



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

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

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

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

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

Some Social, Environmental and Economic Implications of Increased Soil Erosion and Agro-Chemical Use in Caribbean Agriculture

Leslie Anthony Simpson

Soil Scientist, CARDI Jamaica Unit

Frank Bruce Lauckner

Biometrician

CARDI, St. Augustine, Trinidad and Tobago

Abstract

Agricultural cultivation in the islands of the Caribbean is carried out on lands of varying degrees of slope. The increased use of steeper slopes in recent times has led to increased land slips and soil erosion on hillsides, and flooding and sedimentation of coastal regions. Also, there has been a large increase in the use of agricultural chemicals in agricultural production. These two factors present a formidable pollution threat which will ultimately impact on the social and economic wellbeing of the Caribbean people.

In 2000, a project was initiated to research "The impact and amelioration of sediment and agro-chemical pollution on Caribbean coastal waters". This project which used Jamaica and St Lucia as the case study countries looked at various aspects of this problem including the quantification and toxicity of agro-chemicals imported, the on-farm use of agro-chemicals and associated soil management and farming practices, the fate of agro-chemicals in the land-water interface and the harmonization of agro-chemical management in the Caribbean.

This presentation reports on some of the important findings of this study. In particular, the data on the increased importation of agro-chemicals is presented, some of the farming practices which are likely to influence soil sediment and agro-chemical pollution are highlighted and the possible effects of the use of these toxic chemicals on public health and the environment are discussed. In conclusion, implications of improper soil and agro-chemical management to the social and economic fortunes of the Caribbean are also discussed and recommendations are given for alleviating this emerging problem.

INTRODUCTION

Jamaica, the largest island of the English speaking Caribbean, has a total land area of 11,424 km². The greatest length of the island is 235 km, its greatest width is 80.8 km and its least width is 35.6 km (Henry, 1978). The principal range of mountains run east to west with the rivers flowing north and south.

Approximately 80% of the land area is a configuration of mountains ranging between 300m and 2100m in elevation (Henry, 1978). This gives rise to watershed areas comprised of sloping lands the steepness of which, in most cases, is greater than 10%.

There are 33 watershed areas in the island, each is drained by a major river and its tributaries and comprise land areas extending from the hills to the sea (IICA, 1988).

St. Lucia located at latitude 13 50' N and longitude 60 59' W, is the second largest of the Windward Islands with an area of 620 km². The island is 42 km long and 22 km wide with a very irregular, steep terrain especially in its interior, which rises to a height of 950 m. The island boasts very fertile volcanic soils but, due mainly to topographic constraints only 28% (17,360 ha) of the total land area has been classified as suitable for agriculture.

St Lucia has a tropical climate strongly influenced by its broken, rugged topography. Rainfall increases and temperature decreases with altitude, and the western side of the island experiences higher rainfall. Annual rainfall averages about 1600mm in the northern and southern extremities of the island to about 3500mm in the higher altitudes. The island experiences distinct

rainy and dry seasons: the rainy season extends from June to December while February to April are the driest months.

The island is subdivided into 37 water catchments or river basins from which a number of perennial streams emanate. These streams ultimately lead to the sea, and are reported to have a lot of aquatic life, particularly crayfish.

Farming is carried out in watersheds which consist of steep highlands as well as flat valleys. Water courses provide drainage for these agricultural lands and therefore carry any soil sediments from erosion or excess agro-chemicals applied to the soils. Little is known about the amount of soil erosion and agro-chemicals use on these farms, and neither has the pollution from these activities been investigated.

The overall implication in the two islands of the Caribbean is that most of the agriculture is carried out on sloping lands which are prone to erosion. With increased population, more areas of steep lands are being cultivated, and the resulting decrease in forested areas have led to increased landslides and soil erosion on hillsides and flooding and sedimentation of coastal regions. In addition, over the last 5-10 years there has been a general increase in the importation and use of agro-chemicals in farming practices of Caribbean farmers. This increase use has been significant for pesticides particularly insecticides and their use on hillside farms is likely to pollute the aquatic and marine environment.

This presentation reports on the increased agro-chemical importation and use in the Caribbean as recorded in the study **"The impact and amelioration of sediment and agro-chemical pollution on**

Caribbean coastal waters" and links this data to the results of a 2001/2002 survey of farms in Jamaica and St Lucia, which was carried out to determine the farming practices which were carried out in some watersheds and the possible effects on the environment. The social and economic implications of this information, as well as recommendations for alleviating the situation are also discussed.

BACKGROUND

In late 2000, the Centre of Marine Sciences (CMS) of the University of the West Indies (UWI) signed a Memorandum of Understanding (MOU) with The University of York/ Marine Resources Assessment Group (UY/MRAG Ltd). This MOU outlined the basis for collaboration between UWI and the UY/MRAG Ltd on various aspects of the project "Impact and Amelioration of Sediment and Agro-chemical Pollution on Caribbean Coastal Waters." This project is funded by the Department for International Development (DFID) of the United Kingdom (UK)

The MOU envisaged a group at UWI consisting of representatives from CMS, and other Departments/Institutes on campus including the Department of Chemistry (DOC), the Natural Products Institute (NPI) and the Caribbean Agricultural Research and Development Institute (CARDI). The representative from CMS was designated the coordinator of the group.

In the list of activities which the UWI group was given in the MOU, CARDI was made responsible for the carrying out all tasks under Activity #4.

Activity #4 stated that CARDI will undertake a review of soil management and farming practices, including the use of agro-chemicals in the Caribbean, with particular reference to St Lucia and Jamaica and produce a technical report.

METHODOLOGY

Data on the quantity of imports of agrochemicals into the case study countries Jamaica and St Lucia was obtained from various sources and compiled by Esteban et al (2003) and Mees et al (2003).

The survey of a representative sample of large and small farms in five watersheds, Rio Cobre and Wag Water in Jamaica and Rouseau, Praslin and Soufriere in St Lucia was carried out over the period December 2001 and June 2002. The survey instrument consisted of questionnaires of 54 questions in Jamaica and 56 questions in St Lucia and sought to garner information on the farmer, the farm size and location as well as details of the agronomic and other practices. The objectives of the survey were:

- To identify farming practices in the selected watersheds.
- To document important information on fertilizer and pesticide usage of both small and large farmers in the watersheds.
- To determine possible areas of fertilizer and pesticide abuse in the two watersheds.
- To identify possible areas of intervention to improve the efficiency of fertilizer and pesticide use in the watersheds.

- To identify possible alternatives to the use of fertilizers and pesticide in the watersheds.
- To determine the health risks related to pesticide use in the watersheds.
- To identify probable areas of pollution in the watersheds

In Jamaica, the survey was carried out by extension officers, of the Rural Agricultural Development Authority (RADA) of the Ministry of Agriculture, Jamaica, while in St Lucia the extension officers, of the Ministry of Agriculture Forestry and Fisheries (MAFF) of St Lucia, carried out the survey. A total of 299 farms were surveyed in the five watersheds. The completed survey forms were sent to the biometrics section of CARDI headquarters in Trinidad for statistical analysis.

RESULTS

Agrochemical imports and use

Agrochemical here, refers to both inorganic/mineral fertilizers and pesticides. In the case of pesticides it is sometimes difficult to distinguish between those imported for agricultural use as opposed to domestic and other uses, but in general, the vast majority of pesticides is imported for use in agriculture.

Data for quantities of fertilizers imported into Jamaica and St Lucia are given below in Tables 1 and 2. This data cover 5-year intervals from 1980 to 2000 and indicate a definite upward trend in the total amount of fertilizer in use, with significant increases in the mid- 1990's and a slight decline in 2000

in Jamaica and a more substantial decline in St Lucia.

The data from Jamaica indicate a wide variation in the types of fertilizers used over the years and this is thought to be associated with the increasing varieties and blends of products now in the market.

Long-term trends also indicate that total pesticide use is increasing in both St. Lucia and Jamaica, and that agricultural pesticides form a large proportion of the pesticides in use. Table 3 indicates the various pesticides imported into the two islands over the period 1997-2002.

Concurrent with this, there is clear evidence of a long-term increase in the quantities of imports and use of agro-chemicals, not only in St. Lucia and Jamaica but also in the wider-Caribbean (Table 4).

The main factors to have influenced the quantity of agro-chemicals in use include: changes in legislative arrangements, dumping of agro-chemicals, increased pests and diseases, changes in agricultural practices and changes in crop types. Other external factors include international trade and climatic variation.

There are clear indications that insecticides constitute the largest proportion of pesticides imported into Jamaica and St Lucia (and the Caribbean) each year, and this trend is likely to continue.

FARM SURVEY FINDINGS

Farm and farmer characteristics

In this survey, farm size classification was defined in two categories namely small

farms (<5ha) and large farms (>5ha). There were 149 farms surveyed in Jamaica of which 57 were considered large farms. In St Lucia, 150 farms were surveyed with 23 considered as large farms and the remaining 127 farms were considered small farms. In both islands over 60% of the farms were owned by the farmer or his family.

The main crops varied in the two islands with banana, citrus, cocoa, coconuts, coffee, sugar cane and yam being prevalent in Jamaica, while in St Lucia there were bananas, cocoa, mixed vegetables (cabbage, hot pepper and tomatoes) and root crops (dasheen, sweetpotato and yam).

In both islands the majority of farmers were over 40 years old; this was more so in Jamaica where >80% of the farmers were over 40, while in St Lucia 76% of the farmers were over 40 years old (Figure 1). In addition, most of the farmers in the two islands only reached the primary level of education (Figure 2).

Soils and soil management

Figure 3 gives the soil types which were reported on the farms surveyed in the two countries. In Jamaica 81 farms (54.4%) and in St Lucia 91 farms (61.1%) reported having loam as their predominant soil type. This was followed by 39 farms (26.2%) in Jamaica and 45 farms (30.2%) which had clay soils. Since loams are considered the most fertile type of soil the majority of farms were on good soils.

Percentage soil slope being farmed varied in the two islands (Table 4). In Jamaica the majority of farms (83.6%) were on moderate to steep slopes, while in St Lucia the majority of farms (61.3%) were on flat lands to moderate slopes; only one farm

was on very steep slopes. Soil erosion appeared to be more of a problem in Jamaica, mainly because of the greater proportion of steep slopes being farmed.

The survey showed that many farmers observed signs of erosion in the two islands (Table 5), but this was more prevalent in Jamaica than in St Lucia.

Table 6 gives the soil conservation methods employed in the two islands. There was a wider range of methods in use in Jamaica compared to St Lucia. In both islands the use of drains/trenches was prevalent.

In St Lucia, more than half of the farms surveyed were on moderate to gentle slopes, and this lessened the erosion risk, but because of higher rainfall experienced on the island, this increased the drainage problems. On the steeper slopes in St Lucia, erosion is likely to be higher than in Jamaica. In both islands erosion control methods were poor. In St Lucia there was no mention of hedgerows as a means of erosion control.

Tree cover on the farm is also an important means of controlling soil erosion by decreasing the energy of the raindrops on the soil. Figure 5 gives the percentage tree crop cover on the farms surveyed. 112 farms (74.6%) had less than 50% tree cover. 102 farmers (68%) were willing to plant more trees on farm, while 42 farmers (28%) were not.

Soil water management on the farms differed in the two islands, mainly because the rainfall levels in the islands varied. In Jamaica, with relatively low rainfall and relatively lighter soils, lack of water was a serious constraint and a variety of methods to increase the irrigation of crops were used. Despite this, only 40% of the farms practiced

mulching. In St Lucia, rainfall was higher and soils were reported on average to be heavier than those in Jamaica. The problems in St Lucia were more related to excess soil water and drainage.

Use of agro-chemicals

The use of fertilisers and pesticides was widespread on both islands. Chemical fertilizers were being used on most farms although very few had had soil chemical analyses done.

In Jamaica, one hundred and twenty-seven farms (85.2%) used chemical fertilizers or some sort of manure. This is despite the fact that very few farms (<20%) had done soil tests so that fertilizers were not being applied by virtue of recommendations based on soil properties.

In St Lucia, the situation was quite similar with one hundred and forty-five farmers (96.7%) using chemical fertilizers while only 5 farmers (3.3%) never used fertilizers. Thirty-one farms (20.7%) had soil test done while the other 118 (78%) had not done any soil test. One farmer did not know if a soil test had been done.

The great disparity between the number of farmers which have had soil test done and the number using chemical fertilizers indicates that soil fertilizers are not being used in relation to soil fertility levels and may be over used.

In Jamaica a number of pest species and diseases were indicated for the various crops and in 87% of the cases chemical control methods were carried out. In the case of weeds the main means of control was mechanical and only in 26% of the cases was chemical control used.

In St Lucia in 87% of the cases chemical control methods were carried out to control pests while in 67 % of the cases chemicals were used to control diseases. In the case of weeds the main means of control was mechanical and only in 15% of the cases was chemical control used.

The main reasons for using agro-chemicals are indicated in Table 7. In Jamaica, seventy percent (70%) of the farmers felt that agrochemicals increased their yields while 46% felt it improved the appearance of the produce. In St Lucia, one hundred and 125 farmers (83.3%) used pesticides because they felt it increased their yields, while 71 farmers (47.3%) felt pesticides improved the appearance of their produce.

Additionally, in Jamaica 102 farmers indicated that they would purchase more fertilizers if they had the resources, while 75 farmers (50.3%) indicated that they would purchase more pesticides if they had the resources. 103 farmers (69.1%) felt that more fertilizers or pesticides would give them better results in their farming efforts. In response to the question of whether there were affordable alternatives to agrochemicals, 109 farmers (73.2%) felt that there were, but only 77 farmers (51.7%) were willing to use alternatives to chemical fertilizers and 20 farmers (13.4%) were willing to use alternatives to chemical pesticides.

In St Lucia responses were similar with 107 farmers (97.3%) indicated that they would purchase more fertilizers if they had the resources, while 86 farmers (81.9%) indicated that they would purchase more pesticides and 91 farmers (89.2%) indicated they would purchase more pesticides if they

had the resources. Ninety-six farmers (80.2%) felt that more fertilizers or pesticides would give them better results in their farming efforts. In response to the question of whether there were affordable alternatives to agrochemicals, 137 farmers (91.3%) felt that there were, but only 13 farmers (8.8%) were willing to use alternatives to chemical fertilizers and a mere 5 farmers (3.4%) were willing to use alternatives to chemical pesticides.

Pesticide management

A large proportion of farmers in both islands indicated that their interval between spraying and harvesting of produce was 1 week. Seven farms (5.6%) in Jamaica and 13 farms (12.3%) in St Lucia harvested crops 1 day – 1 week after spraying pesticides; alarmingly seven farmers (6.6%) have harvested crops within a day of spraying (Figure 6).

In Jamaica, one hundred and two respondents (78%) indicated that they applied pesticide to produce to be used in the home, while 22% indicated that produce for home use was not sprayed. In St Lucia, seventy-two respondents (53.7%) indicated that they applied pesticide to produce to be used in the home, while a slightly lower 46.3% indicated that produce for home use was not sprayed.

In Jamaica, one hundred and thirty-two respondents (92.3%) indicated that they were not aware of any case of illness on their farm due to pesticide use, while 7 respondents indicated that they had experienced cases of illness due to pesticide use on their farm. In St Lucia, one hundred and forty-seven respondents (98%) indicated that they were not aware of any case of

illness on their farm due to pesticide use, while 3 respondents (2%) indicated that they had experienced cases of illness due to pesticide use on their farm.

Twelve respondents (8.5%) in Jamaica and nine (6%) in St Lucia indicated that they have known of persons who have become ill from pesticide use.

Effects of farming practices and agrochemicals on the environment

The results showed that many of the farmers in both St Lucia and Jamaica were not aware of the environmental impacts of using agro-chemicals on their farms. Farmers also indicated that most of their excess chemicals were stored for future use, applied to the soil or buried. They disposed of containers by burning and most used some sort of protective clothing while spraying.

The response of farmers to the question on the effect of their farming practices and use of agrochemicals on the environment is given in Figures 7-9. In Jamaica about 50% of the farmers felt that farming practices and pesticide use were affecting the environment off the farm, while a little less than 20% felt they were not and about 30% did not know. As regards chemical fertilizers only 55 farmers (36.9%) felt their use was having an adverse effect on the environment, while an almost equal number, 50 farmers (33.6%) felt they were not and 40 farmers (26.8%) did not know.

In St Lucia, one hundred and seven farmers (73.3%) felt that pesticide use was having an adverse effect on the environment, while 32 farmers (21.9%) did not know if there was an adverse effect and seven farmers (4.8%) felt there was no adverse effect. As regards chemical

fertilizers only 62 farmers (41.6%) felt their use was having an adverse effect on the environment, while an almost equal number, 60 farmers (40.3%) did not know and 27 farmers (18.1%) felt fertilizers were not having an adverse effect on the environment. Seventy-five farmers (50%) felt that their general farming practices were having an adverse effect on the environment, 34 % did not know and 16% felt that farming practices were not affecting the environment.

These responses although indicating some difference in the knowledge of the farmers in this area do signal that farmer training on the effect of poor farming practices and excess use of agro-chemicals on the environment may be necessary and can be fruitful.

DISCUSSION

In this presentation, two main factors are highlighted, the phenomenal increase in agrochemicals importation and use in the Caribbean over the last ten years and the farming practices under which these chemicals are being utilized. The first factor is important in that increased agrochemical loading in the region is likely to increase pollution leading to deleterious effects on human health, the environment and economic resources. The need for the effective control of such pollution is internationally recognized and international agreements provide a framework to address the problem. In the wider Caribbean, these agreements should be adopted through a harmonized procedure for agrochemical management. This procedure must include

model legislation to dictate the administration, use and monitoring of agrochemicals. Failure to act decisively on this matter can have an immense social and economic impact on the Caribbean. Given limited capacity, however, the emphasis should be to reduce imports of particularly the more toxic pesticides and control the administration and distribution chain, thus reducing toxic agrochemical loading.

The second factor pertaining to farming practices which aid the pollution process. Agrochemicals are removed from agricultural lands by running water due to run-off and adsorbed to soil particles lost in erosion processes. Soil surface movement of agrochemicals is usually accelerated by steep topography, low soil permeability, high rainfall, strong adsorption of chemicals to soil particles and inadequate soil conservation measures in farming practices. The survey results indicate that there is distinct evidence of soil erosion on farms on both islands, but that conservation practices were very limited.

The survey also indicates that soil management, in terms of fertilizer application, is in no way related to soil properties as less than 20% of the farms had done soil testing. This may be an important area for intervention, to ensure excess fertilizers are not being applied to the soil. In addition, although the majority of farms was on moderate to steep slopes and indicated there were signs of erosion on these farms there was no serious sustained effort to control erosion. Recommended soil conservation practices, particularly the use of vegetable hedgerows, were not in frequent use.

In terms of pesticide use, there was extensive use of chemicals for pest and disease management. Chemical weed control was however limited. It was also widely felt that agrochemical use enhanced the profitability of the farm and more agrochemicals would be used if the resources were available. This attitude of the farmers was quite startling and when coupled with the fact that the majority of farmers were over 40 years old indicated a major challenge to significantly changing their practices.

Pesticide persistence in the soil and the economic product is also a cause for socio-economic concern. Persistence in the soil will be affected by the method of application, the method of soil preparation and the formulation or mixture used. Degradation products and their characteristics must also be considered when deciding what pesticides to use and where they are applied, as these may be more toxic than the active ingredients and therefore also more persistent in the environment. With respect to economic products, standards for maximum residue limits (MRLs) of pesticides in foods have already been established by the Food and Agriculture (FAO)/World Health Organisation (WHO) Codex Alimentarius. The restriction of exports from the Caribbean due to non-compliance with these standards would have disastrous effects on the economic well being of the Caribbean.

Agrochemical use affects the health of those that use and apply them, the consumers of farm-produce grown in pesticide-treated areas, residents of the communities within which agrochemicals are used, and communities which are down-

stream from areas of agrochemical application. In the Caribbean, it is the poor, little-educated, socio-economically disadvantaged who are at greatest risk from improper pesticide use. The survey indicated that the interval between spraying pesticides and harvesting of crops was 1-2 weeks in both islands, but surprisingly a small number of farmers in St Lucia indicated that this interval could be less than 1 day. The farmers in both islands were mostly unaware of any incidences of persons health being affected by chemical spraying although available hospital data from Jamaica has indicated incidences with children less than 5 years old being the main victims.

A high proportion of the farmers in the two islands felt their practices on the hillside would adversely affect the environment off the farm but a higher number did not have an opinion on this matter. This could therefore be a major area for farmer training.

RECOMMENDATIONS

Based on the results of this study the following recommendations are being made to ensure a speedy alleviation of the problems highlighted:

1. Harmonised procedures for agrochemical management should be adopted throughout the region
2. Support mechanisms must be developed to support the agrochemical management procedures
3. Good agricultural practices (GAP) and other good practice codes of conduct for agrochemical use needs to be implemented e.g

- Use of vegetative soil barriers to be introduced and encouraged
 - Use of mulching to be promoted and encouraged
 - Increase soil chemical testing and relate results to fertilizer recommendations
 - Compost making and the use of organic manures should be promoted.
 - IPM systems should be introduced and promoted
 - Training in pesticide management procedures to be given to the farming community
 - Training on environmental protection and the effect of excessive agro-chemical use on the environment to be carried out
4. Socio-economic analysis, including cost-benefit analyses, should be conducted for different farming practices, including options for agrochemical use
 5. Promotion of agriculture in schools to increase youth participation in the sector
 6. Carefully designed public health monitoring plans must be developed, including adequate analytical capacity to enable monitoring for compliance with standards for public health.
 7. Carefully designed long term environmental monitoring plans must be developed.

Acknowledgements

The authors wish to acknowledge the important input made by the various collaborators in this

study, particularly DFID who funded the project. The important role play by the extension officers from RADA in Jamaica and MAFF in St Lucia is also highly appreciated, as is the statistical analyses carried out by the Biometrics Section of CARDI headquarters.

Finally, the view expressed in this paper are those of the authors and do not necessarily represent the views of DFID.

REFERENCES

- Boodram, N., 2002 The fate of agrochemicals in the land-water interface, with reference to St Lucia and the wider Caribbean. DFID NRSP Project R7668. CEHI. <http://www.mragltd.com>
- Esteban, N., P. Espeut, B. Hay, C. Mees and S. Seddon-Brown, 2003 Importation, administration and harmonisation of agrochemical management in St Lucia, Jamaica and the wider Caribbean. DFID NRSP Project R7668. C-CAM and MRAG Ltd. <http://www.mragltd.com>
- Henry, D. 1978: Brief overall diagnosis of hillside farming in Jamaica. IICA Publ. # 12. IICA Office, Jamaica
- IICA, 1988. Improved watershed management and increasing socio-economic well-being through farming systems research and development. A. Min. ag./IICA sub-project of the GOJ-USAID Hillside agricultural project. Proposal Final version. IICA, Office, Jamaica
- Mees, C., Esteban, N., Seddon-Brown, S. 2004: Policy and Management Strategy Document: Management of agro-chemicals for improved public and environmental health. A strategy for improved agro-chemical use and management for the wider Caribbean. Collaborators: CGPC, PCA Jamaica, MAFF St Lucia, CEHI, UWI, CCAM, CARDI & MRAG. DFID NRSP Project R7668. <http://www.mragltd.com>
- Simpson, L., 2003. Review of soil management and farming practices, including the use of agro-chemicals in the Caribbean, with particular reference to St Lucia and Jamaica. DFID NRSP Project R7668. CARDI (Jamaica). <http://www.mragltd.com>

Table 1: Import of fertilizers to Jamaica (1980-2000)

Fertiliser type	1980	1985	1990	1995	2000
	Kg				
Nitrogen (N)	26,195,566	15,520,274	14,191,987	21,848,061	26,241,372
Phosphorus (P)	10,669,848	807,497	12,702	224,085	62,970
Potassium (K)	2,603,044	166,036	362,920	13,026,587	13,264,092
NPK	0	2,722	430,060	53,614	316,757
PK	0	0	0	68	0
NP	716,767	3,110,224	907	12,633,669	11,258,763
NK	0	41,736	12,702	0	0
Other	3,629	2,570,381	3,018,587	7,847,313	178,039
Total	40,188,854	22,218,870	18,029,866	55,633,397	51,321,993

Table 2: Import of fertilizers to St Lucia (1981-2000)

Year	Import Quantity (mt)
1981	1076
1985	1878
1990	6757
1995	11,000
2000	5,300

Table 3: Summary of pesticide imports into Jamaica and St Lucia (1997-2002)*

Field of use	Island	Import quantity (kg)				
		1997	1998	1999-2000	2000-1	2001-2
Fungicide	Jamaica	192849.5	230674.4	1006287.6	1056017.0	877235.7
	St Lucia		3477.0	12854.5	6446.3	4495.8
Herbicide	Jamaica	649836.3	529554.3	689194.2	719799.6	963199.5
	St Lucia		17047.6	44251.0	22816.6	93274.5
Insecticide	Jamaica	597229.0	760503.1	728657.2	796512.5	1256888.9
	St Lucia		7850.9	102708.0	5429.3	534960.3
Nematicide	Jamaica	**	**	208840.0	158455.2	93563.0
	St Lucia					
Other	Jamaica	57450.4	126776.6	106698.6	86292.1	84111.0
	St Lucia		19074.4	14445.3	6722.5	40491.8

* The reporting year changed from calendar year to financial year (April-March) in 1999; data for January-March 1999 are not included in this table.

** Before 1999 nematicides were included with insecticides for Jamaica data.

N.B.: Data for St. Lucia began in 1998; St. Lucia does not record nematicides separately

Table 4: Total Imports of pesticides in selected Caribbean countries (1996-2000)

Country	Total Pesticide Imports (kg)				
	1996	1997	1998	1999	2000
Antigua & Barbuda	N/A	N/A	272,446	533,680	104,369
Dominica	574,200	499,323	410,496	4,783,153	608,722
St Vincent & Grenadines	679,365	1,480,189	783,703	2,109,236	N/A
Grenada	114,945	65,891	150,538	76,475	68,983
Suriname	6,271,481	15,946,805	7,894,401	N/A	N/A

(N/A: data not available)

Table 5: Observed effects of soil erosion on farms surveyed in Jamaica and St Lucia

Observed effects	Jamaica		St Lucia	
	No. of farms	% farms	No. of farms	% farms
Soil lost fertility	28	18.8	16	10.7
More stones visible	29	19.5	19	12.7
Rills and gullies on the land	46	30.9	36	24.0
Other	9	6.0	8	5.3

Table 6: Soil conservation method employed on the farms surveyed in Jamaica and St Lucia

Conservation method	Jamaica		St Lucia	
	No. of farms	% farms	No. of farms	% farms
Terracing	14	9.4	3	2.0
Contouring	44	29.5	29	19.3
Drains/trenches	71	47.7	117	78.0
Stone barriers	14	9.4	7	4.7
Grass barriers	26	17.4	4	2.7
Bamboo barriers	25	16.8	4	2.7
Hedgerows	5	3.4	0	-
None	31	20.8	15	10.0
Other	0	0.0	11	7.3

Table 7: Reasons for using agro-chemicals in Jamaica and St Lucia

Reason for agrochemical use	Jamaica		St Lucia	
	No. of farms	% farms	No. of farms	% farms
Increase yield	105	70.5	125	83.3
Improved appearance of produce	69	46.3	71	47.3
Other reason	6	4.0	13	8.7









