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The role of agroprocessing in the regional diversification thrust

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Introduction

"Now if the capital sector produces no food, its expansion increases the demand for food, raises the price of food in terms of capitalist products and so reduces profits. This is one of the senses in which industrialisation is dependent upon agricultural improvement; it is not profitable to produce a growing volume of manufactures unless agricultural production is growing simultaneously. This is also why industrial and agrarian revolutions always go together and why economies in which agriculture is stagnant do not show industrial development". (W. Arthur Lewis 1954)

Agribusiness is enormous business and agroprocessing, which is an important component of agribusiness, is one of the world's principal industrial activities. Agroprocessing is the application of technology to the transformation of agricultural raw materials to produce various goods and services. Agroprocessing is popularly held to be synonymous with food and beverage processing but in fact this is a limitation in definition with which we ought not to be constrained. It is certainly true to say that food and beverage processing constitute important and significant elements of agroprocessing. There are, however, major areas of agroprocessing that are concerned with products unrelated to the food and beverage subsectors and which we must consider if we are to provide a true and accurate perspective of the potential of agribusiness.

Once the search for gold and silver in the Caribbean Region by the colonial powers in the 16th and 17th centuries proved to be an exercise in futility, the true El Dorado of the region was found in agriculture and primary agroprocessing. The productive potential of the land to lock up solar energy in various cash crops - sugarcane, cocoa, coffee, bananas, coconuts, spices, and timber - and the equable year round climate produced wealth of enormous proportions to the metropolis. This wealth fueled industrialisation in the metropolitan countries and the technology was developed to further process these tropical raw materials to a plethora of high value end products, much of which ended up in the very countries that produced the raw material in the first place. And so was born a pattern of agroprocessing that was to become established and that dominates agribusiness in the region to this very day. In a real sense, the region produced what it did not consume and consumed what it did not produce. Now in the dying years of the twentieth century, attempts are being made to link production with consumption and to use agroprocessing as the tool to achieve this fundamental transformation with the objective of socio-economic development.

Agroprocessing - technological considerations

Agroprocessing refers to transformation after harvesting and so constitutes a major element of postharvest technology. Such technological transformation ranges from the simple to the complex depending on the level of the technology applied and on the degree of transformation that occurs. Thus, simple drying or the removal of water using various types of dryers will result in a product not too different from the raw material, whereas molecular transformation by microbial fermentation will produce something totally unrelated to the original raw material. One economic fact is clear and that is that the amount of value added and hence wealth and employment created will be directly proportional to the level of agroprocessing. Processing trees to lumber is simple and hence little value is added but processing this to veneered cupboard elements will ensure major value added.

Agroprocessing is concerned with manufacturing consumer products but the imperatives of agroprocessing deal with preservation and presentation. On the one hand, preservation is a natural development of the fact that consumer markets have become distal in time and space from production and since agricultural raw materials have an inbuilt characteristic to degrade and recycle, methods must be used to halt or retard this process. On the other hand, presentation has to do with consumer tastes and preferences and the natural specialisation that accompanies civilization as we understand it.

In agroprocessing, therefore, a terminology has arisen that pertains directly to the level of transformation of the agricultural raw material. The processing may be:

Primary
Secondary
Tertiary or higher

Primary processing refers to an elementary conversion of the raw material, e.g. conversion of sugarcane to raw sugar, molasses and bagasse; logs to timber, aloe vera to stabilized gel, live animals to chilled/frozen carcasses. As the level of transformation increases, one progresses through to secondary, tertiary and even higher and at each stage more technology comes into play. As mentioned earlier, during the processing, wealth created and employment generated increase proportionally to the level of processing, leading to products of increasing value.

Agroprocessing and diversification - some policy considerations

Given the relatively large internal market for processed agricultural products; given that the export market for processed agricultural "exotics" beckons temptingly and given that agroprocessing appears to hold significant potential for generating both wealth and employment, one can easily be led to believe that agroprocessing holds the key to the Pandora's box of development. Our experiences to date should warn us against what appears easy and obvious and must inform our future actions.

If we examine the development of the foods and feeds industries in the region through the 1960s to the present, we will see that what started off with the good intentions of backward linkages into agricultural production and opportunities for export in fact never materialised. With considerable assistance from the taxpayer, these industries commenced in the 1960s and 1970s in practically every

territory, initially as import substitution exercises, using imported preprocessed material with the hope that over time, linkages would develop with the primary production sector and products with export potential would be developed. Today, in some of these industries, the import component in terms of raw material continues to approach 100%, linkages into primary production are often zero (except in a few notable instances like Frozen Concentrate Orange Juice in Belize) and extra-regional exports are insignificant. In the period, quality has been variable, prices to the consumer have been high and taxpayer subsidy has continued.

If agroprocessing is to be a real option with developmental potential, the objectives must be explicitly and quantitatively set out. These objectives need to be constantly re-examined and re-evaluated in the context of performance. There is need for careful investigations and detailed feasibility studies as the industry is charting a course into new and unfamiliar areas.

Agroprocessing as an element in agricultural diversification must be considered within the following policy framework:

- to create remunerative, permanent and gainful employment opportunities
- to develop a vibrant agricultural and agro-industrial sector to strengthen the economic base of our economies
- to increase our ability to produce more of our food needs and to increase self reliance, as opposed to self-sufficiency, and strengthen food security
- to effect meaningful and immediate reductions in the huge regional food import bill, thereby reducing foreign exchange outflows for imported food
- to transform a backward, traditional agricultural sector, into a modern technological oriented sector
- to earn foreign exchange through creating and filling niches in the export market.
- to generate R&D into new products, new technologies and new market opportunities
- to create a demand for new goods and services

Within the above policy framework, the following guidelines will be considered in selecting projects:

(a) technical feasibility and financial viability

(b) meaningful relationships must be established with the existing, or soon to be developed, primary production sub-sector

(c) to minimize risk, one ought to look at possibilities as close as possible to our own markets using established technology

(d) significant linkages must be developed with other sectors, e.g. engineering, R&D, packaging, etc.

(e) products must not significantly increase the cost of living to the consumer

(f) there must be maximal utilisation of wastes and by-products

(g) the processing sub-sector must create and sustain an indigenous capital goods sector

Opportunities in agroprocessing

In the light of the above, it would be informative to examine regional opportunities in agroprocessing. For convenience, this examination will commence with existing agriculture.

Sugar

Any discussion on regional agroprocessing must commence with sugar, which for so long has been king in the region and continues to be important to Barbados, Belize, Guyana, Jamaica, St.Kitts/Nevis and Trinidad and Tobago. Regional production has declined by 18% in the period 1980-84 to 748,000 tonnes, with export sales declining in the same period by 11% to 638,000 tonnes. In 1985, sugar prices fell to their lowest level in 14 years against a backdrop of large stocks, failure to negotiate a new International Sugar Agreement and competition from other sweeteners. The long term outlook for sugar prices is grim, so too are the opportunities for export sales. The acreage under sugarcane has remained more or less stable since 1980 at about 125,000 ha. This represents the single largest use of our land resource. Sugarcane thus constitutes a prime situation for agroprocessing since abandonment of sugarcane is not really an option. Any agroprocessing thrust must therefore be two-pronged involving better utilization of sugar and its by-products; and alternative uses of the sugarcane plant.

Utilization of sugar and by-products: Appendix I summarises the range of possible processed products from the various outputs of the existing sugar industry. The list is formidable and becomes even moreso when one considers that it is possible to make more than 10,000 chemical products from sucrose. These range from low volume, high value products like pharmaceuticals and pesticides to high volume low priced products like feeds and alcohol (Thomas 1985, Paturau 1982).

Alternative uses of sugarcane: Much of this work is going on at the Sugar Industry Research Institute in Jamaica where the approach is to treat the sugarcane plant as having the following useful components:

- hard outer rind capable of being cut into strips to produce structural board, decorative board and fuel briquettes (22% of cane)

- the sugar rich pith (75% of the cane) from which the juice can be extracted to leave a material that can be made into animal feed. The pure juice, uncontaminated by rind elements, can be made into specialty syrups and sugars.

- a thin protective layer of wax covering the rind (2% of cane). When extracted this yields a high quality, hard wax.

A commercial facility using this technology is now being constructed at Bernard Lodge in Jamaica.

Cocoa

Cocoa is produced in eight territories in the region with production having declined by some 27% in the period 1980-1984 to 6,856 tonnes. Both Trinidad and Tobago and Jamaica cultivate the fine-flavoured "Trinitario" clones and seedlings. These produce a bean that carries a premium price on the world market. Cocoa is primary processed in the region by fermenting and drying to produce the dried beans of the international trade.

Secondary and tertiary processing of cheaper imported beans are carried out in Barbados, Trinidad and Tobago and Jamaica to produce sweets and chocolate bars as well as chocolate drink bases.

If regionally produced beans, which are in high demand, could only be secondarily processed into cocoa mass, paste, powder and butter, we could increase income ten-fold as compared to the export price for the raw beans. Further processing using indigenous sugars and spices could lead to a range of exquisite high value products.

Coffee

Production occurs in four territories with output having fallen by 50% in the period 1981-84 to 3,044 tonnes. Much of the coffee in the region is already being processed to ground coffee, instant coffee and high value coffee liqueurs.

Bananas

Banana production by the six major producers averaged 220,000 tonnes in the 1980-84 period, with exports accounting for some 65-70% of the total. Because of the demands in metropolitan markets for blemish-free and well-shaped fingers, there is much wastage due to culling and rejects. Processing in the region is negligible, though it is possible to produce chips of various types, purees and frozen bananas.

Coconuts

Regional production of copra has declined by 16% in 1980-85 to 16,700 tonnes. Part of this goes into the production of edible oils and part into non-edible oils for manufacturing purposes. Total regional production of coconut oil now supplies less than 10% of the demand for edible oils (Caricom, 1986) with the bulk of the deficit made up by importing soya and corn oil. Despite this, countries have been experiencing difficulties in disposing of coconut oil. Some coconut oil is used to make toilet soap, other soaps, margarine and shortenings. Because of health concerns and an apparent preference for soft unsaturated oils, more coconut oil will be available for processing.

A major project is now under way to develop a range of high value cosmetic products based on coconut oil. The region continues to import coconut cream and desiccated coconut for the baking industry in significant quantities. Manufacture of these products is based on well-known simple technology and there is no reason why such products cannot be produced in the region.

Other products for coconut include use of the milk for vinegars and the wood from culled and diseased trees. The wood is extremely hard and damaging to ordinary saws, but in countries like Sri Lanka, much of the rafter material for supporting roofs is coconut wood.

Timber and forestry products

The region is rich in exotic, quality, tropical hard-woods, much of it centered in Guyana, Belize, Trinidad and Tobago and Jamaica, but even for ordinary construction timber, the region is dominated by imports. The furniture and woodworking industries are in their infancy and have enormous potential for development given adequate design and marketing support. In fact it is true to say that the potential of our tropical woods, both the well-known species as well as the lesser-known, has not been touched.

It is particularly important to consider the market for well-designed CKD furniture, wooden carvings and objects d'art, wooden toys and games and other wooden articles like cutting boards, cheese boards, wall holders, etc. The growing market for veneers is another area worthy of investigation.

Agroprocessing of non-traditional crops

Fruits and vegetables: The region already has significant installed capacity for processing fruits and vegetables but apart from a few exceptions, much of the raw material used is imported as pre-processed raw material. Thus, in Trinidad and Tobago alone, imports of tomato paste primarily for tomato ketchup exceeds US$2.4 million p.a. and yet it is possible to make perfectly good catsup equivalent to tomato ketchup from pumpkins as anyone who has been to the Philippines and parts of Latin America will know.

A fruit which I want to mention as having great potential, especially for the drier parts of the Caribbean is cashew. This crop can be processed to the nut (the third most expensive consumer nut after macadamia and pistachio) and cashew nut shell liquid which is a material of enormous industrial importance.

One must also mention the growing market for dried fruits. Raisins and prunes are well-known imports but dried products in may cases superior to raisins and prunes can be made from papaya, pineapples, five fingers (Carambola), pommerac (rose fruit) and others.

Meats: Certain of the territories in the region now have an over production of chicken, yet the secondary and tertiary processing of chicken has barely started. Some chicken burgers and sausages are produced, but chicken can be canned or frozen in a number of ways to produce attractive, consumer and institutional products. Much of the necessary technology for these operations is already installed in the region and it would be but a short step to move in this direction.

Fisheries: The region continues to be a net importer of fish and fish products. Practically all of the fresh fish and shrimp catch, except for shrimp exports, is consumed as fresh or frozen raw material. But the shrimping industry especially during trawler operations, catches large quantities of fish which are simply dumped back into the ocean. Much of this dumped fish can be processed to perfectly acceptable products even using such simple technology as salting.

Natural products: The use of aloe vera exudate for skin ailments in the Caribbean is a traditional medicine (Seaforth, Adams and Sylvester 1985). Yet, though we have in our midst an established sector that produces creams and lotions, aloe vera in commercial skin and hair preparations had to come to us via the imported route. Essential oils

can be extracted from our spices by simple distillation or solvent extraction. After standardization, such high priced extracts are vital to the food and cosmetic industries.

Fermentation biotechnology: The region has a well-established fermentation technology, i.e. rum, and to our regret, this was not used to build capability and knowledge in fermentation technology. With our sugarcane base, we could easily have moved to citric acid, vinegars, fruit wines, yeast, bacterial gums and polysaccharides and other fermentation alcohols, acids and esters. Rum as a base for other potable products including liqueurs is an infant industry and yet is an industry with a potential for enormous value added.

Realising agroprocessing potential

Agroprocessing has the potential to revolutionize the agricultural sector in the Region as it has done in other parts of the world. The agribusiness sector consists of the raw material producers (primary producers) working together with the agroprocessors to produce a vibrant and profitable industry that is the foundation of real and lasting socio-economic development. To realise this potential, the following are some of the constraints that need to be addressed:

Raw material supply

A processing sub-sector cannot be built around a raw material supply that is variable in respect of quality, quantity and/or price. Experience in the region to date, especially in respect of fruits and vegetables for processing, has fully demonstrated the unreliability of raw material supply. Contract farming has not lived up to its name, the terms of the contract being broken on occasion by both processor and producer.

Pre-processing facilities

The reality of the situation in the region is that there are established processing facilities based on using pre-processed materials. These processors do not want to handle agricultural raw materials and adequate pre-processing facilities need to be established. There may be a role here for producer cooperatives. Such facilities must be so organised and managed that their outputs are standardised in respect of acceptable quality criteria.

Harvest and immediate post-harvest technology

Harvesting of agricultural raw material and the immediate post-harvest handling will play a significant role in determining the utility of that material for processing. This applies whether one is harvesting logs, fruits, flowers or root crops. When to harvest, how to harvest and how to handle are all important considerations to be addressed. Agricultural raw material is living material and is susceptible to major deterioration after harvest.

Processing technology

Practically all of the processing technology now in use is imported, usually from a limited range of sources. The region needs to broaden its net in the search for more appropriate technology, especially from the Far East and our colleagues in the Third World. We also need to

develop our own capital goods sector so that we can supply some of our needs in technology. CARIRI is already pioneering work in this area.

Packaging

The packaging industry must be broadened and deepened. The range of packaging now available is too limited and far too expensive to support an aggressive agroprocessing sector. New packaging materials, better designs, more attractive colours, better labels, new technology - all these and more are important especially to an export-led sector.

Marketing know how and information

This area must drive the processing sector into the most relevant areas and along the most appropriate directions. Such information must be derived internally and externally. The products of processing must satisfy real consumer needs. For exporters there are enormous obstacles,barriers and the ugly head of protectionism in the metropolitan markets. The processors must satisfy all legal and other criteria, must understand marketing channels and must be prepared to work assiduously and patiently to achieve success.

Training

Training at every level is a must for success in this area. Such training will be both formal and non-formal and must cover handlers, factory workers, technicians and professionals. Training programmes need to be on-going and must be aimed at having adequate knowledge about raw material, the product, the process and the technology.

Entrepreneurship

I feel that the sector and the system need to encourage, develop and breed a new kind of entrepreneur, now coming out of the technical and professional class rather than the trading community. This would provide a new industrial attitude based on innovation and technical expertise. The region's technical and professional people need to think of themselves as employers rather than as employees.

Collaboration

Collaboration amongst ourselves and with other countries of the South is essential to survival. We must be prepared to share R&D, information, experiences, expertise and to collaborate in joint training exercises. Maintenance of equipment has plagued our societies at every level. This is a problem area that can be solved through collaboration.

Research and development (R&D)

All of the above need to be supported by an adequate level of R&D in all areas. Such R&D must collaborative and must address the real problems of the industry. A vibrant industry cannot be built without a quality and quantity of R&D that is the driving force of new ideas, new products, new processes and information. Such R&D must be multi-faceted in approach and multi-disciplinary in execution. The linkages between R&D and the industry must be close and profound if the results of R&D are to be translated into productive activities.

Summary

Agroprocessing has been responsible for transforming agricultural production and for catalysing the development of agribusiness into a major international activity. It is only through agroprocessing that the real and the full potential of the agricultural sector can be realized. Agroprocessing is the driving force behind agricultural diversification creating wealth, generating employment and leading socio-economic development. In the Caribbean Region, our agroprocessing as now occurs is really only marginal except for a few notable areas. Governments must take the lead to provide the conditions that would encourage agroprocessing, linked to agricultural production, to develop and prosper. The sector must be supported be a high level of collaborative R&D that is closely linked to indentifiable policies for industrial development.

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Appendix 1

Range of possible diversification products

1. **Based on Sugar**

   (a) Traditional Products
   - Refined sugar products, e.g. white sugar, castor sugar
   - Syrups, including invert syrups
   - Non-alcoholic drinks, including carbonated soft drinks, cordials, non-carbonated drinks
   - Alcoholic drinks
   - Bakery Products
   - Confectionery Powdered drink mixes
   - Food Products

   (b) Non-Conventional Products
   - Fermentation products including organic acids, xanthan gums, antibiotics, dextrans, gluconates
   - Sucroesters, sorbital (thence to Vitamin C) Alcoholic beverages
   - Animal feeds - pelleted for non-ruminants
   - Sugar charcoal
   - Caramel

2. **Based on Molasses**
   Alcoholic drinks including rum, neutral blending spirits
   Other fermentation products, e.g. organic acids, flavour enhancers, bakers yeast, single-cell protein
   Invert syrup
   Animal feeds for both ruminants and non-ruminants

3. **Based on Bagasse**
   Fuel
   Pulp and Paper
   Cellulose
   Board and building materials
   Bagasse-molasses
   Animal feeds

4. **Based on Filter Press Mud**
   Fertilizers and soil conditioners
   Waxes
   Building materials extender
   Animal feeds

5. **Based on Fly Ash**
   Building materials

6. **Based on Cane Juice**
   Fermentation products, e.g. alcohol, vinegar, dextrans, flavour enhancers
   Drinks (alcohol and non-alcoholic)

7. **Based on Cane Tops/Trash**
   Animal feed (ruminants)