# Environmental Impacts of Lomé Trade Agreement and Fiji's Sugar Exports

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***Abstract***

*Trade agreements are seen as essential instruments to support economic growth. There, however, exist strong possibilities that as trade expands, the environment could be severely damaged by putting pressure on natural resources and the ecosystem. Benefits of trade agreements could be ambiguous. It is, thus, imperative to ascertain whether trade agreements contribute to sustainable development endeavours. The paper focuses on assessing the environmental effects of the Sugar Protocol of the Lomé Convention. It argues that there are deficiencies in the current institutional mechanism at the national level, and a lack of monitoring and evaluation at the ACP-EU level, to minimize the environmental problems associated with the Lomé trade agreement.*

## Introduction

The sugar industry in Fiji has been the mainstay of the Fijian economy for the last 125 years. One of the reasons why Fiji's sugar industry has survived, particularly after constitutional independence from Britain in 1970 and the subsequent government buyout of the sugar milling operations from the Australian multinational Colonial Sugar Refining Company, has been the preferential prices which Fiji's sugar has been getting in the UK. These price arrangements were institutionalised by the Sugar Protocol of the Lome Trade Agreement. Currently about 35 percent of the population is directly or indirectly dependent on the industry. The importance of the sugar industry to Fiji is further explained by the large multiplier effect of the sugar dollar. Sugar industry as compared to the tourism sector has a large domestic component. The preferential EU sugar price for Fiji has made significant contribution to the development of Fiji's economy and rural development and in the reduction of poverty (Prasad and Akram-Lodhi, 1998).

The sugar protocol provided a sustained market and price stability for Fiji's sugar, and sustained sugar farming as a productive activity. However, it is expected that negotiations under the WTO will lead to further liberalisation of trade thus affecting sugar prices which Fiji would be getting. With the erosion of preferential prices the Fiji sugar industry is unlikely to cope with global competition unless serious efficiency and diversification measures were put in place (Reddy, 2003).

The impact of sugar trade on the environment has not attracted much attention. If there were concerns raised about specific issues, they were not considered to be serious enough. This article provides a holistic picture of the impact of the sugar protocol on the environment in Fiji. We explain why some of the negative impacts may have taken place, and discuss possible policy implications for the future.

## Trade, Growth and Environment

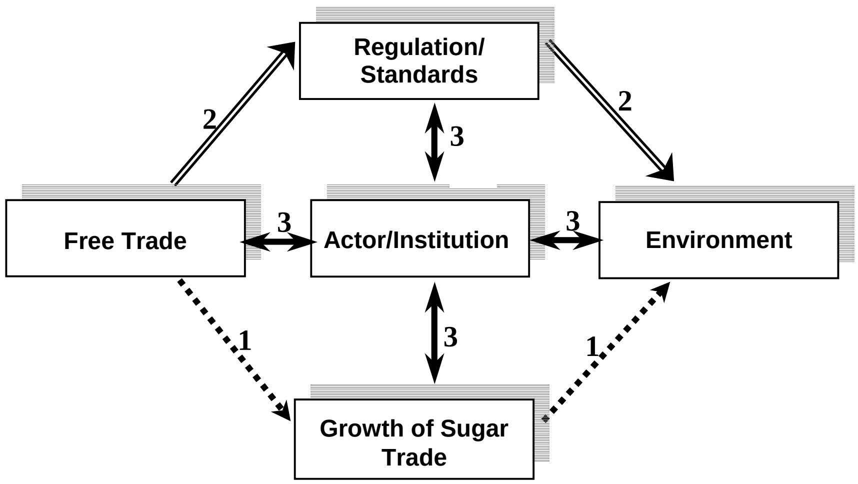
The theory of trade is based on the idea of comparative advantage and economies of scale, which lead to gains from trade that is beneficial to economic growth and efficiency (Bhagwati, 1993, Krueger, 1998). Cosbey (2002) summarises the positive and negative effects of the link between trade and economic growth and trade and environment. The positive effect results from increased wealth due to allocative efficiency, efficiency from competition and imported efficiency. The negative effects can occur in five ways. These include scale effects, income effects, competitive effects, direct effects and timing and transition effects. The scale effects refer to the increasing size of the economy and the resulting increase in environmental problems such as production of waste and use of more natural resources. It is also believed that scale effects are used to further the agenda of the wealthy, and support the call to 'grow now and green later'. Competitive effects could lead to lower environmental standards in some countries, as there could be a ‘race to the bottom’ by some in terms of lower environmental standards; in others, which are more powerful and developed, there could be race to the top in terms of protectionism with requirements of higher environmental standards. Other negative effects could result from direct trade of materials such as illicit drugs and hazardous wastes, as well as through the transitional effects.

While the link between trade and economic growth is somewhat clear where economists believe that the positive benefits of economic growth outweigh the negative effects (Stagl, 2002), the link between trade and improvements in environmental quality has not been clear. The link between trade and environment remains an empirical, and in many cases a controversial, issue. The theory of comparative advantage does not offer an explicit mechanism, which links increased trade with environmental change, whether positive or negative.

The link, however, is logical. Increased trade needs greater growth, which in turn not only uses more resources but also produces more by-products, including waste. This mechanism is captured in the Free Trade-Growth-Environment-Regulation Model (FTGER). Figure 1 shows this model, where the first level shows the causal links between free trade and growth of the industry. The model also shows how this growth affects the environment.

It ought to be noted that there are mixed views on whether free trade will lead to growth or to decline of an industry. In Brazil, free trade increased the volume of sugar traded purely because of efficiency and increased productivity that reduced the cost of producing sugar. Now Brazil competes in the open market. This could have also been true for Fiji if the Fiji sugar industry was as efficient. Currently, the Fiji sugar industry is plagued by many problems – bad management is one, land tenure problem is another, and politics the third. Thus free trade cannot by itself work to raise production. Unless corresponding reforms are effected. the link between free trade and increased production is rather tenuous. But trade generally tends to raise production. In the absence of institutional regulatory mechanisms, it affects the environment.

**Figure 1: The Free Trade-Growth-Environment Regulation Model**




## Lome and Environment

The Sugar Protocol has not come under spotlight for its environmental performance, although the protocol is annexed to the Lomé Convention. It is well understood that the environmental requirements as outlined in Lomé should equally apply to the Sugar Protocol. However it must be recognized that the Lomé regime gave prominence to the environment by stipulating environmental provisions. It started from Lomé II where Article 93 required projects and programmes to consider protection of the environment, while Article 112(e) stipulated that the appraisal of projects and programmes must take into account the effects of projects on the environment. During Lomé III, Article 28 focused on improving farming methods for rain-fed crops while conserving soil fertility. Article 39 emphasised protecting natural resources and exploiting them efficiently as the fundamental objectives for the ACP states. Lomé II was influenced by the fact that most institutions during that time (1980s) focused on conservation of natural resources or ecological sustainability.

However, by Lomé IV the focus changed to integrating environmental protection in the development policies with a wider goal of sustainable development. The environment was accepted in the agreement from a preventative approach, with the overriding objective of achieving a balance between economic growth and environmental protection and management. Article 33 highlighted that if the ACP states are concerned about their environment, then support from the European Community could be sought to bring an immediate improvement in the living conditions of the population and future generations. Article 34, called for the preparation and implementation of coherent modes of development that had due regard for ecological balances. Under Article 35, the ACP states could draw and implement long term policies at national, regional and international level to deal with various dimension of the environmental problem. Article 37 placed emphasis on designing and implementing appropriate environmental instruments such as checklists and Environmental Impact Assessments. Article 38 provided for European Union support towards efforts made by the ACP states at national, regional and international level in furtherance of national and intergovernmental policies and priorities. Article 40 emphasized community assistance to ACP states in obtaining technical information on chemicals and pesticides, to ensure safety at all stages. Article 42 looked at the protection of the natural environment to meet the objectives for agricultural cooperation, food security and rural development. Article 56 was on use of suitable techniques to maintain productivity of agricultural land and controlling soil erosion. Finally Article 77 focused on industrial development, manufacturing and processing based on an integrated and sustainable development strategy.

The Cotonou framework is centred on the objective of reducing and eventually eradicating poverty which is consistent with the objectives of sustainable development, and the gradual integration of ACP countries into the world economy. In defining this strategy further, the agreement emphasizes the economic, social, political, cultural and environmental dimensions of sustainable development (Nielson, 2000).

With regard to the environment, there is a separate section titled ‘thematic and cross-cutting issues’, under Article 32, on environment and natural resources. There is a major shift in the approach taken in the Cotonou Agreement to deal with the environment and natural resources. Environment is no longer compartmentalized and treated as a distinct issue of its own. It is now recognized that environment is a cross-cutting issue. The focus, thus, is on mainstreaming environmental sustainability into all aspects of development cooperation, and support programmes and projects. Another innovation seen in this document is embodied in Article 49, titled *Trade and Environment*, which outlines the environmental component for future trade regimes. This article aims to establish coherent national, regional and international policies reinforcing quality control of goods and services with respect to environmental protection. An improvement of environment–friendly production methods in relevant sectors is highlighted. There is also emphasis on cooperation in the field of standardization, certification, quality assurance and sanitary and phytosanitary measures. It is a clear sign that the Cotonou Agreement has incorporated environmental requirements essential for market access under the free trade concept to meet the WTO requirements.

The presence of these provisions in the Lomé regimes, however, does not necessarily imply that there was little or no damage to the environment. The economic effects of the trade agreement depend on the scale of economic activity between the EU and Fiji as trading partners under the Sugar Protocol. The sugar trade contributes to the growth of the industry and hence, indirectly, to flow–on of growth in the general economy over the Lomé period and now under the Cotonou agreement. The quantity of sugar produced increased over the years. Fiji began capturing the benefits of the preferential prices and adopted a policy of raising cane and sugar production without putting in place relevant policies on the environment.

**Production Performance**

A review of Fiji's Development Plans from 1971 to 1985 reveals that an objective of the government has been to raise sugar cane production and farm productivities, and to raise sugar production and mill efficiencies. During 1971-75, sugar production was limited to meeting the International Sugar Agreement quota and domestic demand. The government was mindful of the fact that there were no market outlets for expanded production. The miller was also reluctant to overproduce sugar, and therefore had carefully organized and controlled the production of cane through farm harvest quotas. With the coming into effect of the Sugar Protocol, the government made a conscious effort to expand output to the level of existing milling capacity (400,000 tonnes per annum). It established a new cane scheme in Vanua Levu (Seaqaqa Development Scheme). Both sugar

(Seaqaqa Development Scheme). Both sugar cane and sugar production virtually doubled from 1975 to the early 1980's. Table 1 show shows the trend in the production of sugar cane and raw sugar.

**Table 1: Sugar Cane and Sugar Production, 1968-2002**

| Year | Sugar Cane Production (M tonnes) | Sugar Production (000 tonnes) | Year | Sugar Cane Production (M tonnes) | Sugar Production (000 tonnes) |
|---|---|---|---|---|---|
| 1968 | 2.87 | 399 | 1986 | 4.11 | 502 |
| 1969 | 2.37 | 305 | 1987 | 2.96 | 401 |
| 1970 | 2.88 | 361 | 1988 | 3.19 | 363 |
| 1971 | 2.54 | 323 | 1989 | 4.10 | 461 |
| 1972 | 2.24 | 303 | 1990 | 4.02 | 408 |
| 1973 | 2.49 | 301 | 1991 | 3.38 | 389 |
| 1974 | 2.15 | 272 | 1992 | 3.53 | 426 |
| 1975 | 2.16 | 272 | 1993 | 3.70 | 442 |
| 1976 | 2.28 | 286 | 1994 | 4.06 | 517 |
| 1977 | 2.67 | 362 | 1995 | 4.11 | 454 |
| 1978 | 2.85 | 347 | 1996 | 4.38 | 454 |
| 1979 | 4.06 | 473 | 1997 | 3.28 | 347 |
| 1980 | 3.36 | 396 | 1998 | 2.10 | 266 |
| 1981 | 3.93 | 470 | 1999 | 3.96 | 377 |
| 1982 | 4.08 | 487 | 2000 | 3.79 | 341 |
| 1983 | 2.20 | 276 | 2001 | 2.82 | 293 |
| 1984 | 4.29 | 480 | 2002 | 3.42 | 330 |
| 1985 | 3.04 | 341 | | | |

(Source: Bureau of Statistics, various years)

As shown in Table 1, sugar output reached a peak of just over 517,000 in 1993-4 season. During 1990—95, sugar production averaged 439,000 tonnes, an increase of more than 50% compared to the average output in 1973–1975, the period immediately after localization of the industry but before the expansion programmes began. After 1995, however, production began declining.

The steady rise in sugar cane and sugar production since Fiji took over the industry in 1973 has been a direct result of the government's resolve to raise production and capitalise on the preferential prices which Fiji was getting abroad. The industry was well planned for growth, and while all the targets were not met, the industry grew significantly. The targets, however, did not come without costs. They placed great demands on the growers, the harvesting gangs, the mills, the workers, and the landlords. These combined, had significant consequences on the environment.

The growth in production until 1995 mainly reflected increases in the areas planted in sugarcane. From the time of signing of the Lomé I, land area under cane increased enormously. Within a decade it rose from 74,322 ha to 92,603 ha. Table 2 shows the trend in cane contracts, and land contracted for cane growing.

**Table 2: Expansion of Sugar Cane Crop, 1966–2002**

| Year | No. of Cane Contracts | Land contracted to grow cane (ha) |
|---|---|---|
| 1966 | 15,579 | 45,000 |
| 1976 | 17,197 | 74,322 |
| 1986 | 22,182 | 92,603 |
| 1996 | 22,339 | 97,699 |
| 2002 | 21,246 | 65,000 |

(Source: FSC Reports)

Table 3 provides a more detailed picture of the area cultivated for sugar cane during pre-Lomé and Lomé periods. It shows continuous increase over every decade until 1996. After 1997, however, land area used for cane cultivation began declining as progressively greater number of land leases were not renewed.

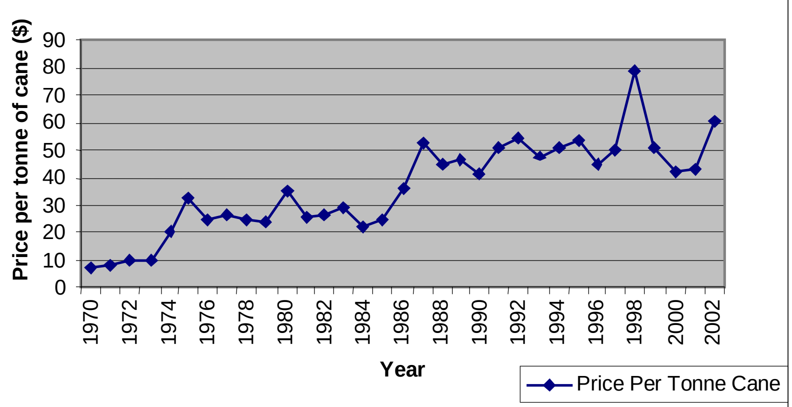
**Table 3: Area Used for Cane Cultivation, 1931-96**

| Period | Total Area (ha) |
|---|---|
| 1931–1940 | 31,938 |
| 1941–1950 | 37,397 |
| 1951–1960 | 38,043 |
| 1961–1970 | 52,180 |
| 1971–1980 | 66,939 |
| 1981–1990 | 88,003 |
| 1991–1995 | 99,357 |
| 1996 | 97,699 |

(Source: Gawander 1998)

The success of the industry in terms of raising production lay significantly on the higher sugar price under Lomé, as well as the reduced market risk provided by a guaranteed minimum quota. Under Lome, prices were 3 to 4 times more than the world market price. The industry also did not need to unnecessarily worry over the volume of sugar exported as there was certainty over the quotas under the Sugar Protocol. It ought, however, to be noted that the single largest boost to the industry was provided by the rise in the price of sugar cane paid to cane growers after the government took over the milling operations. Figure 2 provides the trend in sugar cane price paid to growers from 1970 to 2002.

**Fig. 2: Price of Sugar Cane, 1970-2002 (FJD)**




Source: Bureau of Statistics, various years)

Occasional devaluations of the currency also boosted domestic sugar cane prices. The increased sugar price which Fiji was getting raised its foreign exchange earnings, thereby enabling the state to expand the sugar industry. The relatively higher sugar cane prices meant that farmers also received the necessary incentives to raise production. Lending by the Fiji Development Bank rose rapidly after 1973 (Rao, 2003).

Several factors contributed to the growth of the industry. These include higher sugar price, reduced market risk, government policy on expansion, and access to low interest loans to farmers for farm capital improvement.

While the industry grew and provided significant benefits to the economy, it also had adverse consequences on the environment.

In the absence of effective environmental policies and regulations, increased economic activity generated by trade often tends to contribute to environmental problems. Any form of economic activity, be it in agriculture, industry or the service sector, involves utilization of environmental or natural resources in one form or another (APO, 2001). In this sense, the growth of the sugar industry has also had significant consequences on the environment. The Sugar Protocol of the Lomé trade agreement gave impetus for growth that enabled the sugar industry to expand the production of sugarcane. This means that more land had to be brought into cultivation, and more cane needed to be processed. These two aspects of the industry, in turn, generated two sets of environmental consequences.

On the input side, more land, including progressively marginal land, had to be brought into cultivation, and land had to be intensively used. On the output side, a commensurately greater volume of waste products were being produced.

## Farm Level Environmental Damage

A major source of farm level environmental damage concerns the expansion of sugarcane farming into marginal land. This causes significantly more soil degradation due to the replacement of natural soil cover by sugar cane, and greater use of additives to boost soil nutrients. The latter has an impact on riparian, fresh water and marine environment. Increasing use of marginal land for cane production increases the loss of bio-diversity resulting from greater mono-cropping. Rougher terrain also makes cane transportation more weather-sensitive, thereby leading farmers to practice methods of queue jumping, including cane burning, to get their cane harvested during the dry spells. Soil erosion is another major outcome of the process.

### *Soil Erosion*

Until the early sixties, sugarcane was largely grown on moderately fertile coastal soils. The expansion of the industry gradually expanded cane production to moderately steep and then to very steep hilly lands (Gawander 1998). Farmers calculate the viability of their farms in terms of not only the direct cost of production of sugar cane on their farm, but also on the basis of its delivery to the sugar mills.

Thus, when one speaks of the cost of production, one refers to the costs to mill gate. Generally, the cost of production on lower quality land, and on land progressively further away from the mills, is higher than the cost on better quality, flat land, and land closer to the mills.

The viability of farms on marginal lands, however, has been maintained by sugar cane prices which are results of preferential prices. For some time now, it has been claimed that Fiji has been helped in its policy of bringing marginal land into use by preferential long-term marketing arrangements (see Clarke & Morrison 1987; Gawander 1998; Leslie and Ratukalou 2002). Much land that would otherwise be unprofitable to farm was made economically viable under the Sugar Protocol. Government policies in late 70s and 80s supported the expansion of the industry to marginal land.

A World Bank (undated) case study on Seaqaqa Development Project in the mid-seventies shows that expansion into marginal land has not only caused soil erosion, but also led to the disappearance of 8,000 ha of forest. The loss of biodiversity due to clearing of the forest is unknown.

But what is 'marginal land'? The answer to this question lies in the nature of activity one is referring to.

In 1965, Twyford and Wright categorized land on the basis of whether land in its natural state were suitable for agriculture or not, and if it were, then how much modification to it were necessary to render it suitable. On the basis of the Twyford and Wright classification, the Fiji Landuse Capability Classification (1977) was developed. Table 4 shows the details of the classification.

On the basis of the Fiji Landuse Classification, land in classes I to IV can be used for agriculture. But classes III and IV require extensive conservation methods if agriculture and land is to be sustained. Class IV land is clearly regarded as marginal land.

Table 5 provides data on cane farming by land classes. It shows that between 1984 and 2001 in Nadi, Rarawai, Labasa and Penang there was a marginal increase in the use of flat land for cane cultivation. This is explained by the substitution of sugar cane for other crops on these lands. Table 5 reveals two interesting features of cane cultivation. First, except for Lautoka, there was an increase in the number of growers farming on rolling areas. Second, except for Lautoka and Seaqaqa, the use of steep land for farming increased from 1984.

**Table 4: Landuse Capability Classification**

| Categories | Classes | Characteristics |
|---|---|---|
| Flat (0–3$^0$) | Class 1 | Land suited to permanent agriculture; no erosion risk; no special soil conservation measures required. |
| Undulating to Rolling (4–15$^0$) | Class II – (4–7$^0$)<br>Class III – (8–11$^0$)<br>Class IV– (12–15$^0$) | Class II: good arable land; fertile to moderately fertile; simple conservation practices needed to overcome soil limitations.<br>Class III: requires intensive conservation measures; moderately stony or infertile soils.<br>Class IV: marginal arable land with severe limitations on the choice of crops grown; stony or bouldery soil; very shallow soils; infertile. Largely unsuited for agriculture. |
| Steep land (16– 20$^0$ ) | Class V– (16–20$^0$) | Land is unsuitable for arable cropping but suitable for pastoral or forestry use. |
| Very Steep Land (21$^0$ plus) | Class VI– (21–25$^0$)<br>Class VII– (26–35$^0$)<br>Class VIII– Above an altitude of 800m | Class VI: marginal pastoral land with moderate to severe limitations. Commercial forestry is the preferred land use.<br>Class VII: unsuitable for pastoral use and marginal for commercial forestry.<br>Class VIII: land unsuitable for productive use in both agriculture and forestry. Best protected or reserved. |

(Source: Fiji Landuse Section and Twyford and Wright's classification (1965))

**Table 5: Number of Growers under Areas Classified Flat, Rolling, Steep and Very Steep – 1984 and 2001***

| Districts | 1984 | | | | 2001 | | | |
|---|---|---|---|---|---|---|---|---|
| | Flat | Rolling | Steep | Very Steep | Flat | Rolling | Steep | Very Steep |
| Lautoka | 1072 | 1546 | 721 | 54 | 981 | 1501 | 703 | 54 |
| Nadi | 1375 | 2094 | 475 | 59 | 1487 | 2342 | 508 | 59 |
| Sigatoka | 1050 | 1104 | 128 | 7 | 951 | 1540 | 276 | 7 |
| Rarawai | 1182 | 2001 | 702 | 192 | 1287 | 2229 | 823 | 192 |
| Tavua | 454 | 993 | 177 | 39 | 452 | 1539 | 358 | 39 |
| Labasa | 1481 | 2052 | 699 | 143 | 1558 | 2314 | 752 | 143 |
| Seaqaqa | 748 | 769 | 623 | 464 | 734 | 794 | 617 | 464 |
| Penang | 553 | 1051 | 334 | 24 | 558 | 1073 | 340 | 24 |

* The same classification is used by the FSC as the Landuse capability classification (Source: FSC)

Applying the Landuse classification, there are 4,377 farmers planting sugarcane on steep land, i.e., land with a slope of 16$^0$–20$^0$.

Taking 4.6 hectares as the average farm size, with an average of 3.68 hectares under cultivation (Barrack and May, 1997), 16,107 ha of land was under cultivation on unsuitable land in 2001. Similarly, 982 farmers were cultivating 4,400 ha of very steep land with a slope of above $21^0$.

By world standards land with slopes greater than $8^0$ would be considered unsuitable for growing sugarcane without unacceptable damage to the environment. (Galletly and Swartz, 1974). In Fiji, the Agriculture Ministry's Land Use Section restricts cane cultivation on slopes of $11^0$ and above, although the FSC and NLTB have allowed cultivation on slopes greater than $20^0$ (Leslie & Ratukalou, 2002).

The country's high dependence on the sugar industry to some extent explains the motivation of the Ministry of Agriculture to increase the degree of slope from $8^0$ to $11^0$ to allow cane farming, and their support for production, rather than conservation. Farmers working on slopes greater than $11^0$ commonly do not put in place any soil conservation measures. Over a short period of time, many of these areas experience soil depletion, soil moisture deficits and low productivity (Leslie & Ratukalou, 2002). Surface water run-off from steep land is greater that that from flatter lands. With larger surface run-off, there is also larger soil erosion.

Between 1992-95 the FSC carried out a study on surface run-off at Drasa in Lautoka. Table 6 provides the surface run-off data for different types of cultivation. According to FSC surface run-off was greatest on the bare soil plot that runs uphill/downhill, being $2979m^3$/ha (SCRC, 1995). The least run-off was observed under contour planting with trash conservation, where the volume of run-off was only 310 $m^3$/ha.

The Drasa study shows that the erosion rate was greatest on the bare plots without cane, while contour planting with plant cover effectively reduced the amount of soil loss. The annual rate of soil loss ranged from 1.2 tonnes/ha/year on the contoured trash conserved plot, to 14.4 tonnes/ha/year on the uphill/downhill bare soil plot.

The FSC has also established the link between soil erosion induced by the various conservation practices with cane growth and the final yield. Table 7 shows the links.

Table 7 shows that the contoured plot with trash conservation, which had least amount of run-off and erosion, produced the highest cane yield at 77 tonnes/ha, followed by contouring without trash at 51 tonnes/ha. The uphill/downhill plot without trash produced only 47t/ha or 39% less than the trash conserved contour plot. The total cane yield from four successive crops was 342 tonnes/ha on the trash conserved contoured plot, compared with 285 and 258 tonnes/ha respectively on the contour and uphill/downhill plots without trash.

**Table 6: Effect of Conservation Practice on Surface Run-off and Soil Erosion on an Oxisol with 7% Slope at Drasa**

| Conservation Practice | Run-off ($m^3$/ha) | | | | | Erosion (kg/ha) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Plant | 1R | 2R | 3R | Sum | Plant | 1R | 2R | 3R | Sum |
| Contour without trash | 33 | 182 | 205 | 552 | 972 | 182 | 779 | 776 | 2896 | 4633 |
| Contour with trash conserv. | 46 | 72 | 66 | 310 | 494 | 294 | 232 | 162 | 1214 | 1902 |
| Contoured bare soil | 96 | 575 | 908 | 1263 | 2842 | 592 | 3831 | 3624 | 9555 | 17602 |
| Up/down hill without trash | 299 | 969 | 556 | 888 | 2712 | 601 | 2326 | 899 | 2835 | 6661 |
| Up/down hill bare soil | 583 | 2269 | 2765 | 2979 | 8596 | 1565 | 11417 | 6297 | 14376 | 33655 |
| Annual Rainfall (mm) | 1185 | 1718 | 1555 | 1359 | 5817 | 1185 | 1718 | 1555 | 1359 | 5817 |

* 1R - first ratoon; 2R - second ratoon; 3R - third ratoon.
(Source: FSC)

**Table 7: Cane and Sugar Yield Affected by Soil Erosion Induced by Various Conservation Practices**

| Conservation Practice | Cane yield (t/ha) | | | | | Sugar Yield (t/ha) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Plant | 1R | 2R | 3R | Sum | Plant | 1R | 2R | 3R | Sum |
| Contour without trash | 99 | 71 | 64 | 51 | 285 | 11.0 | 7.7 | 9.1 | 5.6 | 33.4 |
| Contour with trash | 96 | 86 | 83 | 77 | 342 | 11.7 | 9.8 | 12.2 | 8.5 | 42.2 |
| Up/down hill without trash | 98 | 58 | 55 | 47 | 258 | 10.9 | 6.4 | 8.1 | 5.0 | 30.4 |
| Co-efficient Variance% | 11 | 9 | 12 | 18 | - | 12 | 12 | 14 | 18 | - |
| Significance | NS | 1% | 1% | 1% | - | ns | 1% | 1% | 1% | - |

(Source: FSC)

The results obtained from the FSC study clearly show that good soil conservation practice (contouring combined with trash conservation) can reduce run-off and soil erosion. When the amount of run-off and soil loss is lower, more water and nutrients are available for cane growth, resulting in higher yields.

To evaluate erosion of a nigrescent soil on a steep slope of 20%, a trial was established by FSC at Naikabula. The highest run-off of 2081m$^3$/ha occurred following uphill/downhill planting compared with 891m$^3$/ha on the conventional contour-planted plot. When the minimum tillage planting was used, run-off was further reduced to 761 m$^3$/ha. The results, given in Table 8, show that planting by minimum tillage on the contour is required to conserve soil and water on hilly land.

**Table 8: Effect of Conservation Practice on Surface Run-off and Soil Erosion on a Nigrescent Soil with 20% Slope at Naikabula**

| Conservation Practice | Run off (m$^3$/ ha) | Erosion (t/ha) |
|---|---|---|
| Conventional contour planting | 918 | 5.29 |
| Contour planting by minimum tillage | 761 | 3.13 |
| Up/down hill planting | 2081 | 17.20 |
| Rainfall (mm) | 1319 | Data not available |

(Source: FSC)

The capability of the land within conservation limits, which should be the basis for assessment, is often ignored by the FSC and the farmers. Steep land soils are susceptible to erosion. This represents a serious threat to sustainability and will eventually lead to significant soil degradation. Fertilizers and pesticides applied on a soil that is depleted both physically and nutritionally is wasteful of resources. During rainy seasons it washes off the farm, into the rivers and waterways, causing undesirable effects on the environment.

Soil-loss measurements clearly demonstrate that the agricultural productive base in many sugarcane areas is eroding at a rate that is higher than what would be regarded as normal for tropical areas, which is 13.5 tonnes/ha/year (Nelson, 1987). Soil losses from 5–29$^0$ slopes in sugar growing areas is about 22–80 tonnes/ha/year.

Conserving soil fertility by preventing soil erosion has been reiterated in Lomé III, Article 28 and Lomé IV, Article 56 under general provisions for cooperation, as follows:

- Development of production calls for improving farming methods for rain-fed crops while conserving soil fertility …….Article 28- Lomé III

- The use of suitable techniques to maintain productivity of the agricultural land and controlling soil erosion. Article 56 – Lomé IV

While, thus, there are some provisions in Lome for soil conservation, in reality very little has been done to control soil degradation. So far, there has been no audit in the extent to which these provisions have been abided by. No stakeholder – government, FSC, farmer, or landowner – has ever asked for such an environmental audit.

During the CSR days the sugar industry used vetiver grass (vetiveria zizanioides) over a 50-year period as a vegetative soil conservation technique to prevent soil erosion. However, the use of vetiver grass was abandoned in the 1970s after FSC took over the milling and management of the sugar industry; it continues to be overlooked. It is apparent that despite the elaborate implementation and monitoring procedures in the Lomé text, soil erosion continues to be a critical issue for Fiji (NES Report, 1993). It reflects the ineffectiveness of the Lomé agreements in protecting the environment as a result of poor institutional mechanism in Fiji.

*Impact on Riparian, Fresh Water and Marine Environments*

There are three consequences of sugarcane production that are detrimental to coastal catchments. These are: extensive vegetation clearing in the riparian zones of rivers and floodplains; soil erosion, causing stream/river sedimentation; and contamination of water bodies with nutrients, pesticides and herbicides. In Fiji, however, there is a large knowledge gap in this area, which suggests the need for ecological research to understand how such environments are affected by sugarcane production.

What is known, however, is that the riparian zones form a buffer between streams and agricultural systems, performing a filtering function, which reduces the concentration of nutrients, pesticides and suspended sediment in run-off water to water bodies. It helps to reduce soil loss from bank erosion, and from run-offs (Moss et al, 1996). In Fiji, sugarcane is grown at the edge of the rivers and streams, leaving no riparian vegetation. This means that in the absence of a buffer, the run-offs containing valuable agricultural resources (top soil, fertilizers etc.) enter freely into the water bodies. High sedimentation loads have destroyed the wetlands through extensive cultivation of sugarcane. Streams cleared of riparian vegetation in agricultural areas are often choked by the expansive growth of aquatic and semi-aquatic plants (Knight and Bottorff, 1981).

Streams and rivers running through cane fields drain into other water bodies such as estuaries and the sea carrying nutrient loads. Leslie and Ratukalou (2002) reported that erosion over the years has led to thinning of topsoil and the progressive siltation of rivers, and resulted in deterioration of drainage on river flats, frequent flooding and the formation of shallow bars across the river mouths. Eroded soil and nutrients make their way into streams and rivers, and finally reach the marine environment.

A marine survey undertaken at Vuda Point showed a relationship between the foreshore marine environment and Vuda and Sabeto Rivers (Watling, 2002). The changing activities in the catchments affected these and other rivers that drain into the Nadi Bay. Over the last 20–30 years, there have been substantial land use changes in the hinterland of Nadi Bay, which have affected the hydrology and water quality of rivers draining into the Bay. Significant expansion and intensified cane cultivation on steeper slopes is increasing the supply of sediment and fertilizer being carried into the Bay. This has affected the sensitive coral and associated communities (Watling, 2002). Rogers (1979) reported that the suspended sediments could exclude light, leading to coral death.

The expansion of cane belt has contributed to the increased use of fertilizers. The total cost of fertilizers used by the industry exceeded eighteen million dollars in 1995 (Mangal, undated). A portion of this increased fertilizer usage may find its way into the ground water, streams and sea, affecting living organisms. Wood (1975) confirmed that elevated concentrations of one or more nutrients can upset the ecological balance of aquatic systems and cause problems of eutrophication, such as algal blooms and excessive growth of aquatic macrophytes.

### *Sugar Cane Burning*

Controlled burning of leaves and other trash to remove hornets is a known practice in most sugar producing countries. However, what is unusual is harvesting non-green cane by burning, a practice which has become rampant in Fiji during the past decade**.** The FSC estimates that over 95% of all burning is deliberate while around 5% is accidental, caused by lightning, carelessness or neighbourhood conflicts.

Burning has serious consequences on the environment. Trash is burned at a time when the rainy season sets in, thus exposing the soil surface to high intensity rainfall. This causes severe sheet erosion on sloping land and depletes the fertility of the soil. Any reduction in soil fertility affects the quantity and quality of sugar cane. Burning of green cane makes processing expensive and less efficient. It produces a large quantity of wastes and requires extra chemicals for clarification. The cane fire, with an extreme heat of up to 400 degrees, is the root cause of nutrient loss such as nitrogen, sulphur and carbon to the atmosphere (Raison, 1979). It also destroys the soil texture, organic matter and the micro-organisms.

Continuous burning reduces the porosity of the soils and their capacity to hold nutrients and water. Burning also releases greenhouse gases, and diminishes energy potential of bagasse fibres. Evidence of the effects of burning on sugar recovery relates to the accumulation of dextran, a stubborn impurity that interferes with both milling, and later refining, operations (Davies, 1998). To improve the quality of sugar, dextran must be reduced. This is done by using chemicals and enzymes. Production of a larger quantity of molasses is also an indication of the poor sugar recovery rate with regard to processing burnt cane. After 1989 the incidence of burning increased significantly, which shows that the penalty system under the Master Award is an ineffective deterrent.[1]

*Land Lease Impact*

The insecurity of land tenure has also had a deleterious impact on land. There is no incentive for farmers to practice good husbandry closer to the expiry of the leases (Prasad, 1998). So far there has been

[1] The master Award is a contract between the FSC and the cane farmers. This is negotiated periodically. A new contract was negotiated in 1989; some of its provisions were changed in early 1990's. Under the contract, burnt cane receives a lesser price which goes into a 'Burnt Cane Fund'. This fund is then divided between the millers and those growers who deliver green cane according to the formula for burnt cane.

no study on the impact of land tenure on management of leased land in Fiji. It is assumed that the requirements under the lease arrangements are carried out in practice. The Native Lands Trust Board (NLTB) acts as an agent on behalf of the landowners and stipulates its own policy on proper landuse practices. Any improvement on the farms requires prior consent of the NLTB. If this consent is not given then the tenant is not eligible for any compensation for land improvement at the expiry of leases under Clause 40(1) of the Agricultural Landlords and Tenants Act (ALTA).

Most leaseholders undertake improvements to enhance productivity at the beginning of their lease tenure. Towards the expiry of the lease, there is more intensive use of the land through investment in movable capital. This implies that permanent features such as contours, and long-term soil erosion measures are not usually undertaken.

For conservation purposes the following improvements are stipulated in ALTA: clearing of land, establishment of watercourse measures, drainage, establishment of soil erosion control barriers, establishment of contour terrace systems, irrigation and water works, leveling and terracing, and reclamation of land. A survey found that about 95 percent of the farmers undertook substantial improvement on the farms at the beginning of their leases but 78 percent did not seek permission from the NLTB or inform it of the improvements they made (Prasad, 1998). The same study found that about 41 percent of the farmers felt that improvements on land attracted greater rent assessment by the NLTB. This means that farmers who undertake capital improvements and who enhance productivity are taxed in the form of higher rents. As optimizers, farmers tend to avoid carrying out any improvement, and where they do, to avoid informing the NLTB of these. Other studies also confirm this (see for example, Overton, 1994).

Farmers also find that the cost of negotiation on matters relating to investment and improvements is very high. An efficient contract should help internalise costs and benefits but the provisions in ALTA do not do these. This is not the case with the land lease regime in Fiji.

Finally, the institutional environment – where agricultural margins are extremely low (Reddy, 2003) and where there is significant uncertainty on renewal of leases – creates tendencies which do not encourage environmentally sound cultivation and land management practices.

## Environmental Damage as a result of Mill Operation

The second set of environmental impact emerges from the activities related to processing sugar cane. Processing is done by the Fiji Sugar Corporation. The government owns 68% of the company. There are four sugar mills, at Lautoka, Rarawai, Labasa and Penang. None of these mills has any environmental management policy. The Labasa Mill adopted a comprehensive environmental management policy, under the auspices of APO's Green Productivity project, but the system is not operational.

Several studies have indicated that sugar mill effluents are a source of river pollution, which leads to low dissolved oxygen levels and increased temperature (Gangaiya & Green 1991; Tamata & Kubuabola 1996; Fung & Chand 1996; Greenwood 1981; FSC Report 1996, 1997 and 2002; and MAFF Report 1999). Other environmental problems emerge from air pollution, chemical spills, and improper bagasse storage. Nawadra (1995), for example, points out that bagasse stockpiles in Labasa caught fire once leading to evacuation of patients and staff from the Labasa hospital.

### *Solid Waste Management*

Solid waste management is a major problem at all the sugar mills. A large quantity of solid waste is produced from mills. Table 9 shows some of these products.

There is indiscriminate dumping of bagasse and millmud at and around all mill sites. The burning of bagasse in the mills produces a considerable volume of ash. No particular use has so far been identified for this material. Storage of these wastes requires land, which incurs costs to the FSC without any financial returns.

**Table 9: Approximate Waste Levels - Tonnes per season, 2002**

| Mill | Crop (m tonnes) | TCHP* | Bagasse | Mill Mud | Dry Ash | Torri Water (M tonnes) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Evaps | Pans | Total |
| Lautoka | 1.0 | 350 | 252632 | 0 | 20211 | 6.341 | 4.002 | 10.343 |
| Rarawai | 0.9 | 300 | 227368 | 27000 | 18189 | 6.658 | 3.602 | 10.260 |
| Labasa | 0.9 | 320 | 227368 | 27000 | 18189 | 6.242 | 3.602 | 9.844 |
| Penang | 0.3 | 100 | 75789 | 9000 | 6063 | 6.658 | 1.201 | 7.858 |
| Total | 3.10 | | 783158 | 63000 | 62653 | 25.899 | 12.407 | 38.305 |

* TCHP – tones of cane crushed per hour
(Source: FSC)

The cane variety grown in the Labasa and the Rarawai mill areas has high fibre content thus produce large quantities of bagasse, which the mills find difficult to dispose of. The Lautoka and Penang Mills are the only two mills that use the bagasse completely in the boilers, thus avoiding the problem of stockpiles. However, these mills do require land to store mill mud and ash. Bagasse stockpiles are stored directly on unlined ground. The chances of leachates contaminating ground water are considerable. No study has been done so far on whether this is a significant problem.

In Rarawai, sugar retention in bagasse is 7%. This is very high vis-à-vis the rates at Lautoka (2.5%) and Labasa (4%) mills. The two mills that produce excess bagasse also have high sugar retention, so the chances of pollution are even greater.

Mill mud and ash are also dumped close to the river banks; this has completely destroyed the riparian vegetation there. In Labasa, the old stockpile of bagasse is stored along the Qawa river bank. During heavy rain bagasse stockpiles slip into the river, affecting the ecological balance of the river.

Using data from Tables 1 and 9, one can calculate the amount of solid waste produced per season. This is shown in Table 10.

**Table 10: Waste Production per Tonne of Sugar**

| | 1976 Tonnes | 1976 Per tonne of Sugar | 1996 Tonnes | 1996 Per tonne of Sugar |
|---|---|---|---|---|
| Mill mud | 68,486 | 0.24 | 131,387 | 0.29 |
| Ash | 46,139 | 0.16 | 88,515 | 0.19 |
| Bagasse | 584,946 | 2.0 | 1,106,415 | 2.44 |
| Water | 23,612,042 | 82.56 | 45,298,147 | 99.76 |

(Data Source: Tables 1 and 9)

This table shows that the amount of solid waste produced per season has doubled from 1976 to 1996. In 1976, the mills produced 584,946 tonnes of bagasse per season which rose to 1.1 million tonnes by 1996. Similarly, mill mud produced increased from 68,486 in 1976 to 131,387 tonnes in 1996. All the sugar mills are located in urban/peri urban areas. As such, such an increase in solid wastes is difficult to manage for an island nation, particularly when pressure for urban and peri-urban land is rising.

Table 10 also shows that the sugar mills have become more waste-inefficient. The production of mill-mud, ash, and bagasse, as well as water use, per tonne of sugar produced all increased between 1976 and 1996. Mill mud produced per ton of sugar rose by 21%, ash produced per ton of sugar rose by 19% while bagasse produced per ton of sugar rose by 22% during the 20-year period 1976-1996. The main technical causes of the increase in production of wastes per tonne of sugar produced during the two decades 1976-1996, is not known in precise terms, tough two likely factors are diseconomies of scale and the deteriorating mill efficiencies.

*Pollution of Water Bodies*

For each season the four mills draw up to 38.3 million metric tons of water either from rivers (Labasa and Rarawai Mills), sea (Lautoka Mill) or creeks (Penang Mill) for cooling purposes. The used water is then discharged into the water bodies. The discharges are with extra heat, thereby causing the temperature of the discharged water to be higher than the receiving waters. Since none of the mills have a closed circuit cooling system, the receiving waters get polluted from the torri water either by heat or nutrient load (sugar loss).

Table 10 shows that in 1976 approximately 82.5 tonnes of water was used to process one tonne of sugar. By 1996, water usage increased to 99.8 tonnes, an increase of 21%. The used water contains pollutants; it is released with extra heat and other impurities into the water outlets.

Water pollution is a major problem facing all four mills. A Ministry of Agriculture, Forests and Fisheries Report (1999) stated that the water quality measurements taken from Labasa, Wailevu and Qawa rivers showed that the Labasa and Wailevu rivers had acceptable water quality readings, as compared to the Qawa River, which has critical water quality deficiencies during the crushing season. The Labasa mill is located on the banks of the Qawa River. The critical parameter for the Qawa River is the extremely low ‘dissolved oxygen’ (DO) readings during the crushing season. Dissolved oxygen readings for the Qawa River fell well below the acceptable threshold limit of 4.00mg/l. This report concluded that the deficiency is due to sugar mill effluent, because the low readings only occur during the crushing season.

Similar results had been obtained by Tamata et al. (1996) and Fung & Chand (1996), who studied water quality of the Qawa River during pre-and post-crushing seasons. The conclusion drawn from these studies makes the FSC directly responsible for the low DO levels and high BOD (biological oxygen demand) levels, which are the indices of pollution.

Colour or ‘condition’ is an empirical determinant of the state of any waste water; it is often taken to reflect the health of the water (Patrick 1996). During crushing, the Qawa River around and downstream from the mill is often black in colour, which is associated with ‘septic’ waters that have decomposed anaerobically. The effluent discharge from the sugar mill results from the cooling water. Mixed with the cooling water is the process water, which consists of flows from numerous foulces, including juice spills, various leaks, lubricating oils and greases, caustic wash, molasses and particulates such as bagasse and mill mud.

Conditions indicative of an anaerobic water environment include fish kills, which are frequently reported through the media. Heat load is a major problem for the river system. If the Penang and the Labasa mills increase their throughputs, the waterways will be seriously affected by the heat load (FSC, 2002). Poor river water quality also affects people dependent on supplementary income from the river. The Ministry of Agriculture, Forests and Fisheries Report (1999) undertook a fisheries survey, which pointed to the dwindling population of fish in the Qawa River and the decimation of the kai (mussel) fishery.

There are two sources of torri water getting contaminated by sugar. The first source is from crystallizing pans and evaporators. If the boiling level exceeds the safety level, sugar goes up through the arresters into the torri water. The second is when the equipment and plugs fail. Such action causes not only environmental problems, but also loss of revenue, as a result of sugar loss, as well as of costs incurred in treating wastes. The Labasa Mill is the only mill with detectors to gauge the boiling point, but this hasn’t improved the intensity of pollution in the Qawa River.

Although mills have recovery pits (recycling) to collect spilt juices, the installed systems are not fully utilized and are not being operated correctly (FSC Report, 1996). When pumps leak, the juice floats on the ground floor with too many impurities for recycling, and in cases where pit pumps and ejectors break down, the deteriorated juice is sent to the effluent pond (Labasa Mill Report, 1998). In addition, all mills require floor (proper slopes) and drain upgrading to benefit from the recovery system, given that leakages and spillages are a problem in all mills (Buikoto, 2002). Although there are waste-water treatment plants in Rarawai, Labasa and Penang Mills it makes little difference to the problem of waste water. In principle, any spill-over from the production process and pollutants should be directed into these effluent treatment ponds. In the Penang Mill there is a series of pollution ponds to capture process waste water and caustic limes. After a period of retention in settling ponds, where some degree of waste treatment is intended, the effluents are periodically released with a very high BOD value into nearby waterways. Discharges from these are also directed to the river since the capacity of the ponds has been exceeded (FSC Report, 2001b). The treatment ponds are not performing in accordance with the design. In Labasa, for example, the flow rate is up to 5 times that allowed in the design, and BOD loading up to 10 times the design figure (FSC, 1997). For the Penang Mill the amount, rate and the content of waste is unknown (Buikoto, 2002). In the case of the Lautoka mill, there is neither any treatment plant for the stale juice or the waste water from the weekly cleaning of vessels. The effluents are discharged directly into the main drain that opens at the foreshore area. This adversely affects marine life.

Bagasse and mill mud spills also enter the drains that carry torri water, as is the case in Penang Mill. Other mills also have the same problem. The 1996 FSC Report 1996 stated that suspended solids in the foul drains and boiler drains range from 20 to over 200 mg/l. This is not unexpected, given the amount of bagasse and other solids currently entering the drains**.** Given that the bagasse is cellulose, and is highly resistant to decomposition, there is even more reason why bagasse should not be allowed to enter the waste treatment plant and other water bodies. The impact of the discharge is further aggravated by the tidal influence, which traps the contaminant plume over the years, ultimately requiring dredging. De-sludging of the treatment ponds is done once in three–to–five years. In most cases the disposal location of the sludge is unknown. The Rarawai and the Penang mills have no indication of where the sludge is dumped, because they perceive it as a contractors’ responsibility.

*Disposal of Liquid Wastes*

During the production process, the un-limed juice can be kept for 24 hours, whereas limed juice lasts 48 hours and the clarified juice for a longer period. The problem arises when there are frequent mill breakdowns, and of longer durations than 24 to 48 hours. In this case, unlimed juice over 24 hours and limed juice over 48 hours – called stale juice - needs to be disposed. The juice can be converted into molasses. But this is not the core business of FSC. Often, to avoid the whole process being held up by tying up the limited number of vessels in the conversion of the juices to molasses, the stale juice is disposed.

In September 2002, the Penang mill buried 15.2 tonnes of sugar juice into a pit because of a 52–hour mechanical breakdown (Buikoto, 2002). In 1998 and 1999, the Labasa mill discarded 790 and 605 tonnes of syrup respectively (Labasa Mill Report 1999). The Labasa Mill Report (1999) acknowledged that the occasional breakdown of plants always left their environment in an unhealthy state.

A Lautoka mill report (2001) gave an account of hours and reasons for mill stoppage due to inside and outside factors. Outside factors such as rain, transport and sundry amounted to 1079.8 hrs and averaged out at 44 hours per week. The total inside stops, due to mill breakdowns, amounted to 582.3 hrs and averaged 23.8 hrs per week. Of the total potential of 168 hours per week, the mill crushed for 95.1 hours - an average of 57% of capacity. On average, the mill is inoperative for 43% of the cane crushing season.

When a machine stops operating, the FSC incurs losses in overheads, labour costs and material costs. For the environment it means that unnecessary energy is used to start and stop the mill, large quantities of water is used to start the boilers and losses incur through discarding of stale juice. Thus, mill stoppages consume unnecessary raw materials and produce waste (stale juice).

*Odour*

The sugar mills produce strong odours. Sources of odour are blocked drains, bagasse stockpiles, mill mud, anoxic rivers and wastewater treatment ponds. Uncontrolled loading of the wastewater treatment ponds, which often turn septic, causes complaints from people outside the mill boundaries (FSC, 2002).

*Air Pollution*

The largest point source discharge of pollutants into the air is from the burning of bagasse in the boilers. Since none of the mills have wet scrubbers installed, and the moisture content in bagasse is high, it can be concluded that fly ash is released into the atmosphere. Discharge to the air is a common sight at all four mills.

Emission occurs when there are frequent breakdowns in boilers. It is also noted that the stack emissions are at their worst when marine fuel is used to start up or when there is not enough bagasse (FSC Report, 2001a). Although no tests have been carried out, it is evident enough that the particulate discharge is considerable. Residents around the mill sites continue to report the major problem of particulate settling on their clothes or getting inside their houses during the crushing season. This gives a clear indication on the performance of the boilers. FSC recognized the problem in their Environmental Strategic Plan (2002: 6) and stated:

> Presently to avoid complaints from the general public of black smoke and fly ash affecting properties, good combustion control with properly operating ash arrestment equipment and vigilance by operators must be maintained at all times.

Fugitive sources of emissions are generally high. Excessive dust is generated when bagasse passes on the conveyor belt and is transported to the storage site from the stored stockpile areas. The discharge into the atmosphere from the mill activities is a risk to mill workers and the public alike.

## Environmental Regulations and Policies

The Development Plans from the pre-Lomé period (1971–1975) and during the Lomé period disclose the government policy on the expansion of the sugar industry, not only in terms of production by increasing land area, but also in terms of the farmer numbers. Unfortunately, commensurate government policies did not evolve to offset the impacts of this growth on the environment. The consequence has been an increasing problem of environmental degradation due to the expansion of the sugar industry. The major problem on this account is a lack of appropriate and relevant environmental legislation, and they exist, they are either too old or outdated.

*Outdated Legislation*

A relevant existing law is the Public Health Act, 1955. Under this, an industry convicted of polluting under the Act will be fined a maximum of $20. In theory, the Public Health Act could be applied to a wide range of environmental problems that could be described as nuisances, such as unsanitary and contaminated sites, refuse deposits, chimneys, polluted rivers, harbours, ponds, ditches and foreshore. But it is quite inadequate for effective environmental management of wastes and pollution as the nature of pollutants and the polluters has changed since its enactment. Most existing laws are outdated, and are in need of revision or clarification or perhaps even new legislation is required to meet the challenges which have emerged.

A major second problem is that the main intention of some of the Acts covering environment was not environmental protection and/or management per se. This means that other objectives of the Act, which may be in conflict with any environment objective, could take precedence over the environment considerations.

*Lack of Enforcement*

The mere existence of the regulatory instruments, such as the Land Conservation and Improvement Act, the Agricultural Landlord and Tenant Act (ALTA) and the Native Land Trust Act (NLTA), does not necessarily mean that the government has a sound policy on its environment, or that the policy is being implemented properly. The Land Conservation and Improvement Act, 1953, for example, covers good husbandry of land. Failure to adhere to the Act can lead to a farmer losing his/her lease entitlement. Good land husbandry practices are also an integral part of the ALTA, which governs all leasing of agricultural land. Despite the existence of this legislation, sugarcane farming moved unchecked into marginal land. Even the NLTA has sufficient powers to take action against tenants for not complying with practices of good husbandry, by obtaining from the Permanent Secretary of the Ministry of Agriculture, Fisheries and Forests a *Certificate* *of Failure by Tenant to Observe the Rules of Good Husbandry*. In the past 30 years, only one such Certificate of Failure has been issued (Nicole & McGregor, 1999).

*Overlapping Roles*

For most of the existing laws covering environment, the authority to enforce the regulations is divided amongst different agencies. This situation has led to problems of conflicting jurisdiction, and conflicts in objectives among agencies. The responsibility of the NLTB, for example, is to preserve fertility of the land. This overlaps with the duties of the Land Conservation Board (LCB). The NLTB leaves the responsibility of preserving soil fertility to the LCB. Although the LCB has the legal power to perform that role, it has not done so, mainly because of lack of resources, problems with coordination between ministries and bureaucratic inertia. All these are compounded by a lack of political will and awareness.

*Lack of Government Intervention*

There has been a lack of government policy on the sugar industry to address the internal and external challenges that the sugar sector is now facing. A Government of Fiji report (1994) suggested that the government has to determine how the current structure of the industry (e.g. institutions, legislation, etc.), and the level of government intervention are to be modified in order to allow the implementation of proposed policies (like quality cane payment system) to proceed in a timely and efficient manner. After that report, in 1999, a Sugar Industry Strategic Plan was developed (see Sugar Commission of Fiji, 2003). The plan, however, is based around commercial efficiency rather than environmental efficiency. Of the ten action points, only one can be taken to refer to the environment, but this has to do with the farmers and not the milling side of the operation. For the farmers, the plan requires that cane leases comply with Best Practice Management guidelines. For the miller, other than references to reducing wastage and improving mill performances, there is no specific environment policy measure in the plan.

*Role and the Effectiveness of Negotiation Structures*

The Ministry of Foreign Affairs and External Trade has led trade negotiations and signed trade agreements on behalf of the government. The advantage is that they are supposedly more experienced in undertaking negotiations at the international level, and trained to bargain in the international arena and to defend the national positions. However, sometimes the issues under discussion may be directly related to an area of technical competence of a particular functional Ministry or Department. If this Ministry or Department is neither represented at a meeting nor consulted, it can create anomalies between what Foreign Affairs agrees, and what should be negotiated in the best interest of a country in that particular area.

There is often little coordination or consultation between the Ministry responsible for attending such meetings and the one responsible for providing technical support and implementation. Often, briefing notes and negotiating positions are prepared by the competent technical agencies at the national level, but these positions are articulated by officials from Foreign Affairs, who will be able to articulate a country's position, but may not be able to effectively dialogue or negotiate on environmental matters. The entire period of sugar trade negotiation has suffered from this weakness.

*Trade Development Committee*

Fiji has a Trade Development Committee (TDC) whose function is to discuss issues related to external trade with key stakeholders; seek views on the contents of trade agreements, establish a common position on issues related to trade agreements, disseminate information on trade developments to the private sector, source technical assistance, and to develop and implement national and regional action plans on issues related to external trade. The composition of the TDC is too wide and varied for it to be a really effective committee. It so far appears to be of a general consultation type body rather than a specific one in relation to trade agreement associated policy formulation and trade agreement negotiations.

Trade policy is no longer a simple issue; it is becoming complicated particularly in the context of WTO, Cotonou, EPA negotiations, PICTA and PACER and future relations that will unfold as Fiji becomes part of initiatives or agreements with other developed or developing countries. However, for the mechanism to work, it should be given some permanence. Both the WTO and the Cotonou Agreement are important and differ in nature. Fiji, however, has so far not focused on developing institutional capability in environmental issues to tackle the vastly complex environmental issues relating to these trade agreements.

*Communication and Coordination*

At the international level, the EU–ACP failed to monitor and evaluate the Lomé trade agreement in terms of environmental performance, despite the provisions in the Lomé text. Communication and coordination between the different actors engaged in farm and mill levels with the respective line ministries is extremely important for technical advice and assistance. This requires dissemination of information throughout the relevant institutions, to improve the production and milling processes in the sugar trade. Article 220 of Lomé IV, for example, states:

> The objective of development finance cooperation shall be, through the provision of adequate financial resources and appropriate technical assistance to contribute to optimal and judicious exploration, conservation, processing, transformation and exploitation of the ACP state's natural resources in order to enhance the efforts of ACP states to industrialize, and to achieve economic diversification (ACP-EEC, vol. 120: 56).

In Fiji, the sugar miller had no notion of this provision in the text to enable it to begin developing capacity to implement the said objective, or to even seek assistance from bodies like the Centre for the Development of Enterprise (CDE), the Centre for Development of Agriculture (CTA) or technical experts from the EU, to improve the processing of sugar cane or to explore diversification projects for their solid wastes such as bagasse, mill mud and ash.

In light of the current deficiencies in the institutional mechanism at the national level, and the lack of monitoring and evaluation at the ACP–EU level, Lome's successor, the Cotonou Agreement, will continue to cause environmental degradation for at least four reasons.

First, to negotiate internationally and to develop adequate environmental policies, there is a need to have sustainability ronmental policies, there is a need to have sustainability assessment or national environmental impact studies. This has not been undertaken for the Cotonou Agreement. Second, the environment authorities are not in a position to give technical advice, since they are not represented on the TDC. There is also no requirement that the TDC ought to consult the environmental authorities on every trade matter. Third, the current policies are ‘pro-growth’. This is visible from the sectoral policies, budget provisions and exclusion of environmental experts in the national decision making process. Fourth, environmental legislation in Fiji are old and ineffective in a modern environmental management context to address issues related to trade agreements.

At the national level, the government has been ineffective in ensuring that it meets the environmental commitments of the Lomé regime. The environmental institution is, in fact, too weak, powerless and diluted for it to have an influence on economic or sectoral policies generally and on trade policy in particular. It has been ineffective because the institutional mechanisms have not been in place to handle and implement trade agreements. There is no mechanism to assess trade agreements for negative impacts and/or to develop flanking policies to mitigate the impact. There is also no policy on what trade agreements are to be negotiated, implemented, monitored and evaluated as far as environmental aspects are concerned, nor on who will do so and how would it be done. There continues to be the predominance of economic and social development goals in national decision-making, which are isolated from the environmental framework. There is a marked lack of mainstreaming of trade and environment into development policies, to ensure development of coherent policies for achieving sustainable development. Compounding the problem is inadequate technical expertise and financial resources to arrest negative impacts of trade agreements. Ultimately, the problems listed emerge from a lack of political will to confront issues, and to ensure that environmental consideration in any development is not perceived as anti-development. Fiji needs to implement an effective system of integrating environmental concerns, using institutional and legal instruments at the national level, if it wants to reduce the negative impacts of trade agreements on the environment. This needs significant ‘greening’ of thought of the policy makers.

## Concluding Comments

Empirical evidence so far available supports the claim that the expansion of sugar trade has caused adverse effects on the environment, at both the farm and the mill level. The Lomé guaranteed price to farmers and the government's policies have resulted in a significant increase in the production of sugar. This necessitated the use of more natural resources, and production of more pollutants. Despite the inclusion of environmental provisions in the sugar protocol under the Lomé Convention, and now in the Cotonou Agreement, environmental damage caused at all levels of the industry has been increasing.

Sugar trade contributed significantly to the development of Fiji. However, the environmental problems have not been given serious consideration by stakeholders. Such problems are caused by both the growers and the millers. Growers cause soil erosion by planting on marginal land without using conservation practices. Soil erosion reduces soil fertility, which affects the yield and sugar content of cane. This could be related to the lack of secure property rights in land that led to little investment in proper environmental practices. On the other hand, millers are responsible for water and air pollution, which is costing the communities in terms of destruction of rivers, reduced fish catch, loss of recreation facilities, and health risk. The lack of environmental standards in the Mills has caused significant environmental problems for many years. The management of the FSC over the years has turned a blind eye to this. So have the institutions responsible for physical resources, like Native Lands Trust Board, which manages native land on behalf of the landowners. The NLTB has not taken any interest in enforcing the requirements of good environmental practices provided in the leases. Nor has the government done so.

The EU, having condoned poor monitoring and evaluation of the trade agreements, could also be partly responsible for environmental degradation. There is also a need to integrate environmental activities into productivity and quality in order to allow the industry to play a role in sustainable development and to be a responsible corporate citizen.

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