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PLENARY SESSION VII: EXPLORING THE POTENTIAL OF
AGRIBUSINESS IN THE REGION -
PRODUCTION AND SAFETY ISSUES

PROBLEMS OF, AND PROSPECTS FOR, LINKAGES BETWEEN
CARIBBEAN AGRICULTURE AND FOOD PROCESSING:

A case Study Illustration

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Introduction

Small, open Caribbean economies need to explore all possibilities for realising developmental goals of:

- employment creation
- income creation
- structural transformation
- technological development, and
- foreign exchange earning.

Food processing can play an important contributory role in the achievement of these goals. However, with the exception of the primary processing associated with traditional agricultural exports, there has been limited linkage between food processing and Caribbean agriculture. Much of the other food processing activity was established in the post-independence period behind import substitution protectionist barriers. One characteristic of this relatively new food processing activity has been a heavy reliance on imported inputs.

However, there clearly have been attempts to develop processing operations more closely integrated with domestic agriculture. This paper presents some of the results of a study which sought to draw lessons from analysing specific cases of attempted backward linkages between food processing and domestic raw materials.² (Pantin 1983). Tables I-III indicate the potential and reality of domestic raw material processing.

Two questions were posed in the study:

1. What distinguishes success from failure in the cases of attempted utilisation of Caribbean raw materials for processing?
2. What explains the limited utilisation of domestic raw materials in Caribbean food processing?

The study originally sought to answer only the first question. However, a preliminary survey of the Eastern Caribbean, including Trinidad and Tobago, identified few processing enterprises which met the criteria set. The criteria included local ownership and management, some evidence of independent technological decision-making, commercial operation for at least three years and either local raw material using, or if utilising imported raw materials, these could be substituted with domestic supply e.g. pigeon peas.

¹ This paper is part of a larger study undertaken under the aegis of the Caribbean Technology Policy Studies, Phase II, funded by the IDRC, Canada.

² The case studies were concerned particularly with efforts to develop a technological capability in food processing. For the purposes of this paper the domestic raw material issue will be highlighted.

The relatively large commercial food processors established under the import substituting programme were excluded from our study on the grounds that:

- (a) they were import-intensive
- (b) there was no specific research on those established processing enterprises which were un-

ambiguously committed to utilisation of local raw materials, and therefore, these sums were worthy of special study.

However, existing studies of the larger food processors were

TABLE 1: Minor and Lesser Known Fruits of the English Speaking Caribbean with Indicated Potential for Processed Products

Botanical Name	Common Name
<i>Acharas zapota</i>	Sapodilla
<i>Aegle marmelos</i>	Bael fruit
<i>Anacardium occidentale</i>	Cashew apple
<i>Annona reticulata</i>	Custard apple
<i>Annona Sguamosa</i>	Sugar apple
<i>Annona muricata</i>	Soursop
<i>Averrhoa bilimbi</i>	Bilimbi
<i>Averrhoa carambola</i>	Carambola
<i>Calocarpum sapota</i> (or <i>mammosa</i>)	Mamme or Mammeey Sapote
<i>Carica papaya</i>	Papaw, papaya
<i>Casimiroa edulis</i>	White sapote
<i>Chrysobalanus icaco</i>	Cocoa plum, fat pork
<i>Citrus maxima</i>	Shaddock
<i>Citrus medica</i>	Citron
<i>Eugenia uniflora</i>	Surinam cherry
<i>Eugenia jambolana</i>	Java plum
<i>Eugenia malaccensis</i>	Pomereae, chia, Malay apple
<i>Eugenia jambos</i>	Rose apple or Pomme rose
<i>Flacourtia ramontchi</i>	Governor plum
<i>Hibiscus sabdariffa</i>	Roselle, sorrel
<i>Malpighia glabra</i>	Acerola, Barbados cherry
<i>Mammea americana</i>	Mammeey apple or Mammeey
<i>Magnifera indica</i>	Mango
<i>Myristica fragrans</i>	Nutmeg
<i>Passiflora edulis</i> var. <i>flavicarpa</i>	Granadilla, Passion fruit (purple & yellow)
<i>Pereskia aculeata</i>	Barbados gooseberry
<i>Phyllanthus acidus</i>	Damself, Othaheite gooseberry
<i>Physalis peruviana</i>	Cape gooseberry
<i>Psidium guajava</i>	Guava
<i>Spondias cytherae</i> , sonn.	Golden apple, June plum, pommecythere
<i>Spondias mombin</i>	Hog plum, Yellow mombin, Jobo
<i>Tamarindus indica</i>	Tamarind
<i>Zizyphus mauritiana</i> (Jujuba)	Dunks, Indian or Malay Jujube

Source: Sammy, G.M.: The Processing Potential of Lesser Known Tropical Fruits, 1980.

TABLE II: Actual Food Processed, Products, Developed at UWI Dept. of Chemical Engineering, St. Augustine

- Breakfast food - based on root crops or breadfruit
- Sorrel*
- Canned bodi
- Tropical fruit salad
- Passion fruit cordial
- Canned mango slices
- Coconut cream
- Canning of carvuli (fish)

* Commercialisation attempted.

Source: Sammy, G.M.: personal communication.

TABLE III: Processed Products Development by Research Institutes

Barbados:
Dehydrated yam*
Dehydrated sweet potato
Dehydrated eddoes
Dehydrated pumpkin
Cassava flour*
Breakfast flakes (from root crops)
Eddoe soup (dehydrated)
Fish and yam mixes
Bottled papaw
Crystallized fruit and other preserves
ECCM**
Canned mango slices
Pineapple cubes and other fruit and vegetables*
Pickled cucumber and beets
Nectars from papaw
Mango and passion fruit
Jams and jellies of mango
Papaw, guava and other fruit
Mango chutney
Tomato ketchup
Lime juice
Flours from sweet potato and banana

* Commercialisation attempted

**No data were readily available on attempted commercialisation of these processed products developed in the Produce Chemist Departments.

Source: Whitehead, Judy A.: Select Technology Issues in Agro-Industry (11), S.E.S., March 1979, pp.180.

drawn upon to answer the second question posed above.

Methodology

The study utilised a deductive methodology in seeking to answer the two questions. A number of working hypotheses were developed to distinguish success from failure, and to explain the limited examples of attempted utilisation of domestic raw materials. Innovation theory and developmental theory are the strands of economic thought most relevant to the derivation of such hypotheses: the former being more specific to the factors responsible for success over failure.

The industry literature drawn on included the results of the food processing survey of the Eastern Caribbean Common Market and of Barbados undertaken in CTFPS-1 (Dellimore and Whitehead, 1970); and earlier survey of food processing in Trinidad (Pantlin and Cropper, 1975); and unpublished case study material from Draper (Draper, 1981). In addition, a review was made of some of the literature on Caribbean food processing, which has been concerned particularly with the problem of raw material supply to the food processing sector. Finally, the derivation of the hypotheses benefitted from a reflection of the literature on development/underdevelopment in the Caribbean in particular on the role of Transnational Corporations (TNCs) and the domestic private sector in this scheme of things.

The hypotheses advanced may be considered to be of an exploratory nature, particularly with regard to the reasons distinguishing success from failure. Despite attempts to widen the area of study to the Eastern Caribbean, only a few cases were identified as relevant to our objectives. The Jamaica food processing sector was excluded from consideration on grounds of higher costs and also because of the original assumption that the Eastern Caribbean would provide a wide enough base to form generalisations. Given the limited

number of cases identified and hence studied, the resulting hypotheses need to be treated cautiously. However, it is felt that further testing will not dramatically alter the nature of the explanation for distinguishing success from failure.

The limitations of empiricism, even if based on deductive reasoning, is revealed in the attempt to explain the relatively insignificant utilisation of domestic raw materials in the food processing sector. The explanation lies in a more general theory of development/underdevelopment. Hypotheses testing becomes almost meaningless in such a situation given the complex of explanatory variables, some of which are non-quantifiable.

While the hypotheses derived drew on relevant literature as identified above, such material served as a catalyst for advancing explanatory propositions. These were refined by the process of field work which sought to identify the factors considered most important by those actually working in the field. The hypotheses advanced therefore come out of a reflection on the literature as well as the results of the interview process.

Section I

Reasons for Success/Failure

As noted earlier, the attempt to derive hypotheses for distinguishing success from failure, was rooted in the theory of innovation and utilised the case studies approach. The theory of innovation, as Nelson pointed out, is broken into a number of *disjoint traditions* (Nelson, 1977). The case studies approach is one such strand among these traditions.³ Although the hypotheses were derived from a creative analysis of this branch of innovation theory, there was an explicit modification. By and large, food processing in the region concentrates on assimilation of well established techniques of processing rather than on innovation.

However, there is an element of innovation involved in terms of developing processed products, from locally produced raw materials. These may be unique in certain characteristic changes during processing, as compared to even the same raw material grown elsewhere. Differing scales of production, and non-availability of machinery for some scales, may also induce elements of invention in the design and fabrication of machinery and equipment.

Summary of Case Studies:

Sorrel - In the late 1960's, the Food Technology Unit of the Department of Chemical Engineering at The University of the West Indies, Trinidad, under Dr. George Sammy, began research work on the processing potential of sorrel. The latter is a local crop harvested in the Christmas season which is made into a very popular drink. This research effort was scaled up by 1973 with the establishment of a pilot plant with a capacity of half a million pounds of fresh sorrel per annum. (10,000 gallons of concentrate). At the end of the 1970's it was decided to increase

the scale of operation to 30,000 gallons of concentrate, or some 1½ million pounds of fresh sorrel.

In the 14 odd years that it has taken to bring the work on sorrel processing to its present level, the Trinidad and Tobago Government has financed all of the costs involved. The new commercial operation will be 100 per cent government-owned. At no time (with the exception of 1977) has the sorrel plant run at full capacity. The major reason for this state of affairs is the unavailability of raw material supplies. There seems to be an adequate market for sorrel as evidenced by the offer of two commercial processors, who sell a ready-to-drink sorrel product, to purchase all the concentrate which the plant can produce.

Instant Yam - In 1969, the Barbados Sugar Producers' Association initiated research work on the feasibility of an instant yam product, drawing on original research work done at the Food Technology Unit at The University of the West Indies (UWI), Trinidad by Sammy and Steel. In 1971, the Association felt confident enough about the research work to build a pilot plant with a capacity of 45 tons of fresh yam per season on a three-shift basis. Responsibility passed at this time to the Barbados Agricultural Development Corporation (ADC). The instant yam plant was affected adversely by the shortage of raw material supplies at an economic cost price, and of markets for its output.

A feasibility study by the Caribbean Development Bank, (CDB) in 1976, proposed a commercial operation on the assumption of a fresh yam supply at 12 cents per pound. In 1974, the pilot plant was paying 40 cents per pound for good yam. In 1977, the Agricultural Development Corporation decided to close the instant yam pilot plant after 9 to 10 years of development work.

Baby Weaning Foods in the Commonwealth Caribbean - This case

³ One of the most detailed studies of innovation utilising the case studies approach, and based on a deductive methodology is that of the Sappho project, as described by Freeman (Freeman, 1974, 1972). Project Sappho involved the empirical testing of a large number of hypotheses on the reasons for success or failure in a study of 29 paired attempted innovations in the chemical and scientific instruments industries. Those in the chemical industry were mainly process innovations whilst the instruments innovations were all product innovations. The Sappho project team of eight researchers spent 6-9 months reviewing the bibliography of all explanations of success in innovation and scanned 400 items in this time. However, for a more general critique of the Sappho project and under innovation studies see Resenberg, Ch.10.

study does not deal with any one particular enterprise as such, but with the several efforts made to develop baby weaning foods in the Commonwealth Caribbean. This case reviews the several reports, pre-feasibility and feasibility studies and recommendations made in several countries. One commercial factory was established in Guyana but suffers from the unavailability of raw material supplies. It is suggested that this is the common problem which has contributed to the failure to implement recommendations for baby weaning foods in the region. However, another factor has been the questionable results of some of the feasibility studies commissioned.

Exotic Foods Limited - In 1965, Mr. Denis Seegobin started a kitchen-scale operation to process mainly local foods into jams and jellies with emphasis on guava jelly. These were sold under the brand name *Terry's*. Mr. Seegobin came to food processing with a background education in science at the secondary school level, and a wealth of working experience in microbiology, factory management and feasibility analysis. Over the next four years (1965-1969) the company increased the scale of its operations given a rising market demand. In 1969, the prospects of a captive market arose with the decision of the Trinidad and Tobago Government to place imported jams and jellies on the negative list in order to provide infant industry protection to local processors. However, the company did not find favour either with the commercial banks or the IDC* in its efforts to raise the necessary capital for expansion. At this time, a major retail outlet for Exotic Foods, Cannings and Co. Ltd. -- through its grocery subsidiary, *Mi-Lo*, purchased a major share in another foods processing operation and began considering production of jams and jellies. Cannings employed a foreign consultant, who visited Exotic Foods

and recommended that Cannings acquire this smaller processing operation.

This take-over effort was resisted initially by Mr. Seegobin. However, with the continued inability to raise additional capital for expansion, the offer was finally accepted. In addition, there was the fear that the company would lose access to Cannings grocery outlets when the latter went into processing. Mr. Seegobin finally accepted the offer to sell out and to assume the position of Research Director with the Cannings' Food processing operation.

Criteria for Success

To derive hypotheses distinguishing success from failure, it is necessary to define the criteria for success. The criterion for success in the Sappho project⁴ and other studies of innovation was that of commercial success as indicated by significant market penetration and/or profitability. A failure was defined, in Project Sappho, as an attempted innovation which failed to establish a worthwhile market and/or make a profit, even if it worked in a technical sense. As we noted earlier, our focus here is not on innovation but rather that of assimilation or absorption of already successful innovations in fruit and vegetable processing.

Our criteria for success are also somewhat different. Success we define as:

- (a) the ability to assimilate the technical know-how to process a quality output;
- (b) at a competitive price; and
- (c) the ability to sustain production over a sufficient time period to resolve teething problems and operate profitably.

A failure is defined in terms of

*IDC: Industrial Development Corporation.

⁴ Project Sappho is described in 3 above.

the absence of one or more of the three above identified aspects of success.

Factors Distinguishing Success from Failure

Five working hypotheses are advanced to distinguish success from failure in the development/utilization of the potential transnational corporations in Caribbean fruit and vegetable processing. The first four are closely interrelated; the fifth is not integral but it influences the development of these initial four:

- (1) Ability to assimilate the relevant technical know-how to process fruit and vegetables;
- (2) Size of firm, ownership and method of incorporation;
- (3) An adequate raw material supply;
- (4) Existence of an organizational nexus linking marketing, research and development, finance and overall decision-making.
- (5) The active supportive role of the State.

1. *Assimilation* - Without a grasp of the technical issues involved in producing a processed product to meet quality control and other standards, nothing else is possible. One of the recurring observations on the small (cottage) scale fruit and vegetable processors is their inability to maintain a constant standard between batches, the major reason being the lack of awareness of the technical parameters informing the time-worn practices of the owners/processors of these small enterprises.

2. *Size of , ownership and method of incorporation*

- (a) *Size* - Size is defined here in terms of number of employees, skills of these, and quantity produced. A minimum size - above that of cottage type - is considered necessary to achieve

any level of technological development.

The CTPS-1 Survey suggested that size and skills of the development team in an enterprise influenced innovation. The one firm identified by the survey which illustrated the greatest tendency to making changes and involvement in the more inventive type of work was the one with the largest component of formally trained staff, comprising eight qualified persons in engineering, marketing and management. (Whitehead, 1979, pp.176).

- (b) *Ownership* - Local ownership - total or joint venture - is considered to be an essential factor in the development of fruit and

vegetable processing. This is a reflection of a general principle that some degree of local ownership is necessary in all productive activities in the Caribbean in order to permit development of technological skills.

The survey conducted in CTPS-1 of existing processors picked up little evidence of research into processing of local raw materials. There was a greater willingness to innovate in plant and equipment. This tendency was predictably highest among locally owned firms. The example is cited of one local producer who designed and built a scaled-down version of a standard plant, locally, thereby achieving a cost reduction from BD\$6m. - \$1m. (Whitehead, 1979, pp.160).

- (c) *Method of incorporation* - Studies of the food processing industry in Trinidad and Tobago, and the Eastern Caribbean, indicate that the degree of utilisation of local raw materials is closely correlated to the size of

operation and the nature of incorporation.⁵

Small scale processors (mainly cottage or kitchen scale operators) make the greatest use of local raw materials. Such enterprises purchase raw materials from the wholesale markets in relatively small quantities given the scale of operations and related issues of limited storage capacity, and investible surplus for inventories.

Cooperative processing operations also tend to be highly local raw material intensive. These are producer-processor cooperatives which provide a guaranteed market for raw material output with profits shared among producer members. Citrus and coconut cooperatives are among the most common in the region.⁶

Large scale (by local standards), privately owned, limited liability companies set up in the industrialization programmes of the 1960's tend to be highly import-intensive. These

corporate processors exhibit a variety of ownership patterns but depend on foreign embodied technology, and raw material inputs. Sometimes these firms operate with a franchise granted by a well known foreign food

processor.

A study of the fruit and vegetable processing sector in Trinidad and Tobago showed that only 13 per cent of the agricultural inputs into such commercial corporate processing, originated locally. In the case of the cooperative citrus processing industry, on the other hand, all agricultural inputs came from local supply (Pantin & Cropper, 1975, pp.24).⁷

3. **Raw Material Supply** - There are three related issues with regard to raw material supply: quality, quantity and price. In some instances, there is insufficient supply of raw materials. This is particularly true of areas of food processing, whose inputs come from tree crops with a gestation period of several years. Even where there may be adequate supply, there sometimes arises a question of the quality. Some processing operations also demand inputs of particular specifications including size (for standardised equipment) which may not be met by locally grown crops. In other situations where quantity and quality criteria are satisfied, the price may be the problem. Food processors require raw material inputs at a fraction of the price paid on the fresh market, given the additional costs of processing which must be incurred. This makes sense for large scale farmers for whom

⁵ See Whitehead, (1979); Pantin & Cropper, (1975); and Searl, (1974).

⁶ There is a view that these cooperatives are really dominated by a few large producers who are the major beneficiaries. While this may or may not be so, our point here is that self-interest of producers ensure that it is local raw materials which are used. For details see Pantin & Cropper, 1975 and Draper, 1981, Ch.8).⁵

⁷ This survey was conducted in the mid-1970s. Since then the Cooperative Citrus Growers' Association has started to import concentrates to compensate for the seasonal supply of citrus and also a dramatic decline in citrus available domestically. The point can still be made, however, that for cooperative enterprise, domestic raw materials are actively sought in preference to imports.

the lower unit price is compensated for by bulk purchase and guaranteed market. In such instances, the fresh demand is unlikely to clear the crops, or if so, at falling price levels. Given the small scale nature of most Caribbean farming (other than the traditional export crops), the fresh market price is the benchmark used for setting the price to the processing industry. In some instances, rather than incur costs to gain a processing price, it makes more sense for a small scale farmer to leave the crop in the field.

4. *Organisation Nexus* - Success is dependent of management with an adequate basis for financing new processed products. Such management, also must have independent decision-making power within a single institutional framework to handle the technical, raw material, and marketing dimensions for success, together with all the other requirements for efficient management. The Sappho project identified four roles that are important in technical innovation; such roles being played by one or more persons depending on the nature of the firm and of the product. These roles are:

- (a) Technical innovator - the individual who makes the major contribution to the development and/or design of the innovation on the technical side;
- (b) Business innovator - that individual actually responsible for the overall progress of the project;
- (c) Chief executive - the individual who is formally head of the executive structure of the innovating organisation;
- (d) Product champion - any individual who makes a

decisive contribution to the innovation by actively and enthusiastically promoting its progress through critical stages. The case studies showed that there was no nexus which brought together these differing rules into an institutional framework. There are technical innovators in Cariri,* or UWI, or JIDC,** or the agro-labs in the Eastern Caribbean. However, there is no business innovator and certainly no chief executive since there is no enterprise. The technical innovator may double as product champion (George Sammy in the case of sorrel) but may be frustrated by the lack of executive or business innovation. Even, where attempts have been made at commercialisation as in the cases of sorrel and instant yam, there was some dispersal of these innovative roles among differing institutions. (For example, in the case of sorrel, UWI was responsible for product development; Cariri for pilot plant testing; the Industrial Development Corporation (IDC) for funding; and the Central Experimental Station for raw material supplies.

Marketing - Success is dependent on a market demand at remunerative prices. To discover or build such a demand requires detailed marketing analysis and strategies. The case of instant yam suggests an insufficient attention to market analysis in the stage prior to production of a processed product. The estimated market demand in metropolitan markets was based on simplistic extrapolation from the demand for fresh yam and/or, on the size of the West Indian population. Domestic marketing suffered from the lack of promotional finance. Some examples may indicate the problems caused by the

**JIDC: Jamaican Industrial Development Corporation

*Caribbean Industrial Research Institute.

inter-institutional nature of the sorrel project:

- (i) The following is an excerpt from a letter to the IDC by Cariri complaining about delays in decision-making and the likely impact on the preparation of the sorrel plant for the then coming sorrel crop:
"... it was agreed that the IDC would meet internally following an inter-institutional meeting almost two months previously and discuss the future plans of the project following which, a meeting would be called with Dr. Sammy and ourselves. We would be grateful if you would expedite this matter, as if the pilot plant is to be ready for continuous running of sorrel in November this year ... replacements parts, etc. must be ordered now."
- (ii) The following quote is from a letter by Dr. Sammy to the IDC indicating that the project has been delayed by a year: "... bureaucracy and inefficiency have succeeded in frustrating this project to the extent that it will have lost a year."
- (iii) The Centeno agricultural officer responsible for supplying sorrel to the pilot plant complains about arrangements for supply:
"... arrangements ... for disposal of the first harvesting of the sorrel crop have not been steady and speedy to facilitate removal of the first harvest as a result of which more than 75 per cent of this present crop is running to seed -- harvesting operations have been slowed

down due to a lack of funds."

The general point being made is that development of processing activity requires timely intervention and consideration of the activities involved in all the stages from raw material supply to final product, including marketing. In some societies inter-institutional cooperation may provide an adequate base. It is this researcher's view that the Caribbean requires a distinct decision-making entity. We will return to this discussion in the recommendations made later.

5. Role of the State - The sorrel project has been underway for the last fourteen (14) years. This means that if undertaken by a private entrepreneur, other profitable operations would be required while research and development proceeded in this area. (Alternatively, one can suggest that a profit-making orientation may have reduced the developmental period). In the case of instant yam, feasibility was based on the presumption that the Barbados Government would finance promotional work:
"... promotion is essential, and as this project is, initially at any rate, a Government one, it is recommended that, for at least the first two or three years direct television advertising be done at Government's expense, as well as some newspaper advertising ..." (CDB, 1976.)
The cost of such promotional work was estimated to be BD\$66,250 for the first year, decreasing by 25 per cent over the next two years.
Both cases suggest that the State has an important role to play in the utilisation/development of technological capability in the food processing industry. In fact, it is a main hypothesis of

this study, that successful development/utilisation of Caribbean raw materials in the food processing sector is unlikely, unless there is some decisive intervention by the State.

Assessment of the Case Studies - Success or Failure?

Our conclusion is that sorrel processing seems to have succeeded, at least up to the present, where full scale commercialisation is being implemented. The qualified success of sorrel can be explained by a number of factors: The first is the successful assimilation of the requisite know-how for a processed sorrel concentrate and cordial. The second is the existence of what the Sappho project has dubbed a product champion:

"... any individual who makes a decisive contribution to the innovation by actively and enthusiastically promoting its progress through critical stages." (Freeman (2), pp.232).

A third factor has been the willingness and ability of the State to underwrite developmental costs over a number of years. Another factor is the existence of an effective demand for the sorrel product as evidenced by the fact that two existing commercial processors are willing to purchase all of the output of the sorrel plant.

We found it difficult to write off instant yam as a complete failure, although production has ceased since 1977. Instant yam may be seen as a qualified failure. Three of the four factors advanced to explain the success of sorrel processing, seem not to have been as evident in the case of instant yam. It is clear that the Barbados Government was either not able, or not prepared financially to underwrite the instant yam project for any lengthy period. Related to

this was the absence of any product champion to the degree present in the case of sorrel. Mr. Graham Gooding who was responsible for the early work on instant yam, did not accompany the project from the Sugar Producers' Association, where it all began, to the Agricultural Development Corporation. Thirdly, the demand for the instant yam product was not as evident as in the case of sorrel. One reason appeared to be the higher selling price, both in domestic and the foreign markets vis-a-vis near substitutes. Moreover, inadequate marketing strategy seems to have been an important factor. In addition, any increase in yields of yam leading to reduction in the cost of the raw material input could have contributed to the profitability of the instant yam product.

In the case of baby weaning foods, there is little evidence of commercialization. This may be explained partly by the absence of State funding and of product championship. However, the inertia with regards to baby weaning foods cannot be explained without reference to the role of the powerful vested interests of the foreign baby food manufacturers, and of what appears to be misleading feasibility studies by foreign-based consultants. Since little commercial efforts have materialised, it is not possible to categorise this case in terms of success or failure.

The case of Exotic Foods Limited, indicates that a successful operation sold out to a larger commercial processor as a result of limited access to capital and the problem of rising wages induced by the new, larger scale commercial food processors, together with the anticipation that the backward linkage into processing of its major market outlet - a grocery chain - would have affected demand negatively. This case study also illustrates that the use of commercial policy by the State, through placing jams and jelly products on the negative list, was supportive of domestic fruit

processing.

Section II

What Explains the Limited Efforts to Utilise Caribbean Raw Materials in Fruit and Vegetable Processing?

In the previous section, we advanced a number of hypotheses to explain what distinguishes success from failure in attempts to develop/utilise the potential Caribbean transnational corporations in fruit and vegetable processing. These hypotheses need to be treated cautiously given the absence of a sufficiently wide sample to confirm their validity. In fact, only four cases were studied. The major reason for this was the relative absence of existing fruit and vegetable enterprises which met the criteria set, at least in the Eastern Caribbean.⁸ While some failure is inevitable in entrepreneurial activity, explanation for this phenomenon, as well as that of success, requires a significant number of attempts at commercialisation. Given the paucity of such efforts in the region studied, it was considered equally important to explain this phenomenon, as well as the reasons for success.

Five factors are advanced to explain the limited utilisation of existing or potential processing capability of Caribbean fruits and vegetables. These factors or working hypotheses overlap with those identified to explain success. However, the two specific factors which recur - raw material supply, and the role of the State - may be considered outside constraints to success. These five factors are:

- (1) Research institutions do not devote enough resources to passing on information to commercial processors on the products that appear feasible from the technical standpoint;

⁸ The criteria were described in the text earlier.

- (2) Foreign participation in local food processing is a major implement to commercialisation of processed products developed by local research efforts;
- (3) Competition and the profit motive are reinforcing constraints to the utilisation of any Caribbean food processing capability;
- (4) The unavailability of an adequate supply of domestic raw materials is a further restraint, in the short run, on technical innovation in food processing;
- (5) The supportive role of the State is necessary to foster agro-industrial activity.

1. Role of Research Institutions

Tables I-III identified a significant number of processed products which have been developed in the region's research institutions. One obvious reason for the extremely limited attempts at commercialisation, is that these institutions are research oriented and do not carry their results to commercialisation. One could add that these organisations do not devote sufficient time and other resources to communicating their results to the commercial processing firms. Whitehead found that managers sometimes were unaware that such research institutes existed, or were unfamiliar with the developmental results, and also were unclear about their ability to access these institutions for information and assistance. One result of this is that "only 18.4 per cent of the 38 private enterprises visited (in CTPS-I) admitted having used a public research body for any type of advice, however minor." (Whitehead, 1979, p. 179.)

However, the studies of regional research institutions undertaken in CTPS-I indicate that the limited utilisation of such institutions may originate in more deepseated causes. Girvan notes:

"... the virtual absence of effective demand for research and development on process

technologies making use of local materials, and plant technologies adapted to small markets and labour abundant resource endowments merely indicates that there are systems maintaining mechanisms at work which keep the economy on its present structural course." (Girvan, 1979, pp.33)

2. Impact of Foreign Participation

Many of these same firms surveyed by Whitehead were very familiar with at least some foreign sources of information on developments in the food processing industry internationally. The reason for this is unclear and was not explored in the findings of the survey done in CTPS-1. However, "... some 55.3 per cent of these enterprises reported that they depended for any new information on private foreign sources." (Whitehead, 1979, pp.179)

One can surmise that this closer affinity to foreign sources is the result of links through ownership, license or franchise arrangements or from links with the vendors of processing equipment abroad, backed up by commercial literature, and perhaps subscriptions to journals. This foreign participation, either through multinational firms' investment or sales of machinery, franchise, or management contracts all negatively impact on utilisation of the potential capability in food processing residing in the research institutions since there are already established foreign channels to be drawn upon.

C. Competition and Private Profitability

The limited use made by commercial processors, of developmental work done by regional research institutes is not simply the result of lack of information, or of size, ownership or skilled staff complement, although these may play some part. The behaviour of these

firms is quite rational, explainable and predictable if placed in the context of the business environment within which they operate. In the private sector, competition and private profitability are active constraints in that certain bodies benefit from the present limited exploitation of the potential technological capability in food processing within the Caribbean. Those who benefit are:

1. The international food processing companies who either:
 - (a) export finished products to the region; or
 - (b) sell management or technical skills, or franchise rights or machinery to locally-owned or joint venture operations.⁹

⁹ A recent UN study identifies 130 of the largest transnational corporations in the food processing industry which have at least 800 affiliates in developing countries. A summary of this report (by Laidlow) notes that: "Together these affiliates account for 25 per cent of the leading transnational companies foreign food revenues and about 1/8 of the total output of food processing industry in developing countries. Attempts by many Third World governments to control the operations of transnational food companies, in order to encourage the growth of domestic companies and also ensure that food production and processing will benefit the greatest majority of the people, have had limited success. Foreign corporations continue to maintain their dominance in such things as access to markets, capital investment and their control over technology, supplies and sales. In the local markets their branded names and promotional expertise give them an overwhelming advantage over local firms. (Laidlow, 1981, p.6)

2. The local owners of food processing enterprise who either:

- (a) purchase certain facilities from the international food processing companies as indicated in (b) above; and/or
- (b) purchase relatively cheap and reliable raw material inputs from abroad and avoid the hassles of cost, quality and quantity reliability from the use of local raw material suppliers.

Private profitability does not encourage the utilisation of local technological capability. Why should a foreign company utilise indigenous technology or raw materials when it can earn a higher rate of return from export of its own processed products, or from sales of equipment and franchise rights?

Equally, why should a rational profit-maximising local business fight up with local farmers for raw material supplies when he is assured of reliable and cheaper (at existing exchange rates) supplies from abroad? Or go through the trauma of design specification, pilot plant testing and local fabrication when he can obtain equipment from a foreign supplier who also may increase the sales potential by allowing use of a well known foreign brand name?

Competition provides a further disincentive. Any individual entrepreneur who decides to go local faces expenses for research and development which will increase costs as compared to other firms in the industry who take the line of least resistance. For example, the pilot plant for sorrel is estimated to have cost TT\$40,000, while the initial work on the instant yam cost BD\$6,000. The profit motive discourages developmental work in food processing, which has a higher cost/risk than use of foreign inputs and process and plant technology.¹⁰

While present competition may place the outer limit on attempted utilisation or development of a technological capability by locally owned firms, this disinclination also may be historically influenced. Draper notes that most of the local food processing enterprises were established in the immediate post-political independence period of import substitution in the 1960's. The local owners originated largely from the previous food import merchant class.

"They (former food importers) would however bring to manufacturing concerns the attitudes and practices which they knew best as merchants. Any thrust on their part into manufacturing would have a high degree of foreign involvement, either in the form of partnerships, or through licenses to assemble for foreign companies. Their history and experience did not allow them to look forward toward local inputs for manufacturing purposes." (Draper, 1981, Ch.6, p.1)

D. The Inadequacy of Raw Material Supply

The availability of local raw material inputs into the domestic food processing industry is a major, perhaps the major constraint to any immediate utilisation of an existing or potential capability in food processing. The high reliance on foreign inputs is illustrated in Tables IV and V for Trinidad and Tobago, and the Eastern Caribbean, respectively. The most prominent

¹⁰ At the 1982 West Indies Agricultural Economics Conference, this author raised the issue with the representative of a leading commercial processor in Trinidad & Tobago. He argued that local firms could not compete with research and development of foreign firms except in the case of unique indigenous products.

TABLE IV: Food Processing Industry: Raw Material Source Trinidad & Tobago, 1972*

No. of factories	Type of Products Processed	% of Raw material imported
1	Flour	100
1	Citrus	0
1	Chicken for fresh market	0
1	Pork for ham, bacon, sausages	80-90
4	Fruits & vegetables (not citrus)	20-30
2	Beer	80
1	Snack food	60-80
1	Dairy products	50-60
1	Spices	100
2	Ice cream	80-90

* This list does not include softdrinks, bakeries and the large number of kitchen type processors. Although the list is ten years old, there has been no significant change in the input structure of this industry with the exception mainly of citrus and pork. The citrus industry now imports a major share of its inputs in the form of concentrate given the virtual collapse of the domestic citrus industry. A pig industry has been nurtured domestically and will have decreased the level of imports.

Source: Sammy, G.W. (1972): An Approach to Food Processing Development in Trinidad & Tobago.

feature of the food processors in Barbados and the ECC, was that "... processing activities center around putting finishing touches to semi-processed imported inputs." (Whitehead, 1979, pp.141)

The commercial processors may well reject the above analysis of the significance of private profitability and competition as explanations of

TABLE V: Import Intensity of Food Products Barbados & ECCM, 1975

Product	Foreign agr. inputs as % of total agr. inputs	Foreign agr. inputs as % of total value of output
Bread, pastry, etc	96.5	43.7
Confectionery	28.9 ³	18.1 ³
Baking powder	100.0	50.0
Macaroni, spaghetti etc.	100.0	57.1
Ice cream, etc.	58.9	19.8
Milk products	46.8	13.5
Beer, milk, etc.	70.0	7.6
Pepper sauce ²	0.0	0.0
Pepper sauce ²	50.0	36.3
Fruit products & vinegar	51.9	16.1
Margarine etc.	100.0	65.6
Animal feeds ²	93.4	39.6
Corn meal	100.0	33.3
Animal feeds ²	65.9	17.6
Animal feeds ²	96.5	50.0
Peanut butter	100.0	49.3
Dessicated coconut	0.0	0.0
Oil and soap	2.8 ³	2.6 ³
Corn products	98.1	56.7
Peanut snacks	100.0	85.7
Rum punch	51.7	1.6
Fruit syrups	36.4	1.6
Reconstituted milk products	100.0	76.9
Aerated beverages ²	80.5	40.7
Aerated beverages ²	48.1	12.2
Biscuits, etc.	70.5	38.9

Notes: ¹ By value - with reference to major inputs
² Separate manufacturing enterprises producing similar product.
³ Estimate

Source: Whitehead (1979): p.163, table 3.

their behaviour and suggest that domestic supply is the sole cause of the non-utilisation of local raw materials. In the short run, this view has some validity. The more important question is what strategies are necessary over the medium run to induce supply and how do these measures square with the objectives and behaviour of food processing

firms?'

Sammy, Wiltshire and Cropper (1974), note that the price offered by processors for a locally grown raw material is "invariably based on the price of the corresponding imported raw material." (p.2) Since there are no restrictions on such imports, there is no rational reason for processors to pay higher prices for local supplies or to undertake measures to stimulate local production.¹¹ We find therefore, that farmers use local fresh market prices as their benchmark. Processors on the other hand, compare farmers' prices with that of imported inputs, at existing rates of exchange.

The problem of stimulating raw material supply for agro-processing is part of the large issue of agricultural transformation in the Caribbean. This involves issues of agrarian reform and of macroeconomic policy to reverse the declining terms of trade between agricultural and non-agricultural sectors in most Caribbean economies.¹²

However, there are problems peculiar to the processing industry which may not be automatically solved

¹¹ Sammy et al (1974) suggest that higher local prices derive from the internal production and market situation. One needs to add that existing exchange rates also can partially be responsible for the price difference between imported and local materials.

¹² The discussions of agricultural policy necessary to permit the development of a viable domestically-oriented producing sector is a study in itself. Issues of land tenure and technology are important in any discussion, but are beyond the scope of this study. The simple point being made is that while there is a problem of raw material supply to food processors in the Caribbean, the solutions are complex and beyond the terms of reference of this particular study.

by any successful agricultural transformation as evidenced by augmented supply. It is debatable whether existing commercial processors, or new firms established with similar objectives are, or will be, really interested in utilising local raw materials, even if these are readily available. There would still be the additional costs of development work in the context of competition and private profitability.

The interest of foreign firms, in particular, is suspect. An example may illustrate. Cropper (1971) discusses the case of a milk processing plant established in Barbados in 1966, ostensibly to process locally produced milk and to reconstitute imported milk. The reconstituted milk section was intended to subsidise the local milk operation and thus permit a higher price to be paid to farmers as an incentive to increase local milk production.

"It was not appreciated that it was not in the interest of the profitability of the plant to stimulate local production since this would reduce profits ... many techniques were employed to discourage farmers from increasing production. As a result, there has been little increase in the production of milk in Barbados since the opening of a processing plant established specifically for this purpose." (Cropper, 1971, p.6)

This conflict between profitability and utilisation of local raw materials may not be the result simply of foreign ownership or equity participation, or other forms of foreign control. There are many complaints by farmers that even locally owned processing firms tend to engage in highly questionable buying practices and thereby discourage farmers from investing resources in production for such marketing outlets. The following example illustrates: It is a note from the Manager of an experimental farm in

Trinidad outlining what may not be a completely atypical experience with a locally owned processing firm. The Manager responded to a newspaper advertisement, telephone the firm, and was offered a price of 12 cents per pound (1974) for a particular crop.

"A few days after making a check I found I could supply 1400-2000 pounds. This I communicated to them and agreed on a price of 12 cents per pound. On the morning of harvest, I rang to let them know I was sending the crop and again the price of 12 cents per pound was mentioned. When the produce was delivered to the plant ... the price was 10 cents per pound, despite a protest from the van driver."¹³

This was the experience of a reputable farm with some potential influence in the community. Pity the poor, powerless small farmer! This is not to suggest that all processors necessarily engage in such practices, or that price reductions are not sometimes justified, given quality. However, one such experience as that noted above is likely to chasten any farmer involved, and any others with whom he may be in contact.

This processor-producer problem may be exacerbated by the vacillating behaviour of the Government, which may encourage farmers to increase production of a particular crop for processing, and then suddenly change policy leaving the farmer with excess output. The case of pigeon peas in Trinidad and Tobago may illustrate. In the mid-1960's, the Trinidad and Tobago Government encouraged pigeon peas production (Congo peas in Jamaica) through a variety of measures including payment of a subsidy of \$25 per acre of peas planted. As Table VI illustrates, production increased to a peak of 8.7 m. pounds in 1966/67. In the latter year, the Government removed the

TABLE VI: Pigeon Peas Production and Processing, Trinidad & Tobago

Year	Quantity Processed (m.lb.)	Estimated Production ^a
1965	3.0	
1966	1.5	5.9
1967	3.0	8.7
1968	2.5	5.4
1969	1.0	4.8
1970	1.0	5.4
1971	0.3	5.0
1972	0.7	5.2

^aRefers to crop production year i.e. 1965/66, 1966/67, etc.

Source: Cropper, J.: The Prospects for Vegetable Processing in Trinidad (undated).

subsidy while the supply was larger than the combined fresh market and processed market demand. Many farmers, therefore, were left with excess supplies. Pigeon peas production has never recovered and processing plants now import dried pigeon peas.

The removal of the subsidy may have been only one contributing factor to the decline of pigeon peas production: other analysis points to the fact that pigeon peas production was linked to the phased reafforestation programme of the Trinidad and Tobago Government. Farmers were allowed to plant on certain plots. As the reafforestation progressed, it is argued, farmers' plots became more remote and this served as a disincentive. The firm processed the major proportion of the pigeon peas, International Foods Limited (IFL), decided to undertake processing of a number of imported pigeon peas and vegetables to utilise the plant when the pigeon peas crop was over. In 1970, the IFL entered into a contract with the US multinational-Del Monte - to process a line of food products under the Del Monte label. In 1976, the new owners - Cannings, a subsidiary of Neal &

¹³ Personal communication. 1974.

Massy - decided to close the processing plant as the equipment was obsolete. (Draper, 1981)

Section III

Summary and Conclusions

The objectives of this study were to:

1. Explain what distinguishes success from failure in the utilization of domestic raw material in Caribbean fruit and vegetable processing.
2. Consider why are there so few examples, at least in the Eastern Caribbean, of attempted commercial ventures in fruit and vegetables processing, which utilise the existing or potential supplies of domestic raw materials.

These two issues are considered to be interrelated, but important enough to deserve separate consideration.

A deductive methodology was utilised to frame a number of hypotheses to explain the two phenomena under study. Five working hypotheses were advanced for both issues. The conclusions with regard to the particular cases was that sorrel is a qualified success. Instant yam is a qualified failure, Baby Weaning Foods could not be classified, and Exotic Foods was a success purchased by a larger processing operation. The more general conclusion with regard to the second issue under study was that the role of the State is critical to foster linkages between domestic raw materials and the fruit and vegetable processing sector.

Entrepreneurship and the State

However, there are certain inbuilt difficulties in a State-led development of food processing, or other activity in the Caribbean. Public sector entrepreneurship suffer from a number of problems including the lack of focus and the scarcity of skills (managerial and technical). Centralised decision-making tends to conflict with demands of enterprise,

and public officers are assured of income and employment, but of no rewards for success. There are, therefore, no disincentives (loss of income, employment) and incentives (profits or bonuses) to structure the performance of public servants. In addition, Governmental employment, disciplinary and promotional policy tends to place many square pegs in round holes. This could disrupt the efficient running of a particular enterprise since one critical post may be manned by the wrong person (skills, aptitude) without any power or redress at the level of the producing unit.

Diffusion is perhaps the more important limitation on State-run enterprise. Since many of the projects may be small scale, these may be managed by a developmental agency - agricultural or industrial corporation or bank. Culturally, and intellectually, many of the personnel of these institutions are not persuaded of the desirability, far more the feasibility of small enterprises in particular. (Small is humiliating.) Even without such bias, the number of commitments and committees these technocrats have to service, may not allow a concentration on any one project. Even when desirability and feasibility are established, commercialisation suffers from the lack of adequate capital to finance the range of equipment and promotional work necessary to effectively break into the market - at least in competition with the established food processing operations utilising foreign inputs.

One can conclude that these bureaucratic limitations are not insurmountable, being variable in one or two important respects:

1. A change in the nature of the bureaucracy which may require the political change to facilitate the political will for such action;
2. Delinking of profit-making Government financed projects from the full-scale controls of the public service i.e. creation of

individually incorporated enterprises which operate as surplus generating units with all the ramifications inherent in such an objective.

There is some relationship between the two methods of resolving the problems of State participation in enterprise, but this is not our concern at the moment. While the supportive role of the State is identified as necessary, the point is also being made for a less ineffectual form of bureaucratic involvement.

A Multi-Product Processing Unit

The private sector as we have seen, is not interested generally in developing an indigenous

food processing industry, for several reasons - some having to do with the nature of the firm and others with the external problem such as raw material supply, and the historical roots of the dominant private sector class in the region. Even where the State may contemplate intervention, it is hamstrung by bureaucratic ineptitude. State involvement can take two forms: The first would be to introduce incentives to the private sector and effective disincentives to the present method of operation. Secondly, the State may decide to directly participate in commercial enterprise, or there may be a combination of both approaches.

Whatever the form of intervention, a multi-product processing unit seems a prerequisite to bring together in an institutional matrix, the effective management of technical, raw material and marketing development. This proposal is consistent with the hypothesis that one factor distinguishing success from failure was the existence of an organisational nexus linking marketing, research and development, finance and overall decision-making. To successfully transform present and future efforts at utilisation of the regional technological capability in

food processing and avoid, not so much the failures, but limitations of small scale individual operations reducing the rewards of product development, a multi-product food processing unit is necessary. By a multi-product food processing unit is meant an enterprise which utilises differing raw materials but only one or two related processing techniques e.g. freezing, canning, bottling.

Such a multi-product processing unit should comprise:

1. A marketing division concerned with continuous assessment of the market potential, locally, regionally and internationally, for developed or developable products provided by the food processing research division through:
 - (a) development of a method for establishing relationships between demand for food processed products and changes in income, taste, nutritional requirement, mass advertising, etc.
 - (b) sourcing of information - local, regional and international, which would provide analyses of market response;
 - (c) market testing ability - e.g. taste testing for new products.
2. An agronomic research and development division concerned with increasing yields through improved agronomic practices, including methods of harvesting and development of processing varieties.

This is relevant to the problems of instant yam production. The availability of a fingers-free yam would have facilitated peeling and hence reduce costs.
3. A food processing research and development division concerned with:
 - (a) product development
 - (b) packaging;
 - (c) design of equipment,

- (d) fabrication of equipment;
- (e) international sources of equipment for purchase off the shelf.

It may not be necessary for the unit to contain all the skills necessary to perform the functions required of each division. But each division must have the expertise in-house to identify its needs and sources of location of such skills in the external environment e.g. Cariri, UWI, Trintoplan. This permits the possibility for some inter-institutional cooperation particularly among government departments. It does not mean that all these divisions of the multi-product Processing Unit need to be physically located in the same geographic space. However, decision-making procedures must be clearcut. The example of transnational corporations shows that control is possible over many countries since decision-making is well established. Government systems do not lend themselves easily to such control. Hence the proposal for an essentially distinct corporate body where such decision-making control is more feasible.

The advantages of such a multi-product company are:

1. It will allow a greater utilization of productive capacity than seasonal processing of one food crop in a smaller operation, e.g. by linking sorrel and lime processing, production will be continuous for some eight months of the year. (see sorrel case study). Although there is only partial overlap of the equipment and machinery used for both products, the linking of facilities will permit the retention and utilisation of the more highly skilled staff;
2. It will decrease the costs of developing or modifying existing processed products, since the equipment costs and costs of skilled research staff are likely to be similar for one or more product development;

3. It will increase profitability by allowing the introduction of some equipment unjustified by a smaller scale operation, but which reduces the competitiveness of each product developed e.g. sorrel, where the production of the single product makes it uneconomical to purchase the blending and packaging equipment for the end-use product - a sorrel juice. Thus Nestles* and Cannings* purchase sorrel concentrate and produce a sorrel drink using packing equipment available from their other lines and benefit from the value added. These two companies simultaneously transfer to the State the financial costs and headache (devising technical solutions to problems of product development, equipment design, fabrication or purchase, development of reliable supply sources, critical promotion of the product) on all of which it is difficult to place a dollar cost, in producing a commercially viable product. It is not merely the unit profit from sale of ready to drink sorrel versus the sorrel concentrate which must be compared, but the hidden costs in the development of the product;
4. It will enable the absorption of the costs of maintaining the specialised divisions of marketing, agronomic research and development and food processing research and development.

Without such a concentration of energies, utilization of technological capability in food processing in the region is likely to replicate the experience of the cases studied. It is difficult to conclude that instant yam is a complete failure. There is still

*Two commercial food processing firms operating in Trinidad and Tobago, one (Nestles) being foreign owned.

potential, but the financial costs of such a continued effort cannot be borne by an ADC-type institution. Similarly, while sorrel appears more successful, is it as successful as it could be? Should Trinidad and Tobago, rather than Mexico, be capturing the international market for sorrel? Should the sorrel product have taken 14 years to achieve full scale commercialization?

The perfectly rational profit-maximising behaviour of private enterprise in the current business environment in much of the region, does not offer high hope for aggressive development of locally developed processed products. The diffused nature of State participation in the sorrel and instant yam projects indicate the need for a more cohesive unit for product development, than an IDC or ADC.

The cases of sorrel and instant yam are useful examples of the problems which result from absence of a multi-product processing unit with the functions identified. In the case of sorrel, there are a number of possible avenues for increasing yields or easing the tedium or picking.¹⁴ Among these is research on hedge row growing to permit a second, and perhaps third crop from an original sorrel plant. The phototype knife for easing the picking of sorrel still requires further work especially with regard to the quality of the metal, and the technique for changing blades in the field. In the absence of any singular focus or immediacy, the institutions working on these aspects seem to have downgraded further research. In the case of instant yam, work on the development of a fingers-free yam and on higher yielding crops could contribute to a reduction in the raw material costs.

It has also been suggested that the bureaucratic delays from inter-institutional participation in the

sorrel project may have doubled the development period to 14 years. Reservations expressed on the market strategy of the sorrel plant - essentially that of satisfying a derived demand of two existing commercial processors for sorrel concentrate in potential competition from imported sorrel or a synthetic substitute, should have been raised within a specialised marketing division.

The most important reason for producing a sorrel concentrate and cordial was the uneconomic cost of investing in machinery for a ready to drink product. This may have been justifiable for a multi-product processing unit. This certainly seems to explain the reason why the two commercial sorrel processors can purchase the sorrel concentrate and utilise existing machinery available from the production of other ready to use drinks. One can suggest that these large scale food processors are already multi-product processing units, lacking only the agronomic research division proposed above. Whether these existing units can be persuaded to transform themselves remains an open question.

In the case of instant yam, work on the development of the fingers-free yam and on higher yielding crops could contribute to a reduction in the cost of the raw material input.

Institutional Market

In the final analysis, it is the demand for the food processing product which will justify the intervention of the Government and its direct participation and/or efforts to persuade commercial processors to become more innovative. One of the critical constraints of the instant yam product, and of sorrel to a lesser extent, was the development of a reliable market for what were new products, otherwise unavailable commercially. The small scale of these operations did not justify large scale

¹⁴See Sorrel Case Study.

promotional expenditure. In both instances, it was felt that the limited output did not facilitate overseas marketing. In the case of sorrel, investment in equipment for producing a ready to use drink was considered uneconomical for the one product.

There is some evidence to suggest that a ready, captive market of a significant size may be a necessary precondition for moving into full scale commercial operation. That is, there may be threshold level below which small scale discourages persistent investment and research. Small may be fatal. Thomson quotes Whiting as identifying armies as playing an important role in the development of new food processing technology (Thomson 1981, p.7). In the Caribbean, that base for new processing output may lie in the institutional population. The case of instant yam indicates that some 50 per cent of sales went to the institutional population. This market was limited by two facts. Firstly, international agencies provided some of the food as a grant, but this was tied to aid requiring use of food imports. Secondly, commercial processors already had established supply links. These may not be insurmountable problems. Linkage with the demand of the institutional population may be the important step to achieve that threshold level for successful implementation of a Caribbean strategy of local raw material, intensive food processing activity. One illustration of this possibility is in the school feeding programme of Trinidad and Tobago. The carton drinks are obtained from two large commercial processors - Cannings and Nesle - with sorrel drink being one of the several drinks supplied.

TABLE VII: Pilot Plant Production of Instant Yam

Year	Instant Yam (lbs.)	Estimated raw material input (9 lb. = 1 lb.)*	Purchase price damaged yam	Per lb. Good yam	Selling price instant yam/lb.
1971	14,000	126,000	n.a.	n.a.	n.a.
1972	25,000	225,000	4¢	6¢	n.a.
1973	20,000	180,000	n.a.	n.a.	n.a.
1974	19,200	172,800	20¢	40¢	n.a.
1975	50,000	450,000	n.a.	n.a.	\$3.16/lb. (plc.)

*The relationship of raw material to product (9:1) was estimated by the author and should be considered only approximate.

Source: CDB Feasibility Study: Instant Yam, p.3, Table 2-1.

TABLE VIII: Sales of Instant Yam (lb.)

	1974	1975 Jan-Sept.	1975 Whole year est.
Retail (Barbados)	8,800	7,798	12,000
Retail (Overseas)	1,740	-	-
Institutional (through BMC)	14,000	9,800	14,000
Tourist Industry	1,400	2,775	4,000
Total	25,940	20,373	30,000*

*The increased sales in 1975 has been explained by the local (Barbados) scarcity of both yams and sweet potatoes in that year.

Source: CDB Feasibility Study: Instant Yam, p.5, Table 3-1.

TABLE IX: Profile Sorrel Processing in Trinidad and Tobago

Year	Concentrate produced (gals.)	Fresh sorrel equivalent (lb.) (1 gal. / 50 lb.)	Guaranteed purchase price/lb.
1975	200	10,000	16¢
1976	340	17,000	16¢
1977	10,500	525,000	25¢
1978	280	14,000	25¢
1979	1,900	95,000	30¢
1980	500	25,000	30¢
1981	1,355	67,000	30¢

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CONCURRENT SESSION