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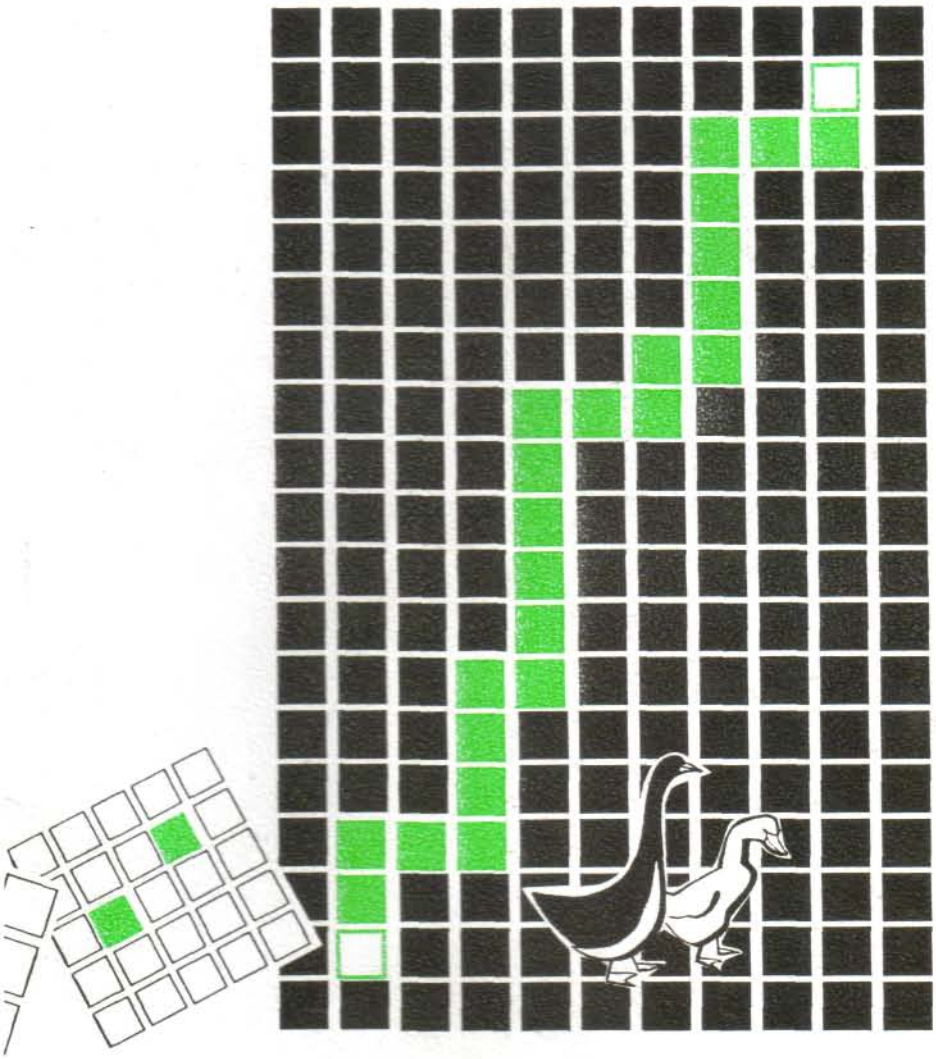

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THE ENVIRONMENT, TRADE AND THE WTO -A CARIBBEAN PERSPECTIVE

Carlisle A. Pemberton
Kathleen Charles[1]

ABSTRACT

The Caribbean in its negotiating position for the next WTO Agreement (WTO 2) ought to be placing particular emphasis on the preservation of the environment. This is because it is in the interest of the Caribbean to promote measures that will allow for special protection of its precarious island and marine environments. Such measures are currently allowed, for example, under the Green Box policies in the Agreement on Agriculture.

For the Caribbean to have a strong negotiating position, however, there must be the evidence of strong research findings that demonstrate any negative impact of liberalised trade on the environment. Also there must be the evidence that Caribbean societies have a strong regard for the environmental protection and are firmly supportive of a strong negotiating position in this regard.

This paper attempts to shed some light on these issues in two ways. First, it reviews a methodological approach that can be used to determine the impact of trade liberalization on the environment. It then provides an example of the use of this methodology by examining some preliminary indications of the likely impact of trade liberalisation in the sugar industry (removal of preferential measures) on the environment in Trinidad and Tobago.

Then the paper reviews preliminary' results of a recent study that demonstrates the value of the population of Trinidad and Tobago places on environmental improvements. The particular case that is examined here is, the value placed on restoration of a famous wetland.

The paper concludes by asserting that the environmental impact of free trade is important enough for the Canbbean to rethink its negotiating position and to push as strongly as possible for the continuation and elaboration of measures that countries may take for the preservation of the environment. In particular it is argued that developing countries should be the recipients of special benefits and provisions for the preservation of the sustamabiliry of their natural resources, as these resources remain the most valued stock of natural resources available to mankind.

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1. INTRODUCTION

This paper is concerned with the impact of an expansion of international trade on the environment, with particular reference to Caribbean island states. The advent of the WTO as an organisation resulting from the Uruguay Round of GATT is likely to have a major impact by expanding non-preferential international trade. What this paper examines is the relationship between the WTO (and its impact on expanding non-preferential international trade) and the environment of Caribbean island states.

The paper first examines the effect of expanding non-preferential international trade on the environment of Third World countries. Then the importance of the preservation of the environment to Caribbean societies is demonstrated by a review of a recent study of the valuation of the Nariva Swamp on the east coast of Trinidad. Then the paper reviews an approach to measuring the impact of an expansion of non-preferential (free) international trade on the environment and uses this approach to look at the specific case of expanded free trade through the removal of preferential access of Trinidad and Tobago's sugar to the markets of the European Union. Finally, the paper offers some recommendations with respect to the position that Caribbean States should adopt with respect to the environment at the current negotiations for the new WTO agreement.

2. WTO EFFECTS ON **INTERNATIONAL TRADE**

The Uruguay Round of Multilateral Trade Negotiations was the most comprehensive and ambitious among the rounds of negotiations to be held under the auspices of the General Agreement on Tariffs and Trade (GATT). One of the major achievements of the Round was the establishment of the World Trade Organisation (WTO), which was initiated on 1 January 1995. On that date, GATT ceased to be a separate institution and became part of WTO. WTO is responsible for the surveillance and implementation of rules governing trade by its members. Any Member that considers another Member to be flouting the discipline of the system or infringing any of its rules can bring a complaint to the WTO and request a settlement of differences. The WTO is also responsible for arranging continuing negotiations for the liberalisation of trade among its member countries.

According to the Business Guide to the Uruguay Round (1995). the successful conclusion of the Uruguay-Round, the coming into existence of the WTO and the commencement of the implementation of the Round's results are regarded as marking a new era in international trade and economic relations. The improved and strengthened rule-based system

developed by the Uruguay Round is expected to promote the smooth and orderly development of international trade. Almost all developing countries are now pursuing policies promoting export-oriented growth, making their industries increasingly dependent on foreign trade.

3. EFFECT OF EXPANSION OF INTERNATIONAL TRADE ON THE ENVIRONMENT

3.1 Beneficial Effects

The advent of the WTO would be expected to lead to an expansion of international trade, especially for developing countries, and this section explores the effects of the expansion of international trade on the environment of developing countries.

Two major arguments have been put forward, which suggest that the expansion of international trade can benefit the environment of developing countries.

The first argument is that increased international trade will improve the efficiency of resource allocation and allow production only under conditions that are environmentally and technically most feasible. The basis of this argument is as follows. A protective regime of high tariffs and quantitative restrictions is likely to lead to the expansion of domestic production into areas that are not environmentally suitable, the production being possible only because of the subsidisation that is afforded by the protective regime. In agriculture. production in such environmentally unsuitable areas is usually only possible by the modification of the natural environment, through the use of ameliorants such as fertilisers, pesticides and irrigation, which are likely to lead to environmental degradation.

Increased international trade as a result of the removal of trade restrictions would mean that production in domestic economies would have to be internationally competitive. Thus, there would be the removal of high tariff and quantitative restrictions, which would lower the implicit subsidisation of domestic production. This in turn would lead to a decrease in the profitability of production requiring high levels of environmental ameliorants. and a decline in production in environmentally-unsuitable areas.

The second argument in favour of the beneficial effects of expanded international trade is that such expansion would allow developing countries improved access to modern, environmentally friendly technology. Expanded international trade would encompass an expansion in the trade of inputs. Such an expansion in trade would lead to the importation of inputs that are more internationally competitive and an important aspect of this international competitiveness is the

environmental friendliness of the technology. Thus, developing countries if they were part of this expanding trading system, would now have access to modern, environmentally friendly technologies.

3.2 Harmful Effects

Two major reasons, on the other hand are suggested for why the expansion of international trade can be harmful to the environment, especially in developing countries. The first reason is the lack of internalisation of cost. It is argued here that an increase in international trade would generate external costs, especially in transportation, that are not reflected in the price of the products. Thus, without the internalisation of these costs by the firms, the level of international trade would be greater than what would be socially desirable which means that more environmental (external) costs would be generated, than would be socially desirable.

The second reason that has been advanced is that increasing international trade leads to the widening of income inequalities within and between countries. As these income disparities increase, the disadvantaged groups may view the more intensive utilisation of environmental goods as their only survival mechanism. More intensive utilisation of these environmental goods may lead to their degradation.

4. THE IMPORTANCE OF THE ENVIRONMENT TO CARIBBEAN SOCIETIES

4.1 Background

In discussing the impact of the WTO in expanding international trade in the Caribbean, the economic impact in terms of the Gross Domestic Product of the economies should not be the only-means of assessment. It is being argued here that the impact on the environment is also an important assessment factor. This is because Caribbean societies place a high value on the preservation of the natural environment. To support this argument, this section will review a study that measures the value that a Caribbean population places on a natural resource - the Nariva swamp.

4.2 Nariva Swamp

The Nariva swamp is the largest freshwater wetland in the eastern Caribbean, with an area of about 6,234 ha. It has been designated a Wetland of International Importance under the Ramsar Convention and registered under the Montreux Record. In accordance with this designation, the Government of Trinidad and Tobago is obligated to ensure its wise use and conservation, specifically for the protection of the vast array of flora and fauna it supports.

4.3 Nature of the Problem

From 1985, the Government of Trinidad and Tobago started the promotion of rice production in Trinidad, through trade protective measures, such as subsidised prices for paddy and quantitative restrictions on the importation of rice. Rice farming was also allowed to expand in the Nariva swamp. The commencement of large scale rice farming in the Nariva swamp caused major ecological damage, because of the indiscriminate farming practices, including channelisation of the swamp, deforestation and the widespread and heavy use of pesticides and fertilisers.

There was a public outcry for the ecological integrity of the wetland and its restoration. This led to this study to value the swamp in an effort to determine whether the cost of restoration would be justified in terms of the benefits that would be derived by the society of Trinidad.

4.4 Contingent Valuation

The Contingent Valuation Method enables the economic valuation of commodities not traded on the market.

This methodology solicits the Willingness-to-Pay (WTP) or the Willingness-to-Accept (WTA) compensation from a sample of consumers, and does so by the setting up of a hypothetical market to which respondents are expected to respond directly.

4.5 Survey Method

The selection of the sample used in this study was done in collaboration with the Central Statistical Office of Trinidad and Tobago. The sample frame consisted of the listing of households in Trinidad based on the 1990 population census. By the use of a three-stage sampling process, 515 households were selected to participate in the survey. The first stage of the sampling process stratified Trinidad into 14 geographic areas called Administrative Areas. Each Administrative area was further subdivided into Enumeration Districts (ED).

The second stage of the process involved the selection of individual EDs based on the proportion of EDs in the Administrative Area (size of the administrative area) to the total number of EDs.

The selection of the ultimate sampling units (households) constituted the third and final stage of the sample selection process. For the selected EDs. a sampling interval was derived and this interval was used to select the required number of households using systematic random sampling.

4.6 The Bid Question

In the contingent valuation exercise carried out it was necessary to put to the respondents a hypothetical situation, which constituted the market used to value the resource. This hypothetical market situation was incorporated in what is termed the Bid Question. The exercise proceeded as follows:

1. First the following material was read to the respondents: *"Protection of wildlife, vegetation, and habitat will require Trinidad and Tobago to alter water and land use regulations, so as to allow more water to remain in the swamp. Suppose a protection program was developed by the Trinidad and Tobago Government to implement and enforce the new water and land use regulations necessary for keeping Nariva swamp in a natural state. This protection would involve elimination of farming in the swamp. Without the protection program, water diversions for farming would continue, causing Nariva swamp to dry up. The major costs of the protection program would be in the form of costs of enforcing the new water and land use regulations, the costs of educating the residents of Nariva, and the costs of managing natural resources in the swamp. Funding to pay for these enforcement and management costs will come from a special Nariva Swamp Conservation Fund administered by the Trinidad and Tobago Government." 2.* Then the following question was asked: *"Would you make a one-time contribution of SX to the Nariva Swamp Conservation Fund to help ensure protection of the swamp in a natural state through the protection program described above?"* l.Yes 2. No

The value of X ranged from $5 to $800 in nine bid levels (as seen in Table 1). The results of this question were then used in logistic regression analysis to determine the mean bid level for the sample. This mean bid level was then multiplied by the total number of households in Trinidad to determine the aggregate value of the swamp.

4.7 Logistic Regression

Table 1 gives the results of the survey with respect to the bid question. Here it is seen that as the bid levels increase the proportion of 'yes[1] responses decreases. The information in Table 1 was used in the logistic regression analysis.

Table 2 shows the results of logistic regression analysis using the econometric package E Views, and shows that the explanatory variables (bid level (Bid), age of respondent (Age) and household income (Income)) are significant by having a p-value of <0.05, This means that the higher the bid level the lower the likelihood of a 'yes' response, which is similar in the case of

Table 1. 'Yes' Responses as a Proportion of the Total of Respondents at Nine Bid Levels

Bro(X)	NUMBER OF RESPONDENTS	NUMBER OF 'YES' RESPONSES	PROPORTION OF 'YES' RESPONSES (%)
5	57	50	87.7
15	57	46	80.7
30	53	40	75.5
50	49	34	69.4
100	52	32	61.5
200	50	25	50.0
300	53	27	50.9
500	49	21	42.9
800	44	11	25.0

Table 2. Results of Logistic Regression

LOGIT // Dependent variable is YES — Sample: 1 464
Date: 11/25/99 Time: 12:46 — Included observations: 464

Variable	*Coefficient*	*Std. Error*	*T-Statisftc*	*Prob.*
a	1.510787	0.356667	4.235841	0.0000
BID	-0.003310	0.000462	-7.160492	0.0000
AGE	-0.016832	0.006608	-2.547290	0.0112
INCOME	0.211060	0.063460	3.325899	0.0010

Log likelihood -268.8106
ObswithDep=l 286
ObswithDep=0 178

Variable	*Mean All*	*Mean D=l*	*Mean D=0*
a	1.000000	1.000000	1.000000
BID	206.8534	137.9021	317.6404
AGE	43.29741	41.68182	45.89326
INCOME	2.028017	2.269231	1.640449

'age[1]. However, in the case of household income the probability of a 'yes[1] response increases as income increases.

The values from the logit output in Table 2 were used in the calculation of the mean Willingness-to-Pay using the mathematical model (Eq.l).

M* = E(WTP) - -a+k/b

(-oo<M*<co) (1)

where

M* = Mean Willingness-to-Pay a =Intercept k = Z"i=i (Regression Coefficient x

Mean Value of Explanatory Variable where the n variables do not include the Bid variable) b = Coefficient of the Bid variable.

Table 3 shows the calculation of k.

Table 3. Estimation of k in Equation 1

Variable	Parameter Estimate (a)	Mean Value of Exp. Var.(b)	a x b
Age	**-0.016832**	**43.29741**	-0.728782
Income	0.21106	**2.028017**	**0.4280333**
			Z = -0.3007487 = k

Calculation of Mean Willingness-to-Pay (using estimates in Table x): M* = E(WTP) = -a+k/b = -(1.510787 - 0.3007487)7-0.00331 = 365.57048 or $365.574.8

4.8 Valuation of Nariva Swamp

The total number of households in Trinidad was 304,199 as given by the 1990 Population and Housing Census. Therefore the value of the Nanva swamp as estimated for the Trinidad population of households is

304,199xTT$365.57 = TT$111,206,028.43 (US$17,651,746)

Due to the fact that the bid elicitation question was seeking a one-time contribution toward the protection of the swamp, the total value of $111,206,028.43 represents the social value attributed to the Nariva swamp

1. MEASURING THE IMPACT ON THE ENVIRONMENT OF EXPANDED INTER-NATIONAL TRADE

5,1 Methodological Approach

This section deals with a methodological approach to illustrate the impact of

increased non-preferential (free) international trade on the environment. The approach will then be applied to the case of increased free trade, by the removal of preferential access of sugar from Trinidad and Tobago to the market of the European Union.

In this methodological approach a comparison research design is utilised. A comparison is made of:

1. The environmental impact of the trade restricted conditions (preferential access, state support etc.), with
2. The environmental impact of the free trade conditions (non-preferential access or the removal of trade barriers).

If the environmental impact is greater under trade restricted conditions then it may be concluded that expanded international (or free) trade will have a favourable impact on the environment

The approach can be further expanded in terms of the following steps:

(a) Description of the cultural practices and market conditions for the commodity under trade restrictions (referred to as the target system),
(b) Determination of alternatives to the target system under expanded international trade.
(c) Description of cultural practices and market conditions for the alternative system.
(d) Development of Environmental Impact Assessment (EIA) Model.
(e) Utilisation of the EIA Model to perform an EIA for the target system.
(f) Utilisation of the EIA Model to perform an EIA for the alternative system.
(g) Comparisons of the EIA's in (e) and (f).
(h) Drawing appropriate conclusions about impact of expanded international trade

5.2 The Environmental Impact Assessment Model (EIA)

The EIA model that was chosen in the study is a modification of FESLM: An International Framework for Evaluating Sustainable Land Management (Symth and Dumanski, 1993, see Table 1). In their model environmental impact is equated with sustainability: "A production system is defined to be sustainable if the system simultaneously:

- maintains or enhances production/ services (productivity)
- reduces the level of production risk (security)
- protects the potential of natural resources and prevents degradation of soil and water quality (biological protection)
- is economically viable (viability) and
- is socially acceptable (accept ability).

The five objectives: productivity, security, biological protection, viability and acceptability are the basic pillars of sustainability." (Symth and Dumanski, 1993).

FESLM proposes class distinctions for sustainability on the basis of the effects of the production system on the five basic pillars. This classification is given in Table 4.

In Table 4, if a land use management system within six years will fail to meet at least one of the pillars of sustainability, then it is unsustainable and may be classed as slightly unstable.

Classification of a land use management system as slightly unsustainable of course does not necessarily mean that it will cease to exist after six years. What it means however, is that within six years the system will fail to contribute meaningfully to some aspect of sustainable development of the environment (human. biotic and physical environment). In other words it will not meet one of the "pillars" of sustainability.

For example Symth and Dumanski (1993) state:

> It will be apparent also that, in many parts of the world, there are active land use (management) systems which should be placed in Class 6 - 'Highly Unstable', since they palpably fail to meet some or all of the 'pillar' requirements (for example, they generate an economic loss or a conservation disaster) but which, for a variety of reasons, not all bad, are expected to continue for more than 2 years. Whether continuation reflects artificial subsidy, irresponsibility, in-difference, or a lack of any identified alternative, classification as 'highly unstable' should draw desirable attention to a serious situation.

The key requirement of the FESLM Model is the identification of evaluation factors which are independent variables with a known effect on the dependent variables of interest *pillars of sustainability*.

Therefore to be useful as an evaluation factor, the factor must:

- vary according to the production systems; and
- its effect on sustainability must be measurable.

Diagnostic criteria are used to measure the variation in the evaluation factors and indicators and thresholds are used to assess the impact of different levels of the evaluation factor on the sustainability of the production system.

Table 4. The FESLM Classification System

	Class	Confidence Limits
Sustainable	1 . Sustainable in the Long Term	>25 years
	2. Sustainable in the Medium Term	15-25 years
	3 . Sustainable in the Short Term	7-15 years
Unsustainable	4. Slightly Unsustainable	5 - 7 years
	5. Moderately Unsustainable	2 - 5 years
	6. Highly Unsustainable	< 2 Years

5.3 Application of EIA Model to Impact of Free Trade on the Sugar Industry of Trinidad and Tobago

The paper now presents an application of this EIA model to the case of the expansion of international free trade by the removal of preferential access of sugar from Trinidad to the European market. Table 5 gives an outline of the FESLM EIA model in this application.

In the Trinidad sugar industry, approximately 60% of the sugar cane is produced by the small sugar cane farmers and 40% by the state owned sugar company Caroni (1975) Limited. With trade liberalisation the following changes can be expected:

- Any reduction in total sugar cane acreage would take place on both estate and farmers" lands, but largely on the estate lands
- Any expansion of alternative crop production would be done solely by farmer.

This position based on the Report of the Government Appointed Tripartite Committee on Caroni (1975) Limited which has recommended:

- Reduction in the acreage of cane grown by the company and
- Expansion of farmers' production of cane.

In the application of the FESLM EIA model therefore, the Target Production Systems would be:

- Sugar Cane Production in Trinidad and Tobago by the Estate (Caroni (1975) Limited, and the alternative production system would be:
- Vegetable production by small farmers

A recent survey of cane farmers provided details of the alternative vegetable enterprises that farmers would

Table 5. Evaluation Factors, Diagnostic Criteria and Indicators used in FESLM Model by Pillars of Sustainability

Evaluation Factor	Diagnostic Criteria	Unit	Indicators					
Productivity			Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Phosphorus Fertilizer	P_20_5 Applied	Kg/ha	0-20	21-24	25-88	89-110	111-200	>200
Potassium Fertilizer	K_2O Applied	Kg/ha	0-170	171-280	281-500	501-600	601-1000	>1000
Nitrogen Fertilizer	N Applied	Kg/ha	<45	45-160	161-270	271-450	451-600	>600
Excess of Salts	N Loss	Kg/ha/yr	<2	2-20	21-30	31-60	61-150	>150
	PLoss	Kg/ha/yr	<0.2%	0.2-<3	3-<5	5-<9	9-<ll	>11
	Irrigation Use	% farmers	<10	10-30	31-50	51-70	71-80	>80
River Pollution	Waste Seen	Complaints				X	X	X
Soil Erosion	Soil Loss	t /ha/vear	1-2	3-10	11-20	21-30	31-50	>50
	Acreage >30°	%						X
	Acreage >20°	%					X	
	Acreage >10°	%				X		
	Acreage <10°	%			X			
	Farmers Reporting	%		X				
Soil Compaction	Bulk Density	G/cm^3			<1.66	>1.66		
Biological Protection								
Pesticide Toxicity	Levels in Wildlife	Ppb				X	X	X

	Toxic nature Liquid	Oral LD50	>10001	4001-10000	2001-4000	201-2000	20-200	<20
	Toxic nature Solid	Oral LD50	> 10000	5000-10000	501-5000	51 -500	5-50	<5
	Aerial spraying					X	X	X

Evaluation Factor	Diagnostic Criteria	Unit	Indicators					
			Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Forest Loss	Forest land now farmed	% Land on farms					X	
Fires	Human health	Nu. of complaints				X	X	X
Factory Emissions	Human health	Complaints					X	
Loss of Biodiversity	Pure Stand Crop	%				X		
Economic								
Cash Flow	Mean/ha/mth	$	>1000	500-1000	0-500	<0		
	Coefficient of Variation	%	<40	41-70	71-100	101-130	131-200	>200
Net Return		$/ha			+ve	-ve		
Competi-tiveness	Existence of subsidy	$/year				X		
Security (Risk)	Wind Damage	% Land					X	
	Disease and Pests							
	Market							
	% Crop Income	% Fanners'			<50	>50		

Social Acceptability Industry Support	Farmers Reporting	%	X					

Table 6. Alternative Crops Stated by Cane Farmers -1988

Activity	Percentage of Farmers*
Vegetables	25
Root crops	19
Dairy	10
Rice	9
Others	29
None	9
No response	5

*Percentages add up to more than 100% since farmers gave multiple responses.
Source: Pemberton, Ragbir and Ramjit

grow instead of sugar cane. These alternative crops to sugar cane are presented in Table 6.

The FESLM Model for sugar-cane production by the estate (company) (Caroni (1975 Ltd.)) in Trinidad,, shows that production of sugar-cane by the company is very unsustainable since the values for most of the evaluation factors are in Classes 4, 5 and 6.

Table 8 shows the FESLM Model for the alternative system, vegetable production by small farmers. Here it is seen that the production of vegetables by farmers was more sustainable than sugar cane production by the company (Caroni (1975) Ltd.) especially with respect to: net return, non-use of aerial spraying, competitiveness (lack of need of subsidy), reduced market risk and risk of fires. Expansion of vegetable production by small farmers would however still involve the use of fertilisers and a wide range of pesticides.

This example illustrates the effects of Trade Liberalisation via a reduction of EU sugar preferential quota for Trinidad and Tobago. It was seen that this would lead to a reduction of cane production by the estate, (Caroni (1975) Ltd.) This would accelerate the trend to farmers producing the majority of the cane in Trinidad and Tobago. The

Table 7. Environment Impact - Estate Sugar-Cane Trinidad

Means	Estate Sugar							
Evaluation Factor	Diagnostic Criteria	Unit	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Productivity								
Phosphorus Fertilizer	P Applied	Kg/ha						139.5
Potassium Fertilizer	K Applied	Kg/ha	22.5					
Nitrogen Fertilizer	N Applied	Kg/ha		203.7				
Excess of Salts	N Loss	Kg/ha					56.4	
Irrigation Use		%	X					
Pesticide Toxiciry	DDE	Ppb						6.8
(Caroni River)	Dieldrin	Ppb						3.0
(sediment)	Op'DDT	Ppb						0.9
	Op ODD	Ppb						3.2
	ppDDT	Ppb						7.3
Pesticide Toxiciry	Bavcarb 50% EC	L						12176.0
(Use by Estate 1993)	Evisect 50% SP	Kg						21240.0
	Hostathion 40% EC	L						10565.0
	Hostathion 25% ULV	L						8039.0
	Karate 2.5% EC	L						8210.0
	Kilval40%EC	L						853.0
	Malathion 94% ULV	L					2837.0	

	Maladrex 25% Dust	Kg				1149.0		
	Primicid 58% EC	L						4343.0
	Scipio61.6%ec	L						9752.0
	Trebon 30% ec	L					307.0	
Means	Estate Sugar							
Evaluation Factor	Diagnostic Criteria	Unit	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
	Padan 50% SP	Kg						
	Miral 500 CS	L						
Insecticides	Bavcarb50%EC	Oral LD50				640.5		
Oral LD50	Evisect 50% SP	Oral LD50				252.5		
	Hostathion 40% EC	Oral LD50					62.5	
	Hostathion 25% ULV	Oral LD50					62.5	
	Karate 2.5% EC	Oral LD50					67.5	
	Kilval 40% EC	Oral LD50					102.5	
	Malathion 94% ULV	Oral LD50				1375.0		
	Maladrex 25% Dust	Oral LD50				1375.0		
	Pnmicid 58% EC	Oral LD50					170.0	
	Scipio61.6%EC	Oral LD50				425.0		
	Trebon 30% EC	Oral LD50		21000.0				
	Padan 50% SP	Oral LD50				335.0		
	Miral 500 CS	Oral LD50		5000.0				
Herbicides	M.S.M.A. 48%	L						34599.0
(Use by Estate 1993)	2,4,-D Amine	L					3023.0	
	Paraquat 27.6	L						26497.0
	Asulox 40	L				11988.0		
	Actril DS	L						3023.0

	Ametrvn/Atrazine	L					15109.0	
	Atrazine WDG	Kg				4500.0		
	Velpar L'	L				6000.0		
	Diuron 80% WP	Kg				8000.0		

Table 8: Environment Impact - Vegetables Trinidad - Farmers

Means	Farmer Crop							
Evaluation Factor	Diagnostic Criteria	Unit	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Productivity								
Phosphorus Fertilizer	P Applied	kg/ha						621.70
Potassium Fertilizer	K Applied	kg/ha					859.20	
Nitrogen Fertilizer	N Applied	kg/ha				420.00		
Excess of Salts	N Loss	kg/ha					116.30	
Irrigation use		%	Ni					
Pesticide Toxicitv	DDE	Ppb						11.66
(Aranguez Waterway)	Dieldrin	Ppb						15.62
(sediment)	Op'DDT	Ppb						1.14
	Op[1] ODD	Ppb						4.18
	pp[1] DDT	Ppb						6.36
	Heptachlor Epoxide	Ppb						0.90
	Karate	Oral LD50					144.00	
	Decis	Oral LD50					135.00	
	Telstar	Oral LD50					55.00	
	Belmark	Oral LD50				450.00		
	Danitol	Oral LD50					66.00	
	Nomolt	Oral LD50		>5000				
	Padan	Oral LD50				325.00		
	Trigard	Oral LD50	> 10000					
	Banrot	Oral LD50		6000.00				

Means	Farmer Crop							
Evaluation Factor	Diagnostic Criteria	Unit	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Soil Erosion	Soil Loss	t /ha/year						61.20
	% on slope >30	%	Ni					
	% on slope >20	%	Ni					
	% on slope > 10	%	Ni					
	% on slope 10	%	Ni					
Soil Compaction	Bulk Density	g/cm3	X					
Biological Protection								
Aerial Spraying	Human Health	Complaints	X					
	Beneficial Biota		X					
Cane Fires	Human Health	Complaints	X					
Herbicide Spray	Legal Action	Number	X					
Factory Emissions	Human Health	Complaints	X					
Biodiversity	Pure Stand Crop	%	X					
Economic								
Production Cost		$/ha	21314.00					
Revenue		$/ha	55080.00					
Net Return		$/ha	33766.00					
Competitiveness	Subsidy	$/ha	0.00					
Farm Size	No. Farmers	% <2 ha	Ni					
		% >2 ha	Ni					
Security (Risk)	Bush Fires	Number		X				
	Crop Exports		X					
	Market		X					

company would not expand its acreage of alternative crops. Instead small farmers would expand vegetable production under the conditions of trade liberalisation in the international sugar market. The result showed that production of vegetables by small farmers was more sustainable than sugar cane production by the estate. Thus it may be concluded that increased international trade in sugar by the removal of preferences granted by the EU to Trinidad and Tobago would lead to a positive impact on the environment.

6. CONCLUSIONS

Environmental impact of free trade and the concern of the Caribbean public for the environment suggest that the issue of the effect of the new WTO on the environment should be of major concern.

The effect of free trade on the environment is not clear cut. Therefore we cannot argue that WTO expansion of free trade is bad for the environment. We recommend instead that in its negotiating position Caribbean countries push as strongly as possible for the continuation and expansion of measures for preservation of the environment. In particular Caribbean countries should try to get special measures adopted for developing countries to receive special benefits and privileges for the preservation of their environments as the natural resources of developing countries (especially those in the tropics) remain the most valued stock of natural resources available to mankind.

This paper has examined the impact of expanded international trade in agricultural commodities on the environment in the Caribbean. The theoretical analysis suggested that expanded international trade can have both positive and negative effects on the environment.

A case was examined in this paper of expanded international trade through the removal of trade preferences. It was found that such removal of trade preferences for sugar exports for Trinidad and Tobago would lead to a positive impact on the environment, as small farmers would grow vegetables with less impact on the environment. However vegetable production would still involve the heavy use of fertilisers and pesticides.

The paper also demonstrated the high value that the population of even a developing state like Trinidad and Tobago places on the environment, hi the case examined, the population valued a wetland, the Nariva swamp, occupying 6.234 hectares at USS17.7M.

Thus we conclude that the environment matters to Caribbean societies and that in its negotiating position, Caribbean countries should push as strongly as possible for the continuation and expansion of measures for the preservation of the environment.

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