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**PROCEEDINGS
OF THE
CARIBBEAN FOOD CROPS SOCIETY**



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FOOD TECHNOLOGY DEVELOPMENT AT THE UNIVERSITY OF THE WEST INDIES

G. M. Sammy
U.W.I., Trinidad

INTRODUCTION

This paper deals with food technology development at the University of the West Indies which serves the English speaking or Commonwealth Caribbean - once the Federation of the West Indies. It is made up of a chain of islands stretching from the Bahamas in the north-west to Trinidad in the south east and includes Guyana and British Honduras on the American mainland. Historically, geographically and culturally they are related. The region was discovered by Christopher Columbus; fought for by European powers; colonized by them for sugar production using African slaves and later Indian indentured labourers. Thus, the more than three and a half million people of the Commonwealth Caribbean share the common experience of colonialism, slavery and the plantation system.

During the whole of the colonial period, which has not yet ended for some of the islands, their economy was geared to the needs of the Mother Country. For example, the world famous Imperial College of Tropical Agriculture (now the Faculty of Agriculture, U.W.I.) was founded in 1922 and established in Trinidad for the Development of export crops which are only now receiving some attention. Further, the region was and still is, to a great extent, producers of primary products and purchasers of processed goods. One important factor which has exacerbated this situation is, that our educational system fosters the purely academic and neglects the applied fields. The potential of the applied sciences is only now being recognized, with changes taking place slowly.

Past political and economic conditions did not encourage the development of processing or manufacturing skills. The one industry, sugar, which required processing before shipment overseas, was always in the control of absentee owners. It is, therefore, not surprising that we lack the most basic skills of food processing, since these were retained by the Mother Country in order to keep her colonies as a ready market for her processed goods.

THE PRESENT STATE OF FOOD PROCESSING INDUSTRIES

Food today is the world's largest industry and it is expanding every year. Food processing and preservation is, therefore, an essential part of the economic development of any nation (3).

The food import bill of the Commonwealth Caribbean before World War II was \$38M (T & T). By 1964 this figure rose to \$245M and in 1975 it is expected to reach between \$400 and \$500M (6). To be more specific, in 1968 Trinidad and Tobago (4) imported \$87.6M worth of food including animal feed, worth \$8.3M. Of this, fruits and vegetables accounted for \$10.1M and wheat flour \$10.5M. Of the \$10.1M worth of fruits and vegetables imported \$3.55M came from Canada, \$1.79M from the U.S.A., \$2.19M from the European Common Market countries, \$1.61M from the sterling areas, but only \$0.48M from the CARIFTA countries.

It would be impossible to expect self-sufficiency in all our food requirements. Nevertheless, there are certain food items in which we ought to be nearly if not totally self-sufficient. A study of the projection for production, demand and import (3) of roots and starchy vegetables, other vegetables and pulses for the year 1975 is given.

Item	Production	Demand	Import	Import as % of Demand
----- Metric Tons -----				
Roots and starchy vegetables	40,824	97,433	56,609	59
Other vegetables	20,866	35,733	14,871	42
Pulses	5,488	21,790	16,302	73

If we accept these projections, and have done nothing about them, we would in 1975 be importing 59% of our roots and starchy vegetables, 42% of other vegetables, and 73% of our pulses. It would seem that at least in this area, we ought to be self-sufficient or nearly so.

Food processing in the Commonwealth Caribbean is mainly confined to Jamaica and Trinidad, with developments now being initiated in Barbados and Guyana. Jamaica is well in the forefront; this is because of the establishment of a department of Food Technology within the Ministry of Trade in the late 50's. Recently the Government of Trinidad and Tobago and UNIDO established the Caribbean Industrial Research Institute which has a department devoted to Food Technology. The Jamaican institution is engaged in research and development work, while the Trinidad institute offers research services for a fee.

The food processing situation in Trinidad and Jamaica is almost parallel, so that a Trinidad example may be extrapolated to give the Jamaican situation.

The food processing situation in Trinidad is as follows:

No. of Factory	Type of Products Processed	Percent of Raw Material Imported
1	Flour mill	100
1	Citrus	0
2	Chicken for fresh market	0
	Pork for ham, bacon	80 - 90 at present
2	Oils & fats	20 - 30
4	Fruits & vegetables (not citrus)	80
1	Brewery	80
1	Snack food	60 - 80
1	Dairy product	50 - 60
1	Coffee processing	?
1	Spice	100
2	Ice-cream	80 - 90

This list does not include soft-drinks, bakeries and the large number of kitchen type processors. A study of the raw material imported shows that the food processing industries receive only a very small quantity of their raw material from local sources. This situation is clearly stated in "Carifta and the New Caribbean" (2) - "the domestic agricultural sector (producing food and livestock products for the local and regional markets) is in a very underdeveloped state, and this results in very high and growing levels of imports of food from the outside world."

The food chain may be divided into four main links; production, preservation and processing, marketing, and consumption. Any attempt to solve the food problem must take into account all four links of the chain. Neglect of any one aspect would frustrate the entire solution. Far too often total emphasis was placed on production with little or no concern for the other three links, - preservation and processing, marketing and consumption. Although this paper will be emphasizing processing, we wish to point out that the food problem must at all times be considered as a whole.

FOOD TECHNOLOGY AT U.W.I.

Food Science and Technology is a relatively new discipline to be introduced at the University of the West Indies. Traditionally, it is usually associated with Agriculture, but being a multidiscipline field with a strong leaning towards engineering in all its processes, it is known to be associated as well, with engineering, the biological, and the nutritional sciences. Food Technology was established in the Faculty of Engineering at U.W.I., instead of the Faculty of Agriculture because at that time the Faculty of Agriculture was concerned mainly with the production link of the food chain, and paid little or no attention to processing. Nevertheless food technology, although placed in Engineering works very closely with Agriculture. It may be considered the bridge between both faculties.

The idea of introducing Food Technology to U.W.I. was first conceived in 1964 by Professor W.S. Norman, then Head of the Department of Chemical Engineering. He invited Mr. C. Pape to join the department to research on the concentration of citrus juices, especially limes. His idea was supported by Professor M. F. Mohtadi who replaced him as head of the department in 1964/65, and in 1966 Dr. Abdo El Mohandes joined the department as a UNESCO expert in food technology to help in the establishment of this discipline. That same year the author was sent to the University of Massachusetts, Amherst, U.S.A. to read for the M.S. in Food Technology. He completed the course and returned to the department for the 1967/68 session when the "Elements of Food Technology" was offered for the first time as an optional subject to the final year Chemical Engineering students.

Food Technology is within the Department of Chemical Engineering and has only one full time member of staff.

TRAINING AND RESEARCH

The philosophy of training and research as applied to food technology at U.W.I. is strongly inclined towards the applied. In research, emphasis is placed on product development.

Training in food technology at U.W.I. may be divided into three sections, undergraduate, postgraduate and summer courses.

An undergraduate degree in food technology is not offered. However, a full course in the "Elements of Food Technology" as an optional subject is offered to candidates reading for the B.Sc. in Chemical Engineering or Agriculture. It is an orientation course and broadly covers the field. The number of candidates opting to read this course both from Chemical Engineering and Agriculture has been encouraging. A number of Chemical Engineering students who took this option have entered the food field either by joining the food industry or by reading for a higher degree in Food Science and Technology.

Postgraduate (7) courses are offered for the Diploma in Food Technology, the M.Sc. in Food Technology and the Ph.D in Food Science. The Diploma is a postgraduate course and requires a first degree for entry. The degree may be in a Biological or Physical science, or Agriculture or Chemical Engineering or Mechanical Engineering. It extends over one academic year, and the course of study depends on the student's background.

Entry to the M.Sc. in Food Technology is through the Diploma or a first degree in Food Science or Technology. It is a research degree with strong emphasis on applied research (product development). Entry to the Ph.D. is through the M.Sc. in Food Science or Technology. It is a "pure" research degree.

The short summer courses are meant to upgrade the knowledge of personnel already employed in the food field. They are normally of two weeks' duration and are for non-graduates. To date five short courses were held, one each in Food Inspection, and Food Quality Control and three in Handling, Packaging, Storage and Marketing of Fresh Fruits and Vegetables. This summer (1972) two more courses in "Handling, etc.", one in Trinidad and the other in Jamaica will be given. These short courses have been financed in the part by "Canada Plus-One."

Our research programmes are strongly product development oriented, and closely tied in with the Faculty of Agriculture. Our main areas of investigation are root crops and fruit and vegetable processing.

Our root crop investigations were financed by the Rockefeller Foundation through the Faculty of Agriculture. The investigations thus far were confined to yams (Discorea spp.) and sweet potato (Ipomoea batatas.)

The yam studies included the preparation of an "instant yam", that is precooked and drum-dried; yam flour and the canning of yam slices in brine. Six varieties from four species were studied: D. alata - lisbon, oriental, and coconut; D. rotundata - portuguese; D. trifida - cush cush (white) and D. esculenta - chinese.

The preparation of an instant yam was quite successful. Data obtained from this study was used in the setting up of a pilot plant in Barbados by the Tropical Products Institute, U.K. This operation was reported successful and considerations are being given to set up a commercial operation. Yam flour studies have shown that 20 - 25 per cent yam flour may be added to wheat flour to produce a fully acceptable loaf, with better keeping qualities than bread from purely wheat flour. The production of yam flour at present is somewhat prohibitive because of cost.

It has been found that yam slices may be canned in brine without the leaching of starch by blanching the slices before canning. The work on yam processing was done by Mr. W. Steele towards his Ph.D. thesis. The work has not yet been published.

The work on sweet potato was done mainly with the cultivar Q49. Two aspects were studied - (1) Flour production and; (2) The canning of slices and whole potatoes in brine. The work on sweet potato flour (5) was published. The study shows that 15 per cent sweet potato flour may be added to wheat flour to produce a fully acceptable loaf. Another study was carried out, when seventeen different cultivars were tested for baking potential. The results are yet to be published.

The canning in brine study was a student project and showed that whole potatoes of Q49 variety may be canned in brine to give an acceptable product with a shelf life of more than a year.

Sweet potato composite flour has commercial possibilities. The next step would be pilot scale baking trials.

The work on tropical root crops will be continued through assistance from the International Development Research Centre in Canada.

FRUIT AND VEGETABLE PROCESSING

Our main study in this area is on roselle (Hibiscus sabdariffa). We have worked out the system for concentrating the hot water effusate of the calyces. We have established that the keeping quality of the frozen concentrate to be better than 2 years. A pilot plant is being built for pilot studies and marketing studies of the concentrate. The plant was designed and is being built by CARIRI.

Other work being done with roselle is a study of the parameters affecting the keeping qualities of the dried calyces; and a study of the spray, foam-mat and vacuum drying of the hot water effusate to produce a solid concentrate.

In association with the Faculty of Agriculture we studied the processing potential of a new cultivar of pigeon peas G.I. 26/2. The results are published in a departmental report (1).

Research in progress includes, the preparation of a jelly from nutmeg pericarp; the preparation of a comminuted citrus drink; the preparation of citrus marmalades from locally grown citrus, and the preparation of a tropical fruit salad from grapefruit, banana, papaya, and pineapples.

FUTURE PROJECTION

We feel that short summer courses should continue both in processing and in the handling, packaging and storage of fresh fruits and vegetables. There is need for a handbook on the handling and storage of tropical fruits and vegetables and possibly additional research in this field.

We feel that research in processing of indigenous foods from local raw material for local consumption should be increased. That surveys should be carried out on the processing potentials and possible uses of the lesser known tropical fruits and vegetables. Our peoples are influenced by the affluence of the North American mainland in the way of convenience foods such as packaged breakfast cereals, etc. We should, therefore, endeavour to provide these from locally grown raw material and processed in small factories. We should also endeavour to reduce our high food import bill through the study and application of the complete food chain, production, processing and preservation, marketing and consumption.

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