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## Crop Diversification: Some possibilities and some problems

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Modern technology has moved so fast that most of the agricultural commodities produced during colonial times are no longer economically produced in the Caribbean. People have neither been prepared for non-traditional economic activity within a post-colonial Caribbean, nor is there infrastructure or economic surplus to encourage meaningful diversification - agricultural or industrial. However, crop diversification shows some promise. Promising areas include production for national self-sufficiency in food and increasing consumption of locally produced food in industries such as tourism and food preservation. The potential of bio-genetic engineering for the Third World bring both promise and risk. A definite problem is the inability of the region to coordinate production of crops in a way that would favour regional economic growth and cooperation. These topics along with others are discussed in this paper.

**Keywords:** Crop diversification; Import substitution; Biotechnology

The development of modern technologies has moved so fast that most agricultural commodities produced during colonial times are no longer economically produced in the Caribbean today. "King Sugar" started its exodus even before most of the countries achieved independence. Sucrose from beet (*Beta vulgaris*), high fructose corn syrup from corn (*Zea mais*) and immobilized enzymes, as well as the non-sugar sweeteners such as saccharin and the bio-engineered "nutrasweet" all significantly reduced the need for labour intensively produced cane sugar.

For example, U.S. consumption of high fructose corn syrup grew from 1.3 million tons in 1978 to 4.3 million tons in 1984 while U.S. sugar imports dropped from 6.1 million tons in 1977 to 1.5 million tons in 1985-86. And this is not all. One of the most promising sweeteners, the protein thaumatin, is extracted from the fruit of the West African plant *Thaumatococcus daneillii* (Anon, 1987b). Thaumatin is 100,000 times sweeter than cane sugar and is sold at \$1,000.00 per lb (or \$2,500.00 per kg) - by Tate and Lyle of Britain. The fruits are not produced outside of their natural habitat. However, International Genetic Engineering Inc. (Ingene) of Santa Monica California (USA), has been working under contract for Beatrice Foods (Chicago) since 1982 on the development of genetically engineered thaumatin protein. Ingene holds a patent of the regulatory genetic sequences it developed to produce the thaumatin protein. Its product may be on the market by 1988-89. Uniliver, a Dutch multinational, DNA Plant Technology Corporation, and Cinnaminson of New Jersey (all collaborating with Monsanto Corp. of St. Louis Missouri) are all working on engineering techniques which would produce non-sugar sweeteners.

In economic terms, Caribbean exports of sugar to the USA dropped from \$686 million in 1981 to about \$250 million in 1985. In 1986 and 1987, the US import quotas for sugar were further reduced, notwithstanding the continued depressed prices for cane sugar on the world market.

Cotton, the other king of colonial times, has been an off-and-on mini economic activity in the Caribbean in recent times. Even countries such as the Sudan which grows 1M hectares of cotton are concerned with innovations in biological engineering which would have impact on world cotton production. Chances for a comeback of cotton production in the Caribbean as a significant economic activity, are close to zero.

Fruit production for export has mostly concentrated on one crop - Bananas. Monopoly control of the marketing of bananas has resulted in many rejections of peasants' fruits and often unfavourable prices for exported bananas. At the world level, the FAO has predicted that demand for bananas will remain stagnant up to 1990. In fact, growth in demand for bananas in Western Europe declined by 0.2% up to 1982 and is expected to increase annually by only 0.1% from 1983 to 1990. Western Europe - especially Britain (which pays preferential prices in some cases) is the prime market for Caribbean bananas.

Except for the prospects of citrus production by Minute Maid, Coca Cola's subsidiary in Belize, there is little hope for other export fruit production. In recent times, Cocoa and Coffee have not been factors and the spice market is saturated. The words - Arrowroot, Ginger, Dyes and Timber are referred to with historical significance.

Rice production in Guyana has been declining either as a direct result of farmers' protest at the political-economic policies of the Government or as a result of reduced inputs of fertilizers etc. These inputs affect higher yield. It has been suggested that Guyana lacks the ability to generate the foreign exchange necessary to purchase these inputs. One must also raise the question of how much green-revolution rice (IRRI strains dependent on fertilizer) is currently grown in Guyana and Trinidad. Without fertilizers and pesticides, many of these new rice types are inefficient yielders. This review of agro-economic crops of the Caribbean just serves to identify the importance of diversification.

### **Diversification opportunities**

Politicians generally think of diversifying the economy. Tourism has provided the biggest diversification success yet, and in the case of Antigua, diversification efforts have moved from the two crop sugar-cotton economy to the one-legged Tourist Economy. The refinery was at one time the second leg. It is difficult to balance on one leg. Light assembly industries are seen by many politicians as the alternative. These activities are riddled with abuses of workers (overworking and sexism) and disrespect for national objectives. Many companies pack and leave when fair labour practices are enforced.

The first job of any government is said to be that of feeding, clothing and sheltering its people. Concentration on the production of food crops is therefore one area, relevant to feeding its people, that Caribbean governments could look to as an answer within the diversification context.

Within this context an even bigger task lies ahead. The colonial policy of importing, rather than growing food (Belize), the extensive use of wheat flour, rice and corn (maize) meal as staple sources of carbohydrates in the diet and the influence of the media (especially of U.S. television) on food preferences has taught us to prefer that which most of us can not produce economically. Therefore, if Caribbean people are to eat more of what they produce, an ongoing education on economic realities, nutrition and pride in eating locally produced food should take place.

In addition, Caribbean foods should be standard to the everyday menus of hotels and restaurants rather than the one-night-per-week-local-food situation that typifies the Caribbean tourist hotel scene.

In places where cash crops still remain the major pillars of the economy, there has always been a systemic obstacle to diversification. Cultivation of cash crops has been in direct competition with food crop production. Both crops have been cultivated in the same rainy season and this prevents workers (peasants) from giving the necessary time to both crops. To remove this obstacle, clear, deliberate choices and strategies must be made by policy makers.

With the demise of sugar cooperatives, coupled with the reduced production and utilization of Jamaican bauxite and alumina, Jamaica has been seeking alternatives in addition to tourism. Agro 21 is one initiative. The objective has been to produce vegetables for the North American winter vegetable market. It has been substantially successful. However, some reports suggest that it has further exacerbated poor human nutrition in Jamaica, since peasants sell all of their nutritious vegetables for cash and leave themselves undone.

### **Essential components of diversification strategies**

It has been suggested (Lewis, 1987) that availability of fertile lands, clear identification of what to produce, identifying markets for products, refrigerated storage and processing, adequate orientation of producers to export marketing, attitudes to foods, the need for extension education, agricultural credit, government and university expertise and assistance were essential for agricultural development. Moreover, these inputs must be undergirded by a clear philosophy of development and an approach which soundly addresses the needs of the small Caribbean farmer within his cultural context. Care for the natural resource base (including land) is as important as the other factors listed above.

### **Biotechnology - promise or threat?**

In examining the sugar economy, I referred to the role of bio-engineering in the production of Nutrasweet and thaumatin. Further examination of biotechnology will help to focus on parameters necessary in considering the future of food production in the Caribbean. Plant tissue culture, as well as recombinant DNA techniques or gene splicing (i.e. incorporating genetic characteristics from one plant or animal in to a virus and thereafter into another plant or tissue which normally does not carry that characteristic) make it possible to revolutionize the production of food and consequently change many industries in the foreseeable future.

Cary Fowler of the Rural Advancement Fund International (RAFI), an organization which keeps a close watch on the manipulation of plant genetic materials, suggests that biotechnology will influence every other industry and has enormous economic implications (Fowler, 1987). Within the past five years, patent applications to the US Patent Office for bio-engineering procedures have increased from none to over 5000. Biotechnology companies have been able to generate great activity in the U.S. and other stock markets. Genentec Inc. of South San Francisco, California, has an annual revenue of US\$100 million, which is predicted to increase to \$10 billion by the early 1990's. Genentec Inc. has bioengineered an anti-blood clotting agent (relevant to heart attacks) called Activase.

David Michael & Co., a flavour manufacturing company of Philadelphia, PA. USA, is currently supporting a three year research project on tissue culture to improve the genetics of natural vanilla in order to make possible a consistent supply of vanilla beans at a reasonable price. (Anon, 1987a) They are using tissue culture to develop new, hardy, disease resistant vanilla plants *which could be grown outside of traditional vanilla growing areas* and they are experimenting with production of natural vanilla flavour using plant cell technology. The possible impact is up to \$67 million in the annual export earnings of Madagascar, Reunion, Indonesia and Comoros Islands.

Another example: American Cyanamid, Eli Lilly, Monsanto, Upjon and Sanofi (France), all cooperated on the production of Bovine Growth Hormone (BGH) or Bovine Somatotropin (BST). This hormone is designated to dramatically increase milk production in dairy cattle (Anon, 1986). The impact would be a drop in milk prices and loss of 23-30% of US dairy farms (predictably the small farms which cannot pay for the BGH shots). Changes in cropping patterns will also occur and a narrowing of the genetic base of dairy cattle (i.e. those strains that best respond to BGH will be selected). In the Third World, people would be further encouraged to import cheap dairy products rather than produce their own. Chances of directly increasing Third World milk production depend on the ability to buy the new cattle and the BGH. The U.S. and Europe already has a surplus of dairy products.

On April 17, 1987, the US Patent and Trademark Office announced its intention to allow patenting of new forms of animal life (Anon, 1987c). In one experiment, human genes have been successfully incorporated into pigs. However, this new development raises serious ethical questions for many.

The point being made here is that, as we consider the question of diversification both at the level of agricultural production and in industry, we must note that there is an energetic move by multinational companies to change not only production patterns but also to control by monopoly the means of production through pricing and patenting. In addition, most of these new technologies keep human participation and human labour input at a minimum. Bio-technology will eliminate the need for certain crops or transfer production from the field to the factory. Producers will not have to deal with labour and political problems.

When we stop to consider that of the 1500 plants used in formal agriculture, 95% of our global nutritional requirements are derived from a mere 30 plant kinds and a full 75% of the diet of Europeans and North Americans is based upon only 8 crops; and to further consider the implications of bio-engineering and bio-technology, we must conclude that the Caribbean, as a region, must either be highly innovative at finding ways to be among the top runners in research, or forever be welfare recipients.

### **The need for cooperative action**

It is therefore necessary for universities and governments to coordinate and cooperate in production, research and marketing so that resources are shared, profits distributed and counter productive duplications eliminated. The idea of a federated Caribbean is not such a bad one even if the most recent advances in this direction were ill conceived.

Festa (1987) noted that U.S. producers of agricultural products were already blaming transfer of agricultural technology to the Third World as the reason for a reduced U.S. market share of export agriculture. He refers to a paper presented by Robert Evenson of the Yale Growth Centre at the meeting of the American Association for the Advancement of Science (AAAS) in which Evenson said: *"The most transferable technology is not a specific item or techniques, but rather the capacity to perform research", what Evenson calls a kind of "intellectual germplasm. It is clear," he says, "that while the U.S. played a role in building these research institutions in developing countries, it has very little power to influence them today."* It seems clear that there are those who see fair trade as no competition!

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