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# SENEGAL: AN ASSESSMENT OF THE FOOD TECHNOLOGY INSTITUTE

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FINAL REPORT

*Bureau for Private Enterprise  
U.S. Agency for International Development*

*Prepared for: USAID/Senegal*

*Prepared by: Ronco Consulting Corporation  
1629 K Street, N.W., Suite 300  
Washington, D.C. 20006  
(202)785-2791*

*Sponsored by: Private Enterprise Development Support Project II  
Project Number 940-2028.03  
Prime Contractor: Arthur Young*

*January 1989*



**Arthur Young**

A MEMBER OF ARTHUR YOUNG INTERNATIONAL

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## EXECUTIVE SUMMARY

With the restructuring of the Senegalese economy and the current policy shifts that both impose budget restraints on the government and promote the private sector, the Food Technology Institute (ITA) is seeking ways to market its services and technology. Its aim is to generate 40 to 50 percent of its budget requirements, as mandated by the government, within five years. One motive for doing this is to cut government expenditures; there is also a need to redirect ITA, traditionally a government service institute, to develop a private sector approach to its work. USAID has been promoting this approach in helping ITA to market its efforts and extend them to the private sector.

The history of the Government of Senegal's involvement in the economy - its former protectionist policies for certain industries, and its previously hostile attitude toward the private sector - has made the private sector suspicious of government motives. At the same time, ITA has been operating as a strictly government service agency, supported by government and foreign donor financing. It has developed a suspicion of the private sector's motives; thus, it has never developed an understanding of the private sector or its problems. It has not learned how to work with private business on a full partnership basis.

ITA has tended to work in an "ivory tower" in its approach toward research and product development. Thus far, its research has not been oriented toward solving a specific problem, the solution to which might generate profits. However, in order for ITA to work effectively with business firms, it will have to reorient its approach and view problem-solving as entrepreneurs rather than scientists or bureaucrats.

ITA has a function to perform, and can be a useful adjunct to the development of small enterprises; currently, it is too narrowly focused on a particular part of an industry that does not offer enough scope to support its high cost. Either it will need to expand its scope to offer integrated support to the food processing industry, or it will need to merge its efforts with other groups, public or private, that can offer this broader scope of support to the industry.

Generally speaking, there are few untapped opportunities in Senegal's food processing field. This is certainly true on the scale of mass production. For the time being, most opportunities for business will be in very narrow and specialized markets. A processor cannot be assured of a continuous supply of any locally produced product at a reasonable cost; in addition, the overall purchasing power in the country is very limited. In the future, food processors will probably have to look to fully vertically integrated approaches, whereby the processor controls the

production, marketing, transportation, processing, and wholesaling of his product. This will require heavy investments and probably external financial and technical support.

Although ITA appears to have the capacity to carry out laboratory analyses and undertake research, that capacity is only of average quality by most standards. This is becoming increasingly true as budget support for inputs, equipment and maintenance is drawing to an end. If ITA is to generate business in the private food processing sector, it will need to create an image of a highly professional, competent and efficient technical institute, that offers a broad spectrum of services and good value for the cost expended.

## I. INTRODUCTION

This report is the result of a consultancy to ITA undertaken by three technicians from RONCO Consulting Corporation. RONCO is a subcontractor to Arthur Young under the Private Enterprise Development Support Project; this project is financed by the Bureau for Private Enterprise in the Agency for International Development. This consultancy was undertaken in Senegal from December 1, 1988 to December 23, 1988, as part of USAID/Senegal's efforts to assist both private sector development and ITA's ability to respond to that development.

The body of the report is organized into five sections. Section II presents the general macroeconomic picture in Senegal and its linkages to ITA and the food processing industry. Section III reviews the background of ITA, assesses the institute and its current work, and identifies problems of a more general or policy nature. Section IV discusses the food processing industry in general; it puts into perspective the area in which ITA should specialize within the agricultural and industrial sectors of Senegal. Section V Looks at the agricultural sector, first in general terms, and then in more specific production, marketing and use of produce subsectors. Section VI discusses some of the options that ITA could explore either to reduce costs, cover costs with service charges, or generate revenues. Section VII is devoted to brief conclusions and recommendations.

## II. THE ECONOMIC AND POLICY SETTING

The major objective of the Senegalese government during the first two decades after Independence was to extend the process of political independence into a gradual Senegalization of the economy, thereby strengthening government control of the economic development process. This objective led to an expansion of the bureaucracy through a proliferation of direct government agencies and parastatal or government-owned corporations. Some of this was done as a direct outcome of adopted economic approaches--i.e., capturing the profits and surpluses in the economy--as a felt need to meet the demand for services. It was believed that the private sector would not make the necessary investments; in order to wrest control of economic subsectors from certain groups, most notably the French and Lebanese, the government felt that the State must take over.

As the government increased its participation in the economy, two major changes developed. First, government investment, employment and expenditures expanded greatly. Second, the government often was in direct competition with the private sector, and even took over some private businesses. Government involvement in business was often inefficient, and resulted in heavy drains on the treasury. Because of government's attitude toward the private sector, a hostile and suspicious relationship evolved.

In 1980 the Government of Senegal recognized that the country's economy was in dire straits. A combination of factors led to discussions with the World Bank and International Monetary Fund about directions that should be taken to maintain economic viability. The Government was, in fact, bankrupt. The external debt was 16% of GDP for 1979 and 1980, and the possibility of that debt rising to over 25% of GDP was real. The public sector deficit was huge, with massive indebtedness to the banking system created by several public bodies, the most notable being ONCAD.<sup>1</sup> Credit expansion had averaged 25.5% over the previous six years, putting enormous pressure on domestic prices and the balance of payments. Only a fixed convertibility with the French Franc kept the currency from becoming worthless.

Thus, in 1980, the Government of Senegal agreed to a stringent set of economic and financial measures that had been worked out with the World Bank and IMF officials; the Government focused the National Development Plan on a structural adjustment of the economy; public investments were re-oriented toward productive sectors.

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<sup>1</sup> Office National de Cooperation et d'Assistance au Developpement.

In December of 1980, the Executive Directors of the International Development Association of the World Bank approved a combined Structural Adjustment Loan/Credit of 22.9 million SDR from IDA and \$30 million from IBRD to Senegal. This followed an IMF Extended Fund Facility (EFF) of SDR 184.8 million, approved in August of 1980. These actions were based on the Government of Senegal's medium-term plan for economic reform (Plan à moyen terme de redressement économique et financière) announced in December of 1979. That Plan was the outcome of requests by Senegal in 1978 to the Bank Group for lending which included an invitation for a Bank team to help draft an economic program for the country.

The structural reform supported by the SAL had four major components: (1) reform of the parapublic sector; (2) reform of agricultural policies; (3) improved production incentives; and (4) investment policies. Drawings against the IMF's EFF were to be based on performance in domestic credit, the overall deficit on central government operations and foreign borrowing. Other areas targeted were usage and price policies, increases in import duties and introduction of export premiums.

One of the areas that was given top priority by government was agriculture. A New Agricultural Policy (NPA) was adopted in 1984 after consultations with the donors, and gives direction to many of their efforts. A major thrust of this NPA is the reduction of state-run agencies in development and management, particularly relating to involvement in productive activities, leading to a gradual shift to private sector involvement in the agricultural sector.

The second part of this strategy is the rehabilitation of a group of enterprises that will remain with government. The idea is to reduce subsidies, improve management with increased autonomy and accountability, simplified by stronger oversight, and the use of contract arrangements.

1980's reforms were further formalized in 1985 when Senegal adopted a medium to long-term plan, developed in conjunction with a consultative group formed among the major donors. These measures emphasized curtailing government expenditures, reducing government's involvement in the economy, curbing imports, promoting agricultural production and emphasizing private sector initiatives in economic growth.

Currently, intensive studies of the subsectors in which government is involved are being done to determine where government will remain. The government has agreed to eliminate subsidy payments and to cover operating losses of public enterprises except in cases where the enterprise is ordered to provide services.

Privatization in Senegal has faced a number of major problems. The primary one has been the determination of the value placed on an enterprise. In most cases, the enterprises that the government would be most anxious to sell are those that are incurring the greatest losses. However, they may also carry high book values, based on prior government investment. If investors want the business at all - which is not assured - it will often be for a deeply discounted price, one reflecting either the entrepreneur's assessment of its value as an enterprise or its value for other purposes, i.e., value of land and plant.

This leads to a second problem facing the program: the government usually wants assurances from investors that they will not significantly lower employment. In fact, reducing employment is essential in many of the industries and service organizations that the government possesses. This has been encouraged by the World Bank group, which wants the government to change the labor code to permit more flexibility in employment. Labor unions have contested this effort; they feel that employment cutbacks would result. It is almost certain that this will be a result of privatization - at least in the first adjustment period - which will make it difficult to succeed.

Another concern is finding investors. Although it is not explicitly stated, there is a sense that the government would prefer to sell company shares to Senegalese citizens or companies. However, it is questionable if this amount of liquid capital exists in the system, given the debt owed by government to private suppliers and the banking system. Finding foreign investors will require assurances of government non-interference, simplified systems for conducting business, and potential high rates of return, none of which are certain.

### III. THE FOOD TECHNOLOGY INSTITUTE (ITA)

#### A. Background of the Institute

The Institute de Technologie Alimentaire (ITA) was established in 1963 to undertake research in food technology. It was created as a support to public and private sector efforts to improve food supplies and nutrition for Senegal; to help in the training of food technologists for public and private sector service; and to offer technical advice to public and private sector firms involved in the transformation, storage and handling of agricultural and food products. The major thrust of ITA's work was concentrated on locally produced foodstuffs, with some secondary effort placed on laboratory analyses for quality control on imported and exported commodities. In 1965 the regulations affecting ITA were slightly altered, on the insistence of the Food and Agriculture Organization (FAO), which prohibited ITA from profiting on the research and development it was undertaking. FAO entered into an agreement to assist ITA with technical assistance and other support. All work was to be for public use with no cost recovery for ITA.

From the early stages ITA planned to cooperate with IRAT (Institut de Recherche Agronomique Tropicale) at Bombay, the Organism de Recherche sur l'Alimentation et la Nutrition Africaine, The Laboratoire National d'Elevage et de Medicine Veterinaire Tropical, the Institut de Recherche des Huiles et Oleagineux, and the Institut Francais de Recherche Fruitiere d'Outre-Mer. A committee of coordination was established that included 6 representatives of Ministries, and 2 people from private industry.

From a report on the Institute done in 1974<sup>2</sup> it was noted that the first buildings and laboratories were not finished until 1969; only after that time were FAO technicians assigned. Large recruitment of university trained people did not begin until 1972, so that not much actual research was done before that time. Work on storage started in 1969, as did work in the meat section. The cereals section began in 1970, and an economics section started studies in production, storage, marketing of primary products and creation of industries. In 1973, ITA began studies of companies and the costs of transformation on a semi-industrial scale of cereals and tropical fruits, with the intention of developing pilot factories.

The pre-industrialization of food processing was the work of ITA and the objective of the FAO Project. As a part of this effort, research was conducted not only on new technologies or adaptations

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<sup>2</sup> "Note Technique Relative A l'Analyse-Diagnostic de l'Institute de Technologie Alimentaire Faite Par le Bureau Organisation et Methods", 29 October, 1974.

of existing technologies, but also on pre-investment with the aim to create food processing industries that were economically viable. At least some segments of industry apparently were hostile to these efforts, and many pretended, according to the report, that ITA had nothing to offer them. The implication is that ITA was creating competition in the food processing industry; although ITA stopped at the point of creating new products some industries seemed to fear that ITA might develop competing plants.

Other donors participated in the work of ITA. In 1973 four projects were approved: aflatoxin research by Great Britain; meat research by Yugoslavia; milk products and pesticide residue research by Belgium; and tropical fruits and vegetables by Brazil. The hope was that these projects would move ITA away from pure research and into extension of technology into the private sector. However, there still existed a split between what ITA staff felt were their more noble motivations of development of the country, as opposed to those of the private firms, especially the large ones, who were perceived to be motivated only by profit. ITA remained suspicious of the seriousness of the private firms with whom it was collaborating. As a result, ITA moved toward research collaboration with other government entities.

ITA arrived at the point where it was too difficult to carry out research in the factories. It was felt that the industrialist could not come into the picture until the research was completed on technology and ITA had prospected the market. Then it would be up to the industry to study expanding that market if it decided to adopt the technology of ITA. ITA would then help the industry in the introductory phase.

In the fruit processing subsector another problem arose; ITA felt that to move to an exploitation phase, it would have to organize production. This was beyond the competence of ITA. To help stimulate this area they proposed acquiring a mobile processing factory that they could take to the Casamance area.

ITA's role as a public service research institute remained until 1985 when economic conditions in Senegal forced the government to restructure its economy under a program of austerity. As a part of that restructuring, research institutes like ITA were informed that they would have to cover part of their costs from self-generated revenues. At that time, ITA was transformed from a totally public service entity to a public establishment with an industrial and commercial character.

Under its new mandate, ITA established the following objectives:

- a. To undertake and coordinate studies and research concerning the treatment, transformation, conservation and storage of all foodstuffs and their byproducts with the goal of promoting the creation of food processing industries;

- b. To develop new food resources derived from cereals, peanuts, fish, meat, milk, fruits and legumes, among others, which could have a high nutritive value and adapted to the tastes and financial means of the local consumers;
- c. To assist in quality control of food products in the production, consumption, importation and exportation stages; and
- d. To initiate programs to train people in food technology.

Given that ITA was a public service institute for 20 years, it has neither the orientation nor the understanding to function within these new guidelines, particularly the requirement that ITA generate 50% of its operating costs after a five year period. The government considered putting a tax on agro-industrial products to help finance agricultural research of all types in 1979. However, this was rejected. By giving ITA an industrial and commercial character, the government felt that it would be assured of generating at least 40 percent of its budget. This was to be achieved from funding supplied by private firms, selling products and processes, and services such as lab tests.

## **B. Review of ITA's Capacity for Research and Product Development**

ITA has a staff of 58 technical personnel divided into four major departments: (1) quality control; (2) animal products; (3) fruit, vegetables and nutrition; and (4) technical support. Each of these is reviewed in turn.

### **1. Quality Control Department**

This department has 17 people working in three laboratories: chemistry; microbiology; and mycotoxin. In addition to quality control work, they provide technical support for the other departments. Annex IX gives a list of the laboratory analyses that this department is prepared to do, along with the support it can offer the other work of the Institute.

All three laboratories have the necessary equipment to conduct routine testing of food products; the personnel is capable of making these tests. The current volume of activity does not warrant additional high technology equipment to increase productive capacity. At times the labs are short of chemicals required for testing different products.

Maintenance is poor or nonexistent due to lack of spare parts and poor training in maintenance procedures for the equipment. This is especially true in the mycotoxin laboratory where two of the

machines used for testing for aflatoxins are not operable. While tests can be made chemically, this process is time consuming. Because this test is very important, particularly during the peanut harvest and export period, its results should be made available to exporters without unnecessary delays.

The laboratories should concentrate on applying known technologies in product development and formulations acceptable to Senegalese tastes. Special research projects can be undertaken if they are donor funded, but ITA does not have adequate budget support for non-donor initiated research.

A major problem with the quality control department is its inability to recover costs for its laboratory work. Individual tests are billed at a tariff established by ITA without a clear evaluation of the costs involved. Recently, ITA re-evaluated some of those cost items for specific tests; the results indicate that billing rates are from 20 to 50 percent too low to fully recover costs, not counting expert personnel. Additionally, ITA indicated that it had been receiving payments for only about 28 percent of the billings. ITA indicates that it is instituting a policy of receiving a percentage of the fee up front; results will not be released until full payment is received. If this can be accomplished, particularly with other government offices, agencies, and parastatals who are notoriously the worst payers, there is some chance that the laboratory can perform well.

## **2. Animal Products Department**

This department has 11 employees and is divided in two divisions: (1) meats; and (2) milk and fish.

The meat section has pilot plant equipment to manufacture canned meats and sausage. There is no milk processing equipment available at ITA, though the laboratories can conduct all of the necessary chemical, bacteriological and microbiological testing that is necessary for milk products. ITA does not have any equipment for processing fish, but has done work in canning, drying, freezing, smoking, fish meal for human consumption and fish paste. Some of these experiments have been conducted at the different processing plants at their request, or in collaboration with private firms or donor supported projects. The meat pilot plant is fairly complete and has the following equipment:

1. A meat grinder or chopper;
2. A mixer/blender;
3. Two cutters for emulsifying meat used in sausage manufacturing, one with a capacity of 20/30 kgs. per batch and the other 10 kgs. per batch. Both units are in operating condition.

4. A vacuum mixer which is not operable due to lack of parts and maintenance.
5. An ice maker that is not working well, but can produce ice.
6. A small domestic type freezer for holding meats until required for processing.
7. A piston type sausage filler.
8. An ice breaker.
9. A batch type unit that can be used for smoking, drying or cooking sausage.
10. A manual closing machine with change parts for various sizes of cans.
11. A semi-automatic vacuum can closing machine with change parts.
12. A semi-automatic atmospheric can closing machine with change parts.
13. Three retorts for batch processing of canned meats.

The sausage equipment is used frequently to test different formulations; the canning equipment does not seem to be used very much; the closing equipment will probably require maintenance before it can become operable.

The meat section also has a steam cooker/granulator for cous. Research for the USAID cowpea project is being conducted in this section which is equipped with a ribbon blender for cooking and a batch tray dryer.

### **3. Fruit, Vegetable and Nutrition Department**

This department has a staff of 28 people and is divided into three divisions: (1) nutrition; (2) cereals and legumes; and (3) fruits and vegetables. The nutrition division consists of five people and a laboratory that is in the process of being installed. Once this has been accomplished the division should be able to conduct experiments on dietary and nutritional requirements in Senegal.

The cereal and legume division is one of the most active divisions at ITA and consists of three sections; (a) grain storage; (b) milling; and (c) a bakery.

The grain storage section is responsible for insect control and improving the grain storage facilities in Senegal. There is a small laboratory with equipment for drying grain and identifying insects that attack the different types of grain. The director of this section received his education in Yugoslavia and has taken courses in grain storage in London and at Kansas State. He mentioned the need for equipment to control temperature and humidity. The personnel in this section seem to be knowledgeable and capable of doing excellent work in this field.

The milling section has a wide variety of machines donated by foreign countries that allow them to clean and mill different types of grain. Some of the equipment is excellent, while other units need repair or are obsolete. Most of the machinery has a limited capacity which is satisfactory for a pilot plant operation, where the need is for equipment that can handle the many different types of grains that are being tested; the machinery is not appropriate for volume production of any one item. The following is a list of the machinery in this section:

1. Stone remover/cleaner. Used for cleaning grain by removing dirt, sticks, stones, undesired grains, weed seed and other foreign material from the grain. The unit is in operating condition.
2. Hulling unit. Used for removing the outer hull or skin from certain grains.
3. Cowpea huller. Used for the experimental cowpea operation funded by USAID.
4. Three locally made Jet 13 milling units used for grain milling.
5. Three Moflaay mills. One is used for fine flour with a capacity of about 30 kgs/hour, one unit is used for semolina that has a capacity of about 80 kg/hour and one unit is used for milling rice with a capacity of about 150 kgs/hour. The equipment seems to be in good operating condition.
6. One SKIOLD mill for semolina with a capacity of 150 kgs/hour. This machine is not used frequently and will need maintenance.
7. One Alpine flour mill with a capacity of about 175 kgs/hour.
8. One Buehler laboratory model for wheat flour that has a capacity of about 15 kgs/hour. The unit seemed to be in good operating condition.
9. Two flour sifting units, one large and one small. Both are in operating condition.
10. One complete laboratory flour mill from India. The unit is obsolete and lacks spare parts to be operational.

The bakery section is complete and operational, though many of the machines could use maintenance to improve efficiency. This section produces various types of breads using different flour formulations and a variety of specialty items such as croissants and cakes. The products are made daily and the limited production from the bakery is sold to ITA staff.

This section has the following equipment:

1. One Diosana mixer with a capacity of 55 kgs. of flour per batch;
2. One water cooler to provide cold water for dough mixing;
3. One dough separator;

4. One loaf former;
5. Two dough fermentation units;
6. One small mixer for cakes;
7. One Paviller oven for bread with a capacity of 144 loaves per batch; and
8. One small oven used for baking cakes and specialty items.

There is a shortage of cake molds which could be purchased at a minimum cost and would increase the efficiency of this section.

The fruit and vegetable section has a complete pilot plant for processing fruit pulps and manufacturing concentrates, jams, jellies, marmalades and nectars. This line was installed in 1985, consequently it is in excellent condition.

Cans and bottles are filled manually which is not a good method of operation, even in a pilot plant, as liquids should be filled at about 91 degrees centigrade (195 degrees fahrenheit) to produce a vacuum in the can or bottle after closing. It is difficult to maintain this temperature in a manual operation; as an alternative retorts are used to sterilize the cans after closing to avoid spoilage. Can closing and bottle capping is also done manually. If ITA plans on using this line for small scale commercial production, semi-automatic closing and filling equipment is needed.

The line was not designed to process vegetables, though some of the machinery such as the washer and inspection belt can be used for this purpose. At present kettles are used to blanch vegetables; this is acceptable if the water temperature and blanching time are controlled. All of the operations are done manually such as grading, peeling, trimming and snipping the ends off of green beans. Cans are filled manually and hot brine is added prior to manual closing. In order to obtain a good vacuum in the cans, boiling brine should be added to small cans, while larger cans should be exhausted or heated to a closing temperature of about 71 degrees centigrade (160 degrees fahrenheit). In modern canneries steam flow closure is used to produce a vacuum; however, this requires high speed equipment that cannot be justified in a pilot plant. A simple solution would be to use a small semi-automatic steam exhaust box that can be manufactured locally. Adding brine and closing could be done on the same equipment suggested for the fruit line. A two basket retort is available for pressure processing vegetables and sterilizing products from the fruit line.

The pilot plant should have a capacity of about 750 to 800 kilos of raw fruit input to arrive at 350 to 380 kgs/hour finished product output, depending on the type of product that is being processed - juice, nectars or concentrate. The line has a batch type vacuum evaporator with a capacity of about 200 kgs/hour that can be used for concentrating juice or manufacturing jams and jellies.

The Vettori-Manghi line from Parma, Italy has the following equipment:

1. Tank type washer with sprays;
2. An inspection and trimming conveyor;
3. An elevator feeding a pitter and peeler;
4. A hot break or heating unit;
5. A pulper and finisher;
6. A vacuum evaporator;
7. Manual filling and closing equipment for cans and bottles;
8. Several steam kettles for heating and adding brine;
9. A two basket steam retort for sterilizing;
10. A small quality control laboratory with the necessary equipment to check the quality of the products that are being manufactured; and
11. Three storage rooms for frozen products.

One of the complaints about the pilot plant is the amount of cooling water used by the evaporator which increases production costs. Since the cooling water does not come in contact with the product, a simple solution would be to reuse the water by means of a cooling tower that can be manufactured locally at relatively little cost.

#### 4. Technical Support Department

This department is divided into two divisions: (1) maintenance and (2) packaging. There are only two people in the maintenance section, the department head and a technician. Staffing is inadequate to maintain all of the equipment at ITA, especially some of the high technology equipment used in the laboratories. The maintenance section should be increased and personnel trained in how to maintain the existing and new equipment supplied by foreign donors. Donors should be requested to provide training for local personnel in the operation and maintenance of their equipment and to supply sufficient spare parts to keep their units operating for at least a two year period.

Packaging is a very important part of food processing. At present this section has no personnel. This is unfortunate because the cost of packaging, particularly in Senegal is extremely high. Adapting or testing new packaging materials that could be used in Senegal should be undertaken, particularly as there are new materials being developed throughout the world to reduce this cost of processing. It may be worthwhile to consider having an engineer who can be responsible for keeping ITA abreast of changes in packaging technology.

### C. The Future Role of ITA

As noted above, ITA was developed as a government supported service industry. Its mandate was to assist public and private firms in food processing technologies and quality control. It was supported by the FAO and other donors over the years who had a primary interest in promoting processing of locally produced foodstuffs, enriching or improving food products through processing, and adapting technologies to the Senegalese food sector. Most donors would not permit ITA to recover the costs of research, adaptation or development of products or processes.

Given ITA's origins, it has not developed the capability to function as a market driven institute, searching for processes, techniques and formulas that could be developed for profit. Until recently, almost all of its work has been publicly funded.

At the present time ITA does not have a strong sense of direction. Given its resources, in plant, equipment, personnel and budget support, its focus must be narrowed. Research and development within the food processing sector, as opposed to ITA's work in quality control, must be driven by market realities, if ITA is to have any hope of recovering operation and development costs. As a first requirement ITA must either develop its own capacity to undertake market analyses or it must establish a relationship with institutions or firms that can assist with this function.

Once market research has been initiated, ITA needs to focus on those products or processes which have the potential to generate the greatest revenues. At this time, that is likely to be items aimed at a very small market segment, more than likely a high end market target. This should include low-volume products which have very high margins, such as specialty fruit processing, exotic juice concentrates, and hot sauces.

Marketing such products must be innovative. For example it may be necessary for ITA to offer a firm or an individual the exclusive right to produce a product it has developed. It may be necessary for ITA to produce and market the product itself; ITA may choose to produce a specific component of a product's ingredients, which is maintained as a closely guarded secret formula, a la Coca Cola. It remains for the legal consultant to determine if ITA is permitted to operate in this fashion in its current legal status.

These cases reveal that at this time it may be necessary for ITA to work in conflict with its mandate to promote the widespread use of locally produced products through the food processing industry for the consumption of the greatest number of people. ITA can only operate within the supply and demand structure dictated by the Senegalese economy. Without low cost inputs, low cost outputs cannot be generated via a processing industry, no matter how efficient.

It appears that ITA has little knowledge of the general business atmosphere within which it must to work. This includes production processes, i.e., knowing who produces what, where it is produced, what the levels of production are and the constraints to increasing production and reducing costs.

ITA also does not seem to be fully versed with the market situation and structure for many of the products it has been using in researching processing possibilities. There is only a limited understanding of and interaction with the modern and artisanal processing industry. It is essential that ITA gain this understanding, in order to better research the needs of the sector, and to understand the economics and marketing structure of the member industries, their sources of raw materials and other inputs and constraints to expanding their processing volumes.

Further, there seems to be some lack of understanding of the general policy and legal framework under which the processing sector is operating. This includes fiscal incentives and constraints, and the changes that have been wrought during the 1980s under the economic restructuring. ITA must be able to answer the following questions:

- What opportunities are developing for the industry as these fiscal changes occur?
- What limitations have been newly created?
- Have the changes in the tariff structures for imports reduced or enhanced the potential for local processing?
- Are government policies to support producer prices and hold down consumer prices effectively removing the profit margins from processing?
- Are there opportunities for processing products where government intervention is not onerous?

In defense of ITA, the Institute was created to focus almost exclusively on the research of the ways to use Senegalese food products through transformation or processing. It does not have the support departments that are needed to address the question of developing the food processing industry. It has not had engineering expertise to evaluate or develop processing equipment or facilities. It has only recently started to consider the economics of food processing. It has never had the capacity to address the marketing system for processed foods. All this considered, it remains true that if ITA is to move forward, accepting its new guidelines, it will need to develop a new knowledge base from which to work.

Right now, there are a number of constraints to ITA's more extensive involvement with the private sector. One is its view that food processing is mainly a technical matter involving formulation, preservation or packaging. The second constraint is the structure of the sector itself. Older and larger firms appear complacent, or even stagnant, in their outlook. They are not actively seeking new products to process or new formulations to market. The small firms have problems beyond simple technical constraints. In a private sector training needs assessment completed in June of 1988<sup>3</sup>, the following constraints to small, private enterprise development were identified: lack of management skills, particularly as related to planning, marketing, pricing and accounting; lack of available credit for both working capital and investment; constraining labor legislation; high factor costs of production, especially as compared to factor costs elsewhere in West Africa; low levels of productivity among workers; and lack of adequately trained middle or line managers. Given these problems it is unlikely that any results of ITA's research will be exploited by the private sector, unless the development of an enterprise is approached from an integrated viewpoint.

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<sup>3</sup> Deborah M. Orsini and David P. Harmon, Private Sector Training Needs Assessment, HRDA Project, USAID/Senegal, June, 1988 (Labat-Anderson under contract to the Agency for International Development).

#### IV. The Food Processing Industry

There are a limited number of reasons that food processing takes place. Production in excess of current consumption requirements during the harvest season is processed or stored for later consumption. This is common in the case of cereals, which are generally easy to store. In the case of more perishable products like fruits and vegetables, the products are usually transformed by drying, freezing, refrigerating or transforming and storing under conditions to prevent spoilage. A second incentive to process is excess production in one region that cannot be consumed locally, but which has a market elsewhere. Processing may be required in order to reduce shipping costs, prevent spoilage, or allow holding for more favorable market conditions. Food processing and storage gain the advantages of inter-seasonal or inter-regional supply shifts, thereby capturing profits from price differentials caused by supply shifts. Processing will usually have the effect of reducing price fluctuations, and will increase food supplies because of the reduction of spoilage.

Food processing may make a product consumable, or useful in another form. This is the case with most vegetable oil processing, such groundnuts and cotton seed in Senegal. It is also the case with cereal milling, or reconstituting previously processed food products such as powdered milk.

Encouraging food processing firms to undertake the transformation of surplus produce, whether seasonal and/or regional, requires that there be an adequate profit margin between the cost the firm must pay for the primary or raw product(s) and the wholesale value of the processed product. Because the elements required for these conditions to be favorable are not always stable nor easily determined, they are discussed more fully under the headings of supply and demand below.

In general, the food processing industry in Senegal is large scale and aimed at a broad consumer market. This is the most mature part of the food processing industry. Potential gains in these industries will come from more efficient operations and management, an increasing market demand, or changes in supply parameters.

As economies mature, consumer demand can either expand or shift due to several factors. These include increased income, time constraints requiring reduced food preparation time, shifts in diet due to changes in tastes or better understanding of nutritional requirements. In these cases food processing industries may find new markets for new products developing. This has long been the case in the industrialized countries of Europe, North America, and Japan, and more recently in newly emerging economies of Asia, North Africa and to a limited extent, Latin America. However, in all of

these countries, the changes are usually gradual, with the first steps being the development of a small market for more sophisticated and expensive processed food products, usually associated with a higher income urban subgroup.

Changes in produce supply could occur due to increased irrigation, improved cultivars that greatly increase yields, improved transportation networks, electrification of the Senegal Valley, or other factors affecting supply and the price of raw materials.

With the exception of the fishing industry, Senegal is not a major producer of processed foods, as there is not a surplus of raw material that can be processed; available raw materials command a high market price, making it difficult to compete with imported products at the processed level. Annex VII contains a list of 50 food processing plants in Senegal, 17 of which are involved with canned, dried or frozen fish; 4 are manufacturers of food products; 3 are flour mills, concerned primarily with imported wheat; 3 are biscuit or cookie manufacturers; 2 plants are concerned with tomato products; 2 plants deal with milk products, but mainly reconstituted dried imported milk; the balance deal with a variety of basic food products.

The consultants held meetings with a milk processor; a company producing tomato paste; a company producing dried and salt fish for export to central Africa; a private businessman who exports fresh mangos and is interested in producing dried mangos; and wholesale and retail food outlets, both government controlled and private.

In discussions with these firms, it was evident that most of the larger firms, especially those with connections to international companies, have little interest in working with ITA. These firms have their own capacity to conduct analyses and product development, or they can get these services through their parent or collaborating firms, who they feel are more reliable. ITA could conceivably work with some of these for quick turn around analyses, if it can establish a reputation for doing quality work in a hurry. The dried fish producer did need help in defatting certain types of fish. However, he indicated that he would only pay for a successful outcome. Some of the smaller companies could use help in preparing feasibility studies in specific technologies, but it is not clear if they understand the possible costs of this work.

The food processing industry in Senegal can be divided into two groups: industries that require large scale investments to provide efficiency in their operations, and small to medium sized industries scaled to meet the needs of the domestic market or to export specialty products. Examples of the first group are flour milling, vegetable oil extraction, slaughterhouses, sugar milling, beverage manufacturing, integrated fishing operations, canned and powdered milk, and tomato paste production. These types of plant

will normally have their own quality control laboratories and should be able to conduct a certain amount of research in their fields of specialization. The only way that ITA can hope to penetrate this market with its services is to offer quality and fast service, and convince the managers of these companies that it is cost effective to contract these services rather than to do them in-house. ITA may be able to offer some services that these companies currently lack, or obtain outside the country, but this will need to be further researched.

The second group of companies includes processors of fresh milk in pasteurization, producers of ice cream, yoghurt and cheese, small bakeries, candy or confectionery producers, canneries for fruit nectars, pulps, jams or jellies, specialty meat items such as sausages or pates, and condiments such as hot sauces, pickles and mustard. As these plants are relatively small, they may not be able to afford a sophisticated laboratory for quality control, product formulation, and new product development; they may lack experience in production methods, cost accounting, marketing and management. This group is likely to need the technical assistance of ITA.

Annex VIII contains a list of 84 clients with whom ITA has had contact or collaborated to provide services. Most of the members of this list are small companies, with the exception of those firms used to test products developed by ITA, such as supermarkets and hotels.

Within this brief and general framework of food processing, it is useful to look at the general nature of the supply and demand side of the food industry to determine what the potential is in Senegal for the expansion in this sector. In the next section we look at the agricultural setting, the production or supply side to the processing industry, and the consumption or demand side of the industry.

## V. THE AGRICULTURAL SETTING

### A. General

The primary sector, comprised of agriculture (12%), livestock (6%), fishing (2-4%) and forestry, contributes about 20% to GDP.<sup>4</sup> The country can be roughly divided into zones relative to rainfall and the type of primary economic activity relative to each area. North of the 500 millimeter isohyet, livestock growing and rainfed cropping of millet and cowpeas predominates. In this area, a small zone along the Senegal River has substantial acreage in irrigated perimeters and in recession agriculture. Rice is grown in this area, as are other cereals such as sorghum and maize and vegetable crops. In another subzone, north of Cap Vert (i.e., north of Dakar), along the coast there is a fairly heavy concentration of vegetable production for the urban and export markets. This area, called the Niayes region, is influenced by the ocean, and has general climate and micro-climates quite favorable to certain crop production.<sup>5</sup>

To the south of the 500 millimeter isohyet is the peanut basin comprised mainly of the regions of Thies, Diourbel, Sine Saloum and Southern Louga. Here is concentrated the main peanut production zone, primarily for export, along with millet and sorghum production. Also found in this zone, along the coast, is a heavy concentration of artisanal fisherman. East and south of the peanut basin in Senegal Oriental, southern Sine Saloum and Upper Casamance a wider variety of crops are grown; it is the main area of cotton production. In the Lower and Middle Casamance farmers grow swamp rice, maize, peanuts and sorghum. It is also the main production area for oil palm and fruit trees.

Of a total of about 3.7 million hectares of cropped land in

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<sup>4</sup> This figure varies from year to year, mainly depending on weather and crop production. The figure give above was estimated as an average by Abt Associates, Inc., Draft SENEGAL AGRICULTURAL POLICY ANALYSIS, September, 1984. The World Bank estimates list agriculture's contribution as high as 30% as late as 1979/1980.

<sup>5</sup> This narrow strip of land, about 15 kilometers wide, stretches along the Atlantic coast between the Cap Vert peninsula in the south and the Taciner (St. Louis area) on the Senegal River estuary in the north. Its climate is influenced by its proximity to the ocean, which has a cold sea current due to the northeast trade winds which blow from November to April, and high degree of humidity in the air. The Niayes are intermediate depressions, flooded due to high water tables, which lie behind the barrier of coastal dunes from Dakar to the Senegal River.

Senegal, 90% is in rainfed cropping, and 90% of cereals are produced under rainfed conditions. Given the extreme variability of the rainfall, this has meant that food production can fluctuate widely from year to year. General estimates of the area in major crops<sup>6</sup> are peanuts 47%, millet/sorghum 44%, rice 3%, maize 2%, cotton 2% and cowpeas 2%. Of the irrigated land of about 25,000 hectares, 1/4 is in sugar cane<sup>7</sup> and most of the rest is devoted to rice.

There are very few large farms in Senegal. Earlier studies showed that 94% were under 10 hectares, and only 1000 farms were in the 50-100 hectare range. In 1960, 80 percent of the population lived in rural areas and were engaged in agricultural activities; two-thirds of the population still does.

Poor soils, a dry climate, erratic rainfall, and a series of subsistence farming systems limit the contribution that agriculture could make to economic growth. This is further exacerbated by the fact that Senegal's main agricultural exports, groundnuts--and to a lesser extent cotton--face major competition in world markets. Efforts to diversify to other crops, even for import substitution have not been very successful. Sugar cane and rice production in the river valleys have proven to be very costly; they have not proven able to compete economically with imported sugar and rice. Much of the country is limited to the production of millet and sorghum, cereals which are low yielders, and are not particularly favored by an increasing urban population which has shifted its tastes more and more to rice and wheat. Attempts to curtail the imports of these commodities, or to substitute higher-cost locally-produced goods, in the case of rice, meet with resistance by a politically volatile urban community.

Rich fishing waters lie off of Senegal's coast, and a fairly dynamic fishing industry has developed. In fact, the World Bank considers fishing and livestock to have contributed most of the growth in the agricultural sector between 1960 and 1980. It was considered that this growth, about 3%, would have been close to zero without these two subsectors. Exports of fish and fish products for the 1983-1985 period are given as averaging \$112 million, or 20.5% of the total merchandise exports--almost equal to groundnuts. There would appear to be scope for further development in fishing, an industry which is currently dominated by foreign-licensed trawlers, and small boat and artisanal fishermen.

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<sup>6</sup> Note that the estimates cover 100% of the cropped land in major crops. This could be somewhat misleading because several crops are grown in combination, most notably cowpeas (niebe) which is almost always intercropped with cereals.

<sup>7</sup> Operated by the Compagnie Sucriere Senegalese or CSS.

Tourism was promoted in the early period after 1960 as a replacement for the economic loss of visitors to the capital of the West African Federation. Tourism steadily rose; by 1980 it contributed 25% of non-merchandise. This subsector seems to have leveled off somewhat since then, according to non-disaggregated data provided by the IMF. There has been, however, a steady increase of official visitors over the last two decades as Dakar has remained a center for West African development and business activities. This sector can be very promising to the food processing industry.

## **B. The Supply Side: Specific Production Patterns**

### **1. General**

For over 15 years, Senegal has been having difficulty producing adequate foodstuffs to cover its local food requirements. Cereals production currently covers less than one-half of the needs of the population as determined by the Ministry of Rural Development at about 210 kgs/capita per year. Red meat consumption is about 10-12 kgs/capita; supplies do not exist to increase this. It is difficult to estimate poultry supplies; although poultry is regularly consumed in the rural areas, it is becoming increasingly difficult for the urban poor to find affordable supplies. Fish is the one meat source that seems to be the most available. Currently it is estimated that per capita consumption of fish is over 20 kgs/per capita. Large quantities are exported each year from Senegal's fertile ocean fishing waters.

One of the major criticisms levelled at Senegal is that food supplies are diminished because of losses occurring from inadequate storage, transformation and conservation techniques. These inadequacies are not sufficiently addressed, the argument runs, by government research units such as ITA, or by the private sector processing industry. Inadequate investments have been made in this area, and capacity is limited to selected items. Further, restricted capacity in this domain is an added constraint to expansion of the supply of foodstuffs, most notably vegetables, fruits, fish and meats.

However, to argue that investments in processing are inadequate is to beg the question. Low productivity of crops and livestock and the concomitant high producer prices are a greater constraint to food processing than the level of technology available. If there are not adequate profit margins between the price of raw materials and the consumer prices charged to support the food processing, storage and marketing system, then investors are not attracted to the industry.

## 2. Cereals and Pulses

### a. Millet and Sorghum

Millet was the first product researched by ITA. A traditional crop of Senegal, it is the staple cereal of the country, particularly in the rural areas.

Millet is considered, with sorghum, a food crop as opposed to groundnuts which are considered a "cash crop". This is one of the main reasons that the quantities on the market are small, sometimes even nonexistent. This is particularly true in years of low production due to unfavorable weather conditions, particularly low and badly distributed rainfall. Cropping is restricted to the rainy season; harvest is done in October-November depending on region.

Attempts to develop cereals production so as to reach self-sufficiency have not had the results hoped for. The statistics of production, published by the Ministry of Rural Development, have, until recent years, combined millet and sorghum in global figures.

For the last four years the production by region are as seen in table VI.1. For the last two production seasons, complementary data are available that disaggregate millet and sorghum production figures as noted in table VI.2. The data indicate the extreme variation in production among cropping seasons.

Marketing of cereals until 1986, was regulated by parastatal organizations such as ONCAD<sup>8</sup>, followed by SONAR<sup>9</sup> who had marketing monopolies. Prices were officially fixed by the government for each production season, and were supposed represent a minimum, or floor price, to be paid to the producer. These prices have risen from a level of 20 FCFA in 1968/70 to 65 FCFA in 1987-1988. These prices were used by the official buying agencies through the cooperatives. Because the buying agencies, (and hence the cooperatives) often made the farmers wait a long time for payment, farmers usually preferred to market any surplus production with private merchants who paid immediately. This was usually reflected in the small quantities bought by government agencies.

Since the adoption of the new agricultural policy the markets have been liberalized, and only a floor price is maintained. Monitoring of the market is now the responsibility of the Food Monitoring

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<sup>8</sup> Office National de Commercialization et d'Aide au Developpement.

<sup>9</sup> Societe Nationale pour l'Approvisionnement Rural. This agency was given responsibility after ONCAD was disbanded in 1980.

Council<sup>10</sup> which publishes market prices in the newspaper each week.<sup>11</sup> For the week of December 5-10, 1988 the price of millet souna (producer) varied between 50 and 75 FCFA per kilogram while the consumer price varied between 70 and 110 FCFA.

b. Corn

Corn production is much less important than millet and sorghum, and is not as widely distributed. This is because, in many cases, corn must be grown under irrigation, unless rainfall is high and evenly distributed. Therefore, the principle producing regions are Casamance, followed by Tambacounda and Kaolack. There are some marginal producing regions near Dakar, St. Louis and Fatick. The data for the last four years by region (table VI.3) clearly show this.

The figures, on the other hand, show that corn production is not nearly as subject to variations in climate as is millet. Variations in production are usually associated with area in production.

As with the other cereals, corn has been subject to a fixed producer price, which went from 18 FCFA per kg. in 1968 to 47 FCFA in 1981/1982. Since the liberalization of the market the price has varied from 45 to 70 FCFA for the producer and 60 to 110 for the consumer.

c. Cowpeas

Cowpeas are grown throughout all the regions of Senegal. Traditionally cowpeas are intercropped with millet/sorghum, either in the millet rows or between rows. Sometimes they are grown as a recession crop like some vegetable crops. For the most part, cowpeas are grown as a food crop, and the quantities on the market will vary greatly. Total production of cowpeas is much less than that of cereals. Regional production data is given in table VI.4.

Climatic conditions do not seem to be the only cause for the wide fluctuations in production. After a record harvest in 1985/86, production continues to decline; 1986/87 was a year with a more or less low rainfall and badly distributed, while the crop year 1987/88 was considered good in that sense.

Work on cowpeas at ITA has covered both storage and processing. Storage has always been a problem with cowpeas, and early work at ITA was oriented toward finding a low-cost and simple method by which rural households could store small quantities, mainly for

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<sup>10</sup> Conseil de Surveillance Alimentaire (C.S.A.).

<sup>11</sup> Journal "Le Soleil".

home use. Recently, work financed by USAID has looked at processing cowpeas to be mixed in wheat or millet flour, and for other forms of consumption. Reducing the degree of flatulence caused by consuming cowpeas as cooked beans has been of major concern.

Marketing of cowpeas has not been recorded, and no data is published on quantities or prices marketed.

### 3. Fruit Horticultural Production

#### a. Fruits - General

A good deal of the efforts of ITA are in the fruit produce area. Some of these have a reasonably large production such as citrus and mangos, while others are produced in insignificant quantities, like guavas and corossol. Fruit production in Senegal is poorly structured. Most of the production is in household orchards, or plantings, and in some cases mini-orchards. Most of these plantations are very heterogeneous and contain, depending on regions, a wide variety of fruit types. Modern orchards with single specie plantations are few, and have been established uniquely in the zones of the Niayes<sup>12</sup> in the north, and in Zuginchor and Kolda in the south.

A study done by the French Fruit and Citrus Research Institute in 1981 indicated that the conditions in the Senegal River Valley (Fleuve) were quite favorable for fruit production, possibly even more so than in the Casamance and Cap Vert. They concluded that a wide variety of fruits could be produced both in the dry upland soils and the valley soils. However, research and testing is required, as is the need to establish tree nurseries, which is also true for most other areas of Senegal. One advantage of developing fruit production in this area, as is the case for vegetables, is that it will receive electricity from transmission lines from the new dam, which should be extremely beneficial to any processing industry.

The estimated production of major fruits in 1986 is provided in the following table.<sup>13</sup>

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<sup>12</sup> See note on this area above.

<sup>13</sup> Because of the difficulty in collecting the data, the wide variations in production and the type of plantations, a production range is given.

## ESTIMATED PRODUCTION OF MAJOR FRUITS IN SENEGAL

Mango	from 70,000 to 80,000 tons
Citrus	from 30,000 to 35,000 tons
Banana	from 5,000 to 7,000 tons
Coconuts	from 1,000 to 1,500 tons
Pineapple	from 200 to 250 tons
Others	from 2,000 to 3,000 tons

It is notable that 70% of the production of mangos is derived from non-grafted trees; the quality of the fruit is mediocre, and sometimes hardly consumable (large seed, very fibrous flesh). The same is true of oranges of which 90 percent of the trees are non-grafted. The major part of the production is not of commercial quality for consumption as fresh fruit. It has not been determined yet if this fruit is useful for processing.

The production of fruit is not sufficient for local consumption needs, and must be augmented by large imports. As is noted in table VI.5, non-tropical fruits, such as apples, pears, and grapes are grouped under the heading other fruits, and represent the largest category of imported fruits. For the most recent years the data on imports are given in table VI.5.

Exports of fruit is not very important as is seen in table VI.6. The categories other tropical fruits and other fruits are most likely only re-exports. It would not be possible for Senegal to export the quantities in these categories as noted in table 7, as only 2,000 to 3,000 tons are produced domestically. Taking that into consideration, Senegal exported about 2,000 tons in 1985, 500 tons in 1986 and 200 tons in 1987.

### b. Major Fruits

#### (i) Mango

This fruit is the most widely grown. Anywhere there is a water table within reach of the mangos' deep root system, they can grow. This is primarily the reason for their wide dispersion. However, some regions are better suited to their production than others; establishment of orchards should be concentrated there.

The largest production is located around Dakar, particularly around Thies or in the Casamance. In the northern zone, i.e. Dakar/Thies, the coastal band called the zone of Niayes seems to be the most favorable, and most of the modern orchards are found there, particularly at Sebikotane, M'boro and Pout. There is also a fairly large production in the department of M'bour. The region of Thies produces 35,000 tons. In Casamance, the principle producing zone is Bignona which alone produces 27,000 tons,

followed by Sedhiou with 9,000 tons and Ziguinchor with 4,000 tons. The entire region produces more than 43,000 tons. Of the total production, grafted trees produce about 25 to 30 percent, or for the entire country, 19,000 to 23,000 tons.

The main production season is between May 15 and July 15, depending on varieties. Specialists assure that the season could be expanded to about six months if a wider selection of varieties were planted.

Farmers do not practice the best techniques of harvesting mangos. Picking of fruit is not done with care, partially because of the size of the trees; fruits are often bruised. The fruit is usually picked too early, before it has adequately matured which is injurious to their organo-leptique quality. The harvest is rarely graded and sized; is usually badly packaged; is often in semi-bulk in used jute bags; and is rarely in boxes or cases designed for fruit.

Depending on quality, producer prices of fruit of grafted mangos during the height of the season run between 50 and 80 FCFA/kg. Some especially good varieties can bring as much as 120 FCFA/kg. Non-grafted mangos bring only 30 to 50 FCFA/kg.

Some mangos are exported; however, conditions are not favorable for Senegal to develop this market. Unfortunately, the harvest period corresponds to the beginning of the spring fruit season in Europe for cherries, strawberries, apricots, peaches, etc. In addition, Senegal's prices are not competitive with those of neighboring countries.

#### (ii) Citrus

The production zone of citrus is more or less the same as that of mangos. Most types of citrus are found in Senegal, with oranges being the most important, followed by lemons/limes, mandarins and grapefruit.

The largest production zone is Casamance, where total production is between 30,000 and 32,000 tons. The Department of Bignona leads with 17,000 to 19,000 tons followed by Sedhiou with 9,000 to 10,000 tons. Oranges lead production with 22,000 to 24,000 tons. Lemon/lime follows with 5,000 to 6,000 tons and mandarin production is between 1,200 and 1,500 tons. Grapefruit production is marginal at only approximately 400 tons.

The second producing region is Thies; its output is nowhere near that of Casamance. Estimates are that 1,000 to 1,200 tons of citrus of all types are produced in Thies; detailed figures are not available. No data is published for the region of Dakar, even though there are several modern orchards developed there.

Modern orchards are not numerous, but are found in the Casamance at Ziguinchor, in the region of Thies at M'bor, in the region of Dakar at Sebikotane and Keur Moussa. There is also a very recent orchard development at Louga by Mr. Djilly M'baye.

In general, the quality of citrus is average, with a significant part being mediocre to poor. The principle cause of poor quality is the method of cultivation, particularly the insufficiency of irrigation. In some cases, notably in the Casamance, the trees are never irrigated; they are expected to produce solely by rain and groundwater. Phytosanitary treatments are never done against insect and pest damage. The result is that the fruit is insufficient in juice; the appearance is not good; and there are often damage spots in the fruit. In addition, because of the excessive heat, the color of the peel stays green because the transformation of the chlorophyll into carotene does not occur. Given these problems, marketing is difficult.

Meanwhile, a certain clientele accepts and even looks for the product, and proceeds stay quite high, even during the peak harvest period. In the markets and among the vendors of Dakar, prices run between 250 and 350 FCFA per kg. for oranges of medium quality.

As with mangos, the harvesting of citrus fruit is not done correctly, nor at the most opportune moment. Given that the coloration is not defined, it is difficult to determine the proper maturity of the fruit. Again, jute bags are used for packing for transport in lieu of proper boxes or crates.

#### (iii) Bananas

This is the third most important fruit in Senegal, and has not been included in any research by ITA. It is grown exclusively in the Casamance in commercial quantities. Production does not cover the demands of the market; imports are almost equal to production, running between 3,000 and 4,500 tons each.

#### (iv) Other Fruits

There are several other minor fruits, coconuts, avocados, guavas, and papaya, which are grown. Coconuts and avocados have not been included in ITA research. Production of guavas is about 180 tons, exclusively in the Casamance. Papaya, with a production of 1,000 tons, is produced mainly in the Casamance, although it is found throughout the country. In the latter case, however, it is usually small groups or isolated trees of traditional varieties which tend to be very heterogeneous. A variety, "Solo," brought in from the Antilles is grown, but more as a sunscreen in association with pineapples.

Other fruits such as Ditax, Jujbe, Tamarind, Gingembre (Ginger), Corossol (Custard Apple) and Pomme Cajou have been included in

research done by ITA. These fruits are grown in small quantities in Senegal. No statistics on them are available. They show up on the markets during their harvest period, but their production is problematic. Producer or market prices are difficult to estimate with any precision.

#### 4. Vegetable Horticulture

Vegetable production has long been of concern to agriculturalists in Senegal. Much of this attention was focused on providing fresh vegetables to the urban markets. The region of Dakar, formerly that of Cap Vert, was until recently the major vegetable producer. In the last years, the urbanization of the area and the satellite town of Pikine has pushed the gardening area outside of the city limits and into other areas. It seems that currently the region of Thies is the predominant producer.

Traditionally, vegetables are produced on small parcels of land averaging 2,000 to 3,000 square meters. Before the drought, gardens were established around the periphery of the "Niayes" or ponds,<sup>14</sup> and were planted as the water descended, in recession farming. Since the 1970s, the drought has forced the gardeners to dig wells or pits for irrigation water. Since 1985 the rains have been more normal, and the water table has risen. This has caused the development of larger gardens. Some of these are irrigated with boreholes of various depths. In several cases, private and government companies have been created to develop agro-industrial truck farms of several hundred hectares.

##### a. Production

Tables in Annexes II and III give figures on production for the years 1985-86 and 1986-87. From the data it is noted that the greatest production is between onions, cabbages, tomatoes and potatoes, which dominate the other vegetables. These are the vegetables consumed the most and which are used most frequently in traditional cooking. None of these have been studied by ITA.

These are the crops destined for the fresh vegetable market. These data do not include the production of crops like tomatoes for processing. That production is concentrated in the Senegal river valley in the region of St. Louis at Dagana.

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<sup>14</sup> See notes about the Niayes above. In addition to the Niayes, there appears to be another term used for more or less the same type of lands, termed Ndiuki, which means "to draw water with ease". Whereas the Niayes are usually considered those areas that tend to run perpendicular to the coast, the Ndiuki are directly on the coast.

Almost all of the vegetables are grown during the dry season between October and June. The harvests began usually in December for the early maturing varieties and types and continue until June for the late types. For the short-cycle crops it is possible to have two crops per season, such as is done for potatoes, under the condition that seed is available when needed. For some crops, like onions, it is necessary to use one season to produce sets (small onion bulbs) for production in the next season.

The quality of the crop varies greatly depending on the technical level of cultivation practiced. This is particularly true of pest control; the cultivation of the crop is continuous and therefore is under constant attack by parasites as well as by animals and plants.

The harvesting of produce is often not done in such a way as to guarantee quality. Of major importance in this regard is the lack of protective packing materials. This is true both when picking in the field and when transporting to market. The usual packages are the jute sacks noted for fruits, or packages made from the leaves of palms. Sometimes boxes used for importing fruit or potato seed are used. In addition, most of these packages are overfilled, causing losses from bruising, crushing, etc. Transport is also inadequate. Many gardeners use local micro buses, trucks that are used for transporting people, or small pickups.

#### b. Marketing

Dakar, as is the case with all the large towns in Senegal, does not have a large wholesale market. Rather, the first stage of marketing is usually done at one of the retail markets called "Castor" markets, before opening time. There are other points where this may be done within the city as well. There have been, in the past, recommendations to establish small markets for this purpose at the production zones, but this has not been done. In most of the cases, the relationship producer-retailer or producer-wholesaler, is conducted by intermediaries, either brokers or special businessmen called "bana-bana" who often possess the familiar small pickup trucks. These people determine both the buying and selling prices of the produce. The market margins vary according to the number of bana-bana in the market. They know the market well, and often guide the producer through its intricacies, particularly if the producer has borrowed operating capital from them. This relationship represents one of the keys of the system.

There are no regulations or standards or controls applied in the market for fruits and vegetables. It seems impossible to envisage how these could be implemented. This is unfortunate, because problems can arise, particularly concerning sanitation and hygiene.

The largest share of vegetable production is destined for local consumption. The one exception is green beans which have been cultivated for export. At one time most of the fresh green beans in Senegal were rejects of crops grown for export. That has changed and now one finds good quality beans in the market. However, it seems that the major share of this crop is still exported. Of 4,180 tons grown in 1985/86, 4,000 tons were exported. In 1986/87, of 2,765 tons of produced, 2,390 tons were exported.

#### c. Exports

Produce exports from Senegal are generally destined for European markets, which are close and best served by transportation systems. For a long period, Senegal was the largest and one of the only exporters of green beans to Europe. In recent years, Senegal has faced increasing competition in this market from several African countries such as Bourkina Fasso, Cameroon, Kenya and Rwanda. This has caused a glut on the market and has already discouraged several green bean exporters from Senegal who have suffered large losses from time to time.

A few other vegetables are exported. Among the most important are melons, hot peppers, peppers, gherkins and gumbo. Data on tonnages of these products is not available except for gherkins which reach 400 to 500 tons annually. However, it seems that melon shipments are greater than that and could reach 800 to 1,000 tons. Hot peppers could also reach import levels of exports (see annex IV).

#### d. The Exporters

Exporters are divided into two categories. The first are the specialist merchants or producers who have large enough quantities to undertake the shipments themselves. Of these we note la Societe SENPRIM which operates large irrigated perimeters built by the Senegalese government; there are also the inheritors of BUD-SENEGAL like BAOBAB (Cap Vert), or those created with the help of F.E.D.<sup>15</sup> such as that of KIRENE (Thies). The second group are exporters; their number has diminished in the last several years. They have the packing, sorting and conditioning equipment and installations needed to prepare produce for export. They buy directly from the producer and undertake the exportation. They never work on a commission basis with a producer.

Packing vegetables for export depends on the importing country's regulations concerning quality and packing materials. Usually

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<sup>15</sup> Fonds European du Developpement, or European Common Market Fund Development Agency.

boxes or cartons are required which must be imported. Transport of fresh vegetables for export is generally by air, although in a small number of cases ships are used; progress has been made in using container ships, which are fast enough to carry perishable vegetables. Air is still the most used but it is becoming restricted because of cost, the capacity of the aircraft and above all the monopoly of AIR AFRIQUE and AIR FRANCE who block all competition, even for direct shipments of airfreight.

#### e. Imports

Imports of vegetables are important as can be noted in annex V. Two types are dominant: potatoes with over 13,000 tons in 1984 and onions with over 15,000 tons. These represent almost 29,000 tons of imports or 95 percent of the total fresh vegetable imports of 30.5 tons. The rest is made up of 10 other vegetables. This represents, for the most part, the needs of the Dakar market during the period when Senegalese production is inadequate. Given their high price, imported vegetables are consumed only by a small fraction of the urban population.

#### 5. Red Meat and Livestock

The estimates of numbers of cattle in Senegal have varied from a high in 1971 of 2.7 million head to a low after the drought of 2.2 million head. Currently there are an estimated 2.2 to 2.5 million. Sheep and goats are estimated to vary from 2.8 million head to 3.2 million, which was the high in 1981. Total fresh meat production is now between 65,000 and 75,000 metric ton per year, an offtake of the national herd of just over 10 percent. This allows a per capita available supply of between 12 and 13 kg/capita annually, down from 16 kgs 15 years ago.

The available supply of red meat is almost totally consumed in the fresh - warm meat state; even the fifth quarters are used generally for human consumption. For the most part, processing consists of slaughtering the animals in government inspected slaughter houses in the larger cities; the meat is retailed in the markets. In rural areas animals are often slaughtered outside during weekly market days. There is a small processing industry which is done by some of the larger food stores such as Filfily and SCORE in Dakar, who make pates, sandwich meats, sausages, etc., largely for the affluent urban consumer.

#### 6. Fish

Senegal possesses one of the world's richest fishing grounds, off the west coast of Africa. This area is exploited by large international fishing fleets licensed by the government to fish the

waters, and by relatively modern, locally based fishing fleets; both fish primarily for export to Europe. Small trawlers and artisanal fishermen fish for the local market and for export. It is estimated that the sub-sector employs about 55,000 fisherman with about 50,000 being artisanal fisherman, and about 5,000 considered industrial. In addition there may be as many as 10,000 riverian fishermen who fish on a part-time basis.

Fish consumption in Senegal is about 27.5 kgs/capita per year. Near the coast and along rivers much of this is consumed fresh. Several fishermen and their families specialize in drying fish for the interior markets, and export to neighboring countries. Fresh and frozen fish, and other seafood products such as shrimp, are exported to Europe. Dried and salted fish are exported to countries in central Africa. The value of fish exports exceeded that of peanuts in 1980; in addition to their contribution to the trade balance, the sub-sector provides from 2 to 4 percent of GDP.

For the European market, processing of fish is handled by the modern fishing industry which has both the technology and plant required for this. For the African market, one local processor, exporting about 10,000 tons of salted and dried fish annually, uses a very low cost plant, maintaining extremely low overheads; he obtains a large portion of his supplies through fish merchants on consignment from the artisanal fishermen.

### C. The Demand Side: Global Demand and Consumption Patterns

In order for the food processing industry to grow beyond its current level of output, demand volume must be compatible with the level of output needed to justify plant investment (general fixed costs), at a price that covers fixed and variable costs. The economy of Senegal has gone through a period of declining real income (i.e., the purchasing power of the population has declined on average). Industrialists face a problem rationalizing investment decisions within the consumer goods industries. Investors will have to be very careful to find those areas in which demand is unaffected by stagnant or declining consumer buying power. It must be determined which goods people will continue to buy even when their incomes decline. The recommended procedure for assessing this is to look at global demand, the purchasing power of the consumer and the pattern of consumer behavior. It is far beyond the scope of this study to make an exhaustive analysis of these conditions, however, some general comments are in order.

For cereals, demand certainly exists; the supply met by local production is far from adequate to meet this demand. In 1984, Abt

Associates<sup>16</sup> estimated foodgrain requirements from 1985 to 2000 based on existing population growth rates. Using estimated cereals production based on known assumptions about land availability and use and known technology, local production of grain will decline from about 45 percent of requirements in 1985 to 33 percent in the year 2000. Currently the foodgrain deficit is in the order of 600,000 to 800,000 tons per year (depending on season and climate). This has been the case for well over a decade and does not appear to be easily changed. However, with the exception of milling wheat into flour, and possibly milling rice paddy, most of the opportunities in the cereals subsector are in trading. There is little that can be gained from transformation of the product.

As can be seen from the discussion of supply above, few products are available in quantities that exceed the requirements for food use in Senegal. The one main exception is probably fish, which may not have reached market saturation but has rather limited buying power. In the case of vegetables, production is not so great as to cause concern about excess supply. Rather there are constraints related to purchasing power of the general consuming public and there is unfamiliarity with the product. The latter case could be corrected through product formulation, advertising or promotion if adequate purchasing power existed to merit such investments. In the case of meat, it appears the market can absorb as fresh product all that can be produced. In the case of fruit, there would appear to be a problem of quality as well as price.

If a general market situation does not exist, then more specific targeted markets will have to be investigated. These are, in a sense, the markets that the current members of the industry are involved in: processed meats for an affluent urban community, high value bakery goods, milk products, etc. The only mass market processed goods tend to be wheat flour, peanut oil, sugar and tomato paste, and these industries enjoy special privileges or protection.

Specialty or specific markets must be studied with care. Most of these are very small and large volume offerings in these product areas will likely cause large decreases in product price. An understanding of consumer behavior toward individual products or groups of products is essential to predict with any confidence the relationship of price to volume, and the probable size of the market. Consumer - expenditure studies would permit this.

There are few studies done on the consumption patterns and household expenditures in Senegal. Such studies are essential for market projections of different foodstuffs. First, it is useful to know present consumption patterns in order to compare supply

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<sup>16</sup> Abt Associates, Inc. Draft, Senegal Agricultural Policy Analysis, September, 1984.

estimates (i.e. production plus imports minus exports) with aggregated figures on the disappearance of various foodstuffs. This helps to determine what the global demands are for each commodity and to verify production estimates as well as calculate post-harvest losses. Additionally, if household budget studies are available, the expenditures of the household income on each commodity or class of commodity can be evaluated. By breaking these down according to income, a determination can be made of the probable consumption of food categories as incomes change.<sup>17</sup> For the food processing industry this permits us to make two market inferences. One, the total quantity of a foodstuff (i.e., canned fruit or juice) that will be purchased from each income group. Two, the likely consumption for these items as incomes change. By linking these consumption patterns to retail prices we can then estimate a demand curve at a given price range which will indicate the quantity the market will absorb at that price.

In the reports reviewed by the team, only two studies for Dakar that would give any indication of income/consumption relationships. The first was a 1979 study by Clark Ross, which was not available. However, reference to it by comparison was made in another study completed in 1984.<sup>18</sup> In the latter study, only 30 households were included and these were broken down only by 3 income groups (under 35,000 FCFA/month, 35,001 to 65,000 FCFA/month, and 65,001 to 100,000 FCFA/month). Most of the analysis in this study concentrated on cereals consumption and did not relate actual expenditures to consumption, i.e., it only estimated consumption of commodities within each income group. As would be expected, the consumption of meat, fish, potatoes and green salad in the diets of the higher income group was considerably greater than that of lower income groups. However, no mention was made of any processed foods other than milling of rice, millet or wheat.

- study on food consumption, production and health in the lower Casamance was undertaken for USAID in 1985.<sup>19</sup> Unfortunately this study does not cover in detail the processed products, and does not delineate consumption by income group. A study will begin this

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<sup>17</sup> In economic terms this is the income elasticity of demand for specific food commodities which is normally evaluated by taking the derivative of the function which relates income to the quantity of an item consumed.

<sup>18</sup> Abt Associates Inc. Senegal Agricultural Policy Analysis, (draft), September 1984, APAP, USAID, Annex B.

<sup>19</sup> Bureau des Etudes de l'Evaluation et de la Programmation de la [SOMIVAC] (BEEP) and Service de l'Alimentation et la Nutrition Appliquee au Senegal du Ministere de la Sante Publique (SANAS), Enquete sur l'Alimentation, l'Etat Nutritionnel et Sanitaire Des Population de la Basse-Casamance, Dec. 1985.

year in Senegal which, over the course of 5 years, will study consumption patterns of some 15,000 families of all income groups throughout the country.<sup>20</sup> Although the results of this study will not be available for the current planning period of ITA, the Institute should attempt to obtain as much preliminary data as they can in the early stages of the study.<sup>21</sup>

In the meantime, an idea of consumption patterns can be obtained from the marketing experience of SONADIS which markets 650 products in 146 stores throughout the country. Of these products, 95% are reported to be foodstuffs. As the company does not market fresh produce, a major share of processed foods are included in their product list. The Director reported that of the 650 items, 58% are imported and the rest are from local industry. Because SONADIS covers most of Senegal with its retail stores, actual sales over time should be a good first indicator of market demand for different products in each region, and evaluation of these sales should help to direct market potential for processed foods.

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<sup>20</sup> This study is funded by the UNDP and the World Bank and is intended to measure the impacts of the structural adjustment program in Senegal on Senegalese families. The management of the study will be undertaken by Robert Ngong and will be part of a multi-country study. It is expected to start in August of 1989.

<sup>21</sup> The study will be undertaken by the national statistics office of Senegal, which will be supervised out of Abidjan.

## VI. SOME POSSIBLE OPTIONS OPEN TO ITA AND DONOR SUPPORT

There are several possible directions that ITA could take, each will depend on the policies and support of the government and the support of donor agencies.

### A. Business as Usual

ITA could continue to operate as it now does, undertaking a limited amount of research and performing laboratory tests for government and industry. If the government maintains its current position of reducing budget support to ITA by 50 percent over a five year period, and no major donor financing can be secured on a long-term basis, several things are implied.

ITA will have to make the appropriate moves to insure that full cost recovery procedures are instituted in its quality control laboratories. Failure to do so will mean that deep cuts in personnel in other departments will be necessary. Personnel cuts will be inevitable in any case. Currently, ITA personnel costs are about 61 percent (206 million FCFA of a total budget of 337 million) of the total budget. State budget support was 185 million in 1986 and was scheduled to be reduced to 92.5 million in 1990.

Because personnel cuts would be necessary, ITA would have to greatly reduce its research activities. Even then, little funding would be available for supplies and maintenance. This scenario is likely to mean that ITA would drift into a stage of inactivity.

### B. Separation of Functions

In the report by Robert M. Colton Associates of January 1988, it was recommended that ITA be separated into two components:

1. A public sector component consisting of a quality control and testing facility having technical advisory and training capabilities and utilization mandated by government test/training requirements for food industry.
2. A private sector component consisting of food product development cooperative and incubator. The Coop would output new products for existing and new companies; the incubator would temporarily house new companies using new product outputs. The Coop would be jointly owned by ITA, private banks and associations and incubator companies.<sup>22</sup>

<sup>22</sup> Robert Colton, page 4.

Under this scenario, determining the division of government budget support between the two components would be important. If it is assumed that the public sector component would receive most of the government financing, then it would be absolutely essential that the private component be adequately capitalized to cover 1 to 2 years of operation without generating major revenues. This component would be made up of those divisions that have 41 of the total of 58 staff currently at ITA; hence, overhead costs for personnel alone would be heavy. A more logical approach under this scenario, would be to establish the quality control labs as an entity that operates under cost recovery principles as suggested above. Interim government funding could then be used to cover a major share of overhead costs in the early years until the co-op and incubator companies began to generate profits. This could be either as "seed" money in the form of a grant, or share actions of a private company.

Disadvantages of this approach are that the research divisions would lose the support of the quality control labs. These would either have to be partially duplicated elsewhere, or the functions would have to be purchased from the public sector labs. Another potential problem could be that private sector investors and/or board members could attempt to treat the research functions strictly as their companies' labs. If one or two large and dominant companies gained this type of control, smaller firms would be discouraged from participation.

#### **C. Generate Needed Revenues from the Sale of ITA Technology**

Currently ITA believes it has technologies that it could market to the private sector, if appropriate mechanisms could be found to protect its discoveries and to ensure that revenues flow back to the institute. This is questionable. Most of the research work that has been accomplished over the years at ITA was done with the support of donor agencies with agreements that the results would be available to the public. ITA does not have proprietary ownership of most of these processes. Secondly, most of the work done at ITA is more in the nature of adaptive research or reformulation. Just as ITA's processes probably could not meet the criterion of patent or copyright, they probably could not generate revenues on a sustained basis.

#### **D. Generate Revenue Through the Partial or Total Production of a Product**

Although ITA's technologies probably could not be legally protected with patents or copyrights, it is possible that some of their processes or formulations could constitute trade secrets. What the legal status of such secrets is in Senegal and how legal recourse can be obtained to insure financial remuneration will be covered

by a legal expert. However, ITA could conceivably undertake the manufacturing of a product it has formulated or the manufacturing of a component of a product. For example, ITA believes it has formulated a process for producing juice from bissap that is superior to that of other processors. ITA could conceivably process bissap and sell the concentrated juice to bottlers or to retailers. The legal status of ITA vis-a-vis the government mandate will have to be determined.

The major drawback to this option is that ITA will need to find operating funds to undertake the processing on a scale large enough to generate adequate revenues. It may also be that ITA does not have adequate plant available to undertake commercial processing. This would certainly be true if other research is to continue. Therefore ITA may also need to find capital, either on its own or through a joint venture, to invest in new plant.

#### **E. Establish Exclusive Rights In Processes or Formulas**

Continuing with the case of the bissap juice mentioned above, ITA could grant the formula for the procedure and ingredients to a commercial processor on an exclusive basis. ITA would agree not to give the formula to any other party, probably for a set period of years.<sup>23</sup> This could be done as a lump sum payment, or worked out as a sort of royalty on a per unit basis. In the latter case, ITA must assure itself that the processor is accurately reporting sales volume and paying accordingly.

#### **F. Establish Collaborative Relationships With Private Firms to Undertake Research on a Reimbursable Basis**

ITA has undertaken research for private sector firms, usually at their establishments, aimed at solving specific problems of the firm. ITA feels that the major disadvantage with this is that the firms do not want to pay as much as the work costs and ITA loses control over the processes or formulas. Discussions with some business firms were mixed over this issue. Some felt that they could collaborate and would be willing to. Others said they would be willing to pay, but only for a guaranteed result. Some felt that ITA would be too expensive because they were inefficient and bureaucratic. In some cases there was even the implication that ITA had nothing to offer.

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<sup>23</sup> The period would be negotiable but the general principle to determine the time-frame would be the amount of time the processor would need to establish the product under his exclusive mark or brand name so he would no longer need the protection of exclusivity. After this the protection should be removed to encourage competition.

In order for this option to work, ITA will have to establish a reputation as an efficient, professional and reliable institute.

**G. Create a Division Within ITA that Functions as a Consulting Group**

Probably the most valuable thing that ITA currently has to sell, particularly to small and medium-sized firms in food processing, is the experience and training of its professional staff. ITA should market this expertise through a consulting office or a subsidiary which could draw on ITA experts to aid private sector firms. This unit could eventually have engineering and financial expertise as well, so that ITA could advise entrepreneurs who wish to set up a new plant, process a new food product or expand its operations. The group should be allowed to utilize outside consultants as well as ITA experts, for example from the University or other private sector firms, to supplement its expertise in order to market complete services in food processing.

The major drawback with this approach is that ITA experts could be away from the institute for extended periods. It is also not clear if ITA experts, currently government salaried employees, would be permitted to sell their time to private firms. It is likely that ITA would want to attempt to market these skills to neighboring countries, which would mean government employees working outside of Senegal.

**H. Utilize the Facilities at ITA to Assist Small Companies Which Wish to Start a Product Line**

In many cases, small firms or individuals may have an idea of a product line that they would like to develop. However, establishing a plant, organizing management, and developing markets are formidable tasks. ITA could manufacture or process foods for the mark or label of an individual who would then only need to undertake marketing. If the entrepreneur is successful in marketing the product, as the market grows and develops, ITA could assist the individual in establishing processing facilities. ITA would receive compensation for the processing, plus a profit.

This system could be along the same lines as an incubator facility as recommended in Colton's report.

## VII. CONCLUSIONS AND RECOMMENDATIONS

ITA suffers from a reputation of being a government service and research institution; this reputation makes it difficult to adopt a posture of an income generating entity. ITA has not had to manage its affairs in a lean, highly cost conscious manner. It does not appear to have gone through the regular process of justifying each and every piece of work that it undertakes. It must now develop long-range planning that starts by prioritizing interventions according to their potential to generate cash flows or cost recoveries.

ITA would appear to have an important role to play in the development of small food processing enterprises in Senegal. However, it cannot be assumed that marketing of the skills or technologies of ITA will be either automatic or easy. There is too much mutual suspicion on the part of both private sector businessmen and ITA technicians to hope for an easy and cordial relationship. ITA must demonstrate to the private sector that it can deliver a quality product in a timely manner at the lowest possible cost. It will have to aggressively sell its services to the private sector.

ITA is probably too narrowly oriented to generate significant revenues from its current technical capacity. It is questionable whether the economic environment of Senegal can sustain a technical institute of ITA's narrow focus. ITA will need to move into financial and marketing advisory services, and will need to develop the capacity to see the food processing industry from a more integrated perspective.

In order for ITA to survive under the conditions placed upon it by government it will either need to generate considerable donor enthusiasm for its work and potential or it will need to take on the demeanor of a hard driving, streamlined business development and advisory organization within the food processing sector. The orientation of ITA will need to change. All work will need to be reoriented toward a market driven focus. The business development side of the Institute would take the lead, and all research would be responsive to the business sides needs.<sup>24</sup> If ITA cannot do this, it is doubtful if it should be maintained as anything more than a quality control and testing facility.

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<sup>24</sup> Note that in this case carrying out work for a specific donor either as a complete project or as part of another investment project effort would be consistent with this approach. It simply means that seeking out donor project work and orienting the research or laboratory testing work for that project would be the same as seeking out private firms to convince them of ITA's capabilities.

USAID should consider supporting ITA's move from a strictly donor/government supported research facility to a technical business advisory and consulting group. The major areas of support will need to be in market research (i.e. carrying out market profiles, consumer demand estimates, or raw material supply markets), contract potentials with suppliers in vertically integrated processing, marketing of ITA's capability, planning and business management.

## **ANNEXES**

ANNEX IA  
THE WEEKLY REPORT - WEEK OF DECEMBER 5, 1988

NAME OF MARKET	DATE OF SURVEY	MIL SOUNA FCFA/KG		SORGHO LOCAL FCFA/KG		MAIS FCFA/KG	
		PROD. (1)	CONS. (2)	PROD. (1)	CONS. (2)	PROD. (1)	CONS. (2)
ST. LOUIS	05/12		85		85		90
DAGANA	06/12		85		85		-
PODOR	06/12		85		85		-
MATAM	07/12		90		90		100
MPAL	02/12		85		85		-
LOUGA	08/12		85		-		95
GOUILLE MBEUTH	05/12		80		-		-
NDIAGNE	08/12		80		-		-
THIES	07/12		85		-		110
THILMAKHA	05/12		75		-		-
TOUBA TOUL	03/12		75		-		110
DAKAR	07/12		89		92		106
DIOURBEL	07/12		75		-		110
TOUBA	02/12		80		75		100
BAMBEY	03/12		80		-		100
NDINDY	04/12	70			-		-
FATICK	04/12		70		-		-
GOSSAS	03/12	60		-			-
PASSY	03/12	65		62		62	
KAOLACK	08/12		73		-		78
MABO	07/12	60		60		60	
PROKHANE	02/12	65		70		70	
NDRAME-ESCALE	05/12	65		70		70	
TAMBACOUNDA	08/12		80		75		80
KEDOUGOU	01/12		-		60		60
BAKEL	06/12		90		75		70
KOTHIARI	05/12	75		70		-	
NDOGA BABACAR	08/12	60		55		60	
KOUTHILABA	04/12	55		55		55	
KOLDA	06/12		85		70		70
PATA	05/12	50		-		45	
MEDINA Y. FOULA	04/12	50		-		50	
ST. MAUR	07/12		90		85		105
BIGNOMA	07/12		110		-		-

(1) PROD. = prix producteur  
(2) CONS. = prix au consommateur

source: CSA  
tel: 22.70.60

ANNEX IB  
THE WEEKLY REPORT - WEEK OF DECEMBER 15, 1988

NAME OF MARKET	DATE OF SURVEY	MIL SOUNA FCFA/KG		SORGHO LOCAL FCFA/KG		MAIS FCFA/KG	
		PROD. (1)	CONS. (2)	PROD. (1)	CONS. (2)	PROD. (1)	CONS. (2)
ST. LOUIS	12/12		90		90		90
DAGANA	13/12		90		90		-
PODOR	13/12		85		-		-
MATAM	14/12		90		-		-
MPAL	09/12		85		85		-
LOUGA	15/12		80		-		85
GOUTILLE MBEUTH	12/12		85		-		-
THIES	14/12		90		-		100
THILMAKHA	12/12		70		-		-
TOUBA TOUL	10/12		75		-		90
DAKAR	13/12		89		93		113
DIOURBEL	12/12		75		-		110
TOUBA	09/12		80		-		90
BAMBEY	10/12		75		-		105
NDINDY	11/12	70		-		-	
FATICK	11/12		80		80		-
GOSSAS	10/12	60		-			-
PASSY	10/12	65		65		70	
KAOLACK	14/12		73		73		80
MABO	14/12	65		65		65	
PROKHANE	09/12	60		-		70	
NDRAME-ESCALE	12/12	68		68		70	
TAMBACOUNDA	14/12		80		75		80
KEDOUGOU	14/12		-		-		60
KOTHLARI	12/12		80		70		70
KOUTHILABA	11/12	55		55		55	
KOLDA	09/12		85		70		70
VELINGARA	10/12		90		75		80
SEDHIOU	09/12		100		-		90
MEDINAYOROFOLA	11/12	50		-		50	
ST. MAUR	14/12		90		85		105
BIGNOMA	14/12		110		-		-

(1) PROD. = prix producteur  
(2) CONS. = prix au consommateur

source: CSA  
tel: 22.70.60

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ANNEX II

CAMPAGNE MARAICHERE 85-86

PRODUCTION EN TONNES

Régions Spécifications	DAKAR	THIES	TAMBA	DIOURBEL	FATICK	LOUGA	ST-LOUIS	ZIGUIN- CHOR	KAOLACK	TOTAL
POMME DE TERRE	9 000	9 495	-	60	312	3 850	420	130	650	23 917
OIGNON	900	13 500	-	80	600	3 500	12 375	9 175	1 500	41 630
CHOU	8 200	11 200	-	275	925	1 900	1 320	525	625	24 470
TOMATE	8 000	5 850	-	100	750	1 800	2 240	748	750	21 238
HARICOT VERT	2 800	1 200	-	-	-	180	-	-	-	4 180
MELON	5 600	2 200	-	-	220	-	-	-	360	8 380
PIMENT	948	600	-	38	125	180	105	380	75	2 461
POIVRON	750	400	-	-	-	-	-	-	-	1 150
AUBERGINE	1 980	1 200	-	160	500	500	900	750	250	6 240
DIVERS	5 115	3 441	-	548	938	1 787	3 186	1 674	558	16 947
	43 293	49 086	-	1 261	4 070	13 697	20 546	13 392	4 768	150 613

ANNEX III  
PRODUCTION CAMPAGNE MARAICHERE 86/87

Régions Espèces	THIES	LOUGA	St LOUIS	DAKAR	AUTRES REGIONS	TOTAL
POMMES de TERRE	6.870	1.025	630	4.415	60	13.000
OIGNON	2.617	4.000	9.787	2.617	968	18.500
CHOU	10.335	2.425	1.898	8.074	2.500	25.232
TOMATE	9.500	2.012	2.500	8.440	2.300	24.752
HARICO VERT	1.535	. 30	-	1.200	-	2.765
MELON	2.428	-	-	3.870	-	6.298
PIMENT	700	300	150	1.040	903	3.093
AUBERGINE		1.500	500	900	1.740	7.140
DIVERS	3.900	2.030	3.610	5.800	3.880	19.220
TOTAL	39.385	12.322	19.475	35.710	13.110	120.000

## ANNEX IV

## Statistiques d'exportations de légumes

ANNEES	1985		1986		1987		1988	
Spécifications	Qtés.	Val.	Qtés.	Val.	Qtés.	Val.	Qtés.	Val.
Pommes de terre - France	48,700	7,114,2	5	2350	4,891	475		
" - Allemagne	203,500	3,122,000	20,118	32,257,435	133,710	3,511,525		
Tomates	1,2,198	1,333,100	22,039	119,519,400	230,055	71,909,625		
Choux	21,700	1,531,100	4,100	47	2,207	326,300		
Haricots verts	24,5561	226,173,268	912,828	2,920,591,723	2387,075	1,308,25		
Épinards - autres	17,419	10,17,525	5,51	1,372,4	5,774	1,214,350		
lenticilles	4,510	25,500	1,000	22	—	—		
Ignames - Haricots	2,430	336,500	1,543	114,9	—	—		
Navets - Betteraves	38,610	10,091,800	7,100	2,084,21	4,525	935		
Concombre - Cornichons	97,459	200,124,850	514,532	244,679,56	369,502	186,705,750		
Oignons - Aub. - échalote	5,673	250,125	15,119	586,2,325	309,002	21,522,125		
Haricots	—	—	153,450	68,034,21	1,408	677,6		
Autres légumes	1,506,709	2,235,365,925	10,6012	894,413,59	753,389	279,216,075		
Total légumes:	2,259,112	2,413,079,744	97,43,454	3,436,265,733	5,324,661	2,165,157,950		

ANNEX V  
IMPORTATIONS LEGUMES

Spécifications	1981		1982		1983		1984	
	Q'tés	Valeurs	Q'tés	Valeurs	Q'tés	Valeurs	Q'tés	Valeurs
Pomme de Terre sem	1644	184924	1326	110.770	482	73.743	679	117.178
Pomme de Terre Cons	9750	781.414	10.380	838.630	12302	1319.894	13.607	1492.261
Tomates	82	13.123	67	12.564	45	8.768	61	15.018
Choux	36	5.524	75	11.897	46	8.704	34	6931
Haricots Verts	0,07	26	0,02	2	0,32	106	1,84	771
Haricots	94	18.776	66	36.972	44,276	14.323	45	13.848
Concombre - Cornichons	13,47	1.114	13,164	1.847	3,83	1239	1,609	651
Oignons - Auls - Echalottes	11395	900.895	11223	1.110.27	15,645	1.508.487	15,378	1.596.371
Epinards	51	25.266	106	29936	110	22.342	47	26.402
Pois secs	95	10.420	89	12.070	39	5331	86	11.599
Lentilles	78	19.057	55	15.621	128	31.801	96	28.027
Ignames - Manioc	0,53	159	0,12	50	15	1.811	0,126	78
Navets - Betteraves	245	26.285	288	35.072	302	43.945	421	55.433
Autres légumes	116,93	69.827	129,696	26.850	191,574	106.851	130,425	118.352
<b>Total légumes</b>	<b>23.601</b>	<b>2.056.810</b>	<b>26.819</b>	<b>2.273.312</b>	<b>29324</b>	<b>3.117.345</b>	<b>30.588</b>	<b>3.482.923</b>

## ANNEX VI

Nom	Adresse	Activités
Adripêche	B.P. 2429 - Dakar	Produits de la mer
Biscuiterie Alimentation Africaine	B.P. 989 - Dakar	Biscuiterie
Biscuiterie Werbe	B.P. 1646 - Dakar	Biscuiterie
Cas	B.P. 2016 - Dakar	Confiserie
Codipral	B.P. 796 - Dakar	Produits alimentaires
Conserveries du Sénégal	B.P. 782 - Dakar	Conserverie de poissons
CSNA	B.P. 286 - Dakar	Produits alimentaires
GMD	B.P. 2068 - Dakar	Minoterie - Aliments du bétail
SONACOS	B.P. 639 - Dakar	Huilerie
Les Moulins Santenac	B.P. 451 - Dakar	Meunerie - Pâtes alimentaires
Pâtisserie-Confiserie de l'Afrique Occidentale	B.P. 26 - Dakar	Confiserie
Procos	B.P. 101 - Dakar	Produits congelés
SAF-COP	B.P. 3176 - Dakar	Produits de la mer
Saigos	B.P. 1041 - Dakar	Pâtes - Conserves - Minoterie
SAPA	B.P. 3317 - Dakar	Conserves de poissons
SAPAL	B.P. 2395 - Dakar Hann	Conserves de poissons
SAPROLAIT	B.P. 1177 - Dakar	Produits laitiers
Salim Wekle & Frères	B.P. 1646 - Dakar	Biscuiterie
SENEPESCA	B.P. 2853 - Dakar Hann	Poisson
Sénégal-Protéines	Nouveau Quai des Pêches - Dakar	Poisson
SIBRAS	B.P. 1752 - Dakar	Brasserie
SIDCA	B.P. 1043 - Dakar	Conserves de légumes & poissons

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Nom	Adresse	Activités
SIPA	B.P. 331 - Dakar	Produits africains
SIPL	B.P. 145 Dakar	Produits laitiers
SMBIS	98, Av du Président Lamine GUEYE Dakar	Boulangerie
SNSSS	B.P. 200 - Kaolack	Sel
SNTI	B.P. 74 - Saint Louis	Concentré de tomate
SOBOA	B.P. 290 - Dakar	Brasserie
SOCAS	B.P. 451 - Dakar	Conserves de tomates
SODEC	B.P. 195 - Lyndiane	Huilerie
SOFRIGAL	B.P. 1419 - Dakar	Poissons
SOFRAVIN	B.P. 2095 - Dakar	Vins
SORUGAL	Rue Bodin Rufisque - Dakar	Glace alimentaire
SOSE Trapomer	B.P. 3281 - Dakar	Produits de la mer
SPAC	B.P. 1821 - Dakar	Produits congelés
Compagnie Sucrière Sénégalaise	B.P. 49 - Richard Toll	Sucrerie
SODIPRAL	2, rue Vincens X Faidherbe - Dakar	X
SERAS	B.P. 14 - Dakar	Produits carnés
SECAL Ets Assad Frères	53, rue Sandiniéry - Dakar	
DAKAR - PECHE	29, Bd de la Libération - Dakar	Poissons
SOPOA	B.P. 2060 - Dakar	Poisson
IFAP	B.P. 380 - Dakar	Filet de pêche
AMERGER CASAMANCE	B.P. 018 - Dakar	Produits de la mer

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Nom	Adresse	Activités
SOPESEA	B.P. 251 - Dakar	Poisson
SARDINAFRIC	B.P. 2330 - Dakar	Poisson
SAIB	DLE 22, rue des Essarts	Conserverie
SEBO	Route de Rufisque tél: 32 49 80	
S.A.A.F.	Route de Rufisque tél: 32 03 64	Culture manichére et industrielle
STIMEX	B.P. 665 - Dakar	Café
SAFPAC : Société Africaine de Fabrication de produits alimentaires et Emballages	Tél : 22 26 18 - 21 21 90	Glace alimentaire, fruits confits, purée de fruits à usage industriel

## ANNEX VII

LISTE DES STRUCTURES OU PERSONNES EN RELATION AVEC L'I.T.A.  
POUR LA VALORISATION DES PRODUITS ET SERVICES

DESIGNATION	CENTRE D'INTERET
Etablissement Abdoulaye TOURE 36, rue Raffenel - B.P. 10304 DAKAR	Achat produits I.T.A. client de l'I.T.A. pour le travail à façon → <i>SPECIAL DAKAR</i>
SETEXPHARM (Société d'Etude et d'Exploitation de Végétaux à usage Pharmaceutique) SARL Km 10 Route de Rufisque DAKAR	Transformation produits horticoles
Société d'Exploitation du Domaine des Flamboyants Km 22 Route de Rufisque B.P. 3153 DAKAR	Exploitation et vente de produits horticoles
SODEVICO (Société de Développement pour l'Industrie et le Commerce) Avenue Bourguiba face cinéma Liber- té B.P. 499 DAKAR	Vulgarisation produits ITA produits à base de farines compo- sées
SONAGA-SONABANQUE 15, Allées Robert Delmas DAKAR	Projet SITRAF Exploitation produits horticoles
Société d'Investissement et de Développement International (SIDI) 6, rue Jean-Lantier 75001 PARIS	Financement petits projets produc- tifs locaux
SECOM/SONAGA 15, Allées Robert Delmas B.P. 3374 DAKAR	Transformation produits halieuti- ques
Monsieur Abdou GUEYE parcelle n° 3742 Tally Boumack Pikine DAKAR	Promotion et vulgarisation produits ITA

(SUITE)

<p>Zone Franche Industrielle de DAKAR Avenue ROUME Immeuble Excellence DAKAR</p>	<p>Collaboration</p>
<p>Entreprise Agricole AGROPAK 1'Agro-industriel et Pastoral du KASSAK B.P. 37 Saint-louis</p>	<p>Exploitation du bissap</p>
<p>Monsieur Pap Amadou KANE Sénégalaise d'Entreprise du Commerce et de Transport Sicap Liberté V villa n° 5551 DAKAR</p>	<p>Production de levure de boulangerie</p>
<p>GIC Gap International Consulting GmbH Obritzner Strabe 1 D-4040 Neuss</p>	<p>Vente de produits sur le marché allemand</p>
<p>YEM Bienvenu B.P. 1217 Douala (CAMEROUN)</p>	<ul style="list-style-type: none"> <li>- installation unité fumerie de poissons</li> <li>- fabrication des dérivés du piment</li> </ul>
<p>C.I.E. SUUNA 12, rue Huart B.P. 582 DAKAR</p>	<ul style="list-style-type: none"> <li>- fabrication aliment de sevrage</li> <li>- transformation industrielle production agricole nationale</li> </ul>
<p>Monsieur Mouhamed FALL s/c de El Hadj Ibrahima SAMB rue 37 X 38 Colobane DAKAR</p>	<ul style="list-style-type: none"> <li>- amélioration des procédés de séchage et de fumage du poisson</li> </ul>
<p>SONED-AFRIQUE 142, rue de Bayeux DAKAR</p>	<p>Transformation et conditionnement des produits horticoles</p>

(SUITE)

M.L. International Trade 2 - 4, rue du Docteur THESE DAKAR	Exploitation produits horticoles
Agence de Promotion des Investissements de Developpement International (APIDI) 5, rue d'Artois 75008 PARIS	Promotion des projets agro-industriels de fruits et légumes
Association fermière de la TAOUEY B.P. 47 Richard Toll	Fabrication de concentré de tomate à partir de leur exploitation
SORES (Société de Restauration Sénégalaise) Aéroport Dakar-Yoff B.P. 8131 DAKAR	Prestation de services, analyses
SOPREICO SUD-SUD	Exploitation produits horticoles
Société TOTRABA rue A X 2 Derklé B.P. 2126 DAKAR	Conservation de la colas
Monsieur Serigne GAYE Consultant financier Im. Patio en face canal IV n° 446 DAKAR	Exportation de mangue
Monsieur Amadou Moustapha NIANG B.P. 28 DAKAR	Transformation et commercialisation des produits ITA
Entreprise Commerciale de Représentation Sicap Liberté II villa n° 1587 DAKAR	Exportation pulpe de mangue

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(SUITE)

Monsieur Mouhamadou M. DIEDHIOU 378 H.L.M. Bongré KAOLACK	Exploitation produits horticoles
Messieurs DIALLO & SOW 260 Ouagou Niaye II DAKAR	Séchage de poissons et oeufs de mulet
E.P.C. Conseil Etude Papa GUEYE conseil 76000 ROUEN	Vulgarisation produits ITA
Monsieur Ben Adboulaye SALL Parcelle n° 1444 Usine Niary Tally Gouye Senghor B.P. 1979 DAKAR	Concentré de bissap
Monsieur A. Moctar DIOP Villa n° H/39 Patte d'Oie Builders DAKAR	Vulgarisation produits ITA produits horticoles
SIPL (Société Industriel de Produits Laitiers) Km 2,5 Route de Rufisque DAKAR	Exploitation des acquis céréalières (Projet PL 480)
NOVOTEL (Société Hotelière du Barachois) B.P. 2073 DAKAR	Exploitation recettes, préparations culinaires
CIPEXA (Compagnie Internationale pour la Promotion des Exploitations en Afrique) 13, rue Parchappe B.P. 2408 DAKAR	Vulgarisation produits horticoles
Monsieur Augustin MANE SENLUX	Exploitation usine pilote de Joal (achat ou participation)

SUPPL

<p>Messieurs R. ISAYA et PREFONTAINE Econosult/Canada 620, boulevard Dorchester Ouest Montréal, P.Q. CANADA N3p 1N8</p>	<p>Financement projets</p>
<p>Madame Michèle CLEMENT Gestion 3512 INC B.P. 4206 DAKAR</p>	<p>Exploitation produits halieutiques : poissons fumés</p>
<p>Monsieur Vincent BERNARD 3, rue Lemercier 75017 PARIS</p>	<p>Vulgarisation produits horticoles</p>
<p>ACAPES rue 6 Bopp B.P. 3432 DAKAR</p>	<p>Transformation et conservation des produits horticoles</p>
<p>COLEACP (Comité de liaison Europe Afrique-Caraïbes-Pacifique pour la Promotion des fruits tropicaux, légumes de contre saison, fleurs, plantes ornementales et épices) 23, Square Ambieux B.P. 45 1040 Bruxelles - BELGIQUE</p>	<p>Promotion des fruits tropicaux</p>
<p>Monsieur Madiaw KAMARA 75 Avenue Blaise DIACNE DAKAR</p>	<p>Exportation poisson salé-séché et fumé</p>
<p>Monsieur Amadou Moustapha SENE Bureau Panafricain de communication B.P. 2729 DAKAR</p>	<p>Transformation et conservation des produits agricoles locaux</p>
<p>SEPAS Rez de chaussée Im; I sacré-coeur I B.P. 7259 DAKAR</p>	<p>Vulgarisation produits horticoles</p>
<p>SOBOA</p>	<p>Stabilisation des jus de diverses espèces fruitières locales</p>

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(SUITE)

Union régionale de Dakar 10è Coördination de Sébikotane	Amélioration condition de transformation artisanale du poisson
C.N.I.S. rue Vincent DAKAR	Coopérative de pêche à MBOUR (MBALLING)
Monsieur Serigne Cheikh Ibra MBACKE B.P. 3707 DAKAR	Projet installation entrepôts frigorifiques destinés à la conservation des fruits et légumes d'une capacité de 150 tonnes
Monsieur Ibrahima MBAYE Im. Martre et Frères 8, rue Laperrine X Lamine GUEYE DAKAR	Valorisation du bissap

(SUITE)

Monsieur Mamadou NDIAYE Parcelle Assainies Unité 5 n° 404 Dakar	Vulgarisation produits ITA
Monsieur Valentin NDIAYE Parcelle Assainies Unité 5 n° 5354 Dakar	"
TRASOW COMPANY INTERNATIONAL B.P. 37 16 Dakar	"
Monsieur Amadou KAYE Société Sénégalaise des Pétroles BP Dakar	Installation tentes solaires
G.I.E. COSEN B.P. 5365 Dakar	Collaboration
TROPIC'CREMES B.P. 2279 Dakar	Fabrication de glaces et sorbets
Boulangerie de Médine B.P. 3275 Dakar	"
Monsieur Laurent Diokel DIOP Cité HAMO GOLF SUD L 081 Dakar	Transformation de fruits et légumes
Monsieur El Hadji Moussa SOW B.P. 7265 Dakar	"
Association des Bacheliers pour l'Emploi et le Développement Av. Bourguiba prolongée X Front de Terre - Lot 51 Dakar	Conservation produits agricoles
Monsieur Ibrahima NDIAYE s/c SONAGA 15, Allées Robert Delmas Dakar	Installation tentes solaires
Générale de Négoce et d'Export International - GENEX INTERNATIONAL 71 av. Hassan II - Casablanca	Collaboration
Monsieur Gorgui MBODJ Cité Patte-d'Oie Buider's n° A 29 Dakar	Conservation et conditionnement des fruits et légumes

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( SUITE )

Société Africaine d'Assistance d'Intervention et de Transport S.A.F.R.A.I.T B.P. 3437 Dakar	Transformation des céréales locales
Agence Générale de Commerce 77 Bd. Charles DE GAULLE Dakar	Importation des produits locaux
Monsieur Ibrahima BA Zone A Dakar	Fruits et légumes - Produits carnés
Monsieur Pape Aly NDIANG NDIAYE Tél : 21 15 16 Dakar	- Noix d'anacarde - Confitures Produits halieutiques
Générale Dior Interpromotion Castors Dakar	Vulgarisation produits locaux
Monsieur Abdoulaye FOFANA Dakar	"
SENET - Sénégalaise de Transport SARL Cité Baïlla FALL - villa n° 5 Dakar	Projet de transformation produits halieutiques
Organisation Mondiale de la Santé (O.M.S.) Dakar	Formation : Contrôle de Qualité
Fédération des Associations des Femmes du Sénégal Dakar	Transformation fruits et légumes
Monsieur Maurice KEITA Dakar	Installation d'une superette (produits locaux)
Groupe SCORE DAMAG Dakar	Vulgarisation produits ITA
SUPERNOVA Dakar	"
Supерette Assad Dakar	"

( SUITE )

Superette Hital Dakar	Vulgarisation produits ITA
Superette Taboucharani ex Hajar Point E Dakar	"
Hotel Indépendance Dakar	"
Hotel NOVOTEL Dakar	"
Hotel Téranga Dakar	"
Hotel Savana Coumba Dakar	"
Centre des Oeuvres Universitaires de Dakar	"
Intendance Militaire Dakar	"
Village d'Enfants SOS Dakar	"
Amicale de la BCEAO Dakar	"
Séchoy et Cie Dakar	Import - Export

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## ANNEXE VIII

### ACQUIS DE L'ITA SUR LA TECHNOLOGIE & LE CONTROLE DE QUALITE DES ALIMENTS

Nous envisagerons ces acquis pour chaque famille de production alimentaire, en considérant respectivement les aspects technologiques et ceux relevant du contrôle de qualité.

#### A - CAS DE LA VIANDE DE BOEUF

##### 1°) - Technologie (produits de transformation)

Les formules de fabrication des produits suivants ont été mises au point :

- Saucisses Merguèses ITA
- Dibi haché
- Saucisses dakaroises
- Saucisses cocktail dakaroises
- Saucisses dakaroises en bocaux
- Foie de boeuf
- Jambon cuit de boeuf
- Langue de boeuf cuite
- Saucissons fumés, séchés
- Saucissons fermentés
- Saucissons aplatis
- Langue de boeuf fumée et séchée
- Boeuf pressé
- Boeuf dans son jus
- Boeuf assaisonné
- Corned beef
- Minced beef

- Luncheon beef
- Chopped beef
- Luncheon beef meat
- Pâté de foie de boeuf
- Mousse de cervelle de boeuf
- Luncheon beef fish
- Tripe en sauce
- Coeurs en sauce
- Langue en sauce
- Boeuf au mafé
- Boulettes de viande de boeuf en sauce tomate
- Boulettes miettes viande -poisson en sauce tomate
- Choucroute garnie (de saucisses dakaraises)
- Rognons en sauce.

2°) - Contrôle de qualité

a) Microbiologie

Les analyses suivantes sont effectuées :

- Recherche de :
  - Spores aérobies mésophiles )
  - Spores anaérobies mésophiles )
  - Spores aérobies thermophiles )
  - Spores anaérobies thermophiles )
- Dénombrement des germes totaux
- Dénombrement des germes aérobies mésophiles
- Recherche et dénombrement des coliformes
- Recherche et dénombrement d'Escherichia coli
- Recherche et dénombrement des streptocoques fécaux
- Recherche et dénombrement des staphylocoques pathogènes

- Recherche et dénombrement des salmonella
- Recherche et dénombrement des clostridium H<sub>2</sub>S<sup>+</sup> - perfringens
- Dénombrement des levures
- Dénombrement des moisissures.

b) Chimie

Dosage et/ou analyse des constituants ou des critères suivants :

- eau
- protéines
- matières grasses
- Na (sodium)
- cendres
- collagène
- amidon
- polyphosphates
- nitrites
- plomb
- indice d'iode
- indice de peroxyde
- indice d'acidité
- point de fusion
- point de solidification
- anhydride sulfuré
- fer
- cuivre
- calcium
- A.B.V.T.(l'azote basique volatil total)

c) Analyses sensorielles

Appréciation des caractères organoleptiques,

B - CAS DU LAIT ET DES PRODUITS LAITIERS

Les acquis dans ce domaine sont relativement limités car la section "Lait et Produits Laitiers" ne dispose pas encore de locaux appropriés. Ces derniers devront être mis en place à la fin de la première phase d'extension de l'Institut. Aussi, seules quelques analyses d'approche ont été faites en collaboration avec les laboratoires de chimie et de microbiologie.

Ainsi les acquis au plan chimique et microbiologique sont les suivants :

a) Plan chimique : analyse d'un lait frais ayant

porté sur :

- la matière sèche
- les protéines
- la matière grasse
- l'acidité
- les chlorures
- la lactose
- les cendres
- la densité
- dosage des mycotoxines (aflatoxines)

b) Plan microbiologique : analyse des laits caillés

de différentes origines (lait caillé fait à partir de lait frais chez le producteur, lait caillé fait à partir de lait en poudre reconstitué, lait caillé préparé au laboratoire).

Cette analyse a trait aux points suivants :

- Dénombrement des germes mésophiles
- Dénombrement des spores thermophiles
- Dénombrement des coliformes
- Dénombrement des clostridium H<sub>2</sub>S - Parfringens
- Dénombrement des streptocoques fécaux
- Dénombrement des staphylocoques pathogènes
- Dénombrement des salmonella
- Isolement de flore mésophile : E. Coli, levures, moisissures
- Isolement de flore thermophile : streptocoques thermophila.

C/ - CAS DES POISSONS ET RESSOURCES HALIEUTIQUES

1°) - Produits de transformation

a) cas de la sardinelle

C'est l'espèce la plus abondante dans nos eaux.

Les réalisations portent notamment sur les produits suivants :

- salés-fumés-séchés sous forme de poisson entier en filets
- salés-séchés (sardinelles salées fortement séchées)
- pâtés de sardinelles type blanc
- pâtés de sardinelles à la tomate
- marinade de sardinelles
- ensilage de sardinelles pour bétail.

b) Cas de la fausse morue (thiof)

- boulettes de thiof à la sauce tomate
- salés-séchés.

c) Cas du brochet

- boulettes frites mises en boîtes
- filets congelés.

d) Cas du capitaine

- salé fumé séché (sous forme de filets simples ou filets fendus)
- filets fumés (poisson de grande taille)
- filets salés-séchés : de type "bacalao"
- boulettes à la sauce tomate
- pâtés de capitaine et de sardinelle.

e) Cas du mullet

- salé-fumé-séché (sous forme de poisson entier ouvert).

2°) - Procédés de conservation

a) Utilisation du pyrèthre pour la conservation de transformés de poisson

b) Technique de conservation des poissons par l'eau de mer

c) Amélioration des méthodes artisanales de conservation du poisson

- techniques de salage (à sec ou en saumure)
- mise au point et pré vulgarisation de prototypes de dessiccateurs solaires artisanaux.

3°) - Contrôle de qualité

a) Analyses chimiques

- humidité
- cendres
- protéines
- ABVT (azote basique volatil total)
- triméthylamine
- mercure
- matière grasse
- indice d'acidité de la matière grasse
- urée
- indice de peroxyde
- chlorure de sodium (NaCl)
- calcium
- vitamine C.

b) Analyses microbiologiques

- aérobie mésophile
- aérobie thermophile
- anaérobie mésophile
- germes totaux
- coliformes
- E. Coli
- streptocoques fécaux
- staphylocoques pathogènes
- salmonelle
- staphylocoques clostridium H<sub>2</sub>S +  
perfringens

c) Analyses sensorielles

- portent principalement sur le goût.

D/ - CAS DES CEREALES ET LEGUMINEUSES

1°) Technologie (mil et sorgho)

- Technique de décorticage et de mouture sèche du mil ou du sorgho en vue de l'obtention de farines se conservant plus longtemps et destinées à la panification, à la pâtisserie ou à la fabrication de couscous.

- Technique de fabrication du pain de mil (70% blé + 30% mil) et du pamiblé (85% blé + 15% mil).

- Technique de fabrication de cake (50% mil + 50% blé).

- Méthode artisanale de stockage des grains ou des graines en fûts métalliques sans introduction de produits chimiques.

- Méthode de stockage des farines par réfrigération ou sous emballage plastique.

- Technique de fumigation et de traitement insecticide des stocks.

- Etablissement de normes pour les grains et farine de mil.

2°) Contrôle de qualité.

a) Analyses physico-chimiques (mil, sorgho,

- Détermination du poids de 1000 grains
- Détermination d'un (1) litre de grains
- Détermination d'humidité
- Détermination des cendres
- Détermination des protéines
- Détermination des matières grasses
- Détermination de cellulose
- Détermination de "Falling number"
- Détermination de couleur
- Détermination de granulation
- Détermination de pH : acidité
- Détermination des acides gras libres
- Analyse et dosage de mycotoxines (aflatoxines).

Pour le blé, les analyses supplémentaires sont effectuées :

- Détermination du glut en humide
- Détermination de l'acide de sédimentation
- Détermination de granulation
- Analyses rhéologiques

b) Analyses microbiologiques

- levures
- moisissures
- clostridium H<sub>2</sub>S
- Coliformes
- germes totaux
- E. Coli
- staphylocoques pathogènes

c) Analyses sensorielles

- Tests d'acceptabilité (goût, saveur, odeur, couleur)

R/ - CAS DES PRODUITS D'HORTICULTURE OU DE CUEILLETTE

1°) - Technologie

Les rubriques suivantes sont l'objet de méthodes appropriées, applicables à différentes espèces fruitières ou maraichères :

- Détermination du stade optimal de récolte en vue de la conservation ou du transport.
- Conservation par réfrigération dans l'air à température constante
- Conservation par réfrigération dans l'air à température modulée (chocs thermiques, réchauffement par paliers, refroidissement en cascade).
- Conservation par emballage sous vide ou non, dans des sachets de polyéthylène.
- Blanchiment
- Amélioration de la coloration des fruits à maturité par déverdisage à l'aide de l'éthrel (agrumes, melons).
- Extraction de jus (goyave, tamarin, bissap, lime, citron, gingembre).

- Fabrication de gélées (goyave , orange).
- Fabrication de marmelades (goyave, mangue, ditakh, mangue + buy, patate douce + bay. neré, anacarde, jujube: melon, citron).
- Fabrication de confitures : (mangue, papaye, anacarde)
- Fabrication de conserve de légumes : (piment, cornichon, haricot, chou).

2°) - Contrôle de qualité

Les acquis portent sur des méthodes d'analyses chimiques, physiques, sensorielles et microbiologiques.

a) Analyses chimiques

Elles concernent le dosage des sucres, de l'acidité, des tannins, des pectines, des vitamines (A et C), de la cellulose, des matières grasses, des protéines, du calcium, du phosphore et de certains métaux (fer, cuivre, plomb).

b) Analyses physiques

Elles sont relatives à la dureté pénétrométrique des pulpes, à la couleur, au taux de matières sèches ou de perte de poids, au poids spécifique des produits frais et aux caractéristiques morphologiques en vue du triage et du calibrage mécanique.

c) Analyses sensorielles

Elles consistent en l'appréciation des caractères organoleptiques des produits, notamment leur consistance.

d) Analyses microbiologiques

Les produits horticoles sont essentiellement altérés par les champignons (moisissures) et, plus rarement par des bactéries ou des virus. Les analyses microbiologiques dans ce domaine portent sur l'identification des agents d'altération en vue de renforcer l'efficacité des traitements prophylactiques.

## BACKGROUND NOTES TO THE REPORT

### The PEDS Project

This study was conducted under the Private Enterprise Development Support Project. The PEDS Project is a five year (FY88 - FY92) \$20 million project managed by the Bureau for Private Enterprise. In the first year of the project, PRE provided technical assistance in response to nearly fifty different requests from Missions and Bureaus. The PEDS Project is designed to provide a wide range of expertise in private sector development. Areas of technical assistance include the following:

- Policy analysis related to private sector development
- Sector assessments and analyses
- USAID private sector strategy development
- Legal and regulatory analysis and reform
- Small-scale business development
- Trade promotion
- Investment promotion
- Free trade zone development
- Financial institutions and instruments
- Management and financial training
- The role of women in private enterprise
- Applications of MAPS: Manual for Action in the Private Sector

USAID Missions have the resources of thirteen contractors available to them through the PEDS Project.

- |                                    |                          |
|------------------------------------|--------------------------|
| ● Arthur Young (prime)             | ● Ferris & Company       |
| ● SRI International                | ● Metametrics            |
| ● Management Systems International | ● Elliot Berg Associates |
| ● The Services Group               | ● Robert Carlson Ass.    |
| ● Trade and Development, Inc.      | ● Ronco                  |
| ● Multinational Strategies         | ● Dimpex Associates      |
| ● J.E. Austin Associates           |                          |

### The Consultancy

This report is based on a three week field visit to Senegal in December 1988. Field work was conducted by Warren Enger, Waldo Heron and Jean-Michel Delvaque. The final report was produced by Warren Enger, team leader for the assignment.

## The Authors

Warren Enger, team leader for this assignment, is a senior agricultural economist at RONCO Consulting Corporation. Mr. Enger has worked with farmers, businesses, government enterprises and agencies in economic and financial analysis; he has carried out sector studies and profiles throughout West, East and North Africa, South and Southeast Asia and the Caribbean and participated in development activities in the public and private sectors over the past 20 years.

Waldo G. Heron is a senior specialist in food processing, with expertise in corporate administration, international marketing and management, joint venture negotiations, technical assistance agreements, feasibility studies and evaluation of food plants. Mr. Heron has worked in many developing countries to assess food processing problems and opportunities.

Jean-Michel Delvaque is a specialist in horticulture research, production, packing, shipping and wholesale marketing. From 1972-82, he was the Chief of the Economic and Marketing Service for FAO/Senegal and Principal Technical Advisor on Marketing, Economics and Planning for Horticultural Production. In 1971-72, he served as marketing expert on a FAO Mission to Syria to evaluate and prepare standards for packaging of fruits and vegetables. From 1957-81, Mr. Delvaque was the Director of the Loire Atlantique Fruit Grower's Cooperative in Nantes, France. He also served as Director General to the citrus growers' cooperative in Sidi Slimane in Morocco. Mr. Delvaque is currently a consultant in the production, packaging and marketing of horticultural crops.