Working Paper No. 03-03

ASSESSING BENEFITS AND COSTS OF COMMERCIAL BANANA PRODUCTION IN THE PHILIPPINES

R.P. Calderon and A.C. Rola

Institute of Strategic Planning and Policy Studies
(formerly Center for Policy and Development Studies)
College of Public Affairs
University of the Philippines Los Baños
College, Laguna 4031
Philippines

Telephone: (63-049) 536-3455
Fax: (63-049) 536-3637
E-mail address: ispps@mudspring.uplb.edu.ph
Homepage: http://www.uplb.edu.ph

The ISSPS Working Paper Series reports the results of studies conducted by the Institute faculty and staff. These have not been reviewed and are being circulated for the purpose of soliciting comments and suggestions.

The views expressed in the paper are those of the author and do not necessarily reflect those of ISPPS and the funding agencies (if applicable).

Please send your comments to

The Director
Institute of Strategic Planning and Policy Studies (ISPPS) (formerly Center for Policy and Development Studies)
College of Public Affairs
University of the Philippines Los Baños
College, Laguna 4031
Philippines

CONTENTS

TABLES

Working Paper No. 03-03

Assessing Benefits and Costs of Commercial Banana Production in the Philippines

Reynan P. Calderon and Agnes C. Rola[1]

ABSTRACT

The Philippine banana industry is currently one of the top agricultural export earners. The increasing demand worldwide has resulted in greater expansion of area planted to banana, including those in environmentally critical places. Current high chemical input technologies used in banana production have been documented to have significant environmental and public health costs. In this paper, we assess the social costs and private benefits of banana production by commercial growers. We used primary data in Bukidnon to argue that government policies can provide incentives and promote environmental stewardship to achieve a net positive outcome from banana production.

[1]*University research associate, and professor, Institute of Strategic Planning and Policy Studies, College of Public Affairs, University of the Philippines Los Baños, respectively.* *The authors gratefully acknowledge the assistance provided by Erica Villavelez in data processing. Financial support was provided by the U.S. Agency for International Development through the Sustainable Agriculture and Natural Resources Management Collaborative Research Support Program (SANREM CRSP).*

Assessing Benefits and Costs of Commercial Banana Production in the Philippines[1]

Reynan P. Calderon and Agnes C. Rola[2]

I. Introduction

Banana is considered as the fourth largest horticultural crop in the world with an estimated production of 64.6 million metric t as of 2000. It is widely grown in countries in Africa, Asia, Europe, Oceania, Latin America, and the Caribbean (ISAAA, 2001). India is reported as the largest producer of banana, accounting for about 21% of total world production in 2000.

As a tropical country, the Philippines grow an abundant variety of fruit crops primarily for local consumption and export market. Banana is considered as the most important fruit crop in the country in terms of volume of production and export earnings. In 1998, the country's share to total world production reached a record high of 6% (**Table 1**).

Table 1. Banana world production, 1998.

Country	Production (000t)	Percent Share
World	58,618	100.00
India	10,200	17.40
Ecuador	7,494	12.78
Brazil	5,551	9.47
Philippines	3,550	6.06
China	3,241	5.53
Indonesia	3,012	5.14
Costa Rica	2,200	3.75
Colombia	2,200	3.75
Mexico	2,041	3.48
Thailand	1,700	2.90
Others	17,429	29.73

Source: Food and Agriculture Organization (1999).

Banana production contributes significantly not only to the national income in terms of export earnings but also to employment. But banana production, aside from the benefits, has said to have negative effects not only to the health of its workers but also to the environment. Worobetz (2000) noted the environmental damages brought about by banana production (**Table 2**).

Thus, in spite of opportunities seen in banana production, it seems that external costs, if not addressed properly, are significant. This paper attempts to evaluate the social

[1]*This working paper was part of the SANREM CRSP/SEA-23 output and was made possible through the support provided by the Office of Agriculture and Food Security, Bureau for Global Programs, United States Agency for International Development, under the terms of Award No. PCE-A-00-98-00019-00.*

[2]*University research associate, and professor, Institute of Strategic Planning and Policy Studies, College of Public Affairs, University of the Philippines Los Baños, respectively.* *The authors gratefully acknowledge the assistance provided by Erica Villavelez in data processing.*

and environment costs and benefits brought about by banana plantations in general with focus in Bukidnon, where primary data are available. Analysis in terms of income, employment, health and environmental effects will be made. Furthermore, analysis of the role of government (LGUs) in achieving a win-win situation will be done.

Table 2. Summary of environmental damages and causes attributed to banana production.

Causes	Damages
• Application of extremely toxic substances (when prevailing criteria are for efficiency and cost reduction) • Clear cuttings at river banks, and tributaries • Inadequate waste disposal • Manual application of pesticides without adequate equipment for tropical conditions • Working population and their neighbors exposed to pesticides • Inadequate warehouses for storing pesticides • Waste water with chemical residues coming from packaging plants and plantations ending up in rivers without any treatment • Lack of monitoring system for water, soil and air conditions in relation to pesticides	• Water, soil, marine, and air contamination • Permanent soil contamination with copper resulting in permanent effects • Sediment production and transport to watersheds and seas • Death of animals, especially fish, caused by pesticide poisoning • Pesticide intoxication of workers and neighbors • Appearance of secondary plagues resulting from excessive application of pesticides • Deforestation • Biodiversity losses (still not adequately evaluated) • Water euthrophication

Source: Lead (1996) as cited in Worobetz (2000).

II. The Philippine Banana Industry

The Philippine banana industry contributes significantly to the agriculture sector and the economy in general. Banana production is a source of income and employment in the countryside with more than 5.6 million smallholder farmers dependent on it (Calderon, 2002). In 2000, the banana sector contributed about 7% to the total value of production in agriculture. Banana is also one of the country's top export earners.

II.1 Production and Income Performance

In the Philippines, banana is currently grown in a total area of about 350,000 ha, which is an estimated 3% of the country's total arable land. For the past years, the area planted to banana has increased which is indicative of the growing economic importance of this horticultural crop. From 300,000 ha in 1990, it grew to more than 320,000 ha in 1995 to its present hectarage of about 350,000 ha (**Table 3**). Significant tracts of land are devoted to banana production in the regions of Southern Mindanao, Southern Tagalog, the CARAGA, and Western Visayas. Large contiguous areas are devoted for commercial production in four provinces in Mindanao, namely Davao del Norte, Davao del Sur, South Cotabato, and Misamis Oriental.

Table 3. Banana area, in hectares, 1990-2000.

Region	Area (ha)			Average annual growth (%)		
	1990	1995	2000P	1990-1995	1996-2000	1990-2000
Philippines	300,200	322,008	348,049	1.43	1.62	1.52
CAR	3,628	3,532	2,409	(0.31)	(7.50)	(3.40)
Ilocos	10,636	11,167	9,829	1.01	(2.13)	(0.74)
Cagayan Valley	8,508	12,755	26,288	9.87	(0.03)	15.74
Central Luzon	2,561	2,623	2,491	0.71	(1.40)	(0.14)
Southern Tagalog	42,752	44,052	52,354	0.64	0.78	2.24
Bicol	11,476	12,476	14,147	1.88	5.13	2.34
Western Visayas	40,807	40,277	32,646	(0.23)	(4.17)	(2.03)
Central Visayas	8,699	10,760	16,407	4.42	13.44	7.41
Eastern Visayas	32,317	24,906	26,521	(4.74)	0.21	(1.72)
Western Mindanao	14,257	21,748	23,572	9.34	1.44	5.49
Northern Mindanao	18,232	22,551	16,483	4.43	(2.68)	(0.69)
Southern Mindanao	40,171	45,593	57,829	2.63	4.61	3.84
Central Mindanao	12,691	14,447	12,527	2.64	13.38	2.16
CARAGA	40,165	38,967	34,510	(0.21)	3.15	(0.99)
ARMM	13,300	16,154	20,036	3.98	4.91	4.26

P- Preliminary estimates. Source: Bureau of Agricultural Statistics (1990-2000).

Banana production consistently grew by 6.17% annually (1996-2000 average), reaching 4.1 million metric t in 2000 (**Table 4**). The top five producers of banana include the regions of Southern Mindanao, followed by Cagayan Valley, Central Mindanao, and the ARMM. In terms of yield per hectare, the Mindanao region recorded the highest yield (**Table 5**). Southern Mindanao recorded an average yield of 34.3 t ha^{-1}; Central Mindanao had 33.94 t ha^{-1}; whereas Northern Mindanao and the ARMM had more than 10 t/ha^{-1}. The national average yield was 11 t ha^{-1}.

The top producers in Southern Mindanao include Davao del Norte, Davao del Sur, and Davao City. Compostela Valley has recently ventured into large-scale commercial production with more than 470,000 metric t produced in 1999 and an estimated 535,000 metric t in 2000. This accounted for about 28% of total production in the region. In Central Mindanao, Lanao del Norte contributed around 78% of the total production in the region. The rest came from North Cotabato and Sultan Kuradat. More than 70% of the total produce of ARMM came from Maguindanao.

Table 4. Banana production, 1990-2000.

Region	Production (metric t)			Average annual growth (%)		
	1990	1995	2000P	1990-1995	1996-2000	1990-2000
Philippines	2,980,680	3,499,100	4,155,668	3.31	6.17	3.59
CAR	29,094	31,856	22,867	2.92	(2.19)	(1.41)
Ilocos	62,850	64,366	49,838	0.57	(0.91)	(2.00)
Cagayan Valley	29,427	30,743	399,431	1.25	56.92	43.42
Central Luzon	33,531	29,768	28,915	(0.24)	3.39	0.49
Southern Tagalog	153,131	137,638	163,820	(2.02)	12.67	1.76
Bicol	47,520	29,865	13,802	(7.80)	(4.90)	(8.60)
Western Visayas	249,648	233,944	207,177	(1.20)	1.50	(1.24)
Central Visayas	66,142	84,706	89,256	5.92	4.66	3.78
Eastern Visayas	137,686	126,537	138,924	(1.17)	7.03	0.92
Western Mindanao	98,973	116,980	127,958	3.43	6.99	3.15
Northern Mindanao	179,046	202,196	176,807	2.48	0.42	0.14
Southern Mindanao	1,184,856	1,700,363	1,914,215	7.72	3.17	5.17
Central Mindanao	255,508	293,060	360,852	2.83	9.50	4.11
CARAGA	316,637	249,142	209,763	(4.12)	0.86	(3.52)
ARMM	136,630	167,935	252,040	4.28	15.33	7.04

P- Preliminary estimates. Source: Bureau of Agricultural Statistics (1990-2000).

Table 5. Banana yield per hectare, in metric tons, 1990-2000.

Region	Yield (t ha^{-1})			Average annual growth (%)		
	1990	1995	2000P	1990-1995	1996-2000	1990-2000
Philippines	9.93	10.87	11.94	1.92	4.34	2.02
CAR	8.02	9.02	9.49	4.38	6.66	3.06
Ilocos	5.91	5.76	5.07	(0.35)	1.51	(1.17)
Cagayan Valley	3.46	2.41	15.19	(5.22)	54.23	23.51
Central Luzon	13.09	11.35	11.61	(1.40)	5.13	0.54
Southern Tagalog	3.58	3.12	3.13	(2.66)	11.74	(0.00)
Bicol	4.14	2.39	0.98	(9.88)	(9.05)	(10.79)
Western Visayas	6.12	5.81	6.35	(1.01)	5.37	0.63
Central Visayas	7.60	7.87	5.44	1.84	(6.27)	(2.48)
Eastern Visayas	4.26	5.08	5.24	3.88	6.62	2.81
Western Mindanao	6.94	5.38	5.43	(4.59)	5.79	(1.54)
Northern Mindanao	9.82	8.97	10.73	(1.70)	3.63	1.28
Southern Mindanao	29.50	37.29	33.10	4.99	(1.24)	1.39
Central Mindanao	20.13	20.29	28.81	0.26	(2.17)	5.48
CARAGA	7.88	6.39	6.08	(3.28)	(2.01)	(2.00)
ARMM	10.27	10.40	12.58	0.27	9.64	2.50

P- Preliminary estimates. Source: Bureau of Agricultural Statistics (1990-2000).

Gross value added by banana showed a steady performance, with an average annual growth of 4.82% from 1990 to 2000. Banana had the highest increasing GVA. A high average annual growth in GVA was seen in the period 1995-2000 with 8.48% (**Table 6**). It ranked second to poultry in terms of average annual growth in 1990-2000.

Table 6. Gross value added in agriculture, fishery, and forestry, 1990-2000.

Industry	(Value in million pesos, at constant 1985 prices) 1990	1995	2000	Average annual growth (%) 1990-1995	1995-2000	1990-2000
Agriculture	153,414	171,069	189,255	2.30	2.13	2.34
A. Agricultural crops	85,870	93,269	100,202	1.72	1.49	1.67
Palay	24,873	28,189	33,134	2.67	3.51	3.32
Corn	10,950	9,837	10,750	(2.03)	1.86	(0.18)
Coconut	7,084	7,380	6,619	0.83	(2.06)	(0.66)
Sugarcane	3,652	3,964	4,908	1.71	4.76	3.44
Banana	2,698	2,809	4,000	0.82	8.48	4.82
Other crops	36,613	41,090	40,791	2.45	(0.15)	1.14
Livestock	16,854	19,834	24,783	3.54	4.99	4.70
Poultry	12,215	16,056	20,504	6.29	5.54	6.79
Agricultural activities and services	7,692	7,457	8,006	(0.61)	1.47	0.41
B. Fishery	30,783	34,453	35,760	2.38	0.76	1.62
2. Forestry	7,320	1,779	1,372	(15.14)	(4.57)	(8.13)
Agriculture fishery and forestry	160,734	172,848	190,627	1.51	2.06	1.86

Source: Economic and Social Statistics Office, NSCB (2000).

II.2 Trade Performance

Early reports had it that the Philippine banana industry made a modest start in the late 1960s (Sebastian, undated). From the initial export of 23,400 tons in 1969, export volume grew to 267,200 t in 1971 and to 822,700 t in 1975. By 1999, exports reached 1.3 million t (Philippine Statistical Yearbook, 2000). To date, banana is the country's major fruit export.

In 1999, 1.3 million t of fresh banana were exported to countries such as Japan, China, Korea, United Arab Emirates, and Taiwan (**Table 7**). These countries are also the country's major export markets for banana chips and banana catsup. Japan has consistently been the largest importer of Philippine banana, accounting for more than 60% of the country's total fresh banana export and about 15% of banana chips export. The USA, Saudi Arabia, and Canada are the major importers of Philippine-made banana catsup.

Table 7. Philippine exports of banana, by country of destination, 1999.

Country	Volume (metric t)	Value (in US$'000, FOB)
Fresh		
All countries	1,319,632	240,703
Japan	820,737	155,517
China, People's Rep. of	160,595	23,441
Korea, Rep. of	124,010	21,575
United Arab Emirates	97,733	15,733
Taiwan	73,680	16,073
Others	42,877	8,363
Chips		
All countries	17,721	19,573
USA	3,193	3,296
Germany	2,086	2,039
UK & N.Ireland	2,064	2,279
Taiwan	1,846	2,184
Japan	1,639	2,439
Others	6,894	7,336
Catsup		
All countries	1,391	1,204
USA	699	614
Canada	165	142
Saudi Arabia	134	106
United Arab Emirates	45	37
Others	347	305

Source: National Statistics Office (2000).

III. Banana Production Technology

About 55% of total production cost of banana was spent on fertilizer and chemicals. The use of fertilizer led to depletion of the soil. Soil analysts reported that intensive land cultivation and overuse of chemicals gravely damaged the land of banana growers in Davao, Philippines. Most banana companies are now on the lookout for more land because the existing plantations have become less productive through the years, a consequence of intensive use of fertilizer and chemicals (JCDB, 1979 as cited in Tabien, 2000).

Moreover, banana production produces two types of wastes: a) vegetal and organic and b) synthetic and inorganic. The volume of waste produced is double the volume of bananas produced. One-fifth of this waste requires special treatment. Astorga (1996) discussed in detail these two types of wastes.

Organic waste. Produced from banana farming and commercial packaging, organic waste includes shoots, flowers, crowns, leaves, and rejected fruits. Depending on biodegradability and the volume generated, this waste can become a serious environmental pollutant.

The shoots, flowers, crowns, leaves and main stems are normally re-incorporated into the soil or are gathered and thrown in large open-air dumps.

Second-grade or reject bananas result from mishandling of the fruit. They have scars or blemishes caused by fungus, damaged neck, or knife cuts. Sometimes rejection occurs when the fruits do not reach the required size for export. Second-grade bananas, comprising 5% of total production, is normally sold, while rejected fruits are either given away, sold as animal feed, used in the production of puree for baby food, or disposed of in the plantation's large open-air dump. Because of its high volume, this organic waste has been considered a special waste.

Normally, the parts that constitute the banana plants themselves are of bulky, fibrous vegetal material, which is difficult to break down. It retard the natural processes of decomposition such as photo-degradation, oxidization, bacterial degradation, etc. The last process occurs in areas where many chemicals are used.

Poor disposal and lack of special treatment for these biodegradable wastes result in proliferation of pathogenic organisms. At the same time, leaching from this waste reaches the ground- and underground water supply, affecting its quality.

Nonbiodegradable (solid) waste. The inorganic wastes include plastic bags and materials such as strings, plastic tape, and agrochemical containers.

The plastic bags impregnated with the chlorpyriphos are used to protect the fruit from insects. The final treatment of this plastic varies, depending on the plantation. At present, many banana plantations accumulate the plastic bags; others recycle, burn, or put them in large open-air dumps. Plastic bags can be seen scattered around the plantation, a great concern because they may find their way to rivers and even the sea, affecting aquatic organisms and coral reefs.

Polypropylene strings used for underpinning or tethering are normally left on plantation grounds, affecting the fertility of the soil. In some plantations though, they are collected for recycling at a later date.

The pesticide containers are not specially cleaned or adequately disposed of. Some of them have been used as water and food-grain containers, waste bins, seats, livestock food troughs, or flower pots.

IV. Health and Environmental Effects of Banana Production

The effects of chemicals, particularly pesticides used in banana plantation, on the environment and public health have been studied throughout the world, specifically in areas where banana plantations have existed for a long period of time. Some of these showed adverse effects of banana plantations.

IV.1 Banana, Agrochemicals, and the Environment

A study by Foro Emaús (1998) showed the effect of chemicals primarily pesticides, used in banana plantations. Consumer demand for perfect bananas in industrialized countries led to transnational companies producing unblemished bananas of uniform size and color. To be able to produce these perfect bananas, plantations depend on high levels of agrochemical use.

In Costa Rican banana plantations, for example, use of pesticides in banana production reached up to 40 kg ha^{-1} per year. In 1995, between 13,872 and 32,640 t of nematicides, have been used according to the International Union for the Conservation of Nature (IUCN) (Foro Emaus, 1998). Although the frequency and doses/ of pesticide application have been reduced as compared with those in 1990, expansion of banana production has caused an absolute increase in the amount of nematicides used.

One of the most serious pesticide problems in banana plantations is brought about by the practice of aerial fumigation with products such as benomyl (brand name, Benlate), propiconazole (Tilt 250 EC), chlorothalonil (Bravo 500), and tridemorf (Calixin). In addition to contaminating nearby homes and water, aerial fumigation poisons plantation workers when spraying occurs while they are working.

Further studies showed that pesticides have been found in Costa Rica's lakes, rivers, and streams. In fact, many indicators point to increased contamination of the region's rivers and other water bodies. Many people do not have access to water in their homes, and because there are no other water sources, they must use the pesticide-tainted rivers to bathe, to wash clothes, and as source of drinking water. A study carried out in the Valle de la Estrella (near plantations owned by Standard Fruit Company and Dole) found local water supplies contaminated with chlorothalonil, a fungicide that is a probable human carcinogen and highly toxic to fish and other marine organisms (Foro Emaús, 1998).

A new study by the Pesticide Program of the National University in Costa Rica found pesticides in the Rio Suerte Basin that drains into the nature conservation area of Tortuguero. Sampling sites were selected in drainage channels near banana fields and packing plants, streams near banana plantations, and the river. The most frequently found chemicals were the fungicides thiabendazole, propiconazole, and imazalil; nematicides terbufos and cadusafos; and insecticide chlorpyrifos.

Foro Emaús (1998) further noted that in February 1998, the Costa Rican Ministry of Environment and Energy publicly denounced the banana industry for contaminating the rivers and for burning pesticide-soaked plastic bags.

IV.2 Health Effects

Mendis and Van Bers (2001) noted several health effects brought about by chemical use in banana plantations. Health problems associated with exposure to toxic

chemicals among farm workers and nearby residents are severe and widespread in fruit-growing regions of Latin America. They ranged from acute conditions such as poisoning (resulting in vomiting, fever, vertigo, and other symptoms), skin burns and rashes, and eye injuries to more chronic health problems such as cancer, birth defects, nervous system damage, and sterilization.

Close to 30% of Guatemalan growers of nontraditional crops have been poisoned at least once, and more than 50% of small-scale melon growers in Costa Rica and Guatemala reported one or more pesticide poisonings over a two year-period in the early 1990s. More than half of the pesticide poisonings in Costa Rica appear to be caused by paraquat, a pesticide used primarily on banana plantations and labeled as extremely hazardous by the World Health Organization (WHO) (Mendis and Van Bers, 2001).

In 1997, 20,000 workers from banana plantations in Latin America, the Caribbean, Africa, and Southeast Asia won in a class action suit brought against nine American companies (including Chiquita and Dole) for sterilization caused by the use of the nematicide dibromochloropopane (DBCP), which was banned from use in the United States in 1977 (Mendis and Van Bers, 2001).

Astorga (1996) further noted that the rate of occupational poisoning among banana workers was 6.4%. The WHO has estimated that some 3% of agricultural workers in developing countries are poisoned each year. The highest figure reported in the world was 7.1% in Malaysia. However, this figure also included accidental poisonings and cases not medically treated.

The impact of improper use must also be considered, since many banana workers use pesticides without sufficient training. Although plantations provide special clothing for pesticide applicators, such clothing is rarely used because of the hot weather. Official statistics reveal that two workers are poisoned by pesticides every day (Foro Emaús, 1998). In 1996, 64% of reported pesticide accidents occurred in banana plantations (633 out of a total of 989). In reality, the numbers are higher because not all accidents are reported, and these reports do not include temporary or chronic diseases, such as asthma, allergies, cancer, and reproductive problems caused by use of the poisons. The herbicide paraquat is main cause of poisonings, followed by carbofuran and terbufos. In November 1997, an 18-year-old banana worker died after being exposed to terbufos (brand name Counter) in a plantation owned by the Chiriqui Land Company (Chiquita) (Foro Emaús, 1998).

IV.3 Ecological Effects

Change in soil use

The banana is an ecologically demanding species that requires abundant humidity, high temperatures, and soil with diverse nutrients. If bananas are cultivated without rotation - on the same land - over a given period, it is common to find all-too-noticeable

mineral deficiencies in the soil, especially of calcium, iron, magnesium, nitrogen, phosphorus, potassium, and zinc (Astorga, 1996).

On the whole, monocropped plantations have been placed in areas of decimated primary rainforest. A characteristic of these tropical soils is their dependency on the biomass of the overhanging forest. Once the protective forest cover is eliminated, the productivity and soil fertility per unit of area decline, diminishing sharply after the first 2 years. This is the reason banana producers require large areas of land -- and subsequent expansion -- in order to make up for the fall in production per hectare. Moreover, these low-density soils are preferred by the banana companies because a) they have a high organic content and b) they require practically no alteration, disturbance, or further attention (Astorga, 1996).

In addition to the required felling and total destruction of the forest in order to introduce banana cultivation, it has also been necessary to ignore forest and water legislations that protect banks of rivers and streams.

During the productive phase, the internal deficiencies of natural and artificial drainage produce severe water and lateral erosion, owing to the fragility of the soil and the concentrated flow of water. The ground, moreover, is kept permanently exposed without any types of shielding vegetation and is also subject to the intense use of herbicides. Consequently, the soil has been effectively degraded into silt, with the knock-on effect of increasing sedimentation in adjacent bodies of water.

The loss of forest and soil, together with high levels of pesticide application, has, in turn, led to a loss of biological diversity, principally of floral species (useful trees) and fauna. The latter includes mammals (e.g., monkeys, ocelots, etc.), birds (e.g., green limpets) and butterflies (Astorga, 1996).

Agroecological effects

The agroecological consequences of intensive monoculture, the total alteration of the biological properties of the soil, and the effects of pesticides on the natural enemies of the pests carry a high price both in terms of regeneration of the soil and appearance of secondary pests.

The resistance of pests to pesticides is becoming a more frequent phenomenon (Astorga, 1996). Until some years ago, benomyl was used with success in the control of black sigatoka (Astorga, 1996). Now, it is rarely used, owing to the resistance of fungus to this fungicide.

In Costa Rica, severe contamination of the soil, phytotoxicity, pest resistance, generation of new pests, and contamination of bananas with toxic residues have been reported.

An example of the soil's loss of organic properties produced by monoculture is to be found in the South Pacific region of Costa Rica, where thousands of hectares of fertile soil are contaminated by an excessive use of a cocktail of chemicals. The damage to the soil in areas of formerly great agricultural potential has been diagnosed as almost irreversible. An investigation by Thrupp (1988) as cited in Astorga (1996) revealed that copper content in majority of the land used for agriculture normally contained between 20 and 50 parts per million (ppm), and that, in contrast, the soils of the banana plantations in South Pacific exceed any normal limits, and can be as high as up 4,000 ppm.

V. Assessing the Benefits and Costs of Banana Plantation: The Bukidnon Case

Traditionally, banana plantations in the Philippines were established in uninhabited lands. Due to rising international demand for banana, production encroached in densely populated areas. In fact, in mid-1999, banana plantations started operation in Lantapan, Bukidnon, considered an environmentally critical area. This densely populated town has a population growth rate higher than the national average (Rola et.al. 2003).

Two companies operated the banana plantations in this municipality, acquiring land in 1998 by leasing small farmers' lots. Coincidentally, during that period, farmers were having problems of low productivity in corn because of drought. Moreover, farmers were incurring losses due to lack of capital to adopt appropriate technology (Tabien, 2000). The banana firms offered a 2-year advance rental (P30,000 from Plantation 1 and P24,000 from Plantation 2 per hectare) paid in lump sum, an attractive option given to the cash-strapped farmers. Top priority with regard to employment in these plantations was also given to working adults of the leasing households.

V.1 Private Benefits from Banana Plantations

Surveys conducted by the SANREM-CRSP SEA showed that wage from plantation income was relatively higher than nonplantation income, by 17% to as high as 113% (**Table 8**). This contributed a lot to incomes of families with members working at the plantation. Further comparison showed that income of households with family members working at the plantation increased by more than 100% in the last 3 years (**Table 9**).

Table 8. Farm wage comparison, per day, Lantapan, Bukidnon.

	1999	2002
Plantation 1	P 132.50	P170.00
Plantation 2	P 125.00	P140.00
Non-plantation	-	
Land preparation		P120.00
Crop care		P80.00-100.00

Source: SANREM Survey Data (2002).

Table 9. Average monthly income (PhP) of households (SANREM respondents), with and without plantation income, Lantapan, Bukidnon, 1999 and 2002.

	Average monthly income
Without plantation Income	
1999 (n=79)	5,114
2002 (n=76)	5,426
With plantation Income	
Plantation 1	
1999 (n=9)	7,400
2002 (n=12)	10,434
Plantation 2	
1999 (n=7)	5,659
2002 (n=17)	16,405

Source: SANREM survey data (2002).

It can be noted, however, that although plantation 2 has relatively lower wage rate than plantation 1, households with members working at Plantation 2 had higher income in 2002. This could be attributed to many other factors such as income from nonfarm sources may have increased, and there were more family members being employed in Plantation 2 than in Plantation 1. Nonetheless, it showed that household income increased significantly with plantation income.

Note further that, although there was an increase in income, Tabien (2000) found out that employment is limiting. Only a few of the working adults were able to work on a regular basis, others are on call. A hiring policy was also released soon after full operation, wherein only those who have skills and whose age ranges between16 and 35 years-old were hired. Owners of farms who were beyond the age requirements either looked for off-farm jobs (which became limited with the shift from corn to banana), or other nonfarm jobs. The tenants working previously in corn farms were able to work in banana plantations on an on-call basis. The farmers stated that before the plantations came in, it was easier for them to look for off-farm jobs in corn farms.

V.2 Potential Social Costs

Perceived health effects

Survey results from SANREM-CRSP SEA show that similarities between illnesses could be observed both from respondents with and without plantation income in Lantapan, Bukidnon. In fact, there was no significant difference in illnesses. Fever and cough were the most common illnesses experienced in the family; (children, adult male, and adult female) (**Table 10**). Although not yet prevalent in children, more diseases are now becoming popular among adult males and females. These illnesses have been perceived to be brought about by climate (**Table 11**). Among adult males and females, overfatigue was perceived to be the most common cause of illness, next to climate changes.

Potential environmental impacts

A study by Tabien (2000) showed some of the potential environmental impacts brought about by operating banana plantations in Bukidnon. On-site and off-site impacts were presented below.

On-site impacts

Reduced water quantity. The banana plantation requires large volume of water for irrigation, fertilization and pesticide application, all of which are drawn from surface water sources. This increase in water demand puts a strain on the limited supply. Water shortage may be experienced because of overextraction. Conflicts in water use among residents and commercial users may also arise. The quantity of water that would have been available for household domestic use, for irrigation of other crops such as rice (downstream area) and vegetables, or for power generation will be reduced.

Reduced water quality. Application of fertilizers and pesticides produces residues that will go with the waterflow and contaminate water bodies. From the soil, pesticide residues and nitrates will go to the river, either through surface run-off or through underground seepage. Rain will carry the pesticide residues and nitrates released directly to the river along with eroded soil. On the other hand, pesticide residues and nitrates in the deeper soil horizons will be released slowly to the river through leaching and seepage of water beneath the soil (Tabien, 2000).

Nitrates lead to eutrophication of rivers. It induces the decomposition process of organic material in the rivers, causing reduced biological oxygen demand. Reduced oxygen in the rivers will lead to death of fish, crustaceans, and other aquatic life forms. Likewise, nitrates make the water unsafe for drinking (both for human beings and animals) and for domestic use. Moreover, pesticide residues in the air and water pose detrimental health hazards and poisoning risks.

Table 10. Distribution of respondents, by type of illness now, with and without plantation income, Lantapan, Bukidnon, 2002.

	Without plantation income		With plantation income				Total	
			Plantation 1		Plantation 2			
Type of illness	No.	%	No.	%	No.	%	No.	%
Child								
Fever	27	49	6	60	7	58	40	52
Cough	21	38	3	30	4	33	28	36
Flu	2	4	1	10	0	0	3	4
Others[a]	5	9	0	0	1	8	6	8
Total	55	100	10	100	12	100	77	100
Adult male								
Fever	19	40	0	0	4	40	23	37
Cough	8	17	1	20	3	30	12	19
Headache	3	6	1	20	0	0	4	6
Others[a]	17	36	3	60	3	30	23	37
Total	47	100	5	100	10	100	62	100
Adult female								
Fever	19	39	1	25	4	36	24	38
Cough	11	22	0	0	1	9	12	19
Headache	3	6	0	0	2	18	5	8
Others[a]	16	33	3	75	4	36	23	36
Total	49	100	4	100	11	100	64	100

[a]*Other diseases include ulcer, stroke, body pain, hypertension, arthritis, appendicitis, skin allergy, stomach ache, toothache, anemia, diarrhea, and hepatitis A. Source: SANREM Survey data, 2002.*

Reduced aesthetic value of the river. Aside from the direct benefits, Lantapan rivers were also used for swimming, fishing, picnics and other recreational activities. Once rivers become polluted, their recreational value will be diminished or, if not remedied, totally lost. **Table 12** showed that 67 or 92% of the interviewed farmers, based on the study by Tabien et. al. (2001), believed that when water becomes contaminated, it will no longer be a safe source of drinking water. Responses also stated that polluted water would be unsafe even for domestic and animal use and would result in a reduction and/or death of fish and other aquatic life forms. Moreover, 32% of them claimed that contaminated water causes skin disease and irritations.

Off- site Impact

Destruction of biodiversity of rivers downstream. The Lantapan rivers are tributaries of the Manupali River, which, in turn, discharges water to bigger rivers, the Pulangi River and the Rio Grande of Mindanao. Chemical pollution of these rivers will therefore, potentially destroy the flora and fauna of the downstream rivers.

Table 11. Distribution of respondents, by cause of illness now, with and without plantation income, Lantapan, Bukidnon, 2002.

	Without plantation income		With plantation income				Total	
			Plantation 1		Plantation 2			
Cause of illness	No.	%	No.	%	No.	%	No.	%
Child								
Climate	42	76	7	70	9	75	58	75
Chemicals from plantation	4	7	2	20	0	0	6	8
Water	3	5	0	0	0	0	3	4
Others[a]	6	11	1	10	3	25	10	13
Total	55	100	10	100	12	100	77	100
Adult males								
Climate	24	56	0	0	6	75	30	54
Overfatigue	12	28	4	80	0	0	16	29
chemicals from plantation	1	2	0	0	1	13	2	4
Others[a]	6	14	1	20	1	13	8	14
Total	43	100	5	100	8	100	56	100
Adult females								
Climate	23	53	1	25	3	38	27	49
Overfatigue	13	30	2	50	4	50	19	35
Chemicals from plantation	1	2	0	0	0	0	1	2
Others[a]	6	14	1	25	1	13	8	15
Total	43	100	4	100	8	100	55	100

[a]*Other causes include wind, dust, lack of immunization, and stress. Source: SANREM Survey data, 2002.*

Table 12. Respondents' perception consequences of pesticide runoff from banana arms to the rivers in Lantapan, Bukidnon, 2000.

Consequence	No. of responses[a] (n=73)	Percent
Water becomes unsafe to drink	67	92
Water no longer suited for other domestic uses	69	94
Reduction and/or death of fish and other aquatic life forms	59	81
Sickness/skin disease	24	33

[a]*Multiple responses were given.Source: Tabien et. al. (2001).*

VI. Toward a Win-Win Situation in Banana Production

Negative health and environmental impacts are major considerations in banana production. In this regard, two major national policies can help regulate banana

production by assuring that social costs are minimized, thus achieving positive net benefits. These policies are contained in the Local Government Code (LGC) of 1991 (RA 7160) and the Fertilizer and Pesticide Authority's Implementing Rules and Regulations. Note, however, that full implementation of these policies to ensure an environment-friendly method of banana production remains a challenge.

VI.1 The Local Government Code of 1991 (RA 7160)

The Philippine Local Government Code of 1991 provides that LGUs have the power to generate and apply resources (Section 18) and are

> *"…responsible for the efficient and effective development plan, program objectives and priorities; to create their own sources of revenues and to levy taxes, fees, and charges which shall accrue exclusively for their use and disposition and which shall be retained by them; … to acquire; develop, lease, encumber, alienate, or otherwise dispose of real or personal property held by them in their proprietary capacity and to apply their resources and assets for productive, developmental, or welfare purposes, in the exercise or furtherance of their governmental or proprietary powers and functions and thereby ensure their development into self-reliant communities and active participants in the attainment of national goals."*

This is probably the reason banana plantations easily operated in Bukidnon. For instance, prior to operation, the companies sought permits from the municipality of Lantapan, which was coursed through the Office of the Mayor and the Office of the Municipal Planning and Development Officer. Consultation with the local government officials during their regular sessions was also conducted, where the companies mentioned their willingness to contribute toward the town's infrastructure development.

The Code also provides that LGUs shall share with the national government the responsibility in management and maintenance of ecological balance within their territorial jurisdiction, subject to provisions of national policies. The Code further provides that LGUs shall discharge functions and responsibilities of devolved national agencies and offices. Section 26 of the Code states the following:

> *Duty of National Government Agencies in the Maintenance of Ecological Balance. – It shall be the duty of every national agency or government-owned or controlled corporation authorizing or involved in the planning and implementation of any project or program that may cause pollution, climatic change, depletion of non-renewable resources, loss of cropland, rangeland, or forest cover, and extinction of animal or plant species, to consult with the local government units, nongovernmental organizations, and other sectors concerned and explain the goals and objectives of the project or program, its impact upon the people and the community in*

terms of environmental or ecological balance, and the measures that will be undertaken to prevent or minimize the adverse effects thereof.

It is clearly stated in the provision of the Code that the national government with the LGUs has the responsibility to look for the welfare of its environment. If companies of banana plantations can easily come in through local government initiatives, as provided by the Code, the responsibilities in maintaining ecological balance should be properly imposed.

VI.2 Fertilizer and Pesticide Policy

The Fertilizer and Pesticide Authority's policy guidelines on product stewardship and responsible care, (Chapter 5 Section 1.1) state that "*The Company concerned shall ensure that its products are handled properly during formulation, storage, transit, application and disposal…"* In addition, Section 1.3 further states that "*The Company concerned shall provide, at cost, protective clothing such as aprons, gloves, mask and boots to users of its product…"* which clearly states that workers applying pesticides must wear complete clothing specifically for chemical applications. Compliance to this rule should also be studied.

VII. Concluding Comments

Our data show that benefits in terms of income and employment are high in banana plantations. In fact, the demand for the product in developed countries is so high that its export promises a favorable trade performance. These benefits, however, come with potentially high health and environmental costs. The issue that needs to be settled at least is the ability and capability of the LGUs to determine the benefits from banana plantations vis-à-vis the social costs involved in terms of environment and public health impacts.

Negative health and environmental effects will be minimized if not totally eradicated with proper implementation of national policies such as the LGC and FPA guidelines. Strict coordination of the LGUs, nongovernmental organizations, and, most especially, the companies involved will be of great help in lessening the risks to health and the environment while enjoying benefits from banana production.

REFERENCES

Astorga, Y. 1996. The environmental impact of the banana industry: a case study of Costa Rica. January 2003.

Bureau of Agricultural Statistics (BAS). 1990. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1991. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1992. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1993. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1994. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1995. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1996. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1997. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1998. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 1999. Quezon City, Philippines.

Bureau of Agricultural Statistics (BAS). 2000. Quezon City, Philippines.

Calderon, R. 2002. Ex-ante assessment of diagnostic kits for banana viral diseases. In: Ex-ante assessment, policy analysis, and extension strategies for selected agricultural biotechnology products. Final Report. Institute of Strategic Planning and Policy Studies, College of Public Affairs, University of the Philippines Los Baños.

Economic and Social Statistics Office. 2000. National Statistical Coordination Board. Makati City, Philippines.

Fertilizer and Pesticides Authority (FPA). 2000. Pesticide regulatory policies and implementing guidelines. FPA, Quezon City, Philippines.

Food and Agriculture Organization (FAO), 1999. FAO Production Yearbook. Rome, Italy.

Foro Emaús. 1998. The price of bananas: the banana industry in Costa Rica. Global Pestic. Campaigner. 8 (1).

International Service for the Acquisition of Agri-biotech Applications (ISAAA). 2000. Banana. http://www.isaaa.org/kc. January 2000.

Mendis, A. and C. Van Bers. 2001. Bitter fruit: attractive supermarket displays of tropical fruit conceal ugly environmental and social costs. Fair Fruit Initiative, Vancouver, Canada.

National Statistics Office (NSO). 2000. Manila, Philippines.

Philippine Statistical Yearbook. 2000. National Statistical Coordination Board (NSCB). Makati City, Philippines.

Republic Act (RA) 7160. 1991. Local Government Code of 1991. Republic of the Philippines.

Rola, A.C., D.D. Elazegui, C.A. Foronda, and A.R. Chupungco. 2003. The hidden cost of bananas: imperatives for regulatory action by local governments. CPAf Policy Brief 2003-01. College of Public Affairs, University of the Philippines Los Baños.

SANREM-CRSP/SEA (Sustainable Agriculture and Natural Resource Management–Collaborative Research Support Program/South East Asia). 2002. Institute of Strategic Planning and Policy Studies, College of Public Affairs, University of the Philippines Los Baños, College, Laguna.

Sebastian, R.S. (nd). Banana exports: the template of growth for 21st-century agriculture. In: The Food and Agriculture Centennial Book, University of Asia and the Pacific.

Tabien, C. 2000. Local government response to the potential environmental impacts of commercial farms on the water resources of Lantapan, Bukidnon. Master of Management (Development Management) field study report. University of the Philippines Los Baños, College, Laguna.

Tabien, C.O., A.C. Rola, W. B. Carada, and E. E. Devibar. 2001. Linking research and local governance in environmental management: the experience in Lantapan, Bukidnon, Philippines. ISPPS Working Paper 01-03. University of the Philippines Los Baños, College, Laguna.

Worobetz, K. 2000. The growth of the banana industry in Costa Rica and its effect on biodiversity. Department of Biological Sciences, University of Alberta.