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ECONOMIC POLICY & SUSTAINABLE RURAL DEVELOPMENT

FEATURE

MEASURING AGRICULTURAL SUSTAINABILITY: AN ECONOMIST'S NIGHTMARE

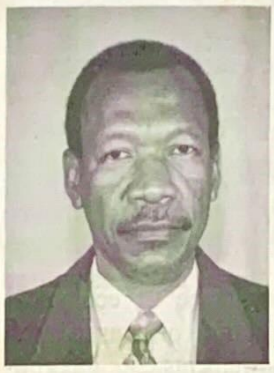
*Dr Curtis McIntosh**

Introduction

A fugitive to Canada arising from the Russian invasion of Czechoslovakia in 1969 had to continue his studies in Agricultural Economics in a capitalist mode and a foreign language. As a result his dreams were not always pleasant. As he sought to explain one of his bizarre experiences he was forced to do a literal translation and reported that he had a terrible night horse. Since the term sustainable development became the buzz words of politicians, environmentalists, economists and many others, this writer has been riding bucking horses in his sleep whenever the measurement dimensions of sustainable development is contemplated; hence the title of this paper.

The concept of sustainable development became popular in the late eighties following the publication of the report of the Bruntland Commission in 1987 - Our Common Future. Here, sustainable development was referred to as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs". The concept, it was noted, implied limitations imposed by current state-of-the-art and social organizations on the environment and by the ability of the biosphere to absorb the effects of human activities.

The report further observed that species diversity was crucial to the normal functioning of the ecosystems and the biosphere - wild species contributing billions annually to the global economy in the form of crop improvement, drugs and medicines and industrial raw materials. Despite the presence of famous economists on the Commission and the expanding computer industry the best estimate of the contribution of wild species was



billions of dollars highlighting the enormity of the measurement problem. This paper recognizes the problems inherent in measuring sustainable development, reviews the concept and brings to the fore the critical elements to be addressed, with particular reference to the agricultural sector.

Concept and Scope of Sustainable Development

Development is a dynamic state characterised by the progressive removal of obstacles to the enjoyment of democratic rights, freedoms and wealth by all segments of the population. It is a multi-faceted, people-oriented concept involving issues of growth in income with equity, in its distribution, improvement in the environment and improvement in the quality of life (McIntosh and Osuji, 1990). The converse of placing obstacles or barriers to the realization of these attributes is the antithesis of development. The dynamic and progressive nature of the process of development implies sustainability without which development ceases or the process regresses. In a sense sustainable development is tautologous. Be that as it may, some alternative conceptualizations are presented.

The view of the neoclassical economists that sustainable development implies maintenance of per caput consumption across all generations or achieving non-declining utility per caput in perpetuity (cited in Veeman, 1989) does not fit into the development concept

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articulated above since it does not preclude constancy of an undesirable situation - sustained poverty, for example (Davis, 1992).

Turner's concept that sustainable development involves maximizing the net benefits of economic development subject to maintaining the services and quality of natural resources over time is an advance but there is more to development than increases in real per caput incomes and that there are renewable and non-renewable (stock) resources which are made substitutable through changes (Turner, 1988; Veeman, 1989).

The world conservation strategy report (1986) identifies five broad requirements for sustainable development cited in Brooks (1990) as follows:

1. Integration of conservation and development.
2. Maintenance of ecological integrity.
3. Satisfaction of basic human needs.
4. Achievement of equity and social justice.
5. Provision for social self-determination and cultural diversity.

The second requirement - maintenance of ecological integrity subsumes the first - integration of conservation and development. The basic requirements 2-5 incorporate very well the development concept put forward by McIntosh and Osuji and is not dissimilar from Veeman's three key components - growth, distribution and environment (Veeman, 1989).

According to Veeman, the growth component refers to the long-run productive capacity of an economy to supply increasingly diverse goods and services for its population. The distributional component revolves around equity in the distribution of the goods and services generated by the economy. The environmental component is concerned with maintaining the integrity of the natural resource base or enhancing it so as to sustain growth over time.

Agricultural sustainability is but a subset of overall sustainable development. The FAO, 1989, puts forward the concept of agricultural sustainability as the capacity of the agricultural production and distribution sector to generate on a continuing basis the goods and services necessary to meet the needs of the present population without jeopardizing the capacity of future generations to meet their own needs. Long-run economic viability while conserving land, water, genetic resources is the hallmark of sustainable agriculture. According to Weil (1990) appropriate agricultural policies and practices are those which:

(a) Enhance or maintain the number, quality and long-term economic viability of farming and other agri-business opportunities.
(b) Enhance rather than diminish the integrity, diversity and long-term productivity of both the managed agricultural ecosystem and the surrounding ecosystems.
(c) Enhance rather than threaten the health, safety and aesthetic satisfaction of agricultural producers and consumers.

These concepts of sustainable development and its subset, sustainable agriculture, provide the vessels for excursions into the measurement of sustained agricultural development.

Measurement of Sustainable Agriculture

The measurement issues are addressed from three perspectives:

(a) Measures of growth;
(b) Measures of equity in the distribution of products of the growth process; and
(c) Environmental impact.

Reference is then made to an alternative to the gross national product approach to measuring economic development.

Agriculture and Economic Growth

Sir. W. Arthur Lewis in his "Theory of Economic Growth" (1955) confined his domain of inquiry to the growth in output per head as distinct from any consideration of distribution or consumption. He rightly contended that the output might be growing while the mass of population could be getting poorer and consumption is declining. The interrelationship between output, consumption, saving and government activity was clearly recognized.

The current measure of economic growth is the Gross Domestic Production (GDP) -- the total value of all goods and services produced by the economy for a particular period of time. Changes in the level of GDP adjusted for price changes (inflation rate) and population growth make for the derivation of real GDP per caput an indicator of economic growth status -- declining, constancy or increasing.

The growth dimension encompasses the accumulation of physical capital, human capital, cultural capital and so on (Lewis, 1955). Current accounting measures ignore the

role of the natural resource base both in terms of services rendered and allowances for depreciation/appreciation. These issues are of particular relevance to the agricultural sector. The measurement of the physical output of the sector is difficult and costly; but technically accomplishable. What confounds is the measurement of natural resource inputs (e.g. soil fertility) into the production process leading to depreciation, e.g., soil erosion, or appreciation (forestation) of the resource. Nor are the extra-market values (tourism) contributed to growth accounted for. Agricultural production activities often conflict with other uses of the natural resource endowments -- at what cost increasing urbanization?

The felling of the Amazon forests for cattle production creates growth but at an inestimable cost on the environment. Through plant and livestock breeding the agriculture sector has enhanced the productive capacity of various species; but have in the process limited the genetic variability of these species, while increasing the input requirements in production.

The Distribution Perspective

A serious indictment on the capitalist mode of production is the inequity in the distribution of the outputs. Increasing inequity of income distribution in the face of the same prevailing prices for all implies a movement further and further away from Pareto optimality. Similarly, the terms of trade between the agriculture and other sectors and its competitiveness at the international level are critical to its sustainability. In some English-Speaking Caribbean countries, the trend in production of major export crops (sugar, cocoa, citrus) has been downward; often without compensating use of the available resources. A major limiting factor is the maldistribution in the basic land resource. In this connection government policy is critical in bringing about a resolution to the problem. But what pattern of land tenure is optimal for efficient resource use while maintaining environmental integrity? What technological combination would ensure that labour is not displaced at a rate faster than it can be absorbed in other sectors? The application of mathematical programming techniques might be successfully applied to the latter; but can these hold for the former?

Measuring Environmental Impact

The fundamental question is whether growth in the economic and agricultural sector impacts adversely on the natural resource base such that growth cannot be sustained indefinitely. Fortunately, the agriculture sector possesses a high proportion of renewable resources and technology could be adopted that allows rejuvenation of soils, the improvement in nutritional content through breeding, land reclamation and desalination, and forestation, to name a few. There are however, the agricultural production practices which lead to excessive extraction rates (fishing) and environmental degradation through excessive use of herbicides, pesticides and fertilizers, poor siting of crops, and inappropriate use of mechanization.

The interplay of environmental enhancing and degrading factors makes for serious measurement problems. The erosion of hillsides contributes to soil deposition in low-lying areas. Extensive inflows of organic matter into continental shelves facilitate the rapid growth of plankton, thus beginning a chain of events which culminate into rather productive fishing zones. The process of erosion and deposition may well be the answer to the rising sea level occasioned by global warming.

Income for expenditure has been used to measure relative poverty between and within sectors and in establishing poverty lines. There is a tendency of reported incomes to be under-stated while expenditures are over-stated. Evidence of expenditure being above income is not uncommon in survey data. The poverty line -- the level of income (welfare) below which a household is designated poor -- is a value judgement that is specific to the particular society. Comparisons with other societies may lead to erroneous conclusions.

A study on poverty in Trinidad and Tobago has shown that the percentage of poor in 1988 was much higher than in 1981/82 (Teekens, 1989, Henry, 1989). This change corresponded with a decline in the economy occasioned by depressed oil prices. The agricultural sector was among the hardest hit by the recession. A possible reason for this is that the sector became the receptacle for those retrenched from other sectors. Nevertheless, the sector has witnessed some positive growth. How to reconcile the growth component in the face of increasing rural household vulnerability is the burning issue.

New Directions

The inability of the GDP to measure environmental services and ecological and geological capital depreciation has led to the search for new methods to measure sustainable development. Daly 1988 cites three major elements of the development process, namely: accumulation, service, and throughput. Accumulation represents the total inventory of goods of producers and consumers as well as human capital. Two forms of accumulation could be identified - funds and stocks. Funds are organic

entities which depreciate as a whole (e.g. machines). Stocks are commodities, portions of which are used up in sequence in the production or consumption process (e.g. petrol). Stocks and funds yield service over time and provide satisfaction of wants. Throughput refers to the flow of matter and energy from one state (form) to another during economic activity resulting in the accumulated stocks and funds and environmental waste. In sum, service represents benefit, throughput is cost and changes in funds and stocks is net accumulation.

This conceptualization has led to the need to keep three accounts - a benefit account, a cost account and a capital account. The *benefit account* seeks to measure the value of services derived from all stocks and funds used in production, rented or consumed. The *cost account* measures the value of depletion, pollution and disutilities of some kinds of labour. The *capital account* places values on accumulated stocks and funds including natural endowments mineral deposits, ecosystems and those produced.

The triad of accounts allows for comparison of benefits and costs. Are the extra benefits of further accumulation worth the extra costs?The satisfactory level of accumulation is the point at which the marginal benefits of services rendered by the extra stocks and funds are equal to the marginal cost of the extra throughput required to maintain the extra stocks and funds (Daly, 1988).

This accounting model is intuitively appealing; but making it operational presents several nightmarish problems - some similar to those encountered in computing the GDP. On the benefit side what value would be put on household chores including service by the consumer for himself/herself (Lewis' example of making clothes)? And is the accounting of the services of the church (input sinners-output saints) made any easier by this approach? Or are Bob Marley's disciples justified in bombing (decapitalisation act) the church when they learn that the preacher is lying?

The cost and capital account is equally problematic. Agricultural systems extract soil nutrients as well as add, change land capability and improve plant and livestock species. The products of agriculture are biodegradable but several inputs in the production process are not and often highly toxic. How would values be assigned to these entities? How would assets (mines) yet unknown be treated in the capital account? Was there an increase in the capital account when the Caribbean became known to the Europeans?

The concepts of compounding costs and discounting future revenues have been applied to problems of resource valuation according to the following equations:

$$C = C(1=r)^t \quad .....(1)$$

$$V = \frac{R}{(1+r)^t} \quad .....(2)$$

in which **C** refers to the final value of an original cost outlay of **C** incurred for **t** years; **V** is the present value of future revenue **R** and **r** is the rate of interest (Heady, 1964). The critical element in the equations is the interest rate. Interest rate changes with time and as **t** tends towards infinity the determination of the interest rate becomes more problematic. Capital investment is a function of the rate of interest and the rate of interest selected for capitalization leads to extreme variability in estimated present values. The investment decision made by each farmer reflects his/her appreciation of interest rate movements within a limited time horizon. Sustainability with its implied indefiniteness holds insurmountable measurement problems. The impossibility of arriving at a precise measure of sustainability is one that the economist may accept as they now do the law of conservation of matter and the entropy law.

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SOCIO-ECONOMIC POLICY, TRADE & INVESTMENT

TRADE LIBERALISATION AND AGRICULTURAL SUSTAINABILITY

CASE STUDY OF RICE PRODUCTION IN TRINIDAD & TOBAGO: PART 1 - IMPACT OF TRADE PROTECTION*

*Dr.Carlisle Pemberton**

An important thesis of this paper is that agricultural commodities which require trade protection are likely to be internationally uncompetitive. Thus, it appears reasonable to assume that trade liberalisation could improve the sustainability of agriculture through inducing efficiency gains. The consequences of trade protection and trade liberalisation are examined based on a case study of the rice industry in Trinidad and Tobago. The paper is presented in two parts. Part 1 examines the impact of trade protection and Part II trade liberalisation. Part II will be presented in the next issue of this newsletter. The paper is organised as follows. Section 1 reviews the concept of trade liberalisation and its relationship to agricultural sustainability. In Section 2, a brief examination of the prevailing system of trade protection and its effect on the rice industry is presented. Some general conclusions are then drawn based on the forgoing sections.

Agricultural Sustainability through Trade Liberalisation

Trade liberalisation has been an important component of structural adjustment programmes, particularly among Latin American and Caribbean countries. These programmes have been implemented in conjunction with the assistance of the major international financial agencies and have been aimed at assisting recipient member countries through periods of balance of payments difficulties. While sustainable agriculture is used in a variety of context, in this paper it refers to systems of agricultural production, which meet the needs of farm families and society at large, but which do not degrade the physical or human environment.

Trade liberalisation refers to "eliminating price controls and relaxing trade protection in a few heavily regulated or protected sectors"

Trade liberalisation also refers to the elimination of state imposed monopolies and oligopolies giving farmers access to cheaper sources of tradable inputs which would improve farm-firms' profitability. Lower cost imports also reduce balance of payments pressures within the domestic economies.

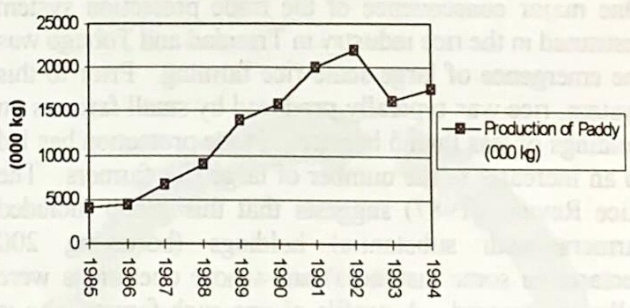
Agricultural sustainability refers to the practice of agriculture within an ecosystem and human community, through the application of appropriate technologies that would not only lead to equitably distributed income within the community but will also improve, or at least preserve, the natural resources of the ecosystem.

Trade liberalisation, by exposing firms to competition, could induce shifts in domestic production away from uncompetitive commodities, to commodities with lower relative costs, thus providing farmers with better long term prospects for profitability.

Overview of trends in the Rice Industry

Rice production in Trinidad and Tobago increased dramatically from 1986 to 1990, paddy production moving from 4,421 metric tonnes in 1986 to 15,774 metric tonnes in 1990 after having been virtually static over the previous decade. (Chart 1). This increase in production was accompanied by an increase in the number of rice producers registered at the State rice mill from about 300 in 1986 to more than 4000 in 1990[1] and can be attributed to the adoption of a higher level of domestic price support.

Chart 1: Paddy Rice Production in Trinidad & Tobago 1985 to 1994



Trade Protection in the Rice Industry

The National Flour Mills (NFM), a state company, controlled the local rice market and acted as the government's agent for the domestic rice price support program. It was contracted to purchase all domestically produced rice at administered prices - TT$1.96 per kg from small farmers, and TT$1.10 to $1.76 per kg from Caroni and large farmers. The only standard initially used by the NFM for the purchase of paddy was the level of moisture in the paddy. Given the structure of this support scheme therefore, the following two problems were inevitable:

(a) the quality of paddy delivered to the rice mill by farmers was low; and

(b) there were sales through "small farmers" of rice which had actually been produced by large farmers[2].

The NFM was granted monopoly status for the importation of rice into Trinidad and Tobago. This was accomplished by placing rice on the (negative) list of commodities that required an import license and the granting of such import licenses only to the NFM. This monopoly import status allowed the NFM to sell imported rice to domestic consumers at prices well above world market prices. The profits from retail rice sales allowed the NFM to finance the purchase of paddy from farmers, at prices well above world market prices. Thus the support program to rice farmers was borne directly by domestic consumers of rice. In an attempt to reduce the adverse consequences of high prices for rice to consumers, the state also maintained price controls on the retail price of rice.

Consequences of Trade Protection in the Rice Industry

Apart from the increase in paddy production described earlier, other consequences of trade protection in the rice industry have been identified. These included:

Emergence of Large-Scale Rice Farmers:

One major consequence of the trade protection system instituted in the rice industry in Trinidad and Tobago was the emergence of large scale rice farming. Prior to this system, rice was typically produced by small farmers on holdings of less than 5 hectares. Trade protection has led to an increase in the number of large rice farmers. The Rice Review (1987) suggests that this group included farmers with substantial holdings (bordering 200 hectares in some instances) and whose operations were fully mechanised. A profile of one such farmer who is reported[3] as having approximately 200 hectares of land and whose operations are fully mechanised is a case in point.

Effect on the Physical Environment:

Major concerns have been raised about the sustainability of rice production in Trinidad and Tobago and especially its effect on the environment in rice-growing areas. For the Nariva Swamp, Trinidad's largest area of wetlands, these environmental concerns include the impact of excessive chemical use on the swamp's wildlife, drainage and ecosystem and, in turn, the impact of these on fishing and the production of other crops.

International Uncompetitiveness of Rice Production:

The international competitiveness as measured by the DRC for the rice industry in Trinidad and Tobago under trade protection is indicated in Table 1[4]. The DRC value of 2.04 suggests that rice production in Trinidad and Tobago under trade protection was not internationally competitive, since farmers received prices for rice paddy that were substantially greater than the international price (border price). While farmers reported a small margin of TT$0.02 per kg in the production of rice (profits using domestic or private prices), they received TT$0.50 per kg in terms of net social transfers, confirming in other words that they were subsidised in the production of rice.

Table 1

Prices	Revenues	Cost of Tradable Inputs	Costs of Domestic Resources	Profits
Domestic (Private)	1.95	0.30	1.63 (x)	0.02
Int'l (Social)	0.77	0.29	0.98 (/)	-0.50
Transfers	1.16	0.01	0.65 (/)	0.50

DRC = (0.98)/(0.77-0.29) = 2.04; yield/hectare of paddy rice = 3000 kg/ hectare.
(x) non-competitive. (/) competitive.
Price of Guyana white rice converted to equivalent paddy rice price (conversion ratio = 0.56.

With respect to the rice industry Orden and Pemberton (1993), have discussed the measures adopted for the industry. These include:

(a) Freeing the rice importing and processing sector from governmental restrictions;
(b) Divestment of National Flour Mills Limited (NFM) which currently administers the rice support program;
(c) Removal of rice from the negative list, eliminating the necessity of obtaining import licenses for the import of rice and ending the NFM import monopoly;
(d) Elimination of controls on the retail price of rice and allowing competitive pressures to set this price;
(e) Limiting the dollar value of the rice subsidy to levels of around TT$20 million: and
(f) Introduction of a rice grading scheme.

Conclusion

This paper has put forward the proposition that trade liberalisation should improve agricultural sustainability. It is argued that this is likely to occur through the removal of market distortions, which tend to discourage the production of commodities not well suited to the natural, physical and social environment. It was further argued that while trade protection measures may result in farmers producing certain commodities profitably (in a private as opposed to the social sense) this profitability is solely dependent on a country's ability to maintain transfers to producers with the implication of higher prices to consumers and/or substantial outlays via Government support programs. Ultimately, once the ability to transfer incomes from the state to consumers or from consumers to producers is threatened, a great deal of disruption induced by declining prices is brought to bear on the farming community.

The case study of the rice industry in Trinidad and Tobago suggests that among the oft-cited rationalisation for trade liberalisation, could be added its contribution to the promotion of agricultural sustainability. However, it is clear that the adjustments that may be necessary to bring about trade liberalisation could cause severe dislocation within the agricultural sector, as domestic support prices are lowered to international levels and direct subsidies are withdrawn. Short term measures may therefore be necessary to lessen the burden of adjustment, especially on lower income groups within developing countries. On this basis, a case might be developed for temporary support to vulnerable groups in developing countries from developed and other developing countries to ease the burden of adjustment while implementing trade liberalisation programmes.

1. Maxwell Stamp PLC (1991)

2. There was an incentive for diversion caused by a $0.20 per kg price differential between small and large farmers.

3. The Rice Review (1987)

4. International competitiveness is calculated using the Domestic Resource Cost (DRC) which measures the value of domestic resources required in order for the commodity to earn one dollar's worth of foreign exchange. A DRC which is <1 indicatesthat the production of the commodity is competitive (Francis and Antoine 1996).

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Introduced and summarized by Patrick Antoine

Editor's Note:

Since this paper has been written, the Government of Trinidad and Tobago has started to implement a number of the recommendations listed in page 6.

To Our Readers

In this issue, we were heartened by the calibre and quantity of submissions from professionals outside of IICA. Thanks for your support and we look forward to your articles/commentaries on issues relevant to our Newsletter.

SUSTAINABLE RURAL DEVELOPMENT

IICA/IDB PROGRAM ON WOMEN FOOD PRODUCERS IN LATIN AMERICA & THE CARIBBEAN*

During the last five years, the Inter-American Institute for Cooperation on Agriculture (IICA), as the implementing agency, and the Inter-American Development Bank (IDB), as the financing agency, have collaborated on an extensive program for **The Analysis of Agricutlural Policies vis-a-vis Rural Women Food Producers.** The first phase of the program was implemented in six Central American countries, while the second phase included the Andean Region, the Southern Cone and the Caribbean. The participating Caribbean countries were Barbados, Jamaica, Guyana and Suriname. These territories provided three typologies, namely small, tourism dominated economies, medium-sized developing economies and relatively large, under-developed economies, respectively.

The results of this study have recently been published by IICA. This newsletter will be publishing excerpts from this publication in its upcoming issues, starting with some major conclusions of the study.

Some Major Conclusions

The relationship between women and agricultural production is structural, stable and permanent. Women food producers participate in activities in all phases of the production cycle and their participation is essential to production activities on small farms.

Women's participation in production activities is developed within a frameowrk of agreement among men, women and other family members, resulting in a variable and flexible division of labor in those tasks associated with farm production.

Women's participation in agricultural activities increases to the extent that they substitute for men, who generally have more opportunities for gainful employment in the off-farm work force.

Women play an important role in farm management and decision-making, indicating that they alone, as well as in association with men, make decisions regarding a farm production and family survival strategies.

There is a high statistical under-recording which makes women's participation in agriculture virtually invisible and leads to an inadequate understanding of the dynamics of small-farm production.

Table 2: Reestimation of women's participation in the agricultural sector.

	Official portrayal			Reestimated
	Total	Men	Women	Women
Barbados	4 400	2 500	1 900	12 581
Guyana	50 316	45 325	4 991	13 302
Jamaica	245 500	185 000	60 500	167 470
Suriname	91 977	49 257	42 720	52 986

Source: Official data: Labour Force Survey 1992 (Barbados); Population Census 1980 (Guyana); Labour Force Statistics 1992 (Jamaica); Agricultural Census 1981 (Suriname).

The access of rural women to the principal factors of production is limited due to structural restrictions characteristic of the small-farm sub-sector.

**Women Small Farmers in the Caribbean. Ed. Brenda Kleysen.US$10. ISBN 92-9039-298 3. San Jose, Costa Rica. IICA/ IDB/July 1996.*

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