Financial Assessment of Shifting from Aerial to Ground Spray in Banana Plantations in Davao Region

ANABETH I. SAN GREGORIO
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The Philippine banana export industry is an important source of income and employment in the country. It is therefore in the country's interest that this sector should be supported by every reasonable means, but it should not also be at any cost. One of the more recent and critical issues confronting the sector is the reported negative effects of aerial spraying to people's health and to the environment. In response to this issue, there have been clamor from several groups that aerial spraying should be banned and instead be replaced by ground spraying. Like any technological change, shifting to ground spraying is not without cost and this is the very bone of contention of the banana industry against the shift. But while it will indeed impose some cost, it is not clear yet to what extent it can affect the overall financial standing of the industry. There is a need to look more closely at the cost implication of shifting to ground spray and assess the industry's claim if it indeed has a fatal effect on the industry's financial performance.

The focus of the Report will mainly be in Davao Region where most of the industry players are operating. Since this is just a small and short term project, this Report will only provide a rapid form of assessment relying mainly on secondary data to evaluate the financial impact of banning aerial spraying and shifting instead to ground spraying. The results of the Report will hopefully aid in making informed positions and decision making to parties concerned.

The Report is divided into five sections. The first section looks into the current position of the Philippine banana industry with respect to the local economy and the world market. This section aims to provide a brief overview to see whether it is a volatile or a strong and stable industry that could withstand changes. The next section focuses on the industry's challenge in confronting sigatoka disease and the background on the issue of aerial spraying. The third section of the Report provides an overview of the dynamics operating in the industry. Such information will aid in understanding which specific players will be most affected by the banning and in what way/s can specific players adapt to the banning and shifting to ground spraying. Fourth section is a detailed account of the estimation procedure and analysis of the financial assessment of shifting from aerial to ground spray classified by key players in the industry. And the last section is a summary of the key points of the Report and the major conclusions given the results of the study.

1 Industry Performance in the Local Economy and Global Market

1.1 Position in Local Economy & Trend in Production and Planted Area

For the past years, the Philippine banana industry proved to be a strong and stable main source of export earnings and employment in the country. The industry, referring to the Cavendish variety that is primarily being exported, consistently ranks second among the top ten agricultural exports in the past years and its share to the total agricultural export receipts does not go lower than 10%. In 2009 in particular, banana export contributed 11% to the total agricultural exports. Likewise, in the last five years, the gross value added of banana registered a 10% average annual increase (Table 1).

Table 1. Top Ten Philippine Agricultural Exports
(FOB Value in M US$, GVA in M PhP)

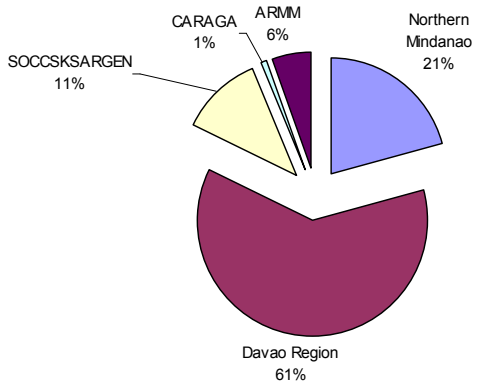
Item	2005	2006	2007	2008	2009
Coconut Oil	657	579	734	1,040	594
Bananas, Fresh	***363***	***404***	***396***	***406***	***344***
Tuna	102	143	211	396	335
Pineapple & Pineapple products	204	222	247	255	263
Dessicated Coconut	127	139	157	240	146
Tobacco Manufactures	113	103	98	125	109
Seaweed & Carageenan	72	712	92	114	99
Unmanufactured Tobacco				63	97
Milk and Cream Products	80	93	139	163	96
Fertilizer Manufactured	92	84		56	93
Total Agricultural Exports	n.d.	n.d.	**3,168**	**3,889**	**3,136**
% Share of Fresh Banana to Total Agri Exports			13%	10%	11%
GVA of Banana	5,740	6,192	6,821	7,918	8,214

Reference: Bureau of Agricultural Statistics

The industry is also a major source of employment opportunities due to extensive individual care needed for banana plants and for packing. In a presentation given by Mr. Lorenzo of PBGEA for Biosecurity Australia in 2002, he made mention that on the average, Philippine banana plantations employ approximately 0.8 to 1 labourer per hectare. He also said that the banana export industry in the Philippines employs 40 000 workers directly and benefits 160 000 Filipinos indirectly. Support services such as stevedoring, trucking, packaging and security indirectly link up an additional 100,000 more workers to the industry (Arquiza 2008).

The Philippine banana production for export is mainly concentrated in in Davao Region, composed of Compostela Valley, Davao del Norte and Davao City. In 2009 for instance, 47,435 ha or 61% of total area planted to cavendish banana in the Philippines can be found in the said Region (Figure 1). The key players in banana export industry are in this Region, singling out this region therefore, as the strategically most important area for Cavendish production in the Philippines.

Figure 1. Top Producing Regions of Cavendish Banana, 2009



Davao Region is ideal for large banana plantations because it has large contiguous tract of land available, it is almost typhoon free, and it has somewhat even rainfall year round and abundant human resources. Moreover, it is in a strategic location for transport of such fresh produce to international consumers.

On a national scale, the area planted to Cavendish banana is continually increasing for the past years, from 51,566 has in 2005 to almost 78,000 ha in 2009. The volume of production also jumped by almost 100% from 2.5 M to 4.5 M metric tons during the same period. Almost half of the increase in production can mainly be attributed to Davao Region. Such increase is not only due to the increase in the area but also to the increasing yield in the Region. Data showed that the Region generates a consistently higher yield than the national average (Table 2).

Table 2. Area Planted, Production and Yield of Cavendish Banana, 2005-2009

	Area Planted (ha)		Cavendish Production (MT)		Average Yield (MT/ha)	
	Philippines	Davao Region	Philippines	Davao Region	Philippines	Davao Region
2005	51,566	37,345	2,490,271	1,991,911	48	53
2006	67,801	40,585	2,810,985	2,231,413	41	55
2007	74,026	44,691	3,323,072	2,439,988	45	55
2008	75,346	45,855	4,329,023	2,746,338	57	60
2009	77,599	47,435	4,497,673	2,877,651	58	61

Reference: Bureau of Agricultural Statistics

1.2 Global Position and Export Trend

As it is the case for most tropical products, due to the special climatic conditions needed to grow bananas, they are mainly produced in developing countries in the tropics. Approximately 98% of world production is in developing countries while developed countries are the usual destination for export bananas. Philippines, currently ranks as the second largest exporter of Cavendish banana, following Ecuador. These two countries followed by the next largest exporter, Costa Rica, supply approximately more than 60% of the total world export of banana (Table 3).

Table 3. Banana Gross Exports

	Gross Exports (in '000 tons)					
	1990-1999 average	2000-2004 average	2005	2006	2007	2008
Latin America	8,898	9,880	10,539	10,760	11,555	11,628
Ecuador	1,680	4,267	4,654	4,402	4,651	4,727
Costa Rica	1,641	1,788	1,615	1,961	2,061	1,869
Colombia	744	1,532	1,622	1,697	1,749	1,798
Carribean	274	134	82	105	78	75
Far East	1,250	1,806	2,169	2,428	2,325	2,343
China	657	45	39	39	36	31
Malaysia	45	27	34	27	27	30
Pakistan	15	4	9	12	7	37
Philippines	***552***	***1,702***	***2,024***	***2,312***	***2,218***	***2,193***
Thailand		8	42	20	21	21
Vietnam	5	9	4	2	2	2
Others	27	11	18	16	15	30
Africa	340	528	505	606	531	552
Oceania	1	0	0	0	0	1
WORLD	10,762	12,347	13,294	13,899	14,489	14,599
Philippine Percentages						
% to Far East	*44%*	*94%*	*93%*	*95%*	*95%*	*94%*
% to World	*5%*	*14%*	*15%*	*17%*	*15%*	*15%*

Source of data: FAO

Like Ecuador, the Philippines is expected to rake in the strength of its global position by taking advantage of its strategic location, low production costs and its well-established marketing channels in Asia. Philippine banana export has significantly grown by over 200% over the period 1990-1994 to 2000-2004 and has continued to remain stable at a rate above 2M MT annually in the succeeding years as shown in Tables 3 and 4.

Based on records, the main importing areas in the world are the European Union, the United States of America and Japan, which together accounted for more than 70% of

total world imports. The regional character pattern of distribution of banana trading defines the preferential market in the industry. Preferential market is mainly determined based on transportation costs and the time requirement for distribution also plays a role in the regional fragmentation of the market. There is therefore a strong basis why Japan, one of the biggest importers in the world, is the number one destination of Philippine banana, with a 55% share of the total Philippine exports (Table 4). Aside from Japan, the rise in population and income from other main markets especially in Eastern Asia and the Middle East will lead to steady growth.

Table 4. Major Market of Philippine Cavendish Banana Export, 2009
(Quantity in '000 MT, FOB Value in M US$)

Importing Country	Quantity	Value	% Share
Japan (Excludes Okinawa)	913.79	205.12	55%
Iran, Islamic Republic of	250.63	41.18	15%
Korea, Republic of South	132.12	27.47	8%
Singapore	100.52	19.46	6%
China, People's Republic of	81.11	13.76	5%
Others	185.88	37.45	11%
	1,664.05	**344.44**	**100%**

Source: Bureau of Agricultural Statistics

This preferential market being enjoyed by the Philippine banana industry has helped brought in millions of dollars to the economy. In 2008, with 2.19 million metric tons export volume, it generated earnings of $406 million (Table 5). Official records also show that for the past several years a relatively steady export receipt averaging to $400M annually (Table 5).

Table 5. Cavendish Export Statistics
(Export Volume in '000 MT, FOB Value in M US$)

	Cavendish Export	
	Volume	Value
2005	2,024	363
2006	2,312	405
2007	2,199	396
2008	2,193	406

Source: Bureau of Agricultural Statistic

2 Understanding the Issue of Aerial Spraying

Sigatoka Disease

To be able to provide a perfect fruit for export consumption that placed the industry to such a favorable position in the world market, the Philippine banana industry had to contend with arduous challenges. Among these challenges, plant disease may be considered as one of the most serious problems in banana farm operations. The black leaf streak, also known as black sigatoka, in particular is one of the most damaging and costly of these diseases.

The high rainfall and humidity of the tropical areas, like the Philippines, in which bananas are grown are especially favorable for sigatoka disease development (Flynn, 2005). The fungus that causes black Sigatoka, *Mycosphaerella fijiensis*, is spread from tree to tree by wind, rain, and irrigation water. The name black Sigatoka was given to the disease because it was first discovered in 1963 in the Sigatoka Valley of Fiji.

Sigatoka is characterized by blackened tissues interspersed with water-soaked, chlorotic areas. As the infected tissues dry, they turn light gray-brown with dark borders and totally collapse. Entire leaves can desiccate and be killed within three to four weeks of the appearance of first symptoms (Fullerton, 1994). The rapid and early collapse of leaves lead to smaller bunches carrying prematurely ripening fruit. The reduction of leaves can lead to reductions in leaf area, yield losses of 50% or more, and premature ripening, a serious defect in exported fruit. In very severe cases all the leaves may dry completely and the bunch may fall from the plant ( ).

The Cavendish cultivars that are used for export are so susceptible that nothing short of intensive fungicide application will control the disease in most areas. Black Sigatoka is controlled with frequent applications of fungicides and cultural practices, such as regular pruning of leaves with infected tissue, proper drainage as humidity can increase leaf spot, population control by sucker pruning/sucker selection to improve airflow and coverage of fungicide application, field sanitation, and appropriate fertilization. In total, these are very expensive practices ( ).

In total, it has been estimated that the costs of control are ultimately responsible for 15-20% of the final retail price of these fruit in the importing countries ( ).

Aerial Spraying

Aerial spraying is a way of applying pesticides to agricultural crops using aircrafts. It is normally used in large farm areas and is preferred due to uniform and apparent efficient coverage in terms of area per unit of time. In the Philippines, banana plantations have been using aerial spraying practice to kill the Sigatoka fungus since the 1970s ( ). The

fungicides such as chlorothalonil or mancozeb, benomyl (brand name, Benlate), propiconazole (Tilt 250 EC), and tridemorf (Calixin) are sprayed on banana plants to prevent the fungus "sigatoka" from spreading. The industry considers aerial spraying as the most cost-efficient method for addressing the sigatoka fungus problem.

However, several issues against aerial spraying have been raised:

- "Local guidelines on aerial spraying do not contain any provision to protect communities living in and around plantations against exposure to pesticide". Exposure to pesticides can cause rashes, skin inflammation and rapidly progressing, life-threatening allergic reactions ( ).

- The chemicals can also lead to chronic diseases such as thyroid gland disorders, chromosomal damage, liver and thyroid cancers, and retinal degeneration ( ).

- Plantations are discontinuous and patchy, buffer zones are not really observed and the planes used for the spraying are known to stray around inhabited areas ( ).

    - A buffer zone is an untreated area wide enough to capture drift fallout adjacent to the sprayed area. Nozzle type, droplet size, product dose, dilution and spray technique should be considered when this unsprayed barrier (buffer) width is determined (FAO).

    - For aircraft spraying, the buffer zone needs to be wider than for ground spraying as it is more difficult to make a precise spray cut-off with an aircraft operating at speed. The width of a buffer zone is also influenced by the pesticide product type and by the presence of adjacent waterways. However, these guidelines are seemingly not being practiced (FAO).

- Pesticide use can also have serious consequences for the environment. At least 25% of the pesticides applied by aerial spraying never reach their target but are instead unintentionally applied directly into ponds and streams or on farmland surrounding the plantations.

Due to its effects on people's health, environment and livelihood, there is a clamor to ban aerial spraying in the Philippines. Instead of aerial spraying, plantations are being asked to shift to other various ground spraying methods such as truck mounted or manual spraying.

But banana growers, led by the Pilipino Banana Growers and Exporters Association (PBGEA) are not convinced with the idea and at the moment are unwilling to stop using aerial spray and to shift to ground spray. The industry is claiming significant potential losses as a consequence of the ban.

3 Banana Industry at a Glance

To come up with reasonable scenarios and assumptions in estimating the financial impact of aerial spray banning, this section will provide a brief account of the dynamics operating in the Philippine banana industry. Such information will aid in understanding which specific players will be most affected by the banning and in what way/s can specific players adapt to the banning and shifting to ground spraying

Historically, the commercial growing of banana in Davao started after World War II when the abaca industry, the major export commodity of the area before the war, experienced a slowdown. In Davao del Norte in particular, the rapid growth of plantation agriculture started in the mid- 1960s when two transnational corporations (TNCs), Castle and Cooke (also known as Chiquita) and Del Monte started banana production operations in South Cotabato and Davao provinces through local subsidiaries (Quitoriano, 2008).

The industry has gone through major transformation since the beginning of the 90's when transnational corporations divested their ownership of plantations, preferring guaranteed supply contracts with medium- and large-scale producers from the countries that actually grow the bananas (Jackson, 2000). Aside from the TNC's own initiatives in divesting ownership, the implementation of Comprehensive Agrarian Reform in 1998 further shaped and cemented this transformation of local growers themselves providing steady supply to TNCs. Table 6 shows a partial list of exporters and their respective growers. The data in the Table is not updated but this is still an accurate picture of the key players currently operating in the industry. One example is Del Monte Fresh, it does not grow its own bananas and instead obtain all its supplies from local corporate growers like TADECO and Lapanday Foods Corporations (Carandang 2009).

Table 6. Major Exporters and Growers in the Philippine Banana Industry, 2004

Banana Exporter	**Brand Name**	**Grower**	**Share to Total***	**Ranks 1st in**
Del Monte Fresh (Phil) Produce	Del Monte	Lapanday Group of Companies, Anflo Group of Companies & Dizon Group of Companies	26	Korea
Stanfilco, A division of Dole Phil	Dole	Sarangani, Cooperatives, Small Growers, Managed Areas	27	Japan
Sumitomo	Gracio	Davao Fruits Corp, AMS Group of	9	

		Companies		
Fresh Asia Produce Company International (FAPCI)	Estrella, Aloha, Mabuhay	Global Fruits Corp, Lapanday Hijo Plantations, Small growers	12	China
Chiquita/Unifrutti	Unifrutti (Middle East), Chiquita Jr (Korea)	Malalag Tortuga Group, Marsman-Drysdale Group of Companies, La Frutera, Inc, Ardexcor	21	Middle East

Source:

As shown in Table 6, TNCs engage in partnership only with the corporate type , small and large scale growers. The industry naturally evolved into this kind of categories. The large scale growers or producers are those with large plantations and medium scale growers are composed mostly of farmers with small land holdings under contract growership with national or multinational companies, individually or as members of a cooperative.

Large Plantations

The majority of plantation companies or professionally managed corporate farms are family-owned companies with usually 100 hectares of land or more (Carandang 2009). These firms formed PBGEA or Philippine Banana Growers and Exporters Association. This association acts as an advocacy group for issues such as agrarian reform, lease rentals, wage rates, etc. (Digal 2007).

At present, there are corporate/plantation growers who have their own brand and support facilities such as box plant, trucking, cooling warehouse, shipping, packing sheds, etc. Two Filipino companies Lapanday and Marsman are starting to compete with the other big companies. Lapanday already has its own packaging houses, cold storage facilities and port. It sells under the brand names of: Estrella, Aloha and Mabuhay bound for China, HongKong and Singapore. Marsman has their bananas under Oro Fresh brand, which is sold in the Middle East and South Korea (Puyod 2007).

Corporate or plantation growers are also engaged into growership agreements with small landowner growers and with farmers' cooperatives. In the case of Lapanday, for instance, from approximately 7000 has, of which all were operated through a corporate managed system, their 2001 data revealed a 75-25 combination of managed farms and contracted growers respectively. Data for 2006 brings this combination to about 67%

managed frms and 33% contracted growers. Furthermore, it is expected that in the next 5 years, the mix will come close to 50/50 in the utilization of corporate managed farms and growership agreement (Carandang 2009).

Small Farmers under Contract Growership

Small farmers are willing partners with corporate growers because unlike the corporate growers, small farmers could not readily participate in the export market, because it is not as easy for them to comply with all export requirements. In order to advance their interest in the export industry, small farmers pooled their farms by joining cooperatives with CARP assistance, which consolidate the harvests of all members and as one organization engage itself to a grower contract with a multinational or national exporting company.

According to Puyod (2007: 89) contract growing in the Philippine banana industry refers to an agreement of a grower with an export company to supply the harvest, which is packed under the exporter's brand. Under this arrangement, farmers maintain ownership of their individual farms. The farmer assumes all responsibilities in farm management and is responsible for the risk of weather fluctuations, harvest losses, rising input and labor costs, whereas the company arranges the export and corresponding logistics and paperwork. (delos Reyes and Pelupessy 2009)

As a contract grower, the division of work and responsibilities and the prices depend on the type of arrangement stipulated in the contract which could be: ex-patio, ex-truck and ex-wharf (Table 7).

Table 7. Alternative Contract Growing Arrangements

FOB Ex Patio	Bananas are sold as bunches upon delivery to the packing house. Recovery risk is borne by the exporter.
FOB Ex Truck	An exporter buys packed bananas and a grower's produce is classified as Class A or B.
FOB Ex Wharf	It is similar to FOB Ex Truck except that hauling is borne by the grower.

Source: Digal, 2005

The buyer pays the farmer/grower/seller per box weighing 13 kilos of bananas meeting specific quality requirements, some of which are stated in Table 8 below (Digal 2007).

Table 8. Different Market Specification for Bananas, per country

Specification	Countries					
	New Zealand	China	Singapore	United Arab Emirates	Japan	
					Type 1	Type 2
Fingers/Cluster	4-8	5-9	5	4-6	3-4	5-6
Calibration	Max:48	Max:48	Max:47	Max:43	Max:47	Max:50
	Min: 41	Min: 38	Min: 41	Min: 37	Min: 42	Min: 40
Finger Length/Cluster	8 inches	7.5 inches	8 inches		8 inches	7.5 inches
Packing Pattern	3 layers	4H/5H lengthwise pack 6H/7H crosswise pack Cluster crosswise pack	4 layers	4-5 hands crown down lengthwise pack	3 or 5 layers	4 layers

Source: Carandang 2009

There is a price review/negotiation at least every 2 years or sooner should there be an increase of 5% in the price of imported materials, such as fertilizers, herbicides, fungicides, insecticides and others, either or both parties may call for a price review/negotiation. All outstanding accounts and compensation due to the buyer and loans guaranteed by the buyer are deducted first from the gross sales proceeds before payment. The buyer has the first lien over the farmer/seller's sales proceeds including the subsequent ones until the latter's account is fully paid. Should there be changes in the industry specifications on weights, the price may be adjusted either upward or downward (Digal 2007).

The buyer has complete ownership of the bananas and is treated as the exclusive exporter of the bananas of the farmer/seller. The buyer has the option but not the obligation to

supply the farmer/seller with plastics, fertilizers, and other inputs needed in the farm for which the seller shall be charged at cost, and for which the buyer shall deduct from the proceeds of bananas due to the seller. The principal provides the seller with technical services (Digal 2007).

The farmer/seller handles and funds the production and operating costs of the farm. The seller permits the buyer or its agent to carry out aerial Sigatoka control activities charged to the seller's account and expense at cost. The farmer/seller may, however, introduce agricultural practices other than those recommended by the buyer as long as these are more economically viable, and ecologically safe and the quality of the bananas produced conform to the specifications annexed to the agreement (Digal 2007).

4 Financial Assessment of Alternative Solutions

4.1 Categories: Plantation vs. Small Growers

Taking off from the previous section, it was shown that there is a clear distinction between two types of banana farms. One is the plantation type, owned and managed by family corporations and the other is the small farm, owned and managed by small landowners and mostly dominated by CARP beneficiaries. It is important to make such a classification at this point due to the presumed difference in cost structure as will be analyzed further in this section.

The Report was not able to secure comprehensive data on the complete list of all large and small banana farms. Nevertheless, available data would show that both large and small farms are significant or key players in the export industry, which further warrants making such distinction in the cost analysis.

Table 9 shows that in terms of small scale Cavendish banana farms, those with sizes bet 1 to 2 hectares are the most numerous, and among small farms, almost a quarter percentage (or 23.6%) are farms with less than 1 hectare area. Most of these individually owned farms came from redistributed land under CARP.

Table 9. Size Distribution of Small Cavendish Banana Farms in Region 11

Size	% Share
<0.5	10.1
0.5 - 0.999	13.5
1.0 - 1.999	27.9
2.0 - 2.999	17.6
3.0 - 4.000	16.4
> 5.0	14.5
All (%)	**100**

Source: delos Reyes and Pelupessy, 2009

These farms are small but combined together they form thousands of hectares of lands devoted to banana farming. Based on the latest data of Bureau of Agricultural Statistics, as of 2009, 44,772 hectares of the redistributed land in Davao Region are planted to bananas. Among the provinces in Davao Region, almost half of these areas planted to banana can be found in Davao del Norte (Table 10).

Table 10. CARP Grants Planted to Banana

Area	Area Planted to Banana (ha)					Number of ARCs				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Compostela Valley	2,929	3,325	4,125	8,534	9,147	5	8	9	14	16
Davao City	2,447	8,325	7,385	7,385	10,868	8	10	10	10	12
Davao del Norte	11,008	13,298	15,213	16,154	21,499	7	9	15	18	21
Davao Oriental	695	1,244	1,244	2,244	2,244	3	3	3	4	4
Davao del Sur	1,513	921	1,231	1,050	1,014	6	7	9	9	8
Total	**18,592**	**27,113**	**29,198**	**35,367**	**44,772**	**29**	**37**	**46**	**55**	**61**

Source: Bureau of Agricultural Statistics

The main thing to note in Table 10 is that small farms find it more viable to invest in banana farming than other alternative land uses as demonstrated by the data that over the years, there is an increasing area of CARP granted lands devoted to banana farming. This may be an indication of a continuing trend of small farms engaging in banana farming. But that is not to say, that large plantations are no longer in the picture. The size of a banana plantation in the Philippines can range from 70 to 6250 hectares. They are actually bigger players, as can be expected, in the export industry. Table 11 below shows a partial list of large plantations operating in Davao Region. Data are patchy and scarce on these large plantations.

Table 11. Partial List of Large Banana Plantations

Company/Plantation	Location	Area (ha)	Exporter
Agrinanas Agri Devt	Davao City	n.d.	Del Monte
AMS Group of Companies			Sumitomo
Soriano Fruits, Corp	Davao del Norte	1,500	
AMS Malalag Farm, Inc.	Davao del Sur	330	Del Monte
AMJR Holdings		n.d.	Sumitomo
Anflo Group of Companies, Inc			
Tagum Agricultural Development Co., Inc.	Davao del Norte	6,474	Del Monte
Apoland Banana	Davao City	209	Sumitomo
Comval Tropical Fruit, Inc			Del Monte
Davao Fruits Corp	Tamayong & Sirib	203	Sumitomo
	Dacudao	436	
	Manuel Gianga	578	
Diamond Farms, Inc			Dole
Dole			
Stanfilco		11,400	
Skyland Division	Davao City	n.d.	
Fresh Banana Agricultural Corp.			Sumitomo
F.S. Dizon and Sons	Davao City	624	Del Monte
Global Fruits Corp	Davao City	133	FAPCI
Lapanday Foods, Corp	Davao City	6,552	Del Monte
Marsman-Drysdale Group			Denadai
MD Nabunturan Agri-Ventures, Inc.	Comval	116	
MD Isalon Organic Banana Agri Ventures, Inc.	Comval	180	
MD Panabo Agri-Ventures, Inc.	Davao del Norte	472	
MD Davao Agri – Ventures, Inc.	Davao del Norte	118	
MD Rio Vista Agri Ventures, Inc.	Maco, Davao (?)	380	
Marsman Estate Plantation, Inc	Sto. Tomas, Davao Prov	1,071	
Progressive Highland Dev Corp	Davao City	192	
Subasta Agri Development	Davao City	300	Sumitomo
Sumifru Philippines, Inc.	Davao del Sur	n.d.	
Tristar Group of Companies		n.d.	Sumitomo
Maco Agriventures, Inc	Davao del Sur		
Madayaw Agri Crops Corp	Davao del Sur		
Malon Farms, Inc	Davao del Sur/Davao City		
Highland Banana Corporation	Davao City	327	
Tagluno Development Corp	Davao City	102	
Malon Farms, Inc	Davao del Sur/Davao City		

4.2 Cost Components

T the Department of Agrarian Reform (DAR) and Land Bank of the Philippines (LBP) in 2007 established a guideline for the determination and valuation of production inputs in cavendish banana growing. According to the guideline, the generally accepted annual cost of operation for every hectare of banana farm is PHP 200,000 and PHP 300,000 for small and large plantations, respectively. Small banana plantations refer to those plantations with less than 20 hectares while large banana plantations are those plantations with area of 20 hectares and above.

This section will provide an overall picture of the cost components in the production/operation of banana farms. This cost overview is important in understanding the overall viability of adapting a particular technology for sigatoka control, whether it is aerial or ground spraying, as what will be shown later.

Table 12. Generally Accepted Cost of Operation
(One hectare banana plantation)

	Small	Large
Field Labor		
Plant Care	41,204.00	41,204.00
Fruit Care	11,480.00	11,480.00
Harvesting	10,192.00	10,192.00
Packing	19,136.00	19,136.00
Sub-total	82,012.00	82,012.00
% to Total	***29%***	***26%***
Materials Inputs		
Fertilizers	22,845.00	22,845.00
Chemicals	70,652.06	70,652.06
Supplies	41,900.00	41,900.00
Sub-total	135,397.06	135,397.06
% to Total	***48%***	***44%***
Irrigation Cost	19,600.00	19,600.00
% to Total	***7%***	***6%***
Indirect Cost	43,481.81	72,556.00
% to Total	***16%***	***23%***
Total Cost/ha	**280,490.87**	**309,565.06**

Source: DBP-LBP

Labor and materials inputs combined, they account for almost 80% of the total banana farm operation. Looking more closely at the field labor item, a large portion or a little over 50% of the labor cost (PhP41T), is devoted to plant care alone. Similarly, the chemicals which is also used for plant care, is more than 50% of the total materials inputs. Note that disease control is under plant care.

In Table 13, a similar pattern can be observed based on the study of Digal (2005), labor and pests and disease chemicals are the major cost items in banana farm operation. According to a study on banana farming in other parts of the world, it has been estimated that the costs of plant disease control is ultimately responsible for 15-20% of the final retail price of banana ( ). Based on another study by Ploetz (2001), the annual cost of fungicide applications in export plantations is about $1,000 per hectare.

Table 13. Allocation of Cost Items in Banana Production

Cost Item	% to Total Cost
Labor	**37%**
Materials Inputs	**52%**
Fertilizers	8%
Pests & disease control chemicals	28%
Propping & bagging materials	11%
Fuel, oil & lubricants	5%
Depreciation & overhead	**11%**
Total	**100%**

Source: Digal, 2005

The depreciation component includes capital expenditures items that were depreciated per hectare like packinghouse, cableway, power lines and transformers, water system, and service vehicles.

While labor is sourced locally, the materials inputs, specifically, chemicals are imported that is why this is item is a large chunk of the total cost If cost aspect is to be any indication, this pattern is consistent to what has been said in the earlier section of the Report that plant disease control, as indicated by the chemicals cost, is a major if not the biggest problem in banana planting.

Looking more closely at the details that compose field labor and materials input, sigatoka control cost items (italicized items in Tables 14 and 15) contribute significantly, if not the major items, in these cost components. It is estimated that 15-20% of the price of bananas is due to the cost of the disease control measures that are used to produce the fruit. (Flynn)

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Table 14. Detailed Costing for Field Labor in Banana Farms

Cost Item	Man-Days/Ha	Rate/Man-Day	Amount/Ha
Field Labor			
Plant Care			
Deleafing	10.4	200	2,080
Mat Sanitation	15.6	200	3,120
Pruning	10.4	200	2,080
Weed Spray	5.2	200	1,040
Fertlization			
Urea	3	200	600
Sulfate	3	200	600
Potash	3	200	600
Replanting	5	200	1,000
Sigatoka Trimming	*15.6*	*200*	*3,120*
Bquetes-Weekly	15.6	200	3,120
Moko-Bunchy Top	5.2	200	1,040
Moko-Eradication	13	200	2,600
Lession Counter	2.6	200	520
Master pruning	3	200	600
Aerial Spraying	*78*	*138*	*10,764*
Tertiary Canal	20.8	200	4,160
Secondary Canal	20.8	200	4,160
Sub-Total			**41,204**
Fruit Care			
Canopy Removal	0.2	200	40
SF-101 (Bud Injection)	15.6	200	3,120
SF-202 (Stem Injection	10.4	200	2,080
Bagging	10.4	200	2,080
Propping	20.8	200	4,160
Sub-Total			**11,480**
Harvesting	50.96	200	**10,192**
Packing	95.68	200	**19,136**
Total for Field Labor			**82,012**

Table 15. Detailed Costing for Material Inputs in Banana Farms

	Quantity	Unit	Cost/Unit	Amount
Material Inputs				**135,397**
Fertilizers				***22,845***
Urea	7.5	Bags/ha	950	7,125
Ammonium Sulfate	12	Bags/ha	570	6,840
Potash	12	Bags/ha	740	8,880
Chemicals				***70,652***
Bud Injection (SF-101)				3,310
Confidor	0.42	Liters/ha	6750	2,835
SECO/Success	0.24	Liters/ha	1980	475
Stem Injection (SF-102)				3,024
Topcin	1.8	Kg/ha	1300	2,340
Basudin	1.2	Liters/ha	570	684
Weed Spray				9,324
Gramoxone	6	Liters/ha	280	1,680
Round-up	6	Liters/ha	320	1,920
Basta	7.2	Liters/ha	700	5,040
Sulfate	1.2	Liters/ha	570	684
Formalin	1	Kg/ha	35	35
Moko/Bunchy Top				1,623
Basudin	0.96	Liters/ha	550	528
BPK	0.96	Liters/ha	300	288
Diesel	0.24	Liters/ha	28.58	7
Rice Hull	2	Tons/ha	400	800
Sigatoka Spray				***53,336***
Bankit	*2.08*	*Liters/ha*	*3825*	*7,956*
SECO/Success	*2.4*	*Liters/ha*	*1990*	*4,776*
Banole	*130*	*Liters/ha*	*41*	*5,330*
Baycor	*6*	*Liters/ha*	*1895*	*11,370*
Manze (MDF)	*12.6*	*Liters/ha*	*195*	*2,457*
Daconil	*8.28*	*Liters/ha*	*410*	*3,395*
Dithane	*24*	*Liters/ha*	*150*	*3,600*
A1-100	*1.38*	*Liters/ha*	*210*	*290*
Folicur	*1.38*	*Liters/ha*	*3480*	*4,802*
Vanozeb	*48*	*Liters/ha*	*195*	*9,360*
Supplies				***41,900***
Bagging				14,400
Polybag	102	Kg/ha		12,750
Flat Twine	15	Kg/ha		1,650
Propping (with guying)				
Twine	250	Kg/ha		27,500

4.3 Cost Computation and Comparison

There will basically be four sets of estimates that will be presented in the analysis:

1. Aerial spraying in plantation
2. Ground spraying in plantation
3. Aerial spraying in small farms
4. Ground spraying in small farms

These costs will be analyzed side by side and will then be compared vis-à-vis the potential gross profit, based on yield, to come up with net returns for each set. The following valuation was brought to a common base so that the values can be aggregated & compared. Most of the available cost and price data are in 2007 prices, hence this was the common base used.

This Report follows the general rule of estimating the incremental effect to in analyzing the cost effectiveness of shifting from one technology to another, like aerial to ground spray. Furthermore, to meet the main objective to see the overall viability, or in other words, whether the industry will still survive if aerial spraying will be banned and ground spraying will instead be adapted, this Report will also look into the total cost vis a vis the net returns per type of technology.

Cost Computation

1. Cost of aerial spraying in plantation

The most basic components for aerial spraying are chemicals and aircraft operation. The cost for chemicals sigatoka control was culled out from Table 15. The information for plane rental was based on the survey of Jamir (2010) for his dissertation and also from the data presented by PBGEA (Appendix). According to Jamir, both banana companies and growers pay for the plane's overhead ferry time if the target plantation is beyond 6 to 10 km from the airstrip. Likewise, plane rentals differ depending on the size of the target plantation. If the plantation is 90 has and beyond, the charge will cost P 233 per ha. per cycle. However if the target plantation is less than 90 ha, the plane rental will be on a per-hour-basis, that is P 22,000 pesos per hour. At a standard operational efficiency of plane spray at 20 has. per hour, the charge rate will be equivalent to P1,100/ha.

In Table 16 below, plane rental and chemicals were then added to generate the total cost for sample plantation and for PBGEA Estimate. From the survey results of Jamir, the responses from two banana plantations (Plantation B and C) on their total cost for sigatoka control using aerial spraying were also considered. An average estimate was the derived from these four sets of total cost estimates to come up with the representative cost for sigatoka control using aerial spraying, which is about PhP68,600/ha./yr.

Table 16. Cost of Aerial Spraying in Large Banana Plantations

Cost of Chemicals (per ha/yr)	**58,670**

Plane Rental			
	Rate/ha/Cycle	# of Cycles/yr	Cost/ha/yr
≥ 90 ha	233	35	8,155
Sample Plantation with < 90 ha	1100	35	38,500
PBGEA Estimate	269	35	9,415

Total Cost		
	Rate/ha/Cycle	Cost/ha/yr
Sample Plantation (≥ 90 ha size)	Chemicals + Plane Rental	66,825
PBGEA Estimate	Chemicals + Plane Rental	68,085
Plantation B	1,202	77,050
Plantation C	2,300	62,500
	Average Cost (per ha/yr)	**68,615**

2. Cost of ground spraying in plantation

Major cost components for ground spraying in a large plantation include labor, chemicals and Martignani trucks. A network of roads around the plantation would also be needed for the Martignani trucks to move around. According to one of the respondents from Jamir's survey, road network design for ground spray requires a road space for every 80 meters (m) length because the effective spray throw of a Martignani truck is limited to only 40 m. The road width usually ranges from 6 m to 10 m.

Table 17. Cost of Ground Spraying in Large Banana Plantations

	Cost/ha/cycle	**# Cycles**	**Cost/ha/yr**
Plantation A	3,100	37	114,700
Plantation B	3,000	34	102,000
Plantation C	1,332	52	69,264
PBGEA Estimate	2,958	35	103,533
	Average		**97,374**

Averaging the total ground spray cost for the three respondents and another estimate based on PBGEA data, the amount is about Php 97 thousand per hectare per year.

3. Cost of aerial spraying in small farms

Four small farmers under contract growership agreement with large plantations provided information on the amount they spent for aerial spraying for sigatoka control based on the company deductions to their account. The amount per hectare per year ranges from 60,000 to 96,000 pesos. In many cases, the farmers do not understand the exact details of what the deductions they are getting, they just simply know of what particular amount it is for sigatoka control as provided in the statement of account they receive.

Table 18. Cost of Aerial Spraying in Small Banana Farms

	Area	Cost/month	Cost/ha/yr
Farmer 1	3.6	22,142	73,807
Farmer 2	5	40,000	96,000
Farmer 3	3.6	18,000	60,000
Farmer 4	3.25		65,500
		Average Cost (per ha/yr)	**73,827**

Average value based on the farmers' response for sigatoka control per hectare per year is approximately PhP73,800.

4. Cost of ground spraying in small farms

A grower in Tamayong provided the following details of the amount he spends for sigatoka control using ground spray for his five hectare farm planted to banana. He noted that he is now spending significantly less amount with the use of ground spray than when he was paying the company for aerial spraying, which was about PhP 30,000 to 40,000 per cycle for his 5 ha farm.

Table 19. Cost of Ground Spraying in Small Banana Farms

Item	Cost Details	Annual Cost (per hectare)
Labor	PhP200/day; 2 workers; 2days/worker/cycle	9,733
Chemicals	PhP 6,000/5 has/cycle	29,200
Power Spray	Php 60,000 (depreciated for 5 years; straight depreciation)	12,000
Gloves, mask, boots		2,700
	Total Cost (per ha/yr)	**53,633**

Note that the approximate computed amount of PhP53,600 is a conservative high bound estimate than what was quoted by the grower since according to the grower, his power spray can last for a much longer period than the five year life span than what was used in the computation. Also, the cost for the power spray is good for the entire five hectare farm, which was no longer reflected in the computation since the entire amount was only accounted for one hectare.

Cost and Returns Estimation

For the final stage of analyzing the viability of shifting from aerial to ground spraying, all the costs items presented earlier will be sorted out vis-à-vis the potential net returns for each scenario. For this purpose, few simple steps were employed:

a) Assumption on the average yield was established

In terms of yield, the Philippine banana industry has the highest yield in the world at 4,692 boxes per hectare per year attained by Lapanday Foods Inc. On the average, production yield is approximately 3,500 boxes per year. But based on official records of BAS, Davao Region has higher average, than the national average, at 4,200 boxes/year. This average was derived given a production volume of 2,439,988 MT and a total area of 44,691 ha for 2007 (as cited in Table 2) a net weight for one box of banana of 13 kg. In the following computations, the value used was rounded off to 4000 boxes/ha/yr to generate a more conservative estimate.

In all cases, whether aerial or ground spray in large plantation farms or small grower farms, the experience of Davao City banana growers has shown that yield remains the same.

b) Generate normalized cost values

At this point, normalized or unit values of costs were computed. For this step, total production costs were derived by adding the computed amount of sigatoka control cost, per scenario, to other cost items like other production costs and indirect costs as cited in Table 12. The unit values (i.e. cost of production per box) for each total cost items were then generated by dividing the total cost with the approximate average yield of 4,000 boxes/year.

c) Compute for the gross value of yield

Based on the approximate average yield, potential gross value of yield was calculated by multiplying the yield with the price of banana per box. Different prices were used for plantations and small farms. FOB price was used for plantations and ex-patio price on the other hand was used for small farms. The FOB price of 2.35 per 13 kg box was computed based on the data presented in Table 5, where volume is 2199 T MT and FOB

Value of $396 M. The ex-patio price of $2.20 on the other hand was based on contract growership agreements of several growers.

d) Potential Gross Profit Estimate

Generated based on what was left after deducting the total cost of production from the potential gross value of yield.

Key Findings

As a point of comparison in interpreting the following results, note that growers on an average around the world receive between 5cents and 10cents per kg profit (Jackson).

Table 20. Comparison of Cost and Returns for Aerial vs. Ground Spray in Large Banana Plantations

	Aerial Spray	Ground Spray
Yield (per ha/yr)	4000 boxes	
Costs (per ha/yr)		
Sigatoka Control Cost	68,600	97,300
Other Production Costs	170,000	170,000
Indirect Costs	72,556	72,556
Total Cost	*311,156*	*339,856*
Cost per Box (in peso)	77.79	84.96
Cost per Box (in US$)	1.69	1.85
Gross Value of Produce (per ha/yr)		
FOB Price (per box)	$ 2.35	$ 2.35
Gross Value of Yield (in peso)	*432,400*	*432,400*
Potential Gross Profit *(in peso, per ha/yr)*	***121,244***	***92,544***
Potential Net Returns (per unit, in US$)		
Net Returns per Box	0.66	0.50
Net Returns per kg	0.05	0.04

- In plantation farms, a shift from aerial to ground spray would equate to a loss of PhP28,700/ha/yr potential gross profit. This means a loss of 15 cents for every box of banana. But still earning a positive potential net return and almost within the world average at 4cents per kg.

- It is a reversed scenario for small farm growers, a shift from aerial to ground spray resulted to an increase in potential gross profit from PhP 116,000 to PhP 138,200/ha/yr or an incremental profit of PhP22,200. In terms of net returns per box, this means a 12cent increase, from 63 to 75cents with the shift. The

net returns is well within the world average especially in the case of ground spraying at 75cents.

Table 21. Comparison of Cost and Returns for Aerial vs. Ground Spray in Small Banana Farmss

	Aerial Spray	Ground Spray
Yield (per ha/yr)	4000 boxes	
Costs (per ha/yr)		
Sigatoka Control Cost	73,800	53,600
Other Production Costs	170,000	170,000
Indirect Costs	45,000	43,000
Total Cost	*288,800*	*266,600*
Cost per Box (in peso)	*72.20*	*66.65*
Cost per Box (in US$)	*1.57*	*1.45*
Gross Value of Produce (per ha/yr)		
Ex-patio price (per box)	$ 2.20	$ 2.20
Gross Value of Yield (in peso)	*404,800*	*404,800*
Potential Gross Profit *(in peso, per ha/yr)*	***116,000***	***138,200***
Net Returns (per unit, in US$)		
Net Returns per Box	0.63	0.75
Net Returns per kg	0.05	0.06

Table 22 below is a summary of the key estimates for all sets:

- Cost of controlling sigatoka using aerial spray is more expensive in the case of small farms compared to the average cost for large plantations. While it will cost PhP68,600/ha/yr on the average for large plantations, for small farms, the estimated average is PhP73,800/ha/yr. There is no clear and ready answer for this. But if it will be explained based on the current system, in the case of plantations, they themselves administer the application of aerial spraying, while for small grower farms, they are being required and being charged against their account for an amount the farmers themselves do not completely understand. This is consistent to the accounts that in several instances, the contract growing farmers are not earning anything, instead they earn negative income, due to the high cost of aerial spraying.

- Results showed that small contract growing farmers will be in a better position if they will shift to ground spray. The cost for small farm is only about PhP53,600/ha/yr, compared to the PhP73,800/ha/yr they are paying for aerial spraying. The shift can translate to a saving of PhP20,200/ha/yr.

- But this is not the case for large plantations, shifting will impose an additional PhP28,700/ha/yr. That is from an average of PhP68,600/ha/yr for aerial spray, it will increase to PhP97,300/ha/yr with the use of ground spray.

- The shift from aerial to ground spray is significantly more expensive for large plantations because of the initial high capital requirement needed to make the shift. As mentioned earlier, there will be a need for additional road network and trucks. Whereas in the case of small grower farms, since they have manageable land holdings of mostly 1 to 5 has, instead of paying high fees for plane rental, the shift will only require them initial purchase of a few equipment like power spray and additional labor.

Table 22. Summary of the Key Results Comparing Aerial with Ground Spray

	Aerial Spray		Ground Spray	
	Plantation	Small Farm	Plantation	Small Farm
Cost and Returns (per ha/yr, in peso)				
Sigatoka Control Cost	68,600	73,800	97,300	53,600
Gross Value of Yield	432,400	404,800	432,400	404,800
Potential Gross Profit	121,244	116,000	92,544	138,200
Net Returns (per unit, in US$)				
Net Returns per Box	0.66	0.63	0.50	0.75
Net Returns per kg	0.05	0.05	0.04	0.06

- Again, while the computation made no distinction between the yield of plantation and small farms, a different set of price was used to value the yield. FOB price was used for large plantations since in several cases, they themselves act as the exporter, while Ex-patio price was used in the case of small grower farms. Hence, the gross value of yield for large plantation is PhP432,400/ha/yr and for small farms, it is PhP404,800/ha/yr on the average.

- Due to the differences in control cost for sigatoka and the valued price of the yield, there is a reversal of scenario in the potential gross profit. The shift from aerial to ground spray will result to a decline in the potential gross profit of large plantations. While in the case of small grower farms, the said shift will result to a possible increase in their potential gross profit due to decline in sigatoka control cost.

As a final note, whether it is the large plantation or small grower farm, the proposed shift from aerial to ground spray is feasible gauging on the positive net returns. Small farm growers will gain from the shift but large plantations will stand to lose potential profits with the increase in cost due to the shift.

4.4 A Few Thoughts on Unaccounted Cost

Current practice in banana market only considers the "cost" of what economics consider as short-run, incremental private opportunity costs. In practice, there are really unaccounted values in the prevailing market price. These are the 'externalities' generated by banana production that are not reflected in the pricing and which therefore makes banana an under priced good.

In simple terms, externality happens when the activities in the process of producing and/or packaging banana create and impose negative effect on other people in the society but were not accounted for in the market price of banana. For example, pesticides in runoff, dust and as drift is considered an externality when it contaminate waterways and therefore affect the lives of rural communities sharing the landscape with banana plantations. It is not the issue whether banana farms follow strictly the residue limit, it is ultimately about other people being affected by what they do, intentionally or unintentionally that create externality. Other externalities or damages that may be brought about by banana production are listed in Table 23 below.

Table 23. Summary of environmental damages & causes attributed to banana production.

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

Source: Lead (1996) as cited in Calderon and Rola (2003)

The issue of externality makes a pressing reason for shifting from aerial to ground spray. By way of shifting, it internalizes some of the externalities created from banana production since it will address the issues raised by those who clamor for the banning of aerial spray. That is why though the shift will impose some losses on profits to plantation companies, there are also benefits to gain from it. This can be a reasonable measure especially now that there is a world trend towards social/environmental consciousness. Addressing such issues are important factors in the eyes of consumers especially since if it will considered that the market for the bananas being exported are developed countries who can very well afford and who are assumed to be educated, well-informed consumers.

5 Summary and Conclusion

The Philippine banana export industry is an important source of employment and export earnings to the country. It has consistently ranked as second among the top ten agricultural exports and it continually brings in millions of dollars every year. Given its crucial role to the Philippine economy, it will do the country well to support and help ensure the sustainability of this sector by every reasonable means, but not at all cost.

In the recent years, the industry was faced by a clamor from various sectors to ban the use of aerial spraying for fungicide application. Those who are pushing for the ban were citing the negative impacts of aerial spray such as its effects to the environment and to the health of the people living around the plantation. The banana industry, as represented by PBGEA, has been fighting against this ban citing that aerial spray is the most cost effective and efficient means to control sigatoka disease and that shifting to ground spray would cost the industry millions of pesos.

Like any technological change, it is true that shifting to ground spraying is not without cost. But while it will indeed impose some cost, it is not clear yet to what extent it can affect the overall financial standing of the industry. This Report looked more closely at the cost implication of shifting to ground spray and assessed the industry's claim if it indeed has a fatal effect on the industry's financial performance.

Results showed that overall, holding all other things constant in the market scenario for banana, even with the ban, and shift to ground spray, the industry can survive the change. Based on the computations made, potential net returns to the industry would still be positive implying that it would still be a viable industry.

Data revealed differences in the cost structure for large plantations and small farms, hence, separate computations and analyses were made. In particular, the computations revealed that ground spray is more expensive than aerial spraying, but only in the case of large plantations. For large plantations, shifting will impose an additional PhP28,700/ha/yr on their operation cost. That is from an average of PhP68,600/ha/yr for aerial spray, it will increase to PhP97,300/ha/yr with the use of ground spray. This means

a loss of 15 cents for every box of banana. But still earning a positive potential net return and almost within the world average at 4cents per kg.

Another way to look at the loss in potential profit is the resulting to gain to society. That by shifting to ground spray, this would mean internalizing the cost of the externalities caused by banana production. This in turn may enable the banana companies to recoup their losses by pricing the banana closer to its true price. This is not far fetched especially since most of the importing countries of Philippine banana are from developed countries. Given the increasing social and enviromental awareness of consumers from these countries they should be made aware that it is only fair that the price they pay for banana not only reflect the direct cost from production but also the indirect cost brought about by the externalities the production generates.

The Philippine banana industry is not a fledgling industry, they have a stable niche in the world market especially since it is a preferential market as earlier discussed in the Report. Moreover, as noted by certain personnel working in the industry, there is a price review/negotiation at least every 2 years or sooner should there be an increase of 5% in the price of imported materials, such as fertilizers, herbicides, fungicides, insecticides and others, either or both parties may call for a price review/negotiation.

In the case of small farms, ground spray is more cost effective than aerial spray. The cost for ground spray is only about PhP53,600/ha/yr, compared to the average amount of PhP73,800/ha/yr they are paying for aerial spraying.

Given the current set up for small banana farms, many of them are still under contract growership. Looking closely at the terms of the contract, for one, growers assume all responsibilities in farm management, including the risks of weather, production, and labor costs. Hence, there seem to be no specific provision in the contract growership agreement prohibiting the growers to shift to other alternative means other than aerial spraying if it is cheaper as long as it meets the objective. Under the agreement, they may introduce agricultural practices other than those recommended by the buyer as long as these are more economically viable, and ecologically safe and the quality of the bananas produced conform to the specifications annexed to the agreement.

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