REVIEW OF AGRO-CHEMICALS USE IN THE AGRICULTURE AND LIVESTOCK SECTOR OF PAPUA NEW GUINEA

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ABSTRACT

Agriculture chemicals are widely available and used in the Agriculture and Livestock sector especially, by large coffee, oil palm and sugar plantations. Limited quantities of chemicals were used in the Cocoa, Coconut and Livestock industry. Smallholder farmers used very little to no chemicals; majority of the smallholder farmers produce organic produce. Fertilizer was the major chemical imported and used by the agriculture sector, followed by pesticides (herbicides, insecticide and fungicide). About 98 % of chemicals sold by chemical distributors were herbicides (glyphosate and paraquat), which are high in demand, with limited quantities of insecticides, fungicides and pesticides. Chemical distributors in the country distributed similar range of chemicals and the quantity based on local demand. The amount of agriculture chemicals imported increased by 9 % on average annually, correlated to the level of agriculture activities, though influenced by commodity price. Annual importation of fertilizer, fungicide, and insecticide increased on average by (9 %), (3 %), and (13 %) respectively. The common chemicals used in small quantities among the smallholder farmers were pesticides to manage pest and disease in fruits and vegetable production.

Key Words: Agriculture chemicals, pesticides, fungicide, insecticide. fertilizer

INTRODUCTION

Papua New Guinea (PNG) has a dual economy, comprising a formal corporate-based economy and a large informal economy, where subsistence farming accounts for the bulk of economic activities. The informal economy involved growing vegetables, tree crops and raisings livestock. Around 85 per cent of the population continues to rely on a combination of subsistence, and cash crop activities in the agriculture sector. Agriculture provides income and employment and a livelihood for over 85 per cent of the population, and absorbs about 40 per cent of formal private sector employment (DAL, 1995). It also contributes around one-quarter of GDP and over one-third of export income (World Bank, 1997). The smallholders predominantly dominate the food and livestock sector; growing staple root crops, fruits and vegetables either for consumption or for sale at small scale. They also farm cash crops mainly for export. The types of crops grown and animals raised are highly adaptive to the local environment.

Food crops account for more than 50 per cent of the total agriculture production, and only 25 percent of the produce are marketed. The marketing of the food crops is limited by availability and accessibility of markets and deteriorating or none existence of appropriate infrastructure. The smallholders are the driving force of subsistence production in PNG, and they accounted for about 85, 000 households (NDAL, 2001). The small holders traditionally produce 75 % coffee, 80% of coconut, 70 % of cocoa and 25 % of oil palm. Nearly all the cardamom and chilies and pyrethrum are produce by smallholder.

The major export cash crops; coffee, cocoa and copra are grown by all types of producers

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throughout the country depending on the soil and climate. Oil Palm, Tea, Rubber and Pyrethrum are other important export crops. Tea is grown almost entirely in the highlands on the estates. Rubber is grown in large holdings in the Southern coastal region, though smallholders grow them in limited quantities. Pyrethrum is grown in smallholdings and only in certain areas of the highlands. There is considerable scope of increases in production of both export crops and crops for local consumption. Imports of fresh fruits and vegetables could be considerably substituted by domestic production with appropriate government policies and support (NDAL, 2001).

Agriculture activities in the country have been on decline in the recent past; there have been little new developments or rehabilitations taking place in the agriculture sector, except for the oil palm industry. New developments have been reported in the Ramu valley in the Morobe and Madang province and East and West Sepik province. The export volume of most cash crops remains stagnant, decline or marginally increases in the recent past, with the exception of oil palm: the oil palm industry has been enjoying reasonably good and steady price over the years.

The quantities of chemicals imported into the country could be related to stagnant growth in agriculture sector and low commodity price. Many of the large coffee, cocoa and coconut plantations around the country have been abandoned, while other plantations had to change their management practices to replace or reduce use of chemicals to remain productive. The amount of chemicals used in the agriculture sector decreases over the years, except for the oil palm and coffee industry; large quantities of chemicals were used in this industry. Limited to no chemicals were used in other agriculture industry including, cocoa, coconut and rubber. Limited quantities of chemical were used in fresh produce industry, especially by few organizations or farms that produce large quantities of fruits and vegetables for local consumption and marketing. Limited to no chemical were used by the smallholder farmers.

Chemicals are required in some agriculture industries, especially by medium size farms as demanded by their operation, but they cannot afford these chemicals: instead the farmers relied heavily on inputs from family members and occasionally hired minimum labour to maintain the farming operation to remain productive.

The Internal Revenue Commission (IRC) is responsible for regulating the importation and export of chemicals in the country. IRC is empowered under the Customs and Exercise Act 1989 including, allied legislations. Though, the custom Acts does not have specific provisions in dealing with chemicals; chemicals are generally falls under the category of goods as defined in Section 1 of the Customs Act. Goods in this case, refer to all kinds of moveable personal property including chemicals. As such, the same treatment is applied to chemicals like any other goods under the Act. Unless, chemicals are categorized and come under the definition of prohibited or restricted imports; then the Customs (Prohibited Imports) regulation applies.

The Department of Environment & Conservation (DEC) is responsible for monitoring and regulating the import, use and management of chemicals in the country. The DEC is empowered under the Environmental Contaminants Act 2000 and (Pesticide) Regulation 1998, to undertake these tasks. Under the regulation, DEC is responsible for awarding import permits, transfer of permits, issuing of pesticide guidelines (for sales, importation, manufacture, distribution, promotion, advertisement and use), keep records of pesticide imports, provide packaging guidelines, scrutinize advertising, and impose fines for offences of non -compliance..

This report is based on a comprehensive survey conducted in 2003-2005 by the Department of Environment and Conservation under a project funded by United Nation Environment Protection (UNEP) and Global Environment Facility (GEF). In the nationwide survey, 48 major agriculture establishments were visited in the Momase (Morobe, Madang, East and West Sepik) Highlands (Eastern Highlands, Simbu & Western Highlands), New Guinea Island (West New Britain, East New Britain & New Ireland) and Southern (NCD, Milnebay & Popondetta). The survey covered major and minor chemical dealers (100 %), agriculture or related organization (90 %) including sampled 200 small smallholder farmers across the country. In total, around 90 % of the major agricultural establishments in each of the provinces of the 4 regions of the country were visited.

OBJECTIVE

The objective of the survey was to determine the status of Persistent Organic Pollutants

(POPs) or POPs-like chemicals including other agriculture chemicals in the Agriculture and Livestock sector of Papua New Guinea.

MATERIALS & METHODS

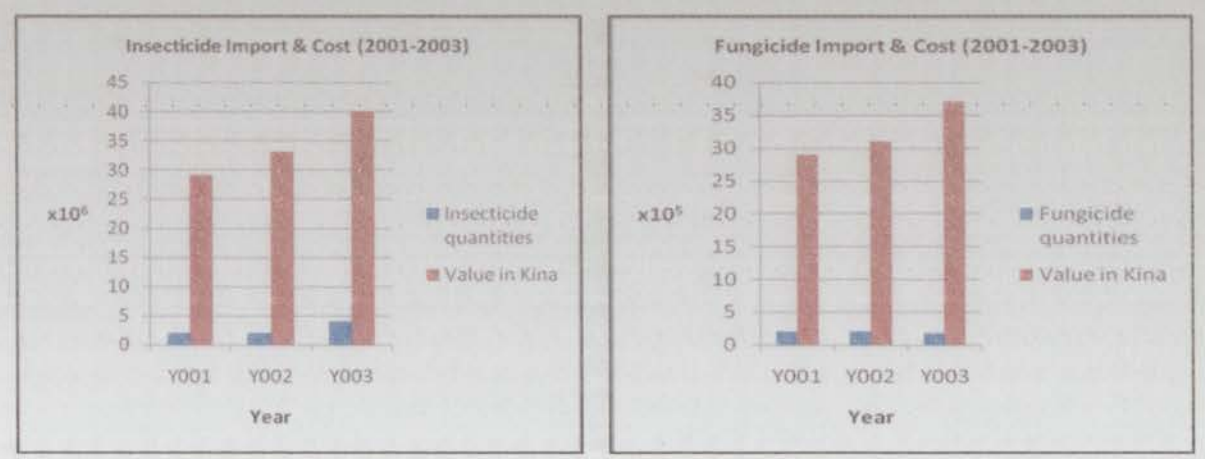
A standard survey form was developed (Kuman, 2005) and used for interviews in the survey to collect relevant data. Interviews were conducted using multi-method approaches (triangulation) (Denzin, 1989) to achieve broader and often better results. The research design was based on a combination of methodologies involving semi-structured interviews, questionnaire surveys, and review of relevant reports and published literature. The survey relied on in-depth qualitative interviews with the relevant stakeholders in the Agriculture and Livestock sector. The multi-method approach enables a comprehensive understanding of the real situation within the agriculture industry. The approach also provides a means of cross-checking the validity of the information and provides an accurate picture of the real situation.

RESULTS

The chemical market in the country is small but lucrative and chemical distributors across the country sell similar range of chemicals (Kuman, 2004) based on local demand. Most chemicals in large quantities were imported from Australia, New Zealand, Malaysia, Singapore and China while others in small quantities were also imported from other countries (Kuman, 2004). Most of the small chemical distributors got their chemical supplies from major dealers: the quantity of chemicals imported into the country is shown in Figure 1& 2. Given that not many agriculture activities took place in the recent years; there may not be significant change in the quantity of chemicals imported into the country, compared to average figures of 2001-2003 (Figure 1& 2). Generally, chemical importation remains constant over the years due to low commodity prices low number of new agriculture developments taking place in the country. In addition, large plantations have abandoned their operations or change their management practices to remain in business.

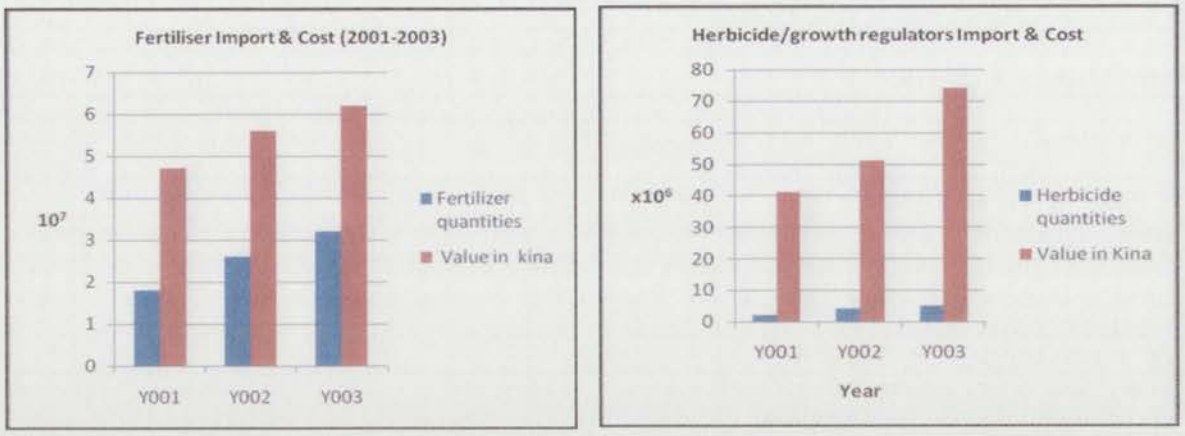
Figure 1& 2 shows the different types and quantities of agriculture chemicals imported into the country from 2001-2003. On average, 25.3 million tonnes of fertilizers worth 54.9 million kina, 0.3 tonnes of insecticides worth 3.4 million kina, 19 thousand kilograms of fungicides worth 325 thousand kina, 0.3 tonnes of herbicides and growth regulators worth 5.5 million kina. The highest amount of fertilizers (32 million tonnes worth 61million kina) were imported in 2003, with the lowest amount (18.1 million tonnes worth 47 million kina) were imported in 2001. The highest amount of insecticides (0.4 million tonnes worth 4 million kina) were imported in 2003, while the lowest amounts (0.2 million tonnes worth 3 million kina) were imported in 2001. As for fungicides, the highest amounts (19 thousand kilogram worth 300 thousands kina) were imported in 2003. The lowest amounts (18 thousand kilogram worth 360 thousand kina) were imported in 2001. The highest amount of herbicide growth regulators (0.5 million tonnes, worth 7.4 million kina) were imported in 2003, while the lowest amounts (0.2 million tonnes worth 4.1 million) were imported in 2001.

Figure 1: Agriculture chemical imports and cost (Insecticide) (a), Fungicide (b)



Source: IRC, 2004.

Figure 2: Agriculture chemical imports and cost (Fertilizer) (a), Herbicide (b)



Source: IRC, 2004

According to figure 3, the average pesticide used in large quantities was Glyphosate, (59 %, 9,300 L), followed by 2, 4-D amine (26 %, 4,167 l) and Paraquat (gramoxide) (11 %, 313 l) with other small quantities of chemicals (≥ 2 %). As for fertilizer, on average, Muriate of Potash was used in large quantities (52 %, 2,217 t), followed by Ammonia nitrate (36 %, 1,540 t) and Sulphate of ammonia (7 %, 283 t) with other forms of fertilizer (≥ 2 %).

and coconut plantations, combined rice, peanut and corn farms and piggery operations also used large amount of chemicals. Other organizations including, service providers or training institutions used limited to no chemicals in their operations. The smallholder farmers grow most of their crops organically. The chemical distributors do not supply all the chemicals range required especially, by large agriculture companies that use a lot of chemi-

Figure 3. An example of quantities of fertilizers (a) and chemicals (b) used in the Oil palm estates

Source: Handbook of Social & Environment, Pacific Rim Palm Oil, 2003

In Table 1, it shows the general distribution of chemical usage in the Agriculture and Livestock sector: this is indicated by the amount of funds spend annually to purchase chemicals. The major chemical users are the oil palm industry, followed by coffee, sugar and poultry; chemical are used in large plantations and livestock processing plant. Few large cocoa

cals; in most cases, these companies ordered their chemicals supplies directly from overseas. Occasionally, local chemical suppliers are contracted to order large quantities of chemicals required by large agriculture companies.

DISCUSSION

Table 1: Annual average chemical expenditure by different major agriculture or related organizations in the country

Industry	Pesticide (K)	Fertilizer (K)
Large piggery (produce 200 tonnes carcass/month and 200 tonnes corn/month	100,000.00	500,000.00
Medium size piggery (slaughter 1,000 pigs/month)	20,000.00	-
Large poultry processing plant (produce 840 tonnes chicken/ month	320,000.00	-
Large cocoa and coconut plantations (produce between 500-600 tonnes cocoa & coconut/year)	50-60,000.00	25,000.00
Large scale rice, corn, peanut & cattle farming combine	129,000.00	**
Large sugar plantation (>1,000 hectares)	**	**
Major pest control companies (>50 employees)	30,000.00	-
Large Oil Palm companies (>1,000 hectares)	1,000,000.00	1,500,000.00
Large chemical suppliers (>20 employees)	200,000.00 for both fertilizer and chemicals	
Small chemical suppliers (<10 employees)	100,000.00 for both fertilizer and chemicals	
Large coffee and tea plantation (>1,000 hectares)	500,000.00	3,000,000.00
Medium size coffee plantations (<40 hectares)	10,000.00	10,000.00
Small citrus farm (<20 hectares)	1500.00	-
Institution on training & farming (<20 hectares)	<2000.00	<3,000.00
Small scale farmers include piggery (<10) poultry (<40), cash crops & fresh produce farmers (<2.5 hectares)	Varies (between 100-300)	Varies (between 100-500)

The chemical importation has increased slightly over the years, largely influenced by the commodity prices. On average, a small increase was recorded in importation of fertilizer (9 %), fungicide (3 %), herbicide (13 %) and insecticide (12 %) over the years. Consecutive low commodity prices over the years has resulted in many large cocoa and coffee plantations been abandoned, as they become uneconomical to operate. An exception is the oil palm industry, which enjoyed a good steady price over the years, recording exceptional growth trend averaging 1.7 million tonnes per year: as the result, the industry continues to use large amount of chemicals as indicated by the amount of funds spend to purchase chemicals annually. Table 1, shows that, on average, 3 million kina was spent annually by a large oil palm company to purchase chemicals. However, there were four oil palm companies operating in the country at the time of survey therefore, the estimated amount of money used to purchase chemicals for the entire industry is estimated to be between 4-6 million kina annually to manage approximately 56,000 hectares of oil palm estate from a total of more than 100,000 hectares: the remaining hectares of oil palm is managed by the smallholder farmers. The total estimated cost is inclusive of chemical used by the smallholder farmers, given that most of the farmers get their chemicals supplies from major oil palm companies under the existing credit scheme arrangement. This figure may likely increase slightly as new large scale oil palm estates have been established in Ramu valley and further new developments are taking place in East and West Sepik provinces. Though, the ownership of the major oil palm company has changed recently, the amount of funds committed to purchase chemicals is likely to remain around the same or increase moderately. The reason being, many smallholder farmers are not using chemicals frequently under existing

credit scheme arrangement; companies are rationalizing chemical application method while others are integrating biological control methods into their operations. The oil palm crop heavily depended on chemicals to maintain or improve productivity and quality as compared to other crops. This means, the industry will continue to use large quantities of different types of chemicals to maintain and develop the industry.

Figure 2 and 3 indicates that there was an increase in fertilizer and pesticide importation from 2001-2003: this also corresponds to the cost, with more chemicals and fertilizer imported in 2003. According to chemical importation record (Figure 1), fertilizer was the major chemicals imported, followed by pesticides (herbicides, insecticide and fungicide).

Table 1, shows that large coffee and tea plantations in the highlands region and oil palm and sugar plantations in the coastal region used large quantities of fertilizer and pesticides. The type of chemicals used by the oil palm plantation is shown in Figure 3. The quantity of chemicals used by oil palm estates in different provinces varies: this could be due to high incidence of pest and disease in some locations as the result of high rainfall, soil type and management practices. Furthermore, research and development efforts are made in the oil palm industry with the aim to incorporate biological control methods as part of Integrated Pest Management (IPM) strategy to reduce chemical application, and hence minimize environmental pollution.

In the case of Livestock industry, large quality of pesticides and cleaning agents were used for general sanitation and pest/disease control management. Generally, companies have schedules to apply pesticides and fertilizers; large companies usually apply pesticides between 4-6 times per year, however all companies try to minimize chemical application as much as feasible to cut cost.

The smallholder farmers use very little to no chemicals; the amount of chemical used is shown by the amount of money spend annually (Table 1). The farmers apply minimum pesticides only in the event of pest or diseases outbreaks in their farms. Smallholder farmers used small quantity of chemicals such as herbicide (gramoxone) to manage weeds on ad hoc basis and applied integrated cultural practices to control disease. Beside, smallholder farmers including increasing numbers of large cocoa and coffee plantations have discontinued using chemicals for many years due to low commodity price and the high cost of chemicals and production. Instead, the companies depend on a healthy work force to maintain their plantation operations to remain in business. Study by Omuru *et al.*, 2001 shown that non-use of chemicals input by smallholder farmers in the cocoa and copra industry is attributed mostly to relatively high cost (85 %) of chemicals and lack of information (63%)- the same applies to other crops as indicated by the result of this study.

The chemicals distributors distributed a similar range of chemicals based on the demand across the country. The chemicals distributors do not supply all the chemicals required by the Agriculture and Livestock sector: many of the large agriculture companies imported their chemicals especially, fertilizers in large quantities directly from overseas. Glyphosate and Gramoxone are the fast selling chemical lines compared to other pesticides distributed in the major centers throughout the country (2004, S. Wood, pers. comm). Though, chemical market is small, it is a lucrative business; especially for large chemical distributors located in areas where there are major agriculture or related activities. However, this is not the same for medium to small size chemical distributors; they do not sell chemicals only but other products as well such as hardware, clothing etc. to remain profitable.

CONCLUSION

The quantity and different types of agriculture chemicals especially, the herbicides and fertilizer used in the Agriculture and Livestock sector in the country are likely to increase in future due to increasing agriculture activities as a result of anticipated shift from subsistence into semi-commercial or commercial farming. This is in line with anticipated governments support to the sector. In future, more chemicals are likely to be used as the result of (a), improved infrastructure across the country, especially in the rural areas (b), better government incentive package for the sector and (c) combine with increasing demand of agriculture commodity both locally and internationally. This means there is also a need for a stringent chemical use and management policies and regulatory system in the country; the current regulatory and monitory system is weak and there were reports of the system being abused. There is also a need to promote environmental friendly methods such as integrated

pest management to minimize use of chemicals to reduce environmental pollution.

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