biscuit and waffles food industries buy their equipment also abroad (England and U.S.A.).

Institutional Infrastructure. - Concerning institutional infrastructure the region is prepared to supply technological and training facilities. Milling and baking is one sector which is present all over the region, institutes and universities. (Argentina, Brazil, Chile, Uruguay, Andean countries, Central America and Mexico). Degree of training is at B.S., M.S., and Ph.D. levels. OAS has a training programme for all Latin American countries, at the M.S. level, which is developed in the School of Food Engineering - UNICAMP - Campinas.

Research and development is also developed in the region, with good teams of very outstanding technical professionals.

What is needed in the field of institutional infrastructure in the region, are: funds and communication among the countries.

Issues proposed for discussion at future Consultation Meetings

- a) Communication among Latin American countries should receive special attention. Information to the food industry should be aggressive and in a digested form.
- b) Food research institutes should have an extension service to market their services and activities, with a practical point of view, to solve industry problems.
- c) The use of defatted soy flour should be a Government law all over the region. The recommended amount should be around 5% in the distributed wheat flour. It was proved already the benefit of this addition, in nutrition improvement, technological factibility, raw material availability. The nutritional needs in the region by the marginal income population would greatly be solved, since cereal products are the mostly used all over the countries.
- d) Development of the utilization of genuine technology at larger scale operations. The use of corn in Latin American Region as human food could greatly be increased if convenience corn products were available in the country all year around.

The wheat importation would be very much substituted by the consumption of regional produced corn. It is easier and recommended the cultivation of corn in tropical and sub-tropical regions as compared with wheat, which is a temperate climate crop.
- e) It is recommended the development of convenience foods based on the use of cereal flours plus soy flour, specially for children in school lunch programmes and at the level of weaning food for young babies and for their mothers. The building-up of brain cells develop in early stages of life.

II - MEAT PROCESSING AND DAIRY INDUSTRIES.

1) Stock heads in the Region.

In spite of the existence of large natural resources in the Region, enough livestock growing traditions and increasing demand for cow meat, the livestock business in several countries of the region have grown at an insufficient development rhythm, as a consequence of the extensive handling and the scarce use of modern technology.

Exceptions made of the numerous livestock zones of Argentina and Uruguay, and in a smaller scale Brazil, Chile and Colombia, still there prevail very low productivity indexes per head, as well as per surface unit.

Limiting factors of development being:

1. feeding deficiencies of the herd
2. animal health shortcomings and pathological deaths.
3. the slow genetical improvement of the native stock
4. difficulties for the adaptation to tropical climates of the European races of high yield.
5. deficiencies regarding pasture holding, exploitation and handling
(Empiric administration, owners absentism)

An integrated livestock plan is required.

The eleven countries of the ALALC in 1966 had around 200 million heads, which figure corresponds approximately to 93% of the Latinamerican herd. Argentina, Paraguay and Uruguay have the largest proportion of stock heads per inhabitant.

The lower relationship is shown by Chile and Perú, considerable buyers of livestock and meat.

Possibilities of livestock growing development are not the same for every country of the Region, due to deep differences of the natural conditions. It is very easy in some of them to increase substantially the population, but in others nevertheless, the efforts made, will be not possible to cover the whole domestic demand with the national stock population.

The pastures' area of Latin America is figured out at 535 million of ha. Only the 12% of it being artificial, or grown pastures. (470 million ha. are natural prairies (meadows)).

The animal charge per ha. in Latin America goes from 1 to 3 heads.

Argentina, Uruguay and Brazil have a charge capacity of 2 heads per ha.

Feeding capacity is very low in the Andean Region (Bolivia, Perú, Ecuador) and still lower at eastern planes of Colombia, Venezuela and Mexico. (5 to 10 hectares per head).

In general terms, the feeding potential of the Latin American Region does not offer serious obstacles for a much wider development of pecuary production.

In spite of the deficiencies of statistical information available, taking as a base the cattle census and other sources, the livestock population of Latin America is figured out at around 230 million of cows; with an average proportion of around 90 heads per each hundred inhabitants. This relationship is per each 100 inhabitants:

94	heads	in	the	countries	of	ALALC		
55	"	"	"	Central	America			
51	"	"	"	the	rest	of	Latin	America

The lower relationship corresponds to Chile and Perú, which are countries strongly importers of cattle and meat.

ii) Production of Meat.

The member countries of ALALC produce around 18-20% of the world production of beef meat and its relevant export exceeds the 25% of the whole world beef meat commerce.

The production of meat reaches 5.5 millions per year and the value of meat exports amount to US\$ 450 million per year.

Argentina and Uruguay, main exporters of Latin America, have been compelled to reduce its high consumption level, to be able to maintain the exports.

Volume of meat production

The eleven countries of the ALALC produced an annual average (1962-1966) of 5.331.00 M. tons, the percentage corresponding to the different countries being as follows:

Argentina	43 %
Brazil	27 "
Colombia	7 "
Mexico	7 "
Uruguay	5 "
The rest of the countries including Bolivia, Chile, Ecuador, Paraguay, Perú and Venezuela	<u>10 "</u> 100 %

Production of Beef Meat in Latin America (1)

(Thousands of tons.)

	1971	1972	1973	1974
Mexico	593	623	572	553
Central America (2)	271	259	232	251
The Caribbean	247	233	250	232
Cuba	133	136	133	133
South America	5,283	5,507	5,789	5,957
Argentina	2,027	2,207	2,163	2,230
Brazil	1,302	2,132	2,211	2,110
Uruguay	231	233	324	333
Latin America	6,394	6,373	6,912	7,033

The relationship between the heads population and the meat production, is as follows:

Annual Average 1962-1965

Country	Million heads	Meat Production Thousands of H. tons.
Argentina	44	2,277
Brazil	30	1,421
Colombia	15	400
Mexico	23	400
Uruguay	3	310

(1) Source: CEPAL, See Bibliographic reference No. 4

(2) Including Panama.

Structure of the Livestock Production

1974

Percentages

<u>Beef cattle.</u>		34.7
Meat	38.2	
Milk	25.7	
Other	0.8	
<u>Poultry</u>		20.7
Eggs	12.0	
Poultry meat	3.7	
<u>Pork</u>		11.0
Pork meat	11.0	
<u>Sheep cattle.</u>		2.8
Wool	1.9	
Meat	0.8	

(11) Meat Consumption.

The average consumption of beef-meat per year (1962-1966) has been in the region, as follows:

<u>Countries</u>	<u>Consumption kg/inhabitant</u>
Argentina	100
Bolivia	60
Brazil	10
Chile	10
Colombia	20
Ecuador	20
Mexico	10
Paraguay	10
Peru	10
Uruguay	10
Venezuela	10

The tendency of the consumption is as follows:

Decrease at: Argentina, Chile and Uruguay

Increase at: Perú and Venezuela.

Stabilization at: the remaining countries.

As a whole the beef meat consumption shows a negative evolution.

The beef meat consumption is very large, in almost every country of the Region, if compared with other animal meats.

The average is highest in Argentina, Paraguay and Uruguay.

Percentage of Beef Meat Consumption in comparison
with other Meats. (1)

<u>Countries</u>	<u>%</u>
Brazil and Mexico	75
Colombia and Venezuela	50
Chile	50
Bolivia, Ecuador and Perú	50

iv) Industrialization.

Industrialization figures are rather scarce for the Region, as an example of the magnitude of this activity the case of Costa Rica is quoted below:

The slaughtering, preparation and preservation of meat in Costa Rica represented in 1975 the 10.1% of the rough value of the food industry and the 16.7% of the aggregated value of that industry.

(1) Other meats: pork, chickens and other small animals.

If we consider industrialization from the point of view of transformed meat product only (as canned corn beef, sausages, salamis and so on), the percentage of meat industrialization in the area fluctuates very significantly for every country.

The countries with a larger industrialization are: Argentina, Brazil, Chile and Uruguay.

The main industries being: frigorization and freezing of meat, canning of meat, preparation of pork products, dry meat, called "charque".

v) Projection of the Meat demand.

Projections made for the future domestic demand, in function of the demographical increase and of the personal revenues available and the levels, habits and tendency of consumption per inhabitant, the effective demand was figured out for the year 1985 in 8.8 million H.T., considering of course, the improvement aspectable of the level of consumption by inhabitant.

After comparing this alternative, it was figured out that the member countries of the ALALC could dispose in 1985 an export balance of beef meat (refrigerated, preserved and alive stock) of around 2,580,000 tons. (equivalent to meat carcass).

The following separate projections constitute the basis for the above figures:

1) Heads population (5% yearly increase)

1971	190,000,000
1972	195,700,000
1973	201,571,000
1974	207,618,000
1975	213,993,670
1985	278,001,100

2) Selection of heads for slaughtering and export alive.

1971 14%

1985 17%

3) Yield of meat per head.

1971 196 kg. per head

1985 200 kg. per head

4) Total production of cow meat: (3.5% yearly increase)

1971 10.6 million tons

1985 11 million tons

vi) Issues intended to improvement of meat industrialization.

a) Governments intervention regarding meat marketing. Latin America requires a more active and efficient official intervention concerning marketing of beef meat. The chaotic situation and several of the irregularities, which daily are evidenced, since the cattle leaves the production spots and goes to the slaughtering house and until the meat reaches consumer hands, can be largely explained by the carelessness of Governments to rule and enforce the norms of transport, processing, classification, storage, sanitary inspection and the selling of the product. Particularly if we take into account that meat is a highly perishable food, with primary costs relatively high and which nutritional importance is vital, the price control to avoid speculation and clandestinity must be particularly rigid.

The specific problem of marketing of cattle and beef meat in Latin America is mainly the following:

b) Factors which must be kept in mind at the formulation of meat industry development.

- 1) Deficiencies of the slaughter houses, particularly Municipal enterprises. Slaughtering through Co-operatives only exist in Argentina, Brazil, Costa Rica and Chile.
- 2) The refrigeration industry, for the storage, transport and preservation of meat, is scarcely developed in Latin America. This is particularly true in the tropical countries, with the imaginable results.
- 3) The lack of meat wholesale markets duly organized. Perhaps the only exception is the market for meat supply of Buenos Aires, where commercial transaction is carried out at the refrigeration and slaughter houses precincts.
- 4) Inadequate classification and quality standards for meat. Perhaps, with the exception of Argentina and Uruguay, where the fractioning of meat is well developed.
- 5) Large number of marketing intermediaries between producers and consumers who increase considerably the meat prices. Among others, the re-grower; the fattening man; the fair staff; the so called industrialist of meat, the wholesale butcher and the retail butcher and so on.
- 6) High marketing margins: Brazil 50%; Chile 60%; Mexico 70% and Venezuela 42%.
- 7) Need to modernize the frigorific industry for meat export purposes, and adaptation of the products to current requirements put forward

by foreign markets, such as special type of cattle, adequate sanitary control, type and meat cuts.

- 3) Inadequate policy of prices. In Bolivia, Brazil, Colombia, Chile, Uruguay and Venezuela, where some type of control has been applied. The policy of fixing and control of prices have resulted unsatisfactory.
- 9) Legal regulations are lacking for the meat market and products' inspection.
- 10) Adequate norms for the classification and typification of cattle and meat are generally lacking.

vii) The Dairy Industry.

The dairy industry is a striking example of inter-relation between industrial and agricultural development. One of the main reasons for the tremendous growth of the Nestle's activities in Latin American countries, goes hand-by-hand with the development of animal husbandry and agriculture wherever the factories are situated.

Milk is considered a fundamental product for the infant cattering and due to its basic role in human nutrition. Governments usually regulate its price and supply, mainly to expedite its consumption by low income people. With industrialized products of milk (butter, cheese, yoghurt, milk powder, condensed milk and evaporated milk) something different happened; they are considered as luxury products to be consumed only by medium and high income level people and they are left out of the Governments control of prices and supplies.

Production of Milk in some Latinamerican countries
Whole milk in 1000mt. (1976)

Argentina	5,526 (1)
Bolivia	35 F. (1)
Brazil	10,667
Colombia	2,893 F. (1)
Costa Rica	119 (1)
Chile	1,054 (1)
Ecuador	790 F. (1)
El Salvador	294 (1)
Guatemala	320 F. (1)
Mexico	1,296 (2)
Paraguay	122 F. (1)
Peru	1,035 F. (1)
Uruguay	750 F. (1)
Venezuela	1,193 (1)

(1) Source: FAO Production Yearbook 1975 - Vol. 30.

(2) Source: Anuario Estadfstico of Brazil (1970).

F. = Estimation.

Venezuela is a country which has shown a growing tendency in the production of milk and has reduced its imports of dairy products. For this purpose the milk producer was granted premiums.

Peru and Chile also have increased their production, but the dairy products' imports continue to grow.

Bolivia, Colombia and Ecuador do not import presently butter and cheese, but are importing growing amounts of milk powder and condensed milk.

Colombia is trying to cover the fluid milk deficiencies, importing whole powder milk.

Production of
Processed Dairy Products

It was not possible to find out homogeneous and trustable data for every country. Some of the figures obtained are given as an example, below:

Mexico (1970)

Cream, butter, cheese evaporated, condensed and milk powder	536	(1000 of M.T.)
Other dairy products	66	do.

Colombia (1971)

Total processed dairy products	480	(1000 of M.T.)
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Central America (1977) (1)

Pasteurized milk (thousand l.)	119,289.6
Milk powder (t.)	6,823.7
Cheese (t.)	3,179.2
Butter (t.)	3,225.3
Cream (thousand l.)	4,054.5
Ice cream (thousand l.)	22,017.0

Brazil (1977)

Cheese	113,031 M.T.
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(1) source: FAO/II.

Figures on consumption of dairy products are scarce and un-trustable.

As an example, the availability in Brazil is given below:

Availability of Milk and Dairy Products
in Brazil (1977)

Fluid milk	21.0 l. per inhabitant per year
Milk powder (equiv.)	14.1 l. " " "
Butter	0.55 k. " " "
Cheese (all types)	1.00 k. " " "

The area covered by the milk production district in Brazil, according to a statement of the Nestlé (1) is approximately six times that of Switzerland and half that of France. This shows the wide possibilities of further development of dairy industry in Brazil.

The large importance of the T.M.C. in the dairy industry business in the Region is very apparent in the table given below:

Table summarizing Nestlé's activities in
Latin American countries (2)

	1972	1975	1978
Local production of milk (t.)	537,453	560,034	610,010
Purchase of fresh milk (t.)	1,670,340	1,569,575	1,739,513
Imported Nestlé products	10,366	13,451	12,400
Personnel	21,940	23,205	25,647

(1) Nestlé in Latin America and the Caribbean

(2) The countries are: Argentina, Brazil, Chile, Mexico, Panama, Jamaica, Perú, Venezuela, Colombia, Trinidad, Guatemala, Nicaragua, Ecuador, Dominican Republic. Source: Nestlé.

Issues suggested for further discussions:

- a) Improvement of cooling milk facilities at farm level.
- b) Improvement of transportation and collection of milk from the farms to the collecting units.
- c) Political fixation of prices and lack of premiums to milk producers, discourage the development of raw milk production

VIII) By products of food industries. Its utilization as animal feed.

As No.1 of the collection "Monografías Tecnológicas" ICAITI, located at Guatemala, has published last year "Production of Microbian Proteins starting from by-products of Agropecuaric Industries".

Several developing countries presently export the by-products of their food industries, instead of using it for feeding their own livestock. This is the case, for instance, of the oil seed cakes coming from the oil industry. A plant to manufacture compound animal feed will help to rationally utilize also cereal rejects, tankage, molasses, lecithin, etc.

It is obvious that if a surplus is recorded in the production of compound of animal feed, this can be exported with a considerable advantage regarding the low price that seed-cakes or brans or other by-products of cereals have.

When a developing country establishes new production unit for food processing, an additional integrated unit to process the by-product into animal feed, should be very adviseable.

Summary and some general Conclusions

As a previous activity for the convening of a global preparatory meeting on the food processing sector, an analytical assessment of the current situation and projections of this sector in the Latin American Region, was requested by UNIDO to the Consultants. The assessment has covered the factors and constraints influencing its development. On the basis of the described findings, food processing sectors priorities in the Region are identified and ways and means to obtain a sound and positive development of Food Processing Industry in the Latin American Region are circumstantially exposed.

Among the main conclusions derived from the present assessment, the following are detached:

Problems related to food processing industry, requiring increasingly a solution:

- a) Irregularity in the typification of the processed products.
- b) A more intensive and eager application of modern quality control systems, at factory level.
- c) Training of medium-level workers of the food industry.
- d) Low quality of raw materials.
- e) Defective quality of packages and packaging materials.
- f) Information system, organization and management must be substantially improved.
- g) The effective link to co-ordinate agriculture and industry is lacking and,
- h) Transport of raw materials must be improved.

Mexico seems to have good future in the production of good coffee and cacao.

Central America has good potentialities for banana and coffee production.

Andean countries have great potentialities regarding cacao, banana, sugar coffee and cotton. The Group must make a strong effort to increase cultivated areas and export processed foods and beverages.

Brazil is one of the major food producers in Latin America and one of the main potentialities for future increased production. The following requirements must be accomplished to get a larger export market demand: Co-operation from T.H.C.; demand for processed foods; extension services, training at medium level; development of raw materials suitable for processing and increase of availability of tin plate.

Argentina and Chile have tremendous potentials for the temperate climate products: meat, milk, cereals, fruits, vegetables, wine, juices. Uruguay has promising outlooks regarding wheat, meat and some sub-tropical fruits (oranges, apples).

Milk is in shortage all over Latin America, with exception of Argentina, which has over-production.

Strong efforts should be made on the adaptation of industrial varieties of fruits and vegetables.

Importers usually prefer raw sugar, which is cheaper. Latin America could make higher earnings if developed countries import refined sugar.

Latin America has great potentialities for oil seed production. Right now it has been observed a tremendous increase in soybean production in Brazil and Argentina. Latin America's production of soybean competes very well, in the international market, because the crop comes in between the harvesting season of U.S.A.

Animal feed is becoming very important for the tremendous boom in chicken and pork husbandry, which is happening in Brazil, Chile, Perú, Venezuela, Mexico and Argentina.

Latin American countries lack facilities for the dissemination of genuine, low capital investment technologies.

Transfer of technology within the Latin American countries, is very much tied-up to the relevant contract which drives the transfer of technology. Presently the contracts made by Latin American countries and developed nations are not in an equity basis.

In the last ten years, in some countries of Latin America, huge companies have been established for the manufacture of food machinery, for domestic and international supply.

In Latin America the large food factories have equipment and machinery sophisticated, automatic, high production capacity and continuous operation; but a large amount of small factories have remained impervious to modernization and continue to use obsolete, high cost of operation, or antique machinery.

In the last ten years, a large amount of initiatives regarding food technology and food industry have shown-up to match the need of adequation of foods to the character of modern life, intending a successful competition in foreign markets. Practically in every country of the region, an organization, or sometimes several institutions, are now responsible for food technology, education and training, food research or food industry development. The concentration on the practical and impending problems of food industry is a must. Basic research and high academic studies should be or have been already carried out by the industrialized countries.

There is a promising possibility for Latin American countries, to export exotic foods to developed countries and centrally planned economies, such as: mangoes products, passion fruit juices, cajew apple juice, banana products, papaya nectar, krill sticks, caper bush, etc.

The differences regarding ecology, soils, climate, topography and so on, existing among the 27 countries which make-up the Region, are reflected in the variety of production of their agriculture and cattle growing, and determine the abundance or scarcity of the different raw materials required by the food industry.

Generally speaking, the quality of raw materials is usually low in the major part of the countries.

The integration of Agriculture and Industry is highly required.

The higher price of crude petroleum recorded in the international market, since the end of 1973, has distorted substantially the outlooks of economical growing of the Latin American countries. The review of the outlooks not only is valid for the 19 deficitary countries, but also for the five exporter countries.

Latin America as a whole shows a solid basis of energetic resources, but individually the countries are liable to energetic crisis of short or medium magnitude.

Concerning the preparation of medium level workers for food industry in Latin America, a strong recommendation is made to the National Service of Medium Level Education (SENA, SENAI, SENATI, etc.), to start teaching food technology, unit operation in the food industry, food machinery maintenance, quality control, etc., at these schools. At present they are only concerned with mechanics, textiles, electronics and nothing about food industries.

The unevenness in which lives a large portion of the woman population of Latin America shows the need of a drastic change. The situation is improving everywhere slowly.

A more accelerated policy incorporating women in development, is required to really make a contribution to the rational development of the food-agro industry in the Region.

The low instruction level of the rural population is a real problem for the development of good raw material quality and homogeneity. The food industry should be located close to the raw material production.

Food industry should not compete with the Agriculture for the obtaining of hand labour.

As a whole, Latin America will continue to be a net importer of wheat.

The international commerce volume of meat products was duplicated during the last 20 years and its increment was accelerated during the last ten years. South America has been for several years the major world exporter of beef and calf meat, providing only Argentina 22% of the world market.

If the increase of production of cacao follows the outlook expected, the South American share of the world export will increase from 19% to 21% in 1980.

The South American exports of citric fruits has increased considerably in the last years. Three South American countries are net and the largest exporters of citric fruits: Brazil, Uruguay and Argentina.

The rational expansion of fruit and vegetable processing industries in Central America, would require an integrated plan and a specific regional policy, not existent now. The assignment of a working group to define these aspects, has been already proposed.

The agro-industry must be taken as a means to develop the primary sector, making the best use of the available resources as a way to re-gain the agricultural vocation of the countries.

In every study, survey or report made regarding the situation of the food processing industries in Latin America, extensive references are made concerning the constraints hindering the development of the food industry. Some of the more fundamental constraints are described in this assessment.

Practically every country in Latin America has specific plans of economic development and have established institutions in charge of the production promotion. Always agro-industry, in both development plans and production promotion, has top priority. Only in few cases agro-industry has a second priority after extractive agriculture.

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73. Situación y Perspectivas de la Lache y sus Derivados en el Grupo Andino Junta de Acuerdo de Cartagena - 10/1978 - Perú.
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75. Tendencias y Proyecciones a Largo Plazo del Desarrollo Económico de América Latina - Cuadernos de la CEPAL - 1978.
76. La Industrialización Latinoamericana en los Años 70 CEPAL - 1978.

SOME OF THE INTERVIEWS HELD BY THE CONSULTANTS

ARGENTINA:

1) Mendoza

- 1) Prof. Ing. Arrigo F. Donino
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- 2) Ing. Máximo Bocklet
Director del Instituto de Ciencia y Tecnología de Alimentos
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- 3) Ing. Alejandro E. Rearte
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- 4) Raúl Mercado
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- 5) Ing. Agrónomo Américo O. Mei
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- 6) Dr. Luis Battistini, Propietario de
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- 7) Ing. Meredith, Gerente de la Agencia de
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11) Buenos Aires:

- 8) Dr. Germán Mendivezua, Consultant of the Government, assigned to
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- 9) Ing. Augusto H. Eulacio - SAP/Representante
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- 10) Ing. Agrónomo Roberto Erwin Halbinger
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- 11) Dr. Jorge Gómez Artero, Chief of Department of
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- 12) Ing. Ricardo Fernando Arenas - A cargo del problema industrial de la Carne - INTI
- 13) Ing. Jorge O. Casale, Director Técnico del Centro de Investigaciones Tecnológicas de la Industria Láctea CITIL (Milk Industry)
- 14) Dr. Roberto A. Marchi, Chief, Department of Food Technology National Institute of Technology INTI

111) Santa Fé:

- 15) Mr. Victor O. Cacchini, Chemical Engineer of Heitar Aparatos S.A. (Manufacturer of food industry machines)
- 16) Ing. Oscar E. Pinnola, Director of the Export Selling Engineering Department of Heitar Aparatos S.A.
- 17) Ing. Juan Carlos Gómez, Manager of Export Selling Heitar Aparatos S.A.
- 18) Ing. Oscar Fernández, in charge of Industrial Operations at the Machinery Plant - Heitar Aparatos S.A.

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- 19) Eng. Mario García Salas, Director of the Projects' Dept. CORFINA - Financial National Corporation
- 20) Dr. Guillermo Pavez - Agro-Industries Economist of UNIDO at Guatemala.
- 21) Dr. Alfredo Guerra Borges, Director of the Industrial Dept. of SIECA (Secretary for Central American Economical Integration) (1)
- 22) Dr. Manuel Martínez y Martínez, Director of the Agricultural Department of SIECA

(1) Its present name is: Permanent Secretariat of the General Treaty for Economical Integration of Central America.

- 23) Dr. Francisco Aguirre E. - Deputy Technical Director of ICAITI (1)
- 24) Dr. Carlos Tejada, Director of INCAP (2)
- 25) Eng. Ricardo Holyns, Food Technologist of San Salvador Republic, in charge of the Organization and first run of a food factory at Guatemala.
- 26) Dr. José María Uribe, UNIDO Expert in Industrial Development.

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- 27) Eng. Eladio Bolaños S. - Acting General Director of Industries Ministry of Economy and Industry
- 28) Dr. Ulrich Hoffmann - UNIDO Expert in the small industry development.
- 29) Eng. Richard Cubero H. - Sectorial Office of Industrial Planning Ministry of Economy and Industry
- 30) Dr. Eulogio Domínguez, Director of the Sectorial Office of Industrial Planning, Ministry of Agriculture and Industry.
- 31) Eng. Nelson Espinoza C. - Agro-Industrial Programation Sectorial Office of Industrial Planning
- 32) Eng. Yoram Levkov - Agro-Industry Development, UNIDO Consultant Ministry of Economics and Industry
- 33) Sr. Jorge Mario Castro, Author of the book "Fundamentals for an Agro-Industrial Policy" published in Costa Rica - 1977

(1) Central American Institute of Research and Industrial Technology

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BRAZIL:

- 34) Hugo Poetsch - Director, President Industrias H.P. Pelotas - R.G.S.
- 35) José Silviare D'Avila, Director Production SADIA-Concordia S.A. - Sao Paulo - S.P.
- 35) Andre Tosello, Director F.E.A. UNICAMP - Campinas S.P. Director ICMA - Máquinas Alimenticias S.A. - Campinas
- 37) Enos Vital Brazil - Co-ordinator for Agro-Industries S.T.I. Ministerio de Industria y Comercio - Brasilia, D.F.
- 38) Carmelo Paoletti - President, Director Industrias Paoletti - Sao Paulo - S.P.

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- 39) Luiz Soto Krebs - Junta Acuerdo Cartagena, Lima
- 40) Victor Martinetti Leon - Presidente, Sociedad de Industrias Los Laureles 368, San Isidro, Lima
- 41) Jorge Eduardo Vega Bozjio - Director de Tecnología ITINTEC - Lima
- 42) Alex Trier Gabler - Asesor Junta Acuerdo Cartagena, Lima
- 43) Juan Carlos Rocch L. - Asesor Técnico, I.I.A. - Lima
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- 46) Hugo A. Torres S. - Director Oficina I.I.C.A. Apto. 11185 - Lima
- 47) Efraim Keisari - Junta Acuerdo de Cartagena/510 - Lima
- 48) Hernán Zeballos Hurtado - Depto. Desarrollo Agropecuario Junta Lima.
- 49) Carlos P. Lecaros - Unidad Estadística, Junta - Lima

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An Example for the Food Industry Development in Latin America.

An outstanding example of food industry development is the SADIA-Concordia group in Brazil, which represents the integration of Agriculture and Industrialization. This group started 33 years ago with a very modest meat processing industry.

Today, this group has the following activities:

- a) Sadia-Concordia S.A., the origin of the group, processes poultry, pork, animal feed, and has all kind of products from chicken, turkey, porks, etc.
- b) Moínho da Lapa S.A., processes animal feed, wheat, cake mixes, deserts.
- c) Frigobrás - Cia. Brasileira de Frigoríficos, processes pork, cattle meat products, frozen storage and frozen meat products, chicken, feed meal, soybean oil and soy meal.
- d) Sadia Avícola S.A., processes animal feed, frozen chicken and turkey products, turkey houses for breeders raising and also supply technology to the farmers who supply their raw materials. The extension service from Sadia group to their raw material suppliers is perfect and work as only one family. Sadia supplies baby chicken, pork matrix, baby turkey, animal feed, consultancy in agronomy and husbandry, seeds, transportation, financial support, subsistence family needs (food, clothes, etc.), and they buy from their raw material suppliers the chicken, turkeys, porks, corn, etc.

The average income of a supplier is US\$ 6,000 as compared with the average Brazilian income of US\$ 700, it is very outstanding. (Annually).

- e) Sadia Oeste S.A., is a slaughter industry, which kills 1,200 animals per day, and completely industrializes them.

f) Sadia Comercial Ltda., makes the distribution and marketing of all the group production. Has a storage net all over the country, refrigerated and frozen products are commercialized all over Brazil and also exported to OPEC, Italy, Japan and other countries.

The results of the group were as follows, for the year 1977:

Billings = US\$ 305,000,000, overcoming 61% the ones of the previous year.

Net Profit, after deduction of income tax = US\$ 7,030,000.

Production: 40,000 thousand poultry

818 thousand porks

355,000 thousand tons of animal feed

200,000 bovine animals

Employees: 8,312 direct employment

Total production: 600 thousand tons

Exported production: 31 thousand tons, only Frigobrás, first biggest chicken exporter in Brazil.

Number of raw material suppliers: Around 4,000 families.

This group shows the positive result of integration of the food agro-industry.

Production of corn, soya meal, slaughter industry by-products, Milling by-products, etc.

Production of raw materials: chicken, turkey, pork, cattle.

Industrialization of Animal products, animal feed, wheat flour, soybean oil, soy meal, etc.

Storage facilities for all products.

Distribution and commercialization of all production.

Technical assistance and know-how for suppliers

- 130 -

Financial support for suppliers.

Creation of enormous amount of hand labour employment.

Creation of genuine and transfer of technology.

MALNUTRITION IN LATIN AMERICA

Country	Area Mi ² c Population	Area Concerned				Protein	Caloric Protein	Vitamin A	Vitamin C	Vitamin D	Folicin	Other Vitamins	Iron	Iodine	Calcium	Zinc	Trace Minerals	Other-Fluoride
		Urban	Suburban	Small City	Rural													
Argentina	1,072,158 28,000,000																	
Bolivia	424,162 5,500,000		ew	ew	ew		XX	XX		X		XX	X	X				
Brazil	3,286,473 110,000,000		X	X		XX	XX	XX				XX	XX					
Chile	282,257 11,000,000	X	XX	X	X	XX	XX	XX	X	X		XX	X	X				FI
Colombia	440,000 26,000,000	c	c	c	c		XX	XX				XX	X	X				
Costa Rica	19,575 2,000,000	w	w	w	ew		XX	XX				B ₁	XX	X				
Dom. Republic	18,816 5,200,000	c	c	c	c	X	XX	X				B ₁	XX	X	XX			
Ecuador	109,483 7,200,000	ew	ew	ew	ew	X	XX	XX				XX	X	X				
El Salvador	8,260 4,200,000	w	w	w	ew	X	ea	XX				B ₁	XX	X				
Guatemala	42,042 6,200,000	w	w	w	w	X	XX	XX				B ₁	XX	X				
Guyana	83,000 800,000	X			X		X	X				XX	X	X				
Haiti	10,714 5,500,000	X					XX	X				XX	X					
Honduras	43,277 3,000,000	w	w	w	w	X	Cr	XX				B ₁	XX	X				
Jamaica	4,232 2,000,000	c				X	XX	X				XX	X					
Nicaragua	50,193 2,300,000	w	w	w	ew		XX	X				B ₁	XX	X				
Panama	29,208 1,800,000	w	w	w	ew		XX	X				B ₁	XX	X				
Paraguay	157,047 2,800,000		X	X	X		X	X		?		XX	X	XX	X	X		FI
Peru	496,222 15,000,000	c	c	c	c		XX	XX				XX	XX	X	X			
Trinidad	1,864 1,000,000	X					XX	X				XX	X					
Uruguay	68,563 3,200,000		X		X		X					B ₁	?	X		?		

C = Pre School Child
W = Pregnant & Lactating Women
Source: LIFE/IFT - Nutrition - Ref. 3 and 9.

REASONS FOR MALNUTRITION IN LATIN AMERICA

Country	Lack Nutr. Educn. & Illiteracy	Economic (Prod)	Low Income	Lag in Prodn.	Inadequate Food Supply				Inadequate Appropriate Technology				Non-Potable Water	Wrong kinds of foods	Poor Communication Among Scientists	Poor Market Practice	No Govt. Nutr. Policy	Early Weaning	Lack Trained Personnel in Food Sec. Industry Interest	Sales & Profit Int'l. Programs	Cater to Penors
					Poor Trans.	Poor Planning	Post-Harvest Loss-Other	Refrig. & Stor.	Dehydration	Canning	Sanitation	Other									
Argentina	X	X				P				X		X	X		X						
Bolivia	X	X	XX	XX	XX	XX	XX	XX	XX	XX	X	XX	XX				X				
Brazil	X	X	X		X	X	P	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chile	XX	X	X	X	X	X	P	X	X	X	X	X	X	X	X						
Colombia	X	X	XX	XX	XX	XX	X	X	X	X	X	X	XX	XX			X				
Costa Rica	X	X	XX								X	XX	XX								
Dom. Republic	X	X	XX	XX	XX	XX	X	X	X	X	X	X	XX	XX							
Ecuador	XXX	X	XX	XX	XX	XX	X	X	X	X	X	X	XX	XX	XX						
El Salvador	X	X	XX								X	XX	XX								
Guatemala	X	X	XX								X	XX	XX								
Guyana	X	X	XX								X	XX	XX								
Haiti	X	X	XX								X	XX	XX								
Honduras	X	X	XX								X	XX	XX								
Jamaica		X	XX								X	X	XX								
Nicaragua	X	X	XX								X	XX	XX								
Panama	X	X	XX								X	XX	XX								
Paraguay	X	X	X	X		P				X		X	X								
Peru		X	XX									XX	XX				X				
Trinidad	X		XX								X	X	XX								
Uruguay	X	X	XX	X		P	X	X	X	X	X	X	XX		X	X					

Source: LIFE/IFT - Nutrition - Ref. 3 and 9.

POST HARVEST LOSSES

Country	Corn	Rice	Wheat	Manioc	Soy	Other	Cereals	Potato	Tubers	Milk	Meat	Eggs	Fish	Fresh Vegetable	Fresh Fruit	Beans
Argentina	10 RFS		10 RFS			10 RFS		15 FP						P	P	
Bolivia			30 FTS			30	30 FTS	30 TSP	30 TSP					FSTP	30 FSTP	
Brazil	40 FS	3 FS	3 FS	10 FS	3 FS	FS	8-10 FS				10 FS			10-15 FSP	10 FSP	33 FS
Chile			20 FS			20 FS							20+ FST	20+ FST	20+ FST	FS
Colombia	20 FTS	20 FTS	20 FTS		20 FTS	20 FTS	10 FTS	8 FS						FTSP	20 FTSP	
Costa Rica																
Dom. Republic																
Ecuador	TSA	TSA	TSA		TSA	TSA								FSTP	FSTP	
El Salvador																
Guatemala	FTS	FTS				7-10 FTSP									20-30 FTSP	
Guyana																
Haiti																
Honduras																
Jamaica																
Nicaragua																
Panama																
Paraguay	FS		FS		FS	FS		FS	FS	S				PS	FS	
Peru																
Trinidad																
Uruguay	4 FS	5 FS	3-5 FS				9 FTS	5 TS	30 FSTP			30 FST	10 FT	15-20 FT		FS

Code: Digits = % Loss
 F = Loss at Farm
 S = Inadequate Storage
 P = Inadequate Processing & Preservation Technology
 R = Rodents & other pests
 T = Transport Loss

Source: LIFE/IFT - Nutrition - Ref. 8 and 9.

FOOD PRODUCTION IN LATIN AMERICA - 1975

(In thousands of Metric Tons)

SUB-REGIONS	MEAT	MILK	CEREALS	FRUIT and VEGETABLES	SUGAR	OILS and FATS	COFFEE	CACAO
ARGENTINA	3,511	5,526	24,541	8,953	1,565	1,200(4)	-	-
CHILE	887	1,054	1,305	2,369	319	234	-	-
PACIFIC AND CARIBBEAN (1)	1,206	5,995	6,520	15,377	3,654	413	706	122
BRAZIL	3,547	10,657	31,253	21,315	7,450	2,430(4)	400	233
MEXICO	1,135	5,553	15,345	9,340	3,110	563	242	34
CENTRAL AMERICA (2)	236	1,262	2,621	6,452	1,595	90	543	8
LATIN AMERICA TOTAL	12,196	31,209	37,001	117,610	25,050	16,362(3)	2,065	361

(1) Venezuela, Colombia, Ecuador, Peru, Bolivia.

(2) Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama

(3) Total oil seed domestic availability

(4) Estimate

Sources: Anuario Estadístico do Brazil - 1977 (LINE)

Cafa de los Mercados de Mexico 1977-78 (H. Olizar)

Situación del Sector Agropecuario en el Grupo Andino. 1970-76 - Junta del Acuerdo de Cartagena.

ICAITI - Encuesta e Investigación Directa - 1971.

FAO- Production Yearbook-1976-Vol.30.

AMERICA LATINA (20 PAISES): PROYECCIONES DE LA POBLACION ECONOMICAMENTE
ACTIVA, TOTAL, URBANA Y RURAL, 1975 Y 2000

(Miles)

País	Población	1975			2000		
		Total	Hombres	Mujeres	Total	Hombres	Mujeres
Argentina	Total	9 887	7 403	2 484	13 404	9 534	3 870
	Urbana	8 062	5 899	2 163	12 018	8 462	3 556
	Rural	1 825	1 504	321	1 386	1 072	314
Bolivia	Total	1 863	1 494	369	3 653	2 763	890
	Urbana	746	588	158	1 912	1 394	518
	Rural	1 117	906	211	1 741	1 369	372
Brasil	Total	32 663	25 224	7 439	71 502	50 766	20 736
	Urbana	20 285	14 658	5 627	56 530	39 437	17 093
	Rural	12 378	10 566	1 812	14 972	11 329	3 643
Colombia	Total	7 839	5 997	1 842	18 780	13 435	5 345
	Urbana	5 013	3 525	1 488	14 939	10 334	4 605
	Rural	2 846	2 472	374	3 841	3 101	740
Chile	Total	3 384	2 584	800	6 115	4 356	1 759
	Urbana	2 664	1 938	726	5 481	3 845	1 636
	Rural	720	646	74	634	511	123
Ecuador	Total	2 003	1 635	368	4 061	3 576	1 285
	Urbana	848	618	230	2 742	1 908	834
	Rural	1 155	1 017	118	2 119	1 668	451
Paraguay	Total	868	684	184	2 064	1 442	622
	Urbana	399	271	128	1 182	806	376
	Rural	469	413	56	882	636	246
Perú	Total	4 497	3 519	978	10 447	7 521	2 926
	Urbana	2 891	2 158	733	8 265	5 855	2 410
	Rural	1 606	1 361	245	2 182	1 666	516
Uruguay	Total	1 189	894	295	1 614	1 148	466
	Urbana	995	728	267	1 485	1 046	439
	Rural	194	166	28	129	102	27
Venezuela	Total	3 521	2 698	823	8 400	6 016	2 382
	Urbana	2 729	1 994	735	7 461	5 263	2 198
	Rural	792	704	88	947	753	194
Costa Rica	Total	649	530	119	1 425	1 022	403
	Urbana	293	203	90	634	568	266
	Rural	356	327	29	591	454	137
Cuba	Total	2 888	2 342	546	5 706	4 171	1 535
	Urbana	1 904	1 452	452	4 361	3 091	1 270
	Rural	984	890	94	1 345	1 080	265
El Salvador	Total	1 578	1 114	464	3 452	2 334	1 118
	Urbana	699	450	249	2 040	1 350	690
	Rural	879	664	215	1 412	984	428
Guatemala	Total	1 887	1 613	274	4 180	3 000	1 180
	Urbana	737	539	198	2 113	1 492	621
	Rural	1 150	1 074	76	2 067	1 508	479
Haití	Total	1 965	1 660	305	3 967	2 948	1 019
	Urbana	452	317	135	1 392	942	450
	Rural	1 513	1 343	170	2 575	2 006	569
Honduras	Total	953	772	181	2 333	1 708	625
	Urbana	367	264	103	1 220	843	377
	Rural	586	508	78	1 113	865	248
Nicaragua	Total	16 346	12 973	3 373	42 739	31 108	11 631
	Urbana	10 645	7 977	2 668	34 118	24 385	9 733
	Rural	5 701	4 996	705	8 621	6 723	1 898
Nicaragua	Total	638	496	142	1 694	1 174	520
	Urbana	335	221	114	1 188	797	391
	Rural	303	275	28	506	377	129
Panamá	Total	583	426	157	1 256	846	410
	Urbana	322	204	118	844	553	291
	Rural	263	222	41	412	293	119
República Dominicana	Total	1 682	1 254	428	4 105	2 928	1 177
	Urbana	732	512	220	2 541	1 751	790
	Rural	950	742	208	1 564	1 177	387
Total (20 países)	Total	96 905	75 332	21 573	211 707	151 875	59 832
	Urbana	61 120	44 516	16 604	162 669	114 123	48 546
	Rural	35 785	30 816	4 969	49 038	37 752	11 286

Nota: Proyecciones preparadas tomando en cuenta las cifras sobre población total, urbana y rural clasificada por sexo y grupos de edad, que ofrece el cuadro 41. Se estimaron tasas de participación en la actividad económica por sexo y grupos de edad para la población urbana y rural en 1970. Las tasas correspondientes a la población urbana se proyectaron linealmente suponiendo que alcanzarían en el año 2020 las tasas de los grupos de sexo y edad respectivas observadas en los Estados Unidos en 1960. Las de la población rural se proyectaron linealmente de modo tal que alcanzarán en el año 2000 los niveles observados en el área urbana en 1970.

CEREALS PRODUCTION AND EXPORTS IN LATIN AMERICA - 1976

SUB-REGIONS	Wheat Prod. Tmp.	Corn Prod. Tmp.	Rice Prod. Tmp.	Barley Prod. Tmp.	Quinoa Prod. Tmp.	Sorghum Prod. Tmp.	Cassava Prod. Tmp.	Potatoes Prod. Tmp.
ARGENTINA	11200	5055	309	760	-	5200	225	1523
CHILE	1219	273	120	73	-	-	-	926
COSTA RICA	300	2153	2370	216	53	373	11	24
BRAZIL	3226	2020	17324	2	2560	62	56	220
MEXICO	3365	2 10004	900	524	433	-	-	4194
CENTRAL AMERICA	100	331	67	-	-	-	-	111
LATIN AMERICA TOTAL	19514	36470	15252	1775	24	11300	30023	9727

Sources: Anuario Estadístico do Brazil - 1977 (1978)

Caja de los Mercados de Mexico - 1977-78 - H. Ortiz

Situación del Sector Agropecuario en el Grupo Andino - 1970-76

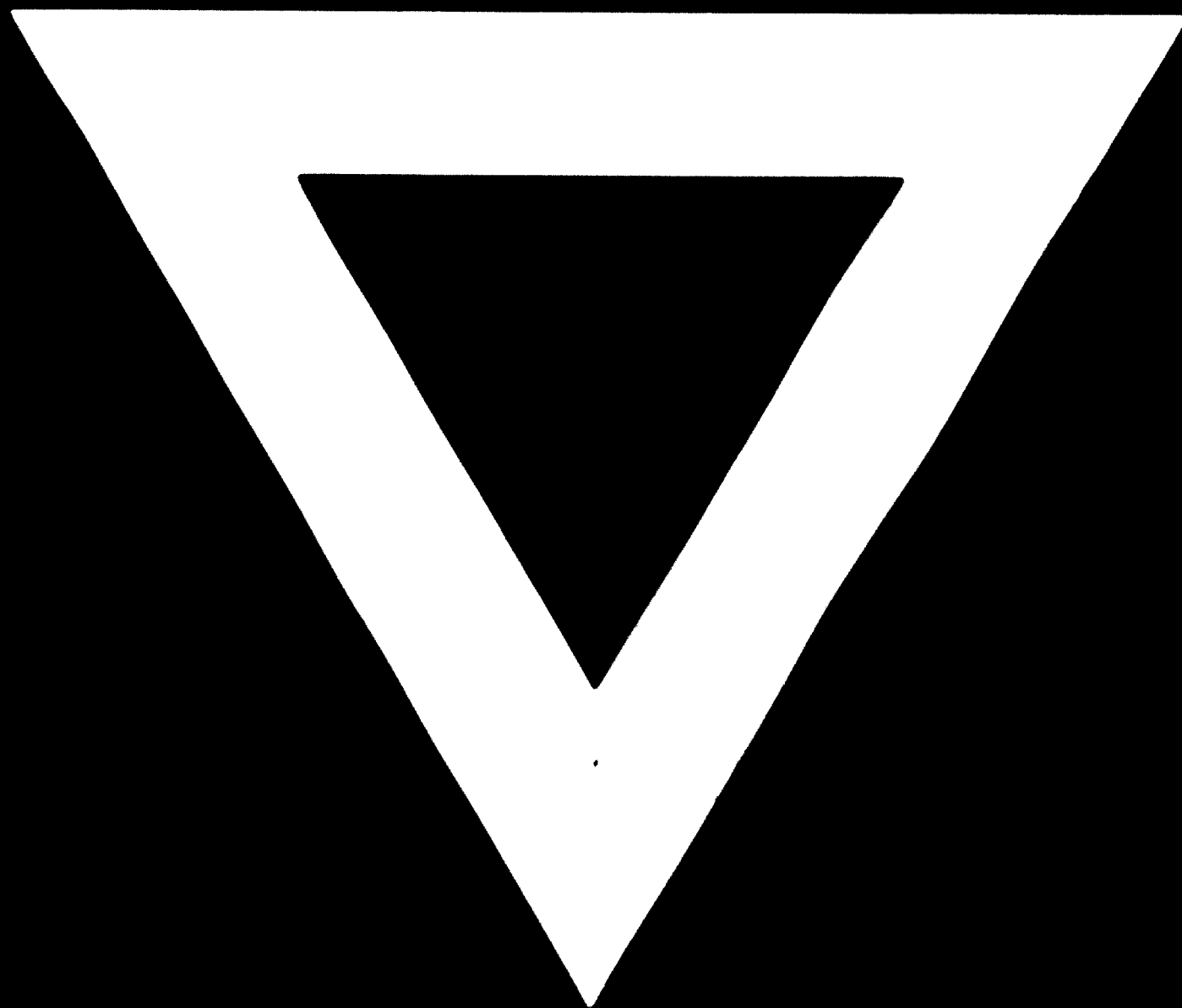
Junta del Acuerdo de Cartagena

Producción Yearbook - Vol. 30 - 1976

ICATH - Encuesta e Investigación Directa - 1971

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