SUSTAINABLE AGRICULTURAL DEVELOPMENT IN THE CARIBBEAN: SOME CONCEPTUAL AND PROCESS DIMENSIONS*

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INTRODUCTION

The issues relating to sustainable agricultural development and natural resource conservation are increasingly occupying the centre stage in discussion of agricultural development strategies in the Caribbean and at the world level. The economics profession is increasingly becoming involved in the sustainable development debate - often from the perspectives of both a contributor to the problem as well as to the solution *[Daly and Cobb, 1989; de Bono, 1990; Longworth, 1991; Singh, 1991; Veeman, 1989; Goodland and Ledec, 1987].* Singh *(1991)* argues that the emergence of sustainable development issues to the forefront of international and regional debate is closely associated with the evolution of *'World View'* perspectives or paradigms. The evolutionary process started from that of the "*Greek World View,*" through the "*Medieval Christian World View*", the "*Machine Age World View*", to the current "*Biospheric World View*". He argues that the Biospheric World View recognizes two basic laws of thermodynamics - the Law of Conservation of Energy and the Entropy Law. In so doing, such a view explicitly recognizes the intrinsic interdependence between the social and economic system on one hand, and the global ecosystem on the other hand. Furthermore, the paradigm holds that the socioeconomic system is linked to the global ecosystem via a series of interdependent biospheric subsystems, including land, water, atmosphere, flora and fauna.

If the Biospheric World View represents the current conventional wisdom regarding man-nature relationship, some credit must be given to the so-called Brundtland Report *[World Commission on Environment and Development, 1987]* for one of the most cogent articulation of the basic premise of the argument. Indeed, the widespread concern about the sustainability of human activities appears to be more than a passing fad. Longworth in his 1991 presidential address to the Twenty First International Conference of Agricultural Economists argues that there has been a permanent shift in public attitudes with respect to the sustainability issue *[Longworth, 1991].* He goes on to argue that sustainable agricultural development has attained a status comparable to motherhood, in that no reasonable person is opposed to the idea in principle. The paradox, however, is that "*in practice, much of modern agricultural output arises from production systems which appear to be unsustainable in the longer run*" *[Longworth, 1991, p.10].*

The issues relating to Caribbean sustainable development in general, and sustainable agricultural development in particular, have been receiving increasing attention in the last five years *[Ahmad et al, 1991; Jackson, 1990; Lewsey, 1990; Mahon and Simmons, 1990; Singh, 1991].* The theme of this conference is indeed timely. There should be little doubt that there are important structural economic and agro-

ecosystem characteristics of the Caribbean region that would pose constraints to the attainment of regional sustainable agricultural development. These characteristics would, among other things, define the *process* or deliberate sequence of actions critical to the attainment of sustainable agricultural development. At the same time, it is imperative that an appropriate conceptual framework accompany any dialogue on the process. A conceptual framework is the first necessary condition for development of a policy framework and for evaluation of the actual or potential impact of the process, relative to the attainment of sustainable agricultural development. This paper attempts to contribute to the dialogue by highlighting some of the important conceptual and process dimensions of the issues.

ECONOMIC DEVELOPMENT AND BIOSPHERIC SUSTAINABILITY NEXUS: UNDERSTANDING THE CONTEMPORARY PROCESS-BASED FRAMEWORK

Some Relevant Concepts

While there is seldom serious disagreement on the importance of both the developmental and sustainability issues, relative to agriculture, there is a discernible lack of clarity on the definitional and conceptual dimensions of the issues. This lack of clarity inhibits, among other things, understanding of the nature of the inter-relationship between the two issues, and add further to the confusion on how to strategically approach the challenges of attaining sustainable agricultural development. In attempting to clarify the issues and articulate at a minimum, an appropriate conceptual framework for analysis of the issues, it might be useful to clarify a few key concepts that are relevant to the central issues. The term concept is used to mean the basic idea or general notion underlying a class of things.

One such concept is *sustainability*. This terminology depicts a particular characteristic of a process that can be maintained indefinitely. A critical aspect of the concept is that relating to the process of maintenance of the characteristic. Recall that earlier a process was defined as a deliberate sequence of actions. Pomareda Benel (1990, p.3) defines the term cogently as, "*making good things last, making them permanent and durable.*" Longworth (1991) points out that sustainability refers not only to the physical environment but the social and economic environment.

Two other relevant and inter-related concepts are *economic growth* and *economic development*. Economists define economic growth as a change over time, in the level of real GDP per capita, or real productivity per capita, or real consumption per capita. Also, from the economists' perspective, economic development is change leading to improvement or progress in some normatively defined criteria of welfare gains and the distribution of such gains. Stated differently, economic development is "*a vector (D) of desirable social objectives, that is a list of attributes which society seeks to achieve or maximize*" *[Pearce, Barbier and Markandya, 1990, p.2]*. One key element of this vector (D) would be increases in the economic growth component, as defined earlier. Other elements of the vector would be: (1) improved health and nutritional status, (2) educational achievement, (3) more equitable income distribution, and (4) access to productive resources, to name a few.

The concept of *agricultural development* is a subset of *economic development*. The conventional view of agricultural development is one involving the modernization process applied to agriculture, such that continuous growth is attained in the productivity, production, income, and the distribution of same, at the farm level or a given agricultural sector or subsector, without public protection to this activity being a necessary condition for its growth. In essence, agricultural development is a vector of desirable social objectives which society seeks to achieve or maximize for its agricultural sector or subsector. Given these intrinsic properties of the economic/agriculture development processes, it follows that *sustainable development* in general, or *sustainable agricultural development* in particular, is a situation in which the normatively determined development vector (D) of desirable social objectives does not decrease over time *[Pearce, Barbier and Markandya, 1990]*.

Process and Concept Integration: A Biospheric Requirement for Sustainability

Recognition that sustainable development issues are inclusive of both the physical environment and the social and economic environment is a principal component of the Biospheric World View of human organization. Indeed, it has been suggested that such a view requires a shift from the traditionally accepted paradigm of human organization, which is dominated by the hedonistic tendencies of "*economic man*", to one embedded in social relations, including man-nature contracts *[Singh, 1991]*. It is at this level where the greatest divergence occurs between economists' and biological scientists' paradigms of the interaction and inter-dependence between the two environments. Specifically, economists do not perceive the physical environment as consisting of a fixed quantum, with a predetermined finite capacity to satisfy human needs *(Longworth, 1991]*. As such, the conventional economic paradigm fails to recognize the laws of thermodynamics, particularly energy conservation and entropy laws.

One of the major challenges confronting the economics profession is to critically evaluate and modify its paradigm to reflect biospheric dimensions of sustainable development. This is a critical and necessary adaptation because it is only in so doing that the economics profession can make pragmatic contributions to the sustainable development debate. This type of intellectual adjustment is equally critical to the debate on sustainable agricultural development in the Caribbean and elsewhere. Indeed, it is becoming quite apparent that some of the major issues relating to Caribbean and Third World agricultural sustainability have to do with the potential conflict between sustainability of the physical environment and sustainability of the social and economic environment. In order to critically analyze the nature of the potential conflict and to articulate information-based policy strategies, it is necessary to recognize the fact that the biospheric concept of sustainable development or agricultural development is intrinsically process-based. By process based we mean that the concept intrinsically and explicitly states a key *necessary condition* for achieving sustainable development.

Recall that a necessary condition is one which is essential or inescapable. In this case, the key necessary condition or process as we defined it earlier, is constancy of the stock of natural capital. In other words, sustainable agricultural development means economic change or modernization at the farm level or a given agricultural sector or subsector, subject to constancy of the environmental or natural resource capital stock *[Singh, 1991; Pomareda Benel, 1990]*.

The process-based concept of sustainable development was articulated in the Brundtland Report *[World Commission on Environment and Development, 1987]* when the concept was defined as, "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*". The report further stated that sustainable development is a process of change, rather than a fixed state of harmony. Within this change process, human activities and organizations governing the exploitation of resources, direction of investment, orientation of technological development and institutional changes are made consistent with future as well as present needs. The definition adopted for sustainable development by the FAO in 1988 is, "*the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations*" *[FAO, 1991, p.3]*. The FAO concept is also process-based and is consistent with that of the Brundtland Report. Singh (1991), points out that more recent global sustainable development strategy documents are also consistent with the 1987 Brundtland Report and the FAO (1991) report in terms of the concept of sustainable development.

In more recent times, further elaboration of the concept tend to highlight or emphasize the point that the critical sustainable development process is one of improving the capacity to convert a constant level of physical resource use to the increased satisfaction of human needs. In essence, the more recent process-based

sustainable development concept differentiates between qualitative development and quantitative growth, and explicitly recognizes that the growth process can be constrained by the capacity of the ecosystem to regenerate and absorb inputs *[Singh, 1991]*. In short, process-based sustainable development or agricultural development is a situation or process in which a sector or subsector is on a trajectory of receiving increases in desirable social objectives, without consuming such large proportions of the energy of the ecosystem, whereby the ecosystem is unable to regenerate itself continuously.

Some Economic Dimensions of the Process-Based Sustainable Development Concept

Veeman (1989) argues that the contemporary view of sustainable development encompasses at least three interwoven aspects that are critical to the understanding of the concept. These are: *(1) an economic growth component, (2) a distributional or equity component and, (3) an environmental asset or natural capital stock component*. Given the earlier review of the concepts of economic growth and economic development, one would intuitively assume or expect that the attainment of economic growth and development would also make sustainable development possible. However, paradoxically the economic growth component of sustainable development is often in conflict with the distributional and environmental components *[Veeman, 1989]*. The traditional theories of economic growth give heavy emphasis to factors such as capital accumulation via high marginal rate of saving, technological innovation and human capital formation. The emergence of the contemporary biospheric view of sustainable development added two other dimensions to the consideration of aggregate welfare gains, and these two dimensions are at the heart of the potential conflict between the three aspects of the sustainable development concept. The two new dimensions are: (1) assignment of greater weight to the stability characteristic of the economic growth component over time, and to the intergenerational implications of economic growth and, (2) assignment of heavy weight to environmental assets in valuing long-term welfare gains *[Longworth, 1991]*.

The time preference behaviour of producers and consumers as they interact in the market-place, could result in divergence between the socially acceptable stability/intergenerational growth distribution and environmental assets quality components of sustainable development on one hand, and the "scale" of the economic growth component, on the other hand. Pomareda Benel (1990) argues that the time preference behaviour among agricultural producers and consumers is at the heart of decisions on resource use and consumption, saving and investment. He further argues that, "*Sustainability requires valuing the future: when the future matters, currently available resources are frequently used with discretion to avoid degradation and/or exhaustion" (p.2)*. The fact that most Third World farmers are poor and uninsured, results in a situation where their production and consumption behaviour are skewed towards the present. In other words, the guarantee of survival this year and the next year is very important. Lipton *[1989, p.1]* argues that within this type of economic context: "*the case for conserving the rural resource base -- for old age or for one's children -- might seem remote*". Under these conditions, degradation of both private and common rural property is encouraged. It would be far from the truth, however, to blame the poor for the bulk of natural capital stock depletion in Third World countries. Vyas (1991) argues that more demand on land and natural resources is made by the life style of the rich than by the need-based exploitation of the poor. He concluded that the relative rate of depletion of natural resources by the poor is small compared to that of the rich, due to wasteful living style.

The biospheric concept of sustainable development dictates a process of economic growth, subject to constancy of natural wealth. As such, it requires that the next generation inherits a stock of environmental assets no less than the stock inherited by the previous generation. The potential conflict between the scale of the economic growth component, and the stability/intergenerational growth distribution and environmental asset components, arises

when the long-term constancy condition of the environmental asset is not met. The contemporary biospheric view of sustainable development clearly points out the need for a conceptual framework which explicitly accounts for the role of markets (both product and factor) in the determination of current and future resource allocation. Redclif (1988) argues that the market has been an obstacle to the achievement of enhanced environmental conditions. He argues further, that greater intellectual efforts should be directed at linking the concept of development with that of sustainability, with market activities being a central component of the linkage.

One of the most protracted source of potential conflict between the Veeman's (1989) three components of sustainable development, is reconciliation of the conventional national income accounting framework used for measuring economic growth and economic development, with the increased weight assigned by the contemporary sustainable development concept to environmental assets as a yardstick of long-term welfare gains. The conventional national income accounting indicators of economic growth and development (GDP, per capita income, etc.) have been severely criticized for their intrinsic failure to reflect diminished potential of future production caused by depletion of non-renewable natural resources *[Mirandas and Muzondo, 1991]*. The conventional national accounting indicators are purely economic accounting indicators. As a result, it is argued that their measurement of economic growth and development, "*can be illusory, and the prosperity it engenders transitory, if the apparent gain in income means a permanent reduction in the stock of environmental assets*" *[Mirandas and Muzondo, 1991, p.26]*. In response to this conflict, a number of industrialized countries, including France and Norway, are now establishing natural resource accounting frameworks to supplement the conventional national income accounting framework, as they attempt to address contemporary sustainable development issues.

The potential conflict between the three components of the contemporary sustainable development concept, particularly as they relate to producers' and consumers' time preference behaviour, on one hand, and shortcomings of conventional national economic accounting framework, on the other hand, can also be viewed in the context of what economists term "*market and/or policy failures*" *[Miranda and Muzondo, 1991]*. Market failure exists when social costs or benefits diverge from private costs or benefits. Policy failure exists when: (1) the public sector fails to redress market failure through legal, regulatory, economic or other means, when it is clearly feasible to do so or (2) when public sector activities magnifies existing market failures *[Miranda and Muzondo, 1991]*. If producers and consumers, given their present day time preference behaviour, engage in market activities that maximize the set of short-term desirable economic growth objectives, this could result in overconsumption and excessive depreciation of long-term environmental assets. The contemporary concept of sustainable development, unlike the conventional concepts of economic growth and development, explicitly includes as a "*necessary*" social objective, preservation of the regenerative capacity of environmental assets overtime. As such, if the behaviour of producers and consumers in pursuit of short-term economic growth objectives, via market-interactions, are in violation of this condition, this would represent a case of market failure.

Policy failure can also exacerbate the conflict between the three components of sustainable development. It should be recognized that policy failure, like market failure, is essentially microeconomic in nature. As such, it is argued that they, "*are thus best addressed through the introduction of new - or a recalibration of existing microeconomic instruments*" *[Miranda and Muzondo, 1991 p.26]*. Public policy can give preference to the present over the future, thereby encouraging producers' and consumers' tendency to seek maximization of short term profit or satisfaction rather than long-term welfare. In short, since attitudes towards sustainable development and/or agricultural development may be compromised by expedient public policy, it is imperative that a public policy framework be an integral part of sustainable development strategy. However, the appropriate public policy framework for

sustainable development must be one in which the development strategy has as its goal, sustainable development in the biospheric sense, rather than transitory economic performance. It is argued, however, that this type of public policy framework, "*must emerge from the country's own understanding and commitment, not through conditional external imposition*" *[Pomareda Benel, 1990, p.11].*

SUSTAINABLE AGRICULTURAL DEVELOPMENT IN THE CARIBBEAN: INTEGRATING THE CONCEPT INTO THE WORLD OF REALITY

The argument presented here is that the contemporary biospheric concept of sustainable agricultural development is intrinsically process-based. Such a characteristic stems from the necessary definitional condition of constancy of environmental assets. It should be recognized, however, that the process configuration of the concept also suggests that a set of sufficient conditions must be in place to attain sustainable agricultural development. It is equally important to recognize that the process characteristic of the concept explicitly denotes a *time* component and a *spatial* component *[Singh, 1991].* The time elements are the present and the future. The spatial elements could run a wide range of ecological boundaries, from ecological earth to the stocks of ecological assets within a specific geopolitical boundary. In this paper, sustainable agricultural development issues within the context of the Caribbean are the primary concern. Specifically, the Caribbean is defined here, to mean the thirteen CARICOM countries of the English-speaking Caribbean (Antigua and Barbuda; Bahamas; Barbados; Belize; Dominica; Grenada; Guyana; Jamaica; Montserrat; St. Christopher and Nevis; St. Lucia; St. Vincent and the Grenadines, and Trinidad and Tobago). The context, therefore is: (1) the *agro-ecosystems* and, (2) the *agro-economic systems* of the Caribbean region as defined, particularly as these two elements might impact the operational dimensions of the sustainable agricultural development concept.

Caribbean Agro-Ecosystems

The agro-ecosystems of the thirteen CARICOM countries have been characterized in terms of a set of physical endowments, inclusive of: (1) mountainous topography, with intensive rainfall and fast moving rivers in most states, (2) limited availability of flat arable land, with a high proportion concentrated in relatively large farms, (3) large number (300,000) of small sized farms on poor quality hillside lands and (4) some difficult to manage ecosystems, such as swamps, saline soils and soils with slippage problems *[Ahmad et al, 1991].* These features of the regional agro-ecosystems, interacted with certain historical patterns of the regional economic structure, to produce a type of agro-ecosystem which dominate flat lands, and another type which dominate hill lands. *Flat land agro-ecosystem* has the following characteristics: (1) arable lands under export crops such as sugarcane, bananas, coconuts and citrus, (2) arable lands under food crops and vegetables, (3) wet lands under rice and (4) problem lands including lands subject to slippage, saline lands, and lands with aluminium soils. *Hill land agro-ecosystem* is characterized by: (1) lands under specific type of export crops, such as bananas, cocoa, coconuts and spices and (2) lands under shifting food and vegetable crop cultivation *[Ahmad, et al, 1991].*

It is argued that the major issues relating to agricultural sustainability within these particular agro-ecosystems, are those stemming from constraints or problems endemic to the five inter-dependent sub-systems which make up the totality of Caribbean agro-ecosystems *(Ahmad et al, 1991).* The five agro-ecological sub-systems with examples of constraints are: (1) *the physical sub-system* - soil management, energy use orientation, pollution levels (2) *the biological sub-system* - approaches to productivity increases and the role of biodiversity, (3) *the crop production sub-system* - choice of technology system, resource management orientation, (4) *the livestock sub-system* - animal waste disposal, quality and quantity dimensions of genetic material and (5) *the socio-economic sub-system* - factors impacting on resource allocation decisions, policy formulation and organizational

framework *(Ahmad, et al, 1991).*

Caribbean Agro-Economic Systems

The major features of contemporary Caribbean agro-economic systems evolved from dynamic interactions between the agro ecosystems of the region and the nature of the region's historical colonial political-economic relationship with the metropoles. Levitt and Best (1978) describe the historical colony - metropole economic relationship as being one of "*hinterlands of exploitation*". They characterize these hinterlands of exploitation as areas of direct extension of the economy of the metropole, whose primary function, "*is to produce a staple required for metropolitan consumption and for entrepot trade to third countries*" *(p.39).* The net effect of these interactive dimensions of Caribbean societies is a unique *structural and organizational configuration*, which is a prime force in shaping the *economic performance* of the agro-economic systems.

Structural and Organizational Characteristics: Caribbean agro-economic systems can be structurally characterized as a dualistic system, including on one hand, (1) large, well capitalized farms, using advanced technology, located on flat lands with soils of high fertility, engaged primarily in monocropping of perennial crops, destined for the export market, and on the other hand, (2) small, undercapitalized farms, using low-input technology, located on hilly lands of fragile soils with low capability, engaged primarily in multiple-cropping of annual crops and livestock commodities, destined for local markets. These structural and organizational characteristics of agro-economic dualism, are sharply defined in terms of at least six critical factors, which have significant implications for the economic performance of the system and the attainment of sustainable development. The six factors are: (1) farm size characteristics, (2) farm financial resource allocation, (3) farm land and soil resource allocation, (4) cropping system and crop species, (5) levels and types of technology applied to farming and (6) target markets *[Ahmad, et al, 1991].*

Economic Performance Characteristics: The level of economic dependence on agriculture in Caribbean economies varies from one of high dependence in Dominica to one of lesser dependence in Antigua and Barbuda. The economic performance of agricultural sectors also varies across countries, as does the economic dependence on export markets for earnings. In terms of agriculture sector's relative contribution to GDP, employment, and foreign exchange earnings, sectoral contribution is dominated by one or at most, two commodities. However, the level of economic dependency on individual crops varies across countries. Sugar cane is relatively more important in Guyana, Jamaica, St. Kitts and Nevis and Trinidad and Tobago, while bananas dominate in the Windward Islands (Dominica, Grenada, St. Lucia, St. Vincent and the Grenadines). The bottom line is that with the possible exception of Jamaica, Caribbean agricultural economies have remained dependent on a few major traditional exports, such as sugar and bananas, and have had little or no success in developing significant alternative crops *[Budhram and Rock, 1991].*

Over the last fifteen years, the agricultural sector of Caribbean countries has shown a decline in its relative capacity not only to earn foreign exchange but also to satisfy domestic food needs. As a result, the food import bill of the region (as measured by the ratio of food imports to total imports) has grown significantly. The region as a whole has become a net importer of food. The contribution of agriculture to GDP has registered a relative decline in the last ten years. Furthermore, this relative decline, rather than being a product of the expansion of other sectors as is generally associated with growth, can be largely attributed to declining levels of food production and stagnation and or decline of traditional exports, particularly sugar. The decline in sugar has been occurring since the 1960s and the decline has been in both absolute terms (declining yields and acreage planted), and relative terms.

The Caribbean sugar subsector has enjoyed some measure of economic insulation from the vagaries of the international market, as a result of special trading arrangements with guarantee prices above world market prices in the EC and the United States markets. However, the sugar industry is faced with declining

efficiency and rising production costs. Sometimes production costs are as high as the guaranteed prices received in the preferential EC and United States markets. A number of Caribbean countries (Antigua and Barbuda, St. Lucia and St. Vincent) have made the decision to stop producing sugar commercially.

Agriculture is the most important sector in terms of contribution to GDP, employment, and foreign exchange earnings in the OECS subregion (Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, Montserrat, St. Vincent and the Grenadines). Tourism is experiencing rapid growth in the OECS countries, but the growth rate is much higher in the Leeward Islands (Antigua and St. Kitts and Nevis), than in the Windward Islands (Grenada, St. Vincent and the Grenadines, St. Lucia, Dominica, Montserrat). The OECS countries, which as a group is generally referred as the LDCs of the Caribbean, have experienced economic growth rates much higher than the so-called MDCs of the Caribbean (Barbados, Guyana, Jamaica, Trinidad and Tobago). Specifically, over the last five years real growth rates have averaged 5 to 9 percent in the OECS, compared to 2 to 4 percent in the MDCs, excluding Barbados *[Budhram and Rock, 1991].*

Banana production is the most important industry in the Windward Islands. The Windward Islands have expanded by almost 10 percent, its banana export contribution to domestic exports between 1977 and 1987 *[Budhram and Rock, 1991].* As such, expanded banana production has been a major factor in the economic growth in the Windward Islands over the last decade. The expansion in banana production has been facilitated by guaranteed and preferential market arrangements with the EC (Lome Conventions). Inspite of the recent economic success of banana production in the Windward Islands a number of problems have emerged which might affect the future economic viability of this subsector. Some of the problems are: (1) labour scarcity, (2) persistency of Moko disease and declining product quality, (3) rising land prices and (4) the predominance of small holder farmings with limited resources for investment (Budhram and Rock, 1991) and (5) low average yields.

Given the economic performance of Caribbean agro-economic systems, the region is seeking desperately to find ways of effectively adjusting to changes in the regional and global economic and agro-ecological environments that are impacting the sector in fundamental ways. Some of the more critical changes are: (1) structural changes in the demand for traditional primary products, (2) consolidation of markets into mega-trading blocs (Unified EC in 1993, US-Canada-Mexico Free Trade Association (NAFTA), (3) trade liberalization initiatives under GATT and (4) sustainable agriculture problems relating to successful management of the physical, biological, production and socio-economic dimensions of natural resources.

Effective adjustment by Caribbean agro-economic systems to these types of changes is imperative for the process whereby agriculture can satisfy changing human needs, while maintaining or enhancing the quality of the regional environment assets. This is the world of reality in which the Caribbean is seeking to operationalize the concept of sustainable agricultural development.

IMPLICATIONS FOR REGIONAL SUSTAINABLE AGRICULTURAL DEVELOPMENT INITIATIVES

Within the Caribbean context the contemporary process-based concept of sustainable agricultural development would mean that the region's agricultural sector (consisting of interactive agro-ecosystems and agro-economic systems) is on a trajectory of attaining increases in socially desirable economic objectives, without the overconsumption of the energy of the agro-ecosystems, thereby permitting the agro-ecosystems to regenerate themselves continuously. In attaining this state, the region would be ensuring the continuity of the natural resource assets from one generation to the next.

A review of the economic performance of Caribbean agricultural sector suggests that the sector has been on a *negative-growth* trajectory for nearly two decades. It is also clear, that there has been significant degradation in the agro-ecological systems of the region over this period of negative-growth. The agro-ecological degradation has come in the form of: (1)

significant increases in erosion and soil loss to the physical eco-subsystem (up to 125 tons per hectare annually from hillside farming alone), (2) increased dependency on chemical fertilizers, pesticides and fungicides in the biological and production eco-subsystems, with attendant decline in biodiversity, due to mortality of non-target species, and at the same time decreasing crop yields and overgrazing of communal lands *[Ahmad et al, 1991]*. A significant aspect of Caribbean agro-economic negative-growth experience is the fact that the economic decline occurred under umbrellas of preferential trading arrangements for major traditional agricultural exports, in the EC and the United States markets. Caribbean agro-economic performance would have been decidedly worse in the absence of these protective umbrellas. The evidence would suggest that the Caribbean region as defined earlier, has failed to arrive at a process of attaining sustainable agricultural development in the contemporary sense of the concept. Furthermore, the evidence also suggests that such a failure was not functionally linked to the conflict sometimes arising from the achievement of economic growth objectives, at the expense of the quality of agro-ecosystem assets. The economic growth indicators were negative and as such, were not a driving force behind the degradation of the agro-ecosystem. The answer must be found elsewhere.

It might be useful to reflect on a number of pertinent questions. One question has to do with whether the negative economic growth experience of Caribbean agro-economies might be functionally related to the degradation suffered by the agro-ecosystem. Stated differently, the question is whether a similar level of agro-ecosystem degradation would have occurred if the growth experience were positive. This is a question, which cannot be answered here. However, another pertinent question where the answer might be deduced is whether the Caribbean can expect to attain sustainable agricultural development without registering economic growth. On the latter question, it is suggested here that the answer is - "*improbable, if not impossible*". In other words, it is suggested here that sustainable agricultural development in the Caribbean is not attainable without economic growth. Earlier, it was argued that the process-based concept of sustainable agricultural development also suggests that a set of sufficient conditions be in place to attain that objective. Agricultural sector growth is seen as a key variable in the set of sufficient conditions. This position is arrived at from two reasoned interrelated considerations.

First, there is agreement with Vyas' *[1991, p.14]* argument that, "*a cardinal principle of sustainability is to ensure protection, if not enhancement, of the incomes of the small and marginal farmers and others whose livelihood depend on these resources*". Agriculture's contribution to economic development is a significant dimension of Caribbean people's welfare status. It is argued that sustainability requires: (1) the alleviation of poverty, (2) a decline in human fertility, (3) the substitution of human capital for natural resources, (4) effective demand for environmental quality and (5) a responsive supply. These factors are contingent upon higher levels of income, which are in turn a product of economic growth *[Panayotou, 1992]*.

Second, it is neither economic growth nor non-growth *per se* which is responsible for Caribbean agro-ecosystem degradation, and the approach to ecological limits. Rather, it is the source and pattern of factors that accompany either path. Some of the critical factors are: (1) the agricultural technology used for productivity enhancement, (2) ineffiencies and waste and (3) dissociation between scarcity and price, benefits and costs, rights and responsibilities and action and consequences. These factors reflect what was earlier called market and/or policy failures *[Panayotou, 1992]*.

The Caribbean region is currently confronted with the dual problem of: (1) addressing long-term concerns for the sustainability of the agro-ecosystem and (2) finding ways of reducing poverty in rural areas and meeting the growing aspirations of its growing population. These two problems have to be addressed concurrently within the context of significant changes in the global economic environment. Some of the more direct relevant global changes are: (1) a unified EC market after 1992, with major implications for restructuring of preferential marketing arrangements for

traditional export crops such as sugar and bananas, (2) the emergence of the North American Free Trade Area (NAFTA), consisting of Canada, Mexico and the United States, with increased possibility of competition in traditional and non-traditional agricultural exports coming from Mexico, (3) transition of Eastern European countries towards market economies, with the prospect for new markets for tropical products, but the diversion of multi-lateral financial aid to these countries and (4) the emergence of Pacific Rim Countries as an area of high potential international growth centre.

The region has opted to meet the challenge of attaining economic growth with agro-ecosystem sustainability via a strategy of agricultural diversification. The particular type of diversification strategy is one of maintaining or enhancing the production and value of the major export commodities, and simultaneously initiating and or increasing the production and value of alternative commodities. The hope is that under a well conceived and implemented agricultural diversification strategy, the region's agricultural sector will improve its competitive performance as it moves along a trajectory of attaining sustainable agricultural development. In pursuing such a strategy, careful attention must be given to those sources and patterns of factors that accompany economic growth and may compromise the environmental sustainability potential. In short, the Caribbean would stand a much better chance of attaining sustainable agricultural development if it can minimize market and or policy failures as it moves along an economic growth trajectory.

CONCLUSIONS

The contemporary biospheric concept of sustainable agricultural development is intrinsically process-based, since it explicitly states constancy of the natural resource stock over time, as a key necessary condition. In addition, the process of achieving such a desirable objective is a function of a set of sufficient conditions being in place. If the Caribbean seeks sustainable agricultural development as a social objective it will be necessary to successfully pursue a path of development, which will reflect continuity in the economic growth of the region's agricultural sector. Economic growth in the agricultural sector is a key factor in increased levels of income for rural people. The protection, if not enhancement, of the incomes of small, marginal farmers, and other rural groups, is a cardinal principle of sustainable agricultural development.

In pursuing sustainable agricultural development, the Caribbean must do so within the context of the agro-ecosystems and the agro-economic systems of the area, and these systems have interactive impacts on the choice of the path taken. The economic growth path to sustainable agricultural development explicitly rejects the notion that agro-economic growth *must necessarily* compromise the integrity of the agro-ecosystem. There is no functional relationship between either the economic growth or the non-economic growth of Caribbean agro economic systems, and the increased degradation of the region's agro-ecosystem. Rather, it is the source and patterns of certain factors that accompany either path which is the cause of decline in environmental assets. These combined factors reflect either market failure and or policy failure.

Caribbean economies face the vagaries of a rapidly changing global economic environment, in which their agro-economies might suffer adverse economic shocks associated with regional marketing realignment of traditional trading partners. At the same time, these global changes offer "*windows of opportunity*" for Caribbean agricultural sectors to pursue a well thought out sustainable agricultural development strategy, base on agricultural diversification. However, the particular type of diversification strategy should be one which seeks to maintain or enhance the production and value of major commodities and simultaneously initiating or increasing the production and value of alternative commodities. Such a strategy if well conceived and implemented, would improve the competitive performance of the sector and propel it along a sustainable development path, with the caveat that appropriate steps are taken to minimize market and policy failures.

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