

The World's Largest Open Access Agricultural & Applied Economics Digital Library

# This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search http://ageconsearch.umn.edu aesearch@umn.edu

Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.

#### CARLTON G. DAVIS (Professor, Food & Resource Economics Department, University of Florida, Gainesville, Florida)

Product-Product Dimensions of Agricultural Diversification Strategy in the Caribbean Community: Prospects and Dilemmas<sup>1</sup>

## INTRODUCTION

Discussions on agricultural diversification issues are more often than not placed within the context of an unquestioned good. It is important, however, that policy-oriented discussions on a Caribbean agricultural diversification strategy recognize the importance of both form and function, and the interaction between these two components to the final outcome. To do otherwise is to ignore the reality that the diversification process offers economic prospects as well as dilemmas. Why are the form and function of a diversification strategy so critical to the success (or lack of success) of the process? This paper focuses on some of the critical economic issues dealing with alternative cropping enterprise decisions within an articulated diversification strategy. This particular area of concern is referred to as the product-product dimension of the diversification process. The objectives of the paper are to raise questions and generate dialogue on the issues, rather than to give specific answers.

The paper is organized into three sections. The first section defines and discusses the concepts of form and function, the operational aspects of these concepts, and the interactive dimensions. The second section discusses some of the multifunctional dimensions of a diversification strategy. This section deals with how some of the product-product relationships at country, region, and farm levels might simultaneously generate both positive and negative economic impacts. Selected empirical data are presented to illustrate the major thrust of the arguments. The third and final section summarizes the arguments from the preceding sections and highlights some of the policy implications for a Caribbean agricultural diversification strategy.

#### FORM AND FUNCTION: DEFINITIONS AND OBSERVATIONS

We define the form of an agricultural diversification strategy to include the shape. structure, characteristic or configuration of the diversification effort. We see at least four dimensions of form. First, form can be viewed as a movement away from monoculture, leading to the adoption of several crops in a given country, region or farm unit. Second, form can be viewed as a transfer of land and other resources from one crop or crop combination to alternative crops or uses. Third, form can be viewed as the resiliency of the various farming systems to adapt to changes induced by alternative crops, and the accompanying technologies implied or necessary. The fourth form can be viewed as a shift of resources, especially labour, out of agriculture. The four dimensions are not mutually exclusive. However, Schuh and Barghouti argue that the fourth dimension is perhaps the most fundamental of the diversification process associated with agricultural development. This inter-sectoral labour transfer dimension of the diversification effort is, unfortunately, not given enough recognition in conventional discussions on agricultural diversification issues. Schuh and Barghouti argue that it should be accorded greater importance, since this form of diversification "is necessary if per capita incomes in agriculture are to keep up with those in the non-farm sector" (p. 43).

Fink and Swanson describe two operational forms of the agricultural diversification process as: (1) the "richness" of the crop combinations, and (2) the "evenness" of the crop combinations. Richness has to do with

<sup>&</sup>lt;sup>1</sup>The author wishes to acknowledge the comments of colleagues, C.O. Andrew, J.K. Dow, M.R. Langham, L.W. Libby and J.L. Seale.

the mix of crops grown within a country, region or farm unit. Evenness, on the other hand, has to do with parity in the distribution of specific crops in the crop mixture. It should be recognized that an agricultural diversification strategy which emphasizes the "richness" approach, runs the risk of not addressing the dominance of the crop mixture by one or two crops. As such, monocultural tendencies might not be addressed, especially if there is a persistent bias towards the dominant crops in the resource allocation process. The critical distinction between the two forms is that the former tends to focus on the absolute number of crops grown, while the latter focusses on the relative importance of specific crops to the agricultural sector. To what extent have sponsored regional conferences, dialogue, and analysis of the diversification issues advanced understanding of these differences and the policy implications of pursuing alternative strategy forms? The answer to this question might have to await the combined deliberations of this conference.

We define the function of an agricultural diversification strategy to mean the specific mode of action by which the diversification strategy fulfills its purpose. In other words, function is the operational mechanism whereby diversification objectives are met. An interesting question relating to Caribbean agricultural diversification strategy has to do with the nature of the functional elements. What are these elements? A recent paper by Demas argues that there are three functional elements to the region's agricultural diversification strategy. These are: (1) intensification of the product of traditional crops by increased productivity and by adding value through further processing, (2) increased production of non-traditional crops for national and regional consumption, and (3) increased production of non-traditional crops for export to extra-regional markets. Demas sees these three-fold "supply side" elements as a means of "achieving more broadly based production structures and competitive production" in the regional economies (p. 5). In more specific terms, he argues that these three functional elements are the key to meeting the related

<sup>2</sup> The Marginal Rate of Substitution (MRS) has the same meaning under the productproduct relationship as under the factorfactor relationship. It is the absolute change in one product associated with one unit change in a competing product. regional diversification objectives of: (1) food security, (2) foreign exchange savings and earnings, (3) employment generation, (4) creation of production linkages, and (5) utilization of under-utilized resources.

# PRODUCT-PRODUCT INTERACTIONS: ECONOMIC PROSPECTS AND DILEMMAS

Within the context of the form, function, and economic objectives of a Caribbean agricultural diversification strategy, we offer some observations on the economic dimensions of the product-product interactions, relative to growth and development prospects. In general terms, we are concerned with the economic consistencies and contradictions between the expansion of traditional crops on one hand, and on the other hand, the expansion of non-traditional crops, particularly as these activities are related to the stated regional agricultural diversification objectives.

#### Conceptual Issues

A logical starting point is consideration of the fundamental economic relationships governing choices between alternative production enterprises. These economic relationships essentially define the limits of the economic impacts of the product-product configuration. Recall that the value of the Marginal Rate of Substitution (MRS) among alternative enterprises defines the economic relationship between these enterprises.<sup>2</sup> First, enterprises are competitive (MRS  $\leq$  0) if the output of one can only be increased through a sacrifice in the production of others. Second, enterprises are supplementary (MRS = 0) if the output of one can be increased with neither a gain nor a sacrifice in the production of others. Third, enterprises are complementary (MRS > 0) if an increase in the output of one also results in an increase in the output of others. An implicit assumption underlying these economic relationships is the constancy of the resource bundle within the production process (Heady). Given the historical factor-factor relationships associated with the political economy of Caribbean agriculture, how much flexibility exists for radical changes in the allocation of the resource bundle between traditional and non-traditional cropping enterprises? Obviously, there would exist considerable variation on this aspect between countries of the region. However, in the aggregate, what is the norm? Answers to these questions would certainly have some bearing on both the economic prospects and the constraints to a diversification strategy, relative to strategy objectives.

# Product-Product Configuration: Economic Prospects and Constraints

The ability of a Caribbean agricultural diversification strategy to meet the individual and multiple economic objectives of the process will depend in large part, on the ability to generate: (1) growth in output and productivity, (2) sustainability in output and productivity, and (3) stability of output and productivity of non-traditional crops. relative to traditional crops (Demas). This suggests that the technical, educational, institutional, and economic problems involved in the introduction and development of non-traditional crops must receive high priority in a diversification strategy. These components are essential to improvement in the competitive position of non-traditional crops vis-a-vis traditional crops, with respect to rates of return to resource use. This dimension cannot be overemphasized, because it has direct bearing on the form of the diversification process, and indirect bearing on the function of the process. Specifically, it should be recognized that Caribbean agriculture is highly diversified, defined in terms of the "richness" of crop combinations, yet highly undiversified (specialized) in terms of the "evenness" of the crop combinations. The historical support network of technical, educational, institutional and economic infrastructure has facilitated this form (Beckford),

Demas, (p. 4) points out that as the Caribbean countries prepare to enter the 21st century, they "are still characterized - as they were at the beginning of the 20th century - by over-dependence on a small number of export crops, mainly sugar and bananas." The persistency of this overdependency on a small number of crop, within a generally highly diversified crop mixture, is directly related to disparities in the rates of return to resources used in nontraditional crops, relative to traditional crops. A facilitative infrastructural network for nontraditional crops is essential to the generation of rates of return to investment in these types of enterprises that are equivalent to or higher than those for traditional crops. Such a support network would include among other things: (1) adequate and timely supply of inputs, (2) research support, (3) market

development and coordination, (4) positive pricing policy, and (5) adaptive technology transfer system. Such a support network would entail costs in terms of money and trained human resources. Also, the cost component of such a support network would vary significantly among countries of the region. Obviously, some benefit-cost assessment will have to be an integral component of support network investment considerations.

One study reports that governmental efforts to diversify the Ghanian agricultural sector away from cocoa, failed primarily as a result of the magnitude of the disparity in the rates of return to resources used in cocoa production, compared to the rates of return for the next best alternative crops (Green and Hymer). Research on the Ivory Coast by Bakayoko substantiates further the importance of relative rates of return to factors of production in determining the long term competitive position of non-traditional crops within a diversification strategy. He computed estimates of the comparative income generating capacity of traditional crops and nontraditional crops at 1980 price levels. His study covered a geographical region of the country that was subjected to an intensive agricultural diversification effort.

Table 1 shows a ranking of five crops by Bakayoko, on the bases of selected economic criteria. These data suggest that farmers would more readily choose to grow cocoa, a traditional crop, because of its economic advantages over the alternative crops. In the decision-making process of choosing the crop to be grown (or adopted) after cocoa, coffee which is also a traditional crop, appears to have the economic edge over rubber, the closest alternative non-traditional crop. The economic advantage of coffee production over rubber is solidified by its relatively higher ranking in terms of net value added per hectare (rank number 1), and value added by labour. Given the combined economic characteristics of the data shown in Table 1, it is obvious that the product-product configuration is heavily weighted in favour of cocoa and coffee at the farm level. Under such circumstances, there is likely to be persistent rigidity in bringing about farm level adjustment. away from cocoa and coffee.

While the cropping alternatives for Ghana and the lvory Coast might vary from those of the Caribbean countries, there are nevertheless some lessons for the region. In a Caribbean agricultural diversification strategy, 4

parity in rates of return to investment in traditional and non-traditional crops is essential to long term movement toward parity in the distribution of the product-product mixture. The declining prices of some of the Caribbean Community traditional agricultural export commodities, coupled with uncompetitive high costs of production, and the necessity to depend on preferential markets for survival, present a major economic dilemma for the region. At the same time, these economic tendencies can be viewed as prospective "windows of opportunity" for movement toward parity in the rates of return to traditional versus non-traditional product mixture. The functional dimensions of the regional agricultural diversification strategy must explicitly recognize and aggressively exploit these "windows of opportunity."

There are, however, concurrent economic dilemmas which must be recognized and addressed as the opportunities for agricultural diversification are pursued. First, how can the production of economically competitive nontraditional cropping enterprises be optimally harmonized within a product-product configuration? Recall that if the non-traditional cropping alternatives are economically competitive, production trade-offs will have to be made among these enterprises. Second, although the traditional agricultural exports might experience externally induced reduction in rates of return, it might be impractical to have complete cessation of their production, given the economic reality of the regional economic structure. Demas (p. 12) points out, "these enterprises are well suited to the agro-environments in which they are found and contribute significantly to export earnings." In addition, they support relatively high employment levels in the region. What criteria are to be used in evaluating the optimal strategy to accommodate competitive economic enterprises and competing economic objectives? Third, what is the range of non-traditional crops that offer good prospects for being able to compete, and what is the cost of research and development efforts to bring them economically on line to compete? Do the indigenous scientific and monetary requirements to get the job done exist or can be arranged? Within the context of research and development efforts for nontraditional crops, it should be borne in mind that any form of new technology will be more beneficial to producers if it is more labour-intensive than the traditional technology. In such a case it will generate increased demand for labour in country economies with relatively high unemployment levels (Schuh and Barghouti).

Within a similar context, one interesting question has to do with whether there are specific functional dimensions of a Caribbean agricultural diversification strategy which, if considered within a specific micro and macro-economic context, suggest operational difficulty in bringing about a restructuring of the traditional-non-traditional product mixture. We think that such a question is . not irrelevant. For example, Demas (p. 9) argues that one of the functional elements of a regional diversification strategy is the "intensification of the product of traditional crops by increased productivity and by adding value through further processing." There is little doubt that product intensification and productivity gain in traditional agricultural export enterprises is a logical diversification strategy under Caribbean economic conditions. If the programming sequence is optimally harmonized with other functional elements of the strategy, the economic pay offs could be significant. However, it should be recognized that if product intensification and productivity gains in traditional export enterprises result in skewness in the distribution of rates of return to investment in favour of these enterprises, this could be a constraint on change in the product mixture. How should this strategy element be harmonized with other elements to create the desired effects?

We observe elements that are common to both the functional dimension and the multiple-economic objectives of Caribbean agricultural diversification strategy. These common elements relate to the source, level, and stability of agricultural sector income. Within this context, we suggest that if agricultural diversification is seen as a means of maximizing agricultural income, then the most profitable level of aggregate output should be recognized as being a function of product-product relationships. In such a relationship, profit is maximized when the Marginal Value Product (MVP) of a unit of resource allocated to one product is equal to that of all other products. If on the other hand, agricultural diversification is seen primarily in terms of income stability, then the income profitability objective might not be met, or it could become a secondary consideration in the production process.

Dialogue on a Caribbean agricultural

 TABLE 1: Ranking of Selected Traditional and Non-traditional Crops in the

 Ivory Coast by Selected Economic Criteria, 1980.ª

Сгор	Net Value Per Hectare	Return Per Man-Day	Value Added By Labour	Annual Income for Farm Unit
	Ranking in Absolute Numbers			
Traditional Crops				
Coffee	1	5	2	3
Сосоа	2	1	1	2
Non-traditional Crops				
Coconut	5	4	5	5
Oil Palm (Bunch)	4	3	4	4
Rubber	3	2 .	3	1

<sup>a</sup>Based on calculations at 1980 price levels.

Source: Bakayoko.

strategy should recognize the consistencies and contradictions of the income level and the income stability components of the product-product configuration. Within the context of the traditional-non-traditional product mixture in the Caribbean, it should be recognized that if the lowest average earnings from the traditional agricultural crops are consistently larger than the highest average earnings from non-traditional alternatives, farmers will be reluctant to produce the alternative crops. Under these circumstances, a greater earnings variability at a higher average level of earnings might be preferable to a more stable earnings level at a lower level of earnings. The former situation could over time, generate large average income to farmers.

It should also be recognized, that agricultural sector earnings and income variability can only be reduced by agricultural diversification if the prices and output of the product-product mixture bear the proper correlation (Heady). Explicit recognition

<sup>3</sup>Technically, this means that correlation coefficients close to 0 are more effective in stabilization considerations than those approaching +1; but they are less preferred than those close to -1. should be given to the different constituents of the earnings and income variability being exhibited in the agricultural sector, and the interactions among the elements. Specifically, it is important that the source of agricultural sector earnings and income variability be identified with: (1) price variation, (2) output variation, and (3) price and income variation interactions. Which prices and output correlations are important to Caribbean agricultural sector earnings and income stability?

Caribbean countries should be cognizant of the fact that for any product-product configuration, whether the concerns relate to price, output, or income levels, the larger the correlations between products, the greater is the inability of additional enterprises to stabilize variation.<sup>3</sup> In his lvory Coast diversification study, Bakayoko computed price. output, and earnings correlation coefficients over the 1960-1980 period for a productproduct mixture of traditional (coffee and cocoa) and non-traditional (coconut, banana, oil palm, pineapple, and rubber) enterprises. He reported relatively large and positive price correlations for the seven crop mixtures. This suggests the general inability of the price levels of the non-traditional crops to stabilize farm income. He noted, however, that the price levels of additional non-traditional crops exhibited some ability to reduce income variability associated with differences in individual commodity cycle, yield variation, and short term changes in supply or demand. It is conceivable that similar price level-income stability relationships might hold for Caribbean product-product mixtures. These specific relationships would have to be determined as an integral part of income stability considerations.

Another finding of some significance to the Caribbean, is that the correlation coefficients for commodity output levels were generally lower than those of price levels (Bakayoko). This suggests that some of the product-product combinations can meaningfully contribute to output stability. In the case of the Caribbean, this finding could be extremely relevant in developing a diversification strategy to cope with income variation that is primarily associated with output, rather than price variation. Specific knowledge of the output correlation coefficients for different product-product mixture would be necessary to determine optimum crop combinations consistent with output stabilization objectives.

#### SUMMARY AND IMPLICATIONS

The general concern of this paper is with the economic prospects and dilemmas of the Caribbean Community's desire to bring about combinations of traditional and nontraditional agricultural enterprises that are consistent with agricultural diversification objectives. We refer to this concern as the product-product dimension of the regional diversification strategy. It was argued that explicit recognition should be given to the form and function of the regional diversification strategy, since these dimensions define, to a large extent, the ability of the strategy to meet economic objectives. The point was made that it is necessary that informed dialogues on the issue recognize the fact that Caribbean agriculture is highly diversified, defined in terms of the number of crops grown; yet highly specialized in terms of the dominance of the product-product mixture by a small number of crops. This form component of regional agriculture was then discussed within the context of an articulated agricultural diversification strategy, and its associated economic objectives. Discussion then focussed on selected "supply side" economic issues associated with the implementation and harmonization of

product-product relationships, within a diversification strategy.

Since the economic relationships between products define the limits of the economic potential of the product-product configuration, it was pointed out that a Caribbean diversification strategy must be based on knowledge of whether non-traditional agricultural enterprises will generate rates of return equal to or higher than those of traditional enterprises. The importance of this dimension for non-marginal adjustment of the product-product mixture at the farm level was illustrated by data from Ghana and the Ivory Coast. Similarly, we highlighted the conflicts and consistencies of the productproduct configuration in meeting improved and more stable income level objectives within the agricultural sector. Specifically, we pointed out that based on studies in the Ivory Coast, changes in the product-product configuration, via a diversification strategy, will only improve and stabilize agricultural sector incomes or output if the output mixture bears the correct correlations.

Caribbean Community agricultural diversification strategy must address certain "necessary" conditions on the supply side, if strategy objectives are to be met. Although not exhaustive, some of these conditions are: (1) generate a stream of improved and/or new varieties of traditional crops that are complementary to and competitive with the more productive traditional crops, with respect to rates of return on investment, (2) develop explicit agro-economic knowledge covering the degree of specific productproduct relationships, so that optimal (or more economically beneficial product combinations) can be programmed into the strategy, (3) develop explicit knowledge of the levels of potential economic trade-offs between competing economic objectives as the strategy is implemented, and (4) recognize that the optimal product-product mixture which might be consistent with regional diversification economic objectives, might be inconsistent or at least be competitive with specific country economic objectives.

We would like to emphasize the fact that we consider the preceding to be some "necessary," but by no means "sufficient" conditions for a successful diversification strategy. We have not discussed to any appreciable degree, the critical "demand side" factors that are likely to impact the productproduct configuration. This neglect is not intended to minimize the effects of these factors. Rather, the discussion was selective in its treatment of factors and issues, given the orientation of the paper. There are also a number of other critical factors that must be addressed as the region plans a productproduct diversification strategy. Some of the demand side factors are recognized and discussed elsewhere (Bourne and Joefield-Napier; Jordan and Durrant; Schuh and Barghouti). Demas also argues that some of the other critical factors are: (1) macro-economic policies, (2) credit dimensions, (3) technology and dissemination. (4) land tenure and distribution. (5) marketing systems and methods, and (6) infrastructure. An effective agricultural diversification strategy will require recognition of and development of appropriate coping strategies for dealing with the two sets of issues. That is a challenge of significant proportions. This paper raises more questions than answers are given. The questions are intended to stimulate discussion and guide the orientation of the debate as the region struggles to find a collective solution to multi-dimensional problems.

## REFERENCES

<sup>1</sup>Axline, W.A. (1986). Agricultural Policy and Collective Self-Reliance in the Caribbean. Boulder, Westview Press.

<sup>2</sup>Bakayoko, A. (1982). Export Agriculture Diversification and Intra-Regional Income Distribution in the Ivory Coast: The Case of the Forested Region, 1960-1980. Ph.D. Dissertation. Food and Resource Economics Department. University of Florida.

<sup>3</sup>Beckford, G.L. (1972). Persisten: Poverty New York, Oxford University Press.

<sup>4</sup>Bourne, C. and Joefield-Napier. W. (1983). Export Performance and Prospects for the Commonwealth Caribbean. In Trade. Debt. and Development in the Caribbean Basin, Editors Salazar Carrillo, J. and De Alonso, I. Institute of Economic and Social Research of the Caribbean Basin (IESCARIBE), Research Summaries No. 2.

<sup>5</sup>Demas, W.G. (1987). "Agricultural Diversification in the Caribbean Community: Some Issues." Statement presented at the seventeenth annual meeting of the Board of Governors of the Caribbean Development Bank, Grenada, May 13-14.

<sup>6</sup>Fink, J., and Swanson, E.R. (1973). "Diversification in Illinois Crop Production, 1938-1970." Illinois Agricultural Economics, No. 1. <sup>7</sup>Green, R.H., and Hymer, S.H. (1966). "Cocoa in the Gold Coast: A Study in the Relations Between the African Farmers and Agricultural Experts." Journal of Economic History, Vol. 26.

<sup>8</sup>Heady, E.O. (1952). Economics of Agricultural Production and Resource Use. Englewood Cliffs, New Jersey, Prentice Hall.

<sup>9</sup>Jordan, K., and Durrant, N. (1987). "Marketing and Trade Issues in Support of Diversification." Paper presented at the joint Caribbean Agro-Economic Society/Caribbean Food Crops Society Meeting, Antiqua, West Indies.

<sup>10</sup>Schuh, G.E., and Barghouti, S. (1988). "Agricultural Diversification in Asia." Finance and Development, Vol. 25