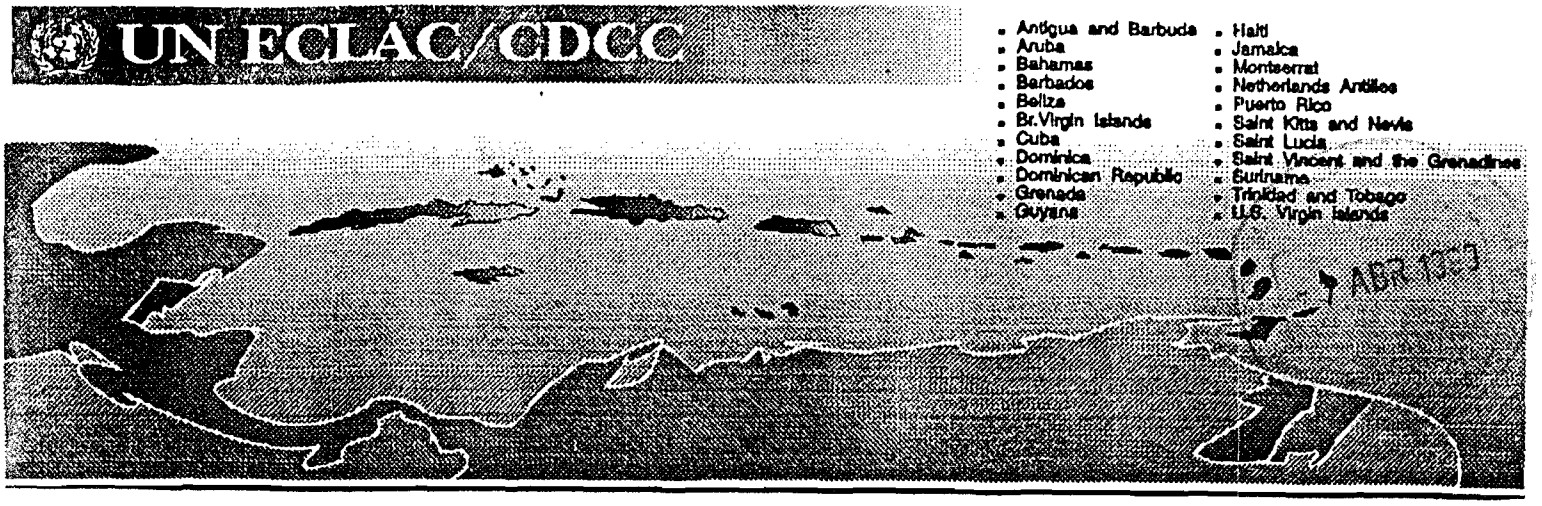

CARIBBEAN COUNCIL FOR SCIENCE AND TECHNOLOGY

Workshop on "Simbiosis" and Food Technology Network in the Caribbean
(under the sponsorship of the Organization of American States (OAS))

Kingston, Jamaica
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REPORT ON THE WORKSHOP ON "SIMBIOSIS" AND FOOD TECHNOLOGY NETWORK IN THE CARIBBEAN

UNITED NATIONS
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN
Subregional Headquarters for the Caribbean
CARIBBEAN DEVELOPMENT AND COOPERATION COMMITTEE

REPORT ON THE WORKSHOP ON "SIMBIOSIS" AND FOOD TECHNOLOGY NETWORK IN THE CARIBBEAN

Courtleigh Hotel, Kingston, Jamaica
5-7 May 1998

1. INTRODUCTION

The "Simbiosis" Workshop was held at the Courtleigh Hotel, Kingston, Jamaica, 5 - 7 May 1998. Representatives from 14 Caribbean countries from both the public and private sectors in the fields of food technology, biotechnology and agro-processing attended the Workshop. Resource persons from the University of the West Indies (UWI), and proponents of the Simbiosis Network from Centro Nacional de Ciencia y Tecnología de Alimentos (CITA) - Costa Rica , Programa Nacional de Colciencias - Colombia, Consejo Nacional de Investigaciones Científicas y Technolgia (CONICIT) - Venezuela and Fundação Tropical Pesquisas e Tecnologia - Brazil, and the Organisation of American States (OAS) were also present. A list of workshop participants is appended.

The term "Simbiosis" in this context is used to describe a Multinational Specialised Information System for Biotechnology and Food Technology in Latin America and the Caribbean. It is an institutional mechanism sponsored by member countries and the OAS used to connect persons and organizational centres with interest in biotechnology, food technology and related areas. The objectives of the workshop were to:

(a) Obtain the status of food technology, including food preservation and agro-processing in the region;

(b) Obtain the status of biotechnology, specifically relating to food and natural products in the region; and

(c) To introduce the Simbiosis Network to the Caribbean with an aim to establishing a web site and home page for food technology and biotechnology.

2. OPENING REMARKS

Dr. Conrad Douglas, Chairperson of the Scientific Research Council (SRC), Jamaica, opened the proceedings by welcoming all delegates to Jamaica and expressed the hope that the workshop would yield positive results.

Dr. Hector Herrera, Senior Specialist in the Department of Scientific Affairs, OAS and Regional Coordinator of the Multinational Project on Biotechnology and Food Technology conveyed the greetings of his organization and embarked on a brief history of the creation of the "Simbiosis" Network and its general objectives and goals. The "Simbiosis" network was created as a necessary

part of the mandated orientation area in Biotechnology and Food Technology in the "Information and Diffusion Category" which forms part of project activities.

Dr Herrera explained that the "Simbiosis" document presents the creation process for the "Simbiosis" system which makes reference to the Multinational System of Specialized Information on Biotechnology and Food Technology for Latin America and the Caribbean. The document includes background of the MPBFT; activities supporting the creation of the system; publications distributed to the participants, which formed the materials for discussion on the creation and operation of the system "Simbiosis". In summary, the document presents a systematized and chronological history of facts that promoted the creation of "Simbiosis", the background related to the Multinational Project on Biotechnology and Food Technology (MPBFT) and its relation with the information issue. He expressed the hope that by the end of the workshop, participants would be aware of the scope of the network and the advantages to be gained by the sharing of information.

Mr. Donatus St. Aimée, Secretary of the Caribbean Council for Science and Technology (CCST) reminded participants about the potential and prospects for biotechnology in developing nations, and the importance of the link between biotechnology and agro-processing. He underscored the importance not only of the direct linkages between the two, but also the other linkages that were equally important to the development of our economies. The provision of good quality products for the local and foreign markets, and the commitment to the proper nutrition of the population were cited as examples. Biotechnology, he added, had an impact on all aspects of life. Research and development was, in most cases, beyond the scope of most developing countries. Therefore, it had now become absolutely necessary to understand the need to pool our available resources and appreciate the benefits to be gained by networking. Mr. St Aimée also emphasised the collaborative role that organizations such as the OAS, the CCST, UWI, the SRC, the Caribbean Industrial and Research Institute (CARIRI), the Institute of Applied Science and Technology (IAST), the Institute of Marine Affairs (IMA) and other national institutions must play in the region.

Dr. Arnoldo Ventura, Special Adviser on Science and Technology, to the Honourable P.J. Patterson, Prime Minister of Jamaica, gave the feature address. His remarks centered around the increasing need for development of information and communication technology in the region. Information by itself, he advised, was no indication of greater possibilities for economic growth nor meaningful social change. Any information network worth its name should generate knowledge and promote wisdom, he added. He reminded participants that the type of information generated would have an important effect on competition and trade. A great deal of goodwill and commonality of purpose would therefore be necessary to ensure that the information was reasonably well shared. As a result, what got on the network should be agreed to beforehand and ways to police it should also be clearly defined. Monitoring of the system should also be a major consideration so that the network is updated on a regular basis. The impact of modern biotechnology on agriculture as a whole was delved into in terms of its dramatic effect on reduction of postharvest losses, improvement in the therapeutic, nutritive and more generally, overall quality of the final product. The timeliness of a forum of this type, as well as the appropriateness of methodologies and technologies was discussed in the context of being crucial in order to keep abreast of international technologies.

3. PRESENTATION OF COUNTRY REPORTS

Following the opening ceremony, the Secretary of the CCST outlined the format for presentations of country reports and other technical papers. Each representative reported on the status of biotechnology, food technology and agro-processing in their respective countries. This was followed by any questions and/or comments. The resource persons from Latin America then presented their papers on "Simbiosis" and gave demonstrations on the operation of the network on the Internet. Presentations were made in alphabetical order by country. The full text of country reports are available upon request.

Antigua and Barbuda

The agro-processing sector in Antigua and Barbuda was mainly concentrated on a number of cottage-type processors producing a variety of products, mainly: jams, jellies, pepper sauce, tamarind balls, juices, and various candies. Most of these operations were done out of homes with a limited number of medium-sized factories existing, mainly producing rum. The Ministry of Agriculture in Antigua and Barbuda had currently embarked on a project to improve proper food handling practices and to encourage agro-processing as a means of diversifying the flagging banana industry which had been hard hit by the recent spate of hurricanes which had plagued this island. Currently no major biotechnology initiatives were being undertaken on this island.

Bahamas

The representatives from the Commonwealth of the Bahamas gave a synopsis of government policy as it related to agriculture. The Ministry of Agriculture, as the main vehicle, attached high priority to developing and diversifying agricultural production, creating linkages between tourism and agriculture and decreasing the dependence on food imports. The Ministry recognised that agro-processing was the key to achieving these objectives.

The unavailability of raw material and packaging material was one of the major difficulties encountered by the agro-processing sector. Other hindrances were also noted, including the development of technical packages, the training of officers in programme development and the lack of equipment for bulk processing of raw material.

The fisheries sector was one of the most valuable natural resources and this held the largest potential for development. Processing in the fisheries sector was for the most part limited to preservation by freezing. This trend was dictated by the crawfish export industry, the driving force in fisheries. Several attempts had been made at value-added processing as it had been the view that diversification would be the future mainstay of the industry. Valued-added processed products included cooked shore crab claws, whole cooked lobsters, conch fritters, conch chowder, conch sausages and conch patties.

The major items produced in the Bahamas were canned pigeon peas, tomato paste, processed meat (mainly pork), ice cream, chocolate and candies, pepper sauce, jams and jellies, fruit-flavoured drinks, cake mixes and "yuma gold", a lemon liqueur. These were produced by a number of established companies operating as small industries.

No biotechnology iniatives were being undertaken in the Bahamas.

Barbados

Dairy processing was the main agro-processing activity in Barbados with the largest processor being Pine Hill Dairy Limited, where flavoured milks, yogurt, cottage cheese and sour milk were produced. UHT packages of fruit drinks were produced under the Kalypso Kool label, while other processed products such as seasonings, pepper sauce, fruit sauces, chutney, syrups, preserved fruits for cake mixes, pie fillings, flavourings for ice-cream, carbonated beverages, jams, jellies, sweets (sugar cakes, tamarind balls, etc.) were also produced. Some fish processing was done, as well as the production of cheeses such as mozzarella, ricotta and mascarpone for the local market.

While the sector was fairly vibrant, problems were experienced especially acquiring raw material. There was some difficulty in acquiring and maintaining locally grown fruit of a consistent quality. This had been highlighted as the main problem for persons who required dried fruits for their products. It was felt that there was a need for the services of food technologists who could assist with the training of local persons from the public and private sector food processing institutions in new innovations, techniques, uses of indigenous products, etc. The commercialisation of production once products had been pilot tested was deemed necessary. Of additional importance also was the establishing of links with regional food technology information centres that would take care of a deficiency in the marketing of products within CARICOM territories.

Biotechnology initiatives were currently undertaken at the UWI, Cave Hill Campus by Dr Leonard O'Garro, Molecular Geneticist. Yam was propagated by tissue culture and the disease-free plantlets produced were established in fields which were not infested with the anthracnose agent, *Colletotricham gloeosporoides* which was responsible for the decimation of White Lisbon yam in the 1970s. Research had been done on the production of yam flour and commercialization of same was about to be embarked upon using solar energy to dehydrate pre-cooked yam. After exhaustive tests, processing had been refined to the extent where colour, texture and overall quality of the flour were predictable and consistent.

Belize

Agro-processing in Belize centres around meats (beef, pork, and poultry), processed fruits and vegetables (citrus, papaya, pepper), sugar cane and other fruits and milk and milk products. The Government of Belize had an emphasis at present on quality control, food safety and inspection procedures geared to improve the food quality of the processed food from this country. As such, meat and meat products were inspected on a regular basis according to United States Department of Agriculture (USDA) guidelines, all

plant products should follow a rigid crop production regime and milk and milk products, though produced on a relatively small scale to satisfy the domestic market, were subject to daily, weekly or monthly testing depending on production load.

No biotechnology initiatives had been undertaken.

Dominica

In an attempt to revive the economy, the Government of Dominica had begun to place emphasis on the diversification of the economy particularly in the agriculture sector. Two priority areas for the period 1998-1999 were agricultural diversification to include fisheries, agro-processing and livestock and the development of agri-business.

Some of the products now manufactured in Dominica were juices, jams, jellies, plantain chips, dasheen chips, puffed products, teas, fruit cheeses, ground spices, meat, chicken and fish meal products, sauces, honey, coffee, cocoa, pepper sauce and the bottling of spring water. Some fish processing was done on a small scale. The agro-processing operations producing the above products were divided into four classifications - large, medium, small, and cottage industries. These were all commercial operations. Fish production is at the pilot stage at present.

As noted for most of the other countries, there were several constraints to agro-processing in Dominica. There was a need for training and technical assistance at various levels of the sector in a range of information areas, such as the basic principles of processing, labeling and packaging, hygiene and sanitation, quality assurance and standards, management, product development, production and marketing. The identification and production of suitable varieties of fruits, vegetables and tree crops for processing was required, together with reliable sources of technical information which could be accessed quickly and conveniently in a range of pertinent subject areas. According to Edward Lambert of the private sector, agri-industry needed to be served by partnerships between small-scale processors and larger companies either at a domestic or regional level. Availability of the factors discussed above would make for a much smoother operation of the sector.

Grenada

The agro-processing subsector in Grenada was the smallest segment of the local industrial economy, contributing about 6 per cent to total industrial output. The sector was described as dualistic in nature, with production and employment dominated by only a few enterprises operating along commercial lines, while there were several individual producers operating along "home industry" or cottage lines. There had been some growth in the number of enterprises over the years however, with 57 agro-processing enterprises identified in a 1997 survey as compared to 19 in 1987.

The major crops produced in Grenada were nutmeg/mace, bananas, cocoa and some minor spices. These represented the traditional exports and provided an important source of raw material for local processing in Grenada, although the volume processed was small, relative to the amounts exported in the largely unprocessed condition.

Agro-processing activities in Grenada could be grouped into seven product categories based on the type of raw materials used and the end products. These were fruit and vegetable processing, nectars and juices, sauce/pickles/seasonings, ground spices, snack foods, cocoa processing, wines and liqueurs and others (honey, seamoss, etc.) Products were geared primarily to satisfying domestic demand, with marketing done mainly by the processor. Since in most instances the processor had little expertise in formulating adequate strategies, marketing was poorly organized. A few enterprises were aware of the need to penetrate external markets (the domestic market was small - 90,000, with low per capita income) and promote their finished products on the regional markets. According to Heida Rahim of the Produce Chemist Laboratory, the long-term development of the agro-industrial sector would depend heavily upon the local capability to penetrate and secure both regional and extra regional markets for current and potential products. In order to realise the potential, however, the quality of finished products that these markets demanded was a hurdle that had to be overcome. The high cost of importing production inputs, specifically packaging, and the fact that much of the equipment used was obsolete were two of the major problems. Agro-processors in Grenada faced tremendous difficulties in accessing financial assistance from the traditional banking system. Recognition of the crucial role played by agro-processors had more recently led to increasing financial and other assistance (business management skills, etc) from institutions such as the Grenada Industrial Development Corporation, the Agency for Rural Transformation as well as international agencies e.g the French Technical Mission. Government had enunciated a policy strategy to fully develop industries based on the utilization of local/indigenous raw material.

Fresh chilled fish was processed for the export market, while frozen storage, salting, drying and smoking of fish was done for use on the domestic market. Processors were now exploring the canning of fish as well as the manufacture of fish paste, fish burgers and fish fingers.

Propagation of banana plants by tissue culture was being done with assistance from the Chinese Agricultural Mission. More recently the tissue culture programme had expanded to include propagation of orchids and anthuriums, which were ready to be farmed out to selected farmers to be used for cut flower commercialisation. With respect to other biotechnology initiatives, Grenada did not have the necessary facilities but stood to benefit from research activities in the area of bio-engineering at the Biotechnology Unit at UWI Cave Hill, Barbados.

Guyana

There were a number of factors which favoured agro-processing activities in Guyana, the major ones being the availability of arable land, the wide variety of crops produced in abundant quantities and the fact that the economy was agriculture based. The crops produced were both traditional and non-traditional. Traditional crops included sugar cane, rice and coconuts while among the non-traditional crops were pineapple, mango, cherry, passion fruit, carambola (star fruit), cashew, citrus, coffee, avocado, peanut, malacca, hot pepper, tumeric, banana, plantain, cassava (tapioca), sweet potato, yams, pumpkin, eggplant, bora, black eye and minica. Arising from these crops were the traditional processed products such as sugar, molasses, rice, rums, wines and liqueurs. A number of other local processed products had entered the market in fits and starts, some with reasonable success, others failing and disappearing from the scene. These included heart of palm, copra, edible oil, vinegar, jams/jellies/marmalade, fruit wines, breakfast cereals, snack foods, amchar, dried fruits and spices, pineapple chunks, casareep, carambola juice and preserve.

In spite of the identified factors and advantages, the agro-processing sector in Guyana was not well developed. Some constraints experienced by the agro-processing sector were the fact that technology and expertise were in short supply, the markets were not readily available for the quantities and quality produced, the prohibitive cost of processing and the reluctance of local entrepreneurs to enter into agro-processing. Some initiatives that had been taken included the linking of production with processing, educating the public on the benefits of agro-processing and the techniques and technology that might be utilised and the identification of markets. These initiatives were taken by the Government which was treating this as a priority issue by developing tax benefits, and by local industries and other institutions and organizations, such as the New Guyana Marketing Corporation, the University of Guyana, the IAST, Guyana Bureau of Standards, Inter-American Institute for Cooperation on Agriculture (IICA) and the Food and Agriculture Organization (FAO) of the United Nations.

There were three institutions in Guyana which utilised biotechnology expertise and skills. These were the University of Guyana, the National Agricultural Research Institute (NARI), and the Guyana Sugar Corporation Limited (GUYSUCO). At the Department of Biology a final year course called Molecular Biology and Biotechnology was offered as part of its four-year undergraduate programme. NARI was engaged in tissue culture activities for the propagation of plantain suckers and sweet potato which were sold to farmers and in a project funded by the International Atomic Agency, which attempted to produce moko resistant plantain suckers. GUYSUCO was also experimenting with this technology in the hope of producing higher yielding, higher quality varieties of sugar cane. It had its own Agricultural Research Unit where other activities were carried out, and also used the facilities at NARI. Of the three institutions NARI was the best equipped to conduct biotechnology activities. The main drawback however was the lack of trained personnel.

Jamaica

A survey of the Jamaican agro-processing sector revealed that more than 89 percent of producers were involved in the production of sauces, ackee, callaloo, juices, fruits and vegetables as well as jams. Other small operators processed and manufactured coffee and cocoa, dried snacks, spices/ soups and processed meats. The technologies used in processing included canning, acidic preservation, pasteurization, refrigeration and sugar preservation. More recent innovations were also utilized such as high temperature/short term processing, essential oils extraction, reverse osmosis and ultra filtration techniques, fermentation and minimally processed food and packing in a modified atmosphere.

Fish processing was also done, Jamaica presently being the world's largest producer of queen conch and *Strombus gigas*. Fish processing was however limited to the processing of fresh water fish since there was a decline in the capture of marine fish. Pickling of imported fresh mackerel as well as the canning of sardines, mackerel and tuna was also done.

Biotechnology initiatives had been in the area of training of students at the M.Phil. and Ph.D. levels. Some of the main research programmes undertaken at UWI, Mona had been in yam bioengineering and the development of transgenic plants resistant to viral diseases (papaya, tomato, pepper). A DNA diagnosis project to detect food -borne pathogens was recently initiated. The Scientific Research Council had set up an active tissue culture laboratory where disease -free material for the industry was produced The Biotechnology Centre at UWI had also worked with the private sector and had successfully hosted several local and regional workshops and seminars.

Several recommendations had been suggested for the improvement of the agro- processing sector in Jamaica. They include:

(a) Increased and improved training in food technology and agro- processing.

(b) Training at the rural community level to enable these communities to engage in agro-processing to produce value-added products, minimise the waste of their crops and advance themselves economically.

(c) Extension of food technology training to high schools.

(d) Improved facilities and equipment so as to facilitate development of newer technologies and implementation of more applied research.

(e) Further strengthening of the agro-processing resource network to offer greater assistance to agro-processors.

(f) Development of an "incubator" agro-processing facility.

It was felt that much more could be achieved in the field of biotechnology in Jamaica with more financing and greater regional collaboration.

Saint Kitts and Nevis

Food processing in Saint Kitts and Nevis was limited to the cottage industry, where much of the processing activities were carried out in the home. Formalized agro-processing was coordinated by the Ministry of Women's Affairs through an Activity Coordinator. The following processed food was produced by these twin islands: chutney, kuchela, pickles, vinegar, syrup, ice-cream, juices, wine and liqueur, jams and jellies, candies and sugar cake. Fruits were preserved by mainly blanching and/or freezing. Some of the fruits preserved by this method included: tomatoes, peas, beans, breadfruit, peppers, green bananas, pawpaw, citrus, green mango, ripe banana, golden apple, tamarind and coconut. Some enterprises also produced a rum-based liqueur called "Jook", local sweets (jawbone breakers, pull-pull), seamoss, yogurt, hamburger meat, sasparilla and herbal remedies. Commercially, St Kitts Food Products manufactured margarine and shortening from imported fish oil.

Certain constraints were highlighted which it is believed seriously impede the progress of the industry including but not restricted to the difficulty in obtaining suitable equipment and packaging material, plant pests (pink mealy bug) which hamper fruit production, animals (wild donkeys and monkeys) which destroy crops, very little or no access to financing by the women's groups which dominate the cottage industry.

Saint Lucia

Diversification of the main agricultural enterprise, banana cultivation had been a commitment of the Government of Saint Lucia, especially with the decline of banana production. This move towards diversification began with the establishment of the Produce Chemist Laboratory, whose objectives were to demonstrate that agro-processing could be a viable enterprise for persons involved in the private sector, to provide an outlet for the utilization of surplus fresh produce and to encourage increased production of raw material. The pilot plant was no longer in operation since one of Government's objectives had been achieved. However the goal of mass production of planting material in order to supply the agro-processing market with raw material was still being attended to.

At least ten commercial agro-processing plants existed in addition to numerous small operators. The main products produced were jams and jellies, marmalades , fruit syrups and sauces, chips, seasonings, tonics, teas, wines, flavoured oils, margarine, flavoured and pasteurized milk, yogurt, ice-cream, milk-based alcoholic drinks, sausages, hams, meat and fish burgers, minced meat, salted shark and sea moss. Most of these products were consumed locally with a small percentage being exported to regional markets.

Constraints to agro-processing had been identified as follows: the exorbitant price of raw materials, poor communication between primary and secondary producers and the seasonal nature of produce. Some attempts had been made to produce *in vitro* plantlets of a variety of crops, but this was limited by insufficient culture room/banks space, the lack of a mist propagating system. The Food Technology and Microbiology Unit of the Produce Chemist Laboratory was also limited by inadequate staff to conduct the chemical analyses necessary for efficient advisory services.

Saint Vincent and the Grenadines

Approximately 20 agro-processors existed in Saint Vincent and the Grenadines. They produced a variety of products such as fruit juices, jams, jellies, sauces, syrups, spices, pasta products, bottled spring water, plantain chips and pepper sauce. Like many of the other small islands agro-processing was limited to the cottage industry, which because of its small size was hardly able to meet local demand. Some processing of fish and meat was also undertaken, with fish processing playing a vital role in the economy as the country was considered to have a very well developed fish industry. Frozen and smoked fish were exported to various European countries.

Again there were constraints which hampered the progress of the agro-processing sector in Saint Vincent and the Grenadines. Most processors had no formal training. It was also felt that in order to complement the technical work being undertaken suitable equipment including computer hardware and software was necessary.

Tissue culture programmes for a variety of crops such as yam, cassava, banana were currently being conducted in collaboration with the Caribbean Agricultural Research and Development Institute (CARDI) as a means of producing disease-free planting material and to generally keep abreast of changes in the global market place.

Suriname

Commercial agro-industrial development of non-traditional food crops started in the late 1950s with the establishment of a medium-sized State-owned processing plant, Tropica Industries Limited. The prime objective of the company was the processing of rejected citrus fruit for export. In Suriname most produce was consumed fresh although there was a growing demand for processed fruits. Facilities to process fruit ranged from cottage industries to medium-sized units. The raw material used in the cottage industries was often fruit from backyard gardens and the products produced ranged from pickles, chutney, jams and marmalades to candies and juices. The production in industries at this level was adjusted to demand and customers were usually a fixed number of regular buyers although there were a few processors who produced for supermarkets and small retail shops.

There were about 12 medium sized fruit and vegetable processing units producing mainly juices. Most of them also produced jams and syrups from processed fruits or from artificial flavours. Because of the low and often irregular supply of fruits the units were operating at about 40 per cent capacity. Very few vegetable crops were processed in Suriname as the varieties did not easily lend themselves to processing. Processing of vegetables was further compounded by the unwillingness of most small farmers to produce large amounts of vegetables on a contractual basis, high production costs and the unavailability of inexpensive packaging material. Another important factor was the consumer's preference for fresh vegetables. The vegetables processed included chinese cabbage, cabbage, tomato, hot pepper, string beans, gherkins and tannia. Only about two per cent of the processed vegetables were exported.

The fish processing industry in Suriname could be divided into artisan and industrial processing plants. The former represented mainly family undertakings that process fish on a very small scale. These plants, until very recently, had been the most important producers of traditional fish products which included smoked and salted fish, dried shrimp and trasie, a fermented product made of shrimp and used in the seasoning of food. They now had to endure increasing competition from industrial enterprises that produced the same products under better economic and far more sanitary conditions.

The Centre of Agricultural Research in Suriname was primarily responsible for agricultural research and established a tissue culture laboratory in December 1988. The laboratory was initially set up to introduce the novel tissue culture techniques to Suriname and create facilities for university students to do practical work. Presently the laboratory was involved in the production of banana plants on a commercial basis.

Trinidad and Tobago

Trinidad and Tobago, while depending for many years on the energy sector for income generation had recently been focusing on the development of the tourism sector, agricultural production and agri-processing. There existed quite a large number of large and medium-sized companies producing alcoholic and non-alcoholic beverages, canned fruits, vegetables and cereals. Companies were also involved in the production of jams, jellies, pickles, confectioneries and juices. Both local raw material and imported concentrates were utilized for production of the processed commodities.

Biotechnology initiatives had been ongoing for the past 12 years with the establishment of the Food Technology Unit at the University of the West Indies under the late Professor George Sammy. This Unit offered post graduate studies in the area of Food Science and Technology. The Biotechnology Unit was part of the Department of Life Sciences at the same institution. Courses in Molecular Biology and Plant Biotechnology were offered as part of the B.Sc. Botany programme. Research was carried out in a number of areas within these two divisions which resulted in better planting material and products with a longer shelf life.

SYNOPSIS OF COUNTRY PAPERS

An overview of the papers presented would suggest that certain commonalities existed between production patterns/constraints experienced by agro-processors of Caribbean territories. These had been identified as follows:

- Most of the agro-processors operated small cottage production systems.

- Processors had difficulty in acquiring and maintaining a consistent supply of locally grown fruit to ensure production of standardized commodities.

- There was a need for training of persons involved in this sector by qualified food technologists.

- The following products were processed in almost all the Caribbean islands: jams, jellies, juices, candies, pepper sauce, some fish processing and spices.

- Proper hygiene and sanitation practices had been highlighted as concern in almost all the islands.

- Management of the processing unit once it became commercialized had been shown as a major constraint.

- Very few large commercial agro-processing units were in operation throughout the Caribbean.

- Many of the products produced by the smaller islands of the Eastern Caribbean territories did not meet strict international standards, as such most of these products were utilized merely to meet local demand for these items.

PRESENTATIONS FROM RESOURCE PERSONS

The resource persons were taken from a variety of organizations from Latin America and the Caribbean: CITA, Programa Nacional de Colciencias, CONICIT, Fundaçâo Tropical de Pesquisas e

Tecnologia "Andre Tosello", UWI and the OAS were represented at this Workshop. A demonstration on accessing and obtaining information from the "Simbiosis" web site was done by the resource persons from Latin America. CITA's representative detailed how Costa Rica established a presence on the web site and the problems encountered. The other representatives also gave their experiences and cited similar problems.

One of the concerns of Caribbean delegates was the question of information security. While information security was considered an important issue, people were reminded that the concept of "Simbiosis" was sharing of information. Any information deemed confidential should not be included. There were however ways in which access to certain types of information could be limited. More important than information security was the need to update the web site on a regular basis. Assistance would have to be sought from the responsible agency in collecting and collating the requisite data. The design of web page was also emphasised as being important. The representative of CITA related that the first design used was not attractive and they were mandated by the OAS to have the page redesigned by qualified designers. Country representatives were advised to start with the systems and information that were available and build from that point. The establishment of a web page, not including the cost of acquiring hardware, software and access to internet services was estimated at US$2,000.

Representatives from some countries gave brief synopses of the reasons why and the methods of developing their web sites. The main reason for development of sites was cited as access to information by sectors. Antigua and Barbuda stated that no web sites providing information about the island had been developed within that country. Bahamas had two internet service providers, but the cost of their services were very high and new hardware would be required if the "Simbiosis" home page were to be developed. In Barbados, a number of web sites existed on various businesses, although participants were not sure if Barbados as a country had a site. A web page was available on Belize, which carried information that catered mainly to the tourism industry. Many countries did have web pages and would therefore be able to "piggy-back" off the country facilities that were present in order to establish a " Simbiosis" web site.

REPORT SUMMARY

The following observations on the establishment of Simbiosis in the region were made based on the discussions following presentations at the meeting:

1. Service providers were available throughout the region.

2. Web pages were present at various stages of development.

3. The major management constraints identified were:
   * The lack of the necessary hardware and software
   * Lack of trained personnel to implement the project
   * Lack of funding
   * Conversion of data to HTML format

Technical issues highlighted for address were:
- Network design
- Information security
- Sustainability or maintenance of the system

Non-technical issues required for success of the network were also discussed as follows: Commitment to work, willingness to share information, hard work, free time, responsibility of focal point to, among other things, update information, ensure that the security of the system was maintained, sensitize policy makers of the need to establish this network and last, but by no means least, technical cooperation among developing countries.

CONCLUSION

The Workshop focused on obtaining the status of the agro-processing/ biotechnology sector in the Caribbean, as well as introducing the "Simbiosis" Network to representatives of Caribbean countries. A synopsis of papers, as well as a summary of the similarities between agro-processing products throughout the islands and constraints experienced, were also presented. In order to actually establish the Network, participating countries would have to ascertain where they stood in terms of physical and technical capability. This information was to be collated by CCST so that assistance could be given in the establishment of the network. Discussions highlighted the concerns of participants with respect to establishment and maintenance of the network. The Latin Americans were able to address most of these concerns, based on their own experiences with "Simbiosis".

LIST OF PARTICIPANTS
WORKSHOP ON "SIMBIOSIS" AND FOOD TECHNOLOGY NETWORK IN THE CARIBBEAN

5-7 May 1998
Courtleigh Hotel, Kingston, Jamaica

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