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Final report

Small research and development activity

project	**Managing trade risks arising from the use of crop protection chemicals in mangoes in the Philippines**
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1 Acknowledgments

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2 Executive summary

The production and sale of fresh food commodities is an essential part of the economy of the Philippines. The Philippines is the world's 6th largest mango producing country and is reliant on maintaining access to export markets to sustain economic viability and development. However, developed economies are increasingly introducing more stringent domestic standards which often adversely impact on developing economies that may lack the capacity to comply.

This trend has meant there is a greater focus on compliance with pesticide maximum residue limits (MRLs). MRLs are set by each country and at the international level by the Codex Committee on Pesticide Residues. When food commodities are traded between countries these foods are understood to be safe for human consumption and any residues in or on the traded food must comply with the importing countries' or the Codex limit.

Unfortunately, as MRLs can vary between countries, compliance in the exporting country does not guarantee international compliance. These MRL disparities can result in inadvertent breaches occurring, with potentially significant consequences e.g., loss of market access. This can have serious implications for both the grower and the exporter in the developing country.

This study has been carried out with the aim of benefiting export industries in the Philippines. The objective was to analyse the mango export chain in the Philippines by assessing how current practices may be constraining effective residue risk management. It also: focuses on the capacity of the local industry to respond to the challenges posed by increasing scrutiny and regulatory change; outlines a potential framework for the development of strategies to meet these challenges; and identifies how future research could be targeted to address constraints.

3 Introduction

The ability of the agricultural industries in developing countries to gain and retain market access is seen as potentially problematic due often to uncertainty over how they can achieve and maintain compliance with importing countries standards. As a result there are concerns over the potential adverse impact on developing economies of the tightening of food quality and safety standards in many importing countries (Jaffee *et al*. 2005, Henson and Jaffee 2007). This has led to fears that the standards could become defacto barriers to trade restricting market access from developing economies, such as the Philippine mango industry, that lack the infrastructure or resources to develop and implement the necessary management systems (Henson *et al*., 2000; Alpay *et al*. 2001).

The production and export of fresh food commodities is an essential part of many developing countries' trade and economic wellbeing, i.e., economic growth and poverty reduction (Achterbosch and van Tongeren, 2002; Geithner and Nankani 2002; Weinbereger and Lumpkin, 2005). Many agricultural industries within these countries rely on access to export markets to sustain economic viability and development. For example, in 2005, the Philippines exported more than one million tonnes (Anon 2006a) of tropical fruit to Japan.

Pesticide residues are one area where there has been a substantial move towards the establishment of increasingly stringent standards. Compliance and enforcement of maximum residue limits (MRLs) is becoming a significant issue in the global trade of raw agricultural commodities. However MRLs, while nominally concerned with food safety, are based upon the use pattern of a pesticide on a specific commodity and are governed at the domestic level by local regulatory requirements. Unfortunately domestic compliance does not guarantee compliance in export markets

While there is movement towards greater harmonisation of regulatory standards[a] and the use of United Nations (Codex) standards as benchmarks, pesticide MRLs can and do still vary from country to country. It is possible for countries to reject food imports where residues do not comply with either local or Codex standards.

All major importing destinations have significant residue monitoring programs in place for both domestic and imported produce. The programs of three important markets Japan, the EU and the USA are being enhanced through increased levels of sampling as well as broadening the range of compounds for which testing will occur. For example, in a recent publication[b] the Japanese Imported Food Inspection Service (IFIS) reported that during 2004 it had analysed over 20,000 ‘agricultural foods’ for residues of nearly 200 pesticides. In 2005, with the application of a new MRL ‘Positive list” it is understood that there had been an increase in the number of chemicals for which analysis is undertaken to over 400 as well as an increase in sampling.

When a MRL breach occurs the type of enforcement action taken can vary considerably between countries. In general the regulatory action taken when a consignment is found to contain unacceptable residues is to reject, require destruction, re-export or change the use to a non-edible purpose. The response may prompt additional sampling requirements or short-term loss of market access until such time as the importing authority is satisfied no further MRL breaches will occur.

Against this background the Australian Centre for International Agricultural Research (ACIAR) funded AKC Consulting and UPLB to undertake a preliminary study on the capacity of the Philippine mango industry to respond to these enhanced compliance requirements in importing countries. The study specifically explored current impediments to achieving and maintaining MRL compliance in major export destinations for Philippine mangoes. The study was done in to two phases: a general desk-top review of current MRLs in major export destinations and a more specific field phase consisting of face-to-face meetings with mango industry stakeholders. The complete Terms of Reference are presented in Appendix 1.

The preparatory desk-top phase of the study identified that in major export markets and internationally in Codex a significant number of MRL gaps existed for pesticides approved for use on mangoes in the Philippines. As a result trade problems were likely to occur especially given Japans uniform limit of 0.01 mg/kg. For example, the levels of pesticide residues detected on fruits and vegetables imported into Japan having increased significantly in the past two years. This increase has been primarily due to the introduction of the ‘positive list’ in 2006 and the associated default uniform limit, i.e., if no MRL then must be below the limit of determination (LOD) of 0.01 mg/kg.

Therefore, there is a significant risk of trade problems occurring due to a the lack of MRLs. A lack of information about these MRL gaps in importing countries could have serious trade implications for exporters, as residue violations can result in market access

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[a] OECD Pesticide Risk Reduction and Registration Steering Groups

[b] Results of Monitoring and Guidance based on the Imported Foods Monitoring and Guidance Plan for FY 2004.

difficulties, increased costs associated greater monitoring, and financial loss should shipments be quarantined or market access denied.

The field phase identified that there were technical, institutional and process related problems currently constraining the ability of the Philippine mango industry to effectively manage pesticide residues.

The report opens with an outline of the activities undertaken in the study, a description of the Philippine mango industry (production and exports), domestic regulatory framework and the international standards the mango industry is having o contend with is provided. The identified constraints (chapter 7), future concerns and potential strategies are then explored in greater detail. Finally in chapter 10 recommendations for possible assistance to the Philippine mango industry to aid in compliance with international standards, Japan in particular, are listed.

3.1 Desktop review

The initial step involved identifying the MRL gaps between the Philippines and major export destinations. Current MRLs in key export destinations for pesticides approved in for use in mangoes in the Philippines was collated and compared. The result of this comparison was the identification of over 150 instances in which no MRLs existed. A collated listing is provided in Appendix 4 to this report.

Unsurprisingly the collated MRL information confirmed that risks from residue breaches existed in a number of export markets. On investigation it was found that for many MRL disparities no data was publicly available with which industry could develop risk mitigation options, such as extended harvest intervals. It was concluded that the mango industry lacked a real appreciation of the risks associated with the use of various pesticides.

On completion of this analysis, advice was sought from chemical manufacturers to identify those chemicals where regulatory activity may either be in place or planned, i.e., where changes are likely to occur in the future.

3.2 Field Phase review

Upon conclusion of the preliminary desktop review an extensive stakeholder consultation process was undertaken consisting of face-to-face meetings and workshops with producers, and key industry & government personnel in the major production regions of Guimaras, Palawan, Cebu, IloIlo and Davao and with regulators and chemical manufacturers in Manila and Los Banos. In Table 1 are listed the organizations met during the survey, see Appendix 3 for the full listing of individuals met.

Figure 1 Map of Philippines showing regions visited during the field phase of the study

Table 1 Organisations and location visited during the field phase of the study.

Location	Organisation
Los Banos	NCPC-UPLB, PCARRD, CPAP, PHRTC UPLB, PQS, BPI
Alabang	Croplife
Manila	Exporters, NMRDC, BPI PQS, FPA, NPAL and DA-HVCC Head Office
Palawan	DA, LGU-DA, PAO-DA, PPC, DA RFU, SALT
Cebu	NSQCS-7, PAL – Cebu Satellite lab, MES DA, Felvina Farms, NRA CC, RCPC-DA, BPI-NSQCS, DA-RFU 7, VCMI-MPC, RCPC-DA 7,
Iloilo & Guimaras	Mango Growers Assoc., DA LGU Jordan, DA LGU San Lorenzo, BPI-NMRDC, POAS Guimaras, DA LGU Btn, DA LGU Nueva Valencia,
Davao	FPA. DA Crops Div, BPI-PAL – Davao Satellite lab, DA-HVCC-RFU XI, DA Agribusiness, PQS DA RFU XI, DA RCPC, Diamond Star, SMMIDC, DA-RFUXI-Davao City, Dole
Digos, Davao del Sur	DA PAO, DA BPI

The purpose of the consultations was twofold. Firstly, to identify what linkages existed between stakeholders and what systems were in place to either manage residues prior to export or in the event of a violation respond appropriately. Secondly, given the difficulties the industry has experienced with maintaining market access, the project team sought to identify what constraints inhibited the industry's capacity to achieve and maintain MRL compliance in export markets such as Japan.

Specific issues discussed included existing violation response mechanisms, e.g., traceability, current pesticide management systems, e.g., implementation of GAP[c],

[c] *GAP – Good Agricultural Practice*

pesticide information needs, e.g., residue data and training requirements, communication, e.g., information dissemination, and regulation, e.g., capacity of domestic system to respond.

Upon completion of the stakeholder consultation the project team proposed areas in which future ACIAR research activities could be focused, i.e., to improve the capacity of the Philippine mango industry to effectively manage pesticide residue and achieve and maintain MRL compliance in export markets. The collected information was collated with initial findings and preliminary recommendations presented at the IUPAC conference in Beijing in 2007. During this phase consultation also occurred with QDPI personnel involved in project HORT/2003/071.

4 The Philippine Mango industry

Mangoes are the third most important fruit crop in the Philippines, after bananas and pineapples. In 2005, the area planted to mango was estimated at over 160,000 ha producing in excess of 900,000 mt (BAS 2006). It was estimated that the value of production of the Mango Industry was 18 billion pesos in 2006. The majority of the fruit produced is consumed domestically[d] with between 3 and 4% exported as fresh mangoes, which in 2006 had a value of US$23.9 million[e].

In 2006 the Philippines was ranked as the seventh largest mango producer with approximately 4% of the global area planted to mangoes. In terms of the regional spread the area planted within the Philippines is dominated by three production regions; Luzon, Mindanao and the Visayas comprising 50, 35 and 14% respectively

The Philippines government is proposing to improve profitability by increasing per capita consumption, increasing production volumes to 2 million tonnes by 2020 and export volumes of mangoes by 15% annually up to 2010 and 10% up to 2020[f]. The objective is through growth to attain higher domestic mango prices, i.e., that increased volumes and revenues will have a flow-on effect and stimulate growth in the sector overall.

It has been estimated that 73% of the total area planted to mangoes is owned by small-holder farmers with 24% operating farms of between 3 and 10 ha in size. The Philippine mango industry supports as many as 2.5 million Filipinos[g] and that improving industry value would provide a significant benefit to the population at large and as a result industry growth has been identified as a government priority. However, this predominance of small-holder farmers is seen as a significant weakness in taking the industry forward[h] due to quality control and yield problems. In addition to the disparate nature of the sector the type of marketing arrangements have also been identified as an issue adversely affecting sector efficiency, see Figure 2.

[d] *http://hvcc.da.gov.ph/mango.html*

[e] *http://countrystat.bas.gov.ph/PX/Dialog/varval.asp?ma=TDVAE101&ti=Exports+of+Food+and+Live+Animals+%28Code+00%29%2C+1994%2D2006&path=../Database/FAO/MEGA/&lang=1&unit=%5BQuantity+in+kilograms+%28or+as+indicated%29%5D+%5BValue+in+F%2EO%2EB%2E+US%24%5D*

[f] *Mango Industry Strategic Plan 2006. Philippine Dept of Agriculture.*

[g] *http://hvcc.da.gov.ph/mango.html*

[h] *Mango Industry Strategic Plan 2006. Philippine Dept of Agriculture.*

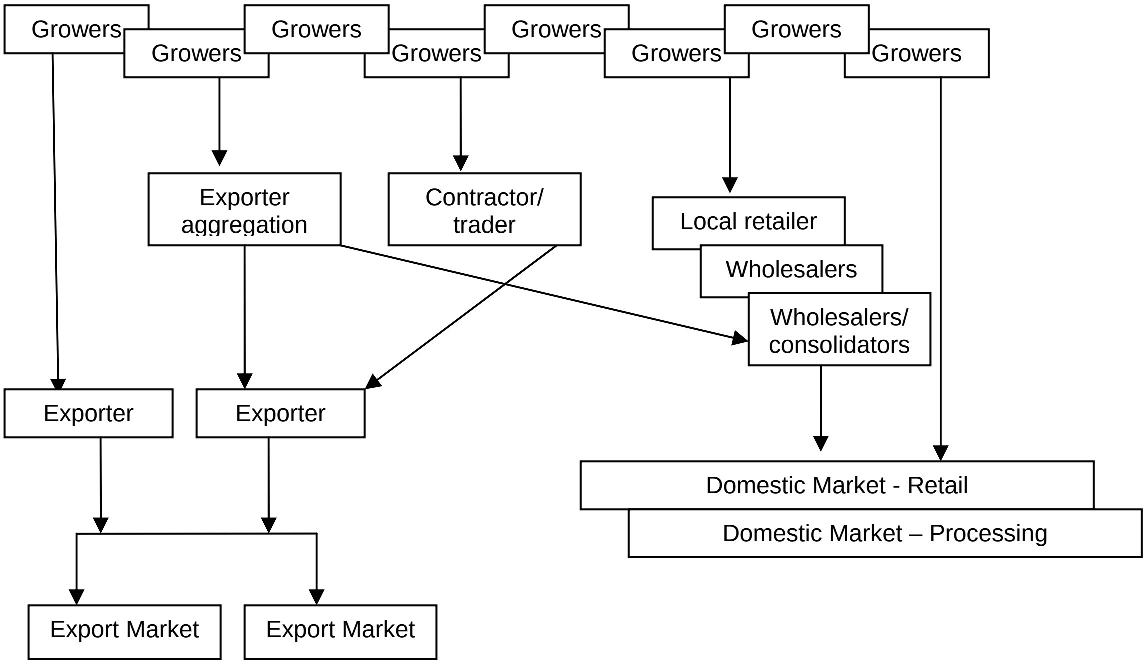

Figure 2 Simplified representation of the mango supply chain in the Philippines

4.1 Mango Exports

Mangoes comprise up to 50% of all tropical fruit produced worldwide with approximately 80% of world production coming from just 10 countries (Jedele *et al.* 2003). India and China dominate with over 50% of the world mango area. In 2005 world production of mangoes was estimated at approximately 27 million tonnes from 3.87 million ha (FAOStat 2005).

The majority of mangoes produced are consumed domestically with as little as 3% of global production exported (FAOStat 2005). A situation closely mirrored by the Philippines, i.e., between 3 and 4% in 2006[i]. In the Philippines the volumes of mango exports have remained relatively static in the period 2001 to 2006 with variations being more a reflection of changing seasonal conditions. This is despite the area under production increasing from 137,000 ha in 2001 to 160,000 ha in 2005, i.e., a 16% increase in acreage (BAS 2006).

Table 2 Mango exports from the Philippines 2001 to 2006

Year	Volume (mt)	USD$ Value
2001	34,131	27,978,816
2002	35,515	27,275,080
2003	35,778	31,031,488
2004	33,663	28,735,236
2005	31,268	26,627,042
2006	26,169	23,962,919

In the Philippines it has been estimated that as little as 50% of harvested fruit could be considered export quality (Anon 2005). As indicated in the Mango Industry Strategic Plan quality gains have been identified as a priority and are to be sought primarily by enhancing crop management practises, both pre and post-harvest, and achieving gains in

[i] *http://countrystat.bas.gov.ph/PX/Dialog/varval.asp?ma=TDVAE101&ti=Exports+of+Food+and+Live+Animals+%28Code+00%29%2C+1994%2D2006&path=../Database/FAO/MEGA/&lang=1&unit=%5BQuantity+in+kilograms+%28or+as+indicated%29%5D+%5BValue+in+F%2EO%2EB%2E+US%24%5D*

yield and reductions in post-harvest losses. From an export perspective the success of this strategy will depend largely upon the ability of the industry to produce quantities of fruit that comply with the quality standards of importing countries.

4.1.1 Export markets

Globally, the United States, the European Community and Japan are the largest import markets for mangoes, while significant volumes are also imported by Singapore, the Republic of Korea, China and Hong Kong (Anon FAO 2005). World mango imports are projected to increase by 1.4 percent annually to reach 844,246 tonnes by 2014 with the USA and Europe dominating.

For the Philippines the Japanese market has been historically important, making up to as much as half the value of fresh mango exports. In 2004 the Philippines exported in excess of 7,000 tonnes mangoes to Japan, valued at over USD seventeen million (FAO Stats). In 2005 and 2006 a drop in volumes exported to Japan have occurred (see Table 2). It is believed that this drop was in part due to difficulties the Philippine mango industry has had with MRL compliance. For example, in 2006 Philippine mangoes were placed under Japanese Inspection Orders, i.e., increased residue monitoring (Anon 2006b), following MRL violations. More recently, due to further breaches some loss of market access occurred.

Table 3 The top five export markets for fresh mangoes from the Philippines, ranked in order of value 2004 to 2006

Country	2006		2005		2004	
	Volume (mt)	Value (USD$)	Volume (mt)	Value (USD$)	Volume (mt)	Value (USD$)
Japan	6,483	13,433,015	7,964	15,497,950	9,956	17,917,593
Hong Kong	14,148	6,063,015	18,556	7,156,076	20,398	7,921,208
Korea	1,145	2,307,911	846	1,465,659	808	1,411,981
China	3,508	1,251,840	2,853	851,105	1,822	518,266
Singapore	508	349,485	525	389,118	388	266,371

In this context the research team was funded by ACIAR to undertake a preliminary study of the Philippine mango industry with a view to identifying constraints to achieving compliance and potential courses of action to aid the industry better respond to the rapidly changing regulatory environment associated MRLs.

4.2 Pest Management

The Philippine mango industry is affected by a number of pest and diseases (see below). To date the principal means of control has been through the application of a wide range of pesticides. Many of the pesticides used are broad-spectrum in activity and generic with multiple registrants.

As indicated previously the Philippines government is seeking to improve both profitability and sustainability within the mango industry by expanding market opportunities. Implementing changes in practises associated with pest management have been identified as fundamental to achieving this aim. It has been proposed that these improvements could be achieved by reducing production costs, e.g., 60–80% of mango production costs in the Philippines are due to high levels of pesticide use (Bayogan *et al*., 2006), increasing tree productivity, e.g., actual harvestable yield of mango is only 50–75% of potential yield[j], reducing pest and disease losses, e.g., it has been estimated that

j HORT/2003/071: Integrated pest management and supply chain improvement for mangoes in the Philippines and Australia

> 50% harvested fruit is lost due to pests and diseases, strengthening traceability and implementing GAP certified mango production regions.

Associated with the latter are issues of initiating residue monitoring, and improving compliance with quarantine/market access requirements, and improving supply chain management and technical performance[k].

4.2.1 Active ingredients and pests

Pests and diseases

A range of pests and diseases affect mango production in the Philippines. The primary management approach is the through the application of pesticides. The majority of which belong to older chemical groups such as dithiocarbamates, organophosphates and pyrethroids. From discussions it was evident that program spraying, particularly of fungicides, was not uncommon, suggesting that previous initiatives to develop and implement integrated pest management appear to have had limited impact. It is understood that the development and adoption of IPM techniques is a priority for further research so as to reduce the current potentially over reliance on pesticides. Success in this area would, eventually, aid in residue management however given the current situation it is likely that pesticides will continue to provide the primary means of pest management in the short to medium-term.

In the main, other than for the quarantine pest Mango pulp weevil, the suite of problems can occur throughout the Philippines. In the major mango production regions the most important pests and diseases and those pesticides approved for their control are identified and listed in Table 4.

Table 4 Pesticides approved for the control of major pest and diseases affecting mango production in the Philippines

Problem	Pesticides
Insects	
Fruitflies (Dacus spp.)	Acephate, acetamiprid, carbaryl, cypermethrin, etofenprox, lambda-cyhalothrin, fenthion, permethrin, spinosad, trichlorfon, carbosulfan
Scale insects	Carbosulfan
Twig borer	Cypermethrin, acephate, carbaryl, deltamethrin, diazinon, esfenvalerate, gamma-cyhalothrin, permethrin, phenthoate
Tip borer	Acephate, acetamiprid, beta-cypermethrin, BMCP, carbaryl, carbosulfan, clothianidin, cypermethrin, deltamethrin, diazinon, esfenvalerate, fenvalerate, Flufenoxuron, gamma-cyhalothrin, imidacloprid, lambda-cyhalothrin, permethrin, phenthoate, cyfluthrin
Leaf hopper	Acephate, acetamiprid, beta-cyfluthrin, PBMC, buprofezin, carbaryl, carbosulfan, cartap, clothianidin, cyfluthrin, cypermethrin, deltamethrin, diazinon, dimethoate, dinotefuran, esfenvalerate, etofenprox, fenthion, fenvalerate, Flufenoxuron, gamma-cyhalothrin, imidacloprid, lambda-cyhalothrin, methiocarb, permethrin, phenthoate, pymetrozine, thiamethoxam, chlorpyrifos
Thrips	clothianidin, imidacloprid, lambda-cyhalothrin, methiocarb, carbosulfan
Cecid fly	clothianidin, etofenprox
Capsid bug	clothianidin, etofenprox
Mango pulp weevil	Lambda-cyhalothrin
Mealy bug	carbaryl, flufenoxuron
Diseases	

[k] *Mango Industry Strategic Plan 2006. Philippine Dept of Agriculture.*

Problem	Pesticides
Anthracnose	Azoxystrobin, benomyl, captan, carbendazim, chlorothalonil, copper, difenoconazole, iprovalicarb + propineb, mancozeb, propineb, tebuconazole, thiophanate methyl, thiram
Mango scab	captan, copper, mancozeb, thiram
Powdery mildew	Benomyl
Diplodia stem end rot	Chlorothalonil, iprovalicarb + propineb, tebuconazole

Pesticide use

There are currently over 50 pesticides, active ingredients, approved for use in Philippine mangoes with a large number of products available containing these chemicals, i.e., multiple registrants for many pesticides. For example, there are over 100 individual products registered that contain cypermethrin. Of the commercially available products, insecticides make up the majority constituting 70.1%, followed by herbicides (13.8%) and fungicides (13.3%). Many of these pesticides are commodities, i.e., generic in that no one registrant has proprietary rights (patent protection).

Due to the relatively large number of pesticides available specific information on pesticide usage by production region was sought from industry stakeholders during meetings and workshops (see Appendix 5 – Pesticide Use Analysis). The major pesticides used are listed in Table 5. As could be expected the pesticides identified as most commonly applied reflected the major pest or disease problem of that region. As a result the pesticides applied showed a degree of variability across mango production regions due to differences in climate as well as pest and disease pressure.

Table 5 Pesticides identified as most commonly used by region

Source	Cebu	Davao	Iloilo	Guimaras	Palawan	Researcher exporter
Fungicide						
Azoxystrobin	X	X	X	X	X	X
Benomyl/carbendazim/thiophanate methyl	X	X		X	X	X
Cu variants		X	X		X	
Difenoconazole				X	X	X
Mancozeb	X	X	X	X	X	X
Propineb	X			X	X	X
Insecticides						
Carbaryl	X	X		X	X	X
Cartap HCl	X	X		X	X	X
Cyfluthrin	X			X	X	X
Cypermethrin	X	X	X	X	X	X
Deltamethrin				X	X	X
Dinotefuran		X		X	X	X
fenthion	X			X	X	X
Imidacloprid		X		X	X	X
Imidacloprid + cyfluthrin		X		X	X	
Lambda cyhalothrin	X	X			X	X
Phenthoate	X	X		X		
Pymetrozine		X		X	X	X
Thiamethoxam		X		X	X	X
Others						

Source	Cebu	Davao	Iloilo	Guimaras	Palawan	Researcher exporter
Malathion		X		X	X	
Profenofos		X		X		X

From interviews and meetings with the farmers it also became apparent that often their selection criteria for pesticides were efficacy, availability and cost. It was also apparent that the marketing activities of pesticide manufacturers could also have a substantial influence on the pesticides selected of by farmers.

5 Philippine Pesticide Regulatory Framework

5.1 Legislation

The Fertilizer and Pesticide Authority, attached to the Department of Agriculture, has the main responsibility for the regulation importation, registration, distribution, application and disposal of pesticides and fertilizers in the Philippines. Its mandate is derived from Sec. 9 of Presidential Decree No. 1144 (the law that created the FPA) which provides the legal framework within which the FPA can regulate the use of pesticides.

The FPA consists of two regulatory division's, fertilizer and pesticides which have the role of ensuring that adequate supplies of fertilizer and pesticide are available at reasonable prices; protecting the public from the risks inherent in the use of pesticides; and educate the agricultural sector in the use of these inputs[I]. The registration for a pesticide is valid for a period of three years.

To implement the provisions of the Decree, the responsibility of the FPA covers the importation, manufacture, formulation, repacking, distribution, delivery, sale, transport, storage, and use of any pesticide and other agriculture chemical. The rules and regulations are contained in the "Fertilizer and Pesticide Authority – Pesticide Regulatory Policies and Implementing Guidelines" or the "Green Book" as it more commonly referred to.

The Fertilizer and Pesticide Authority's Green Book serves as a basic guide, which compiles all requirements and procedures that need to be met by pesticide manufacturers, formulators, re-packers, distributors, traders, and users or applicators of fertilizer, pesticides, and other agricultural chemicals. Another primary function of the Authority is to educate fertilizer and pesticide handlers through continuous training and information dissemination.

5.1.1 Data Requirements and registration

To gain a registration for a new pesticide an applicant must provide data covering chemistry (specification data), efficacy, toxicology, i.e., human safety, environmental effects, environmental fate and residues in food. In terms of residues in food data requirements are principally residue decay curves for residues on crops to be treated and proposed MRL for crops expected to contain residues. There is a requirement for local data to be provided, e.g., one local supervised residue trial accompanied with supporting overseas data.

For commodity or generic pesticides, requirements are considerably less and may be satisfied by citing appropriate reviews from developed countries or providing results of international reviews by organizations such as the World Health Organization or Food and

[I] *http://fpa.da.gov.ph/*

Agriculture Organization, e.g., JMPR Monographs. For generic pesticides data that must be provided covers primarily product specifications which need to be authenticated by independent laboratory analysis. The fees associated with gaining a registration for a generic compound can be relatively low depending upon which category an application falls.

A consequence of these generic pesticide registration requirements has been the proliferation of registered products. This has caused some difficulties from a label management perspective due to variability in label content, i.e., a lack of harmonization of information/recommendations between older and newer pesticides.

5.1.2 MRL Policies

The policy within the Philippines has been to adopt Codex MRLs. The drawback of this approach, for mangoes, has been the limited number of Codex MRLs that exist for the commodity. FPA is proposing to amend this system where a pre-requisite of registration will be the nomination of a MRL to cover potential residues.

Nevertheless, the current lack of published MRLs has meant that it is difficult for growers and exporters to assess whether the correct use of a pesticide, as per registered GAP, is likely to result in residues that comply with import tolerances. This situation is potentially exacerbated by current requirements for limited generation of local residue trial data.

5.1.3 Residue testing

No overarching formal monitoring program for pesticide residues is in place for the Philippine mango industry. There has been limited residue monitoring occurring of export produce but only for two pesticides, i.e., ones subject to inspection orders due to previous MRL violations. This testing is an outcome of an agreement signed between the Philippine Mango Exporters Foundation and the Department of Agriculture in 2006 and was in response to MRL breaches in Japan.

This targeted analysis is primarily undertaken by the National Pesticide Analytical Laboratory (NPAL) in Manila and a satellite laboratory in Davao City. There are also a number of other PAL satellite laboratories regionally located within the Philippines. Accreditation is problematic with NPAL, previously funded by the Japan International Cooperation Agency, accredited with the relevant Japanese authority for testing of chlorpyrifos and cypermethrin. The laboratory issues a certificate of analysis indicating the results of testing, which, in turn is provided by the exporter with a Phytosanitary Certificate to the importing country authority.

The capacity of these laboratories, particularly those in regional areas, to test a wide range of chemicals is limited. For example, the PAL Satellite laboratory in Cebu can test for 25 pesticides in total, covering only organophosphates, organochlorines and synthetic pyrethroids.

6 Regulatory standards and trade

Although international standards such as the Codex Alimentarius have been established, in part to facilitate trade, the regulation of pesticide use and the monitoring of pesticide residues is a national responsibility. Most countries use various standards to manage the trade in agricultural commodities, both domestic and imported. In the main these measures either serve to protect the environment (phytosanitary measures) or human health and safety (sanitary measures). In general these standards must be met to in order to gain and maintain access to a market.

As a result compliance with standards is gaining importance in export market development for agricultural commodities. Standards define what can be traded globally, i.e., establishing preferred processes, standardizing quality levels, and making possible the acquisition of commodities from anywhere in the world. Standards in effect can determine what commodities from where will be accepted in which markets and for what price. In addition to the role of standards changing, how they are set and implemented, is shifting as well.

In order to compete effectively in the global marketplace, Philippine export industries must not only work to meet increasingly stringent standards set by importing country governments, retail industry associations and individual firms but also seek to participate more actively in the standards setting process. While these trends pose many threats due to a relatively weak domestic systems of standards, there also exists opportunities that can be captured through improved standard compliance. Philippine mango growers have only recently become aware of these trends, through MRL breaches, and have tended to be reactive in response.

6.1 Codex

The Codex Alimentarius Commission (CAC) implements the Joint FAO/WHO Food Standards Program, the purpose of which is to protect the health of consumers and to ensure fair practices in food trade. The CAC adopts three types of standards: 1) commodity standards which define what qualifies as a particular commodity; 2) residue standards, which define acceptable levels of pesticides, veterinary drugs, food additives and contaminants; and 3) codes of practice, guidelines and other recommended measures that assist in achieving the purposes of the Codex Alimentarius such as recommendations of good practices in food production, i.e., of an advisory nature.

Codex standards are significant in international trade due to the importance placed upon them by the World Trade Organization (WTO). An aim of the Uruguay Round of trade talks was to strengthen international rules with regard to dealing with problems of market access through barriers to trade. The issue of non tariff trade barriers were dealt with through the development of the Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) Agreements. These agreements placed greater importance on the use of Codex standards as international benchmarks against which national food regulations can be evaluated.

Codex standards are voluntary, and member countries are not obliged to adopt them for national purposes. However, for the purposes of the WTO agreement a standard is now considered adopted when it has been approved by the CAC. As a consequence Codex standards have become an integral part of the legal framework within which international trade is being facilitated. They have, already, been used as benchmarks in international trade disputes, and it is expected that they will be used increasingly in this regard.

Of specific interest to this project is the Codex Committee on Pesticide Residues (CCPR). This committee has the responsibility of setting maximum residue limits (MRLs) for Codex (CXLs) for pesticide residues in food commodities. Since its inception the CCPR has set over 2,500 CXLs from more than 200 pesticides. To assist in the decision-making the CCPR utilizes the Joint Meeting on Pesticide Residues (JMPR), an expert committee, providing scientific input on matters relating to risk analysis and the setting of CXLs.

The JMPR has responsibility to evaluate pesticides for possible health hazards arising from the occurrence of pesticide residues in food. The JMPR reviews data pertaining to toxicology, chemical behaviour, animal metabolism, use patterns and the resulting residues. The JMPR then produces reports within which are contained recommendations to set or withdraw CXLs based upon the data provided.

Currently within the Codex system there are few mango MRLs established, i.e., currently only 10. This lack of MRLs is a significant impediment where mangoes are exported to countries that either default to Codex or use Codex MRLs as benchmarks for compliance purposes.

6.2 ASEAN

Due to concerns over a lack of Codex MRLs in important crops and different MRLs between ASEAN member countries the Sectoral Working Groups of the ASEAN Ministers of Agriculture and Forestry initiated the formation of an Expert Working Group on Pesticide Residues. This group has been set the task of harmonizing MRLs between ASEAN member countries through closer collaboration on MRL setting. Allied with this is an intention to pool technical and financial resources. While some progress has been made in harmonizing MRLs, e.g., MRLs have been established for 61 pesticide covering 775 pesticide-commodity combinations, there have been only eight harmonized MRLs established for mangoes. All of which have been referenced from the Codex system, i.e., no new data has been generated.

6.3 Japan

Japan a significant importer of food where imports account for 60% of food consumed[m] the issue of food safety and residues can be acute. As part of a revision of its Food Sanitation Law Japan implemented new regulations in 2006 covering residues of pesticides in food. Under the new legislation, Japan’s Ministry of Health, Labour and Welfare (MHLW) has adopted a regulation based on a "positive list" approach with MRLs for specific chemical-commodity combination residues. The MHLW established provisional MRLs for 758 agricultural chemicals, in addition to existing MRLs, and a uniform limit of 0.01 ppm for residues of pesticide not contained on the list. Foods containing residues exceeding the MRLs on the list, or 0.01 mg/kg in cases where there are no MRLs established will be regarded as violations of the Food Sanitation Law and will be prohibited from being sold or used as food in Japan.

With these new regulations, MHLW will not change its monitoring plan for imported foods, except that each sample will be tested for more residues. The same number of samples will be taken and there will be no new documentation or data requirements from MHLW after the implementation, however some importers are asking for additional information.

6.4 Hong Kong

Hong Kong relies heavily on imported produce with local production only accounting for 3% of fresh vegetables consumed[n]. Hong Kong is an important market for Philippine food exports, particularly fresh fruits and vegetables with in excess of HKD 3,000 million[o] imported from the Philippines in 2004.

Recently the Centre for Food Safety (CFS) of the Government of the Hong Kong Special Administrative Region released a discussion paper titled “Proposed Regulatory Framework for Pesticide Residues in Food in Hong Kong”[p] regarding a proposed introduction of new subsidiary legislation to regulate pesticide residues in food and to develop a “positive list approach” to specify maximum residue limits (MRLs) and

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[m] *Food Supply and Demand Table of 2002 (Ministry of Agriculture, Forestry and Fisheries*
[n] *Agriculture, Fisheries and Conservation Department. Agriculture in HK. Available from: http://www.afcd.gov.hk/english/agriculture/agr_hk/agr_hk.html*
ohttp://www.censtatd.gov.hk/press_release/press_releases_on_statistics/index.jsp?displayMode=D&sID=-3560&sSUBID=-3560
[p] *http://www.cfs.gov.hk/english/whatsnew/whatsnew_fstr/whatsnew_fstr_21_Pesticide.html*

extraneous maximum residue limits (EMRLs) for pesticide residues in food. The approach being considered essentially requires that for any pesticide applied to a crop the resultant residues must be either non-detectable or comply with an existing MRL.

It is intended that the enactment of new legislation will also introduce an element of traceability. All importers and distributors will be required to register with the Food Safety Authority and keep records of food sources and distribution. This will be coupled to the three tiered monitoring approach followed by the CFS, i.e., routine, targeted and seasonal surveillance. In the event of a significant food contamination issue the commodity in question can be recalled and traced back to its source.

7 Constraints

This study has identified a number of factors constraining the mango industry from successfully complying with international standards. Specifically these are availability of locally generated residue data; the limitation of the regulatory framework in the Philippines, i.e., in terms of residue management including implementing and monitoring of GAP, and in countries with which trade contacts exist; availability of data on the use of pesticides in relation to residues and availability of analytical capacity and methods. These constraints are elaborated in greater detail below (a summary can be found in Appendix 2).

7.1 Information and flow

A primary constraint on mango exports from the Philippines is the lack of information on the residue profile of the pesticides used. All pesticides used in the Philippines gain regulatory approval on the basis that they are applied by good agricultural practice (GAP), i.e., where GAP is defined by specific domestic requirements such as pest or disease controlled, environmental or occupational health and safety. Unfortunately, abiding by national GAP does not guarantee residue compliance in export markets. It was apparent during the study that the majority of growers have little awareness of residue related issues and little or no idea of what residue levels might be present on harvested fruit.

This can also be compounded by a disparity between pesticide labels on rate expression and application requirements. Such shortcomings have been recognised by the FPA and the pesticide manufacturers and for example, newer products are carrying rate recommendations on the basis of a concentration rather than area treated. However, there is potentially a time lag between the issuing of new labels and those for older generic products.

Currently there also exists a general lack of readily available information on current and proposed standards in key export markets. In addition there is no clear mechanism by which such information, if available could be disseminated to relevant stakeholders.

7.1.1 Linkages

The Philippines has a somewhat unique structure in terms of government service delivery to the agricultural sector with there being government groups active at different levels, i.e., federal, regional and local. The most prominent of these are either part of, or allied to the Department of Agriculture (DA) however, much locally based agronomy is provided by agriculture staff situated within Local Government Units (LGU). At the regional level can be found Bureau of Plant Industry component facilities such as Pesticide Analytical Laboratories satellite offices or the National Mango Research & Development Centre of based in Guimaras and representatives of the High Value Commercial Crops Program. In addition, there is the overarching research coordination provided by PCARRD and research expertise of the universities. These groups have the function of undertaking research as well as providing extension and training to farmers.

The Department of Agriculture Division indirectly, also has responsibility, through the FPA, an Attached Agency, for the registration and inspection of pesticides. Ostensibly the Department has responsibility for the certification and inspection of pesticide dealers and sprayers as well as training through extension staff. However, the linkages between government activity and agribusiness appear to be relatively weak. While there was some evidence of collaboration there does not appear to be extensive collaboration between the different sectors, i.e., government, producers/exports and the pesticide industry. It is believed that a significant level of cooperation will be required for the mango industry to effectively manage residues to mitigate the risk of MRL breaches.

7.2 Capacity

There is a level of expertise within the pesticide manufacturer industry and government in relation to pesticide use and residues. However, there is a lack of understanding amongst growers on the processes involved in MRL setting and the means of managing residues. The ability of the mango industry to effectively manage pesticide residues into the future will hinge on the availability of relevant information on residue behaviour and the capacity of pesticide analytical laboratories to verify that management practises implemented are effective. An opportunity exists for ACIAR to make a positive intervention by providing resources to allow residue trial data to be generated and to enhance local analytical capacity and expertise.

7.2.1 Residue monitoring

As indicated previously limited residue monitoring is occurring within the Philippine mango industry. Mango exporters are having produce tested but only for certification and only for two problematic pesticides, i.e., due to previous MRL violations. A more proactive approach is required targeting those pesticides identified as having greatest risk of violative residues.

For exporters to gain confidence in a residue management system based on the export GAP concept a mechanism of verification is required. An option that the industry should consider is that of a coordinated program of residue monitoring. Such a program could provide data to not only validate export GAP practices but also the added benefit of providing a means of satisfying importing countries that an effective residue management scheme is in place.

To implement a monitoring program the export mango sector would need to consider such issues as the breadth of testing required, i.e., the number of pesticides tested, sampling protocols and analytical capacity. While a simple system is desirable, the amount and quality of data generated will be critical in terms of having a monitoring program that benefits the industry. In any event there is little value in the export sector of the industry considering the implementation of a residue monitoring program until such time as there is an export GAP system available.

7.2.2 Analytical capacity

On the basis that the mango export sector is capable of implementing quality systems to manage pesticide use via the introduction of export GAP, an ongoing risk for the sector is the availability of suitably accredited laboratories for residue testing. Reliable analytical methods have to be available to ensure compliance with MRLs is possible. Similar concerns over the lack of capacity in developing countries to generate scientific data with regard to pesticide MRLs have been raised in various international fora, e.g., the 59th Session of the Codex Executive Committee.

Currently the main analytical capacity rests within government laboratories; however the capacity and accreditation status of these laboratories is uncertain. Analytical laboratories involved in pesticide analysis can use a variety of methods in residue determination depending on the purpose of the analysis. These methods are generally based around standard or otherwise published methods which have been verified for the respective analyte(s) and matrices. The performance of the analytical methods and verification that they meet international standards are fundamental elements of laboratory systems internationally and involve such measures as ongoing proficiency testing, validation and accreditation of each specific analytical test to international standards (ISO/IEC 17025) and an evaluation of the laboratories' facilities, staff and technical capabilities.

Unfortunately, there is a degree of uncertainty over the capacity of currently available laboratories within the Philippines to test the broad enough range of pesticides available both rapidly and to a suitable level of sensitivity. In addition, the accreditation status of currently available laboratories is also unclear.

Under current circumstances it is unlikely that private or government analytical laboratories would invest to develop their facilities in the short term. In the longer term should residue testing become an integral part of a mango export quality system their development could become economically viable. In the interim consideration should be given by ACIAR to facilitating this process through either the provision of additional resources, i.e., equipment, or by providing targeted funding to aid in the achievement of accreditation.

7.2.3 Quality systems

Allied to this is a need to strengthen control systems within the export mango supply chain. This will be particularly important where fruit aggregation or consolidation occurs at the wholesale or exporter level. Without the development of suitable compliance mechanisms, i.e., traceability and verification systems, it is highly unlikely that fruit sourced from small-holders could be used in any export program with confidence. As a consequence, it is believed that ACIAR should give consideration to aiding the development of appropriate control systems in any mango supply chain projects that may be initiated into the future.

7.3 Regulatory framework

7.3.1 Standards

The current state of compliance with pesticide MRLs in the Philippine mango industry is essentially reactionary, i.e., responding only to requirements when dictated by export markets. The demand for quality, from a residue perspective in the domestic market is relatively low and thus, the system of grades and standards is weak. Currently, domestic MRLs are not promulgated by the FPA for pesticides approved for use in mangoes. It is understood that manufacturers, when seeking approval, propose a maximum residue level, which is used by the regulator in undertaking risk assessments. However, to date this nominated residue level has not been formally promulgated or published. This lack of information results in growers potentially having little idea of pesticide residue levels resulting from use, i.e., they have no benchmark with which to assess whether the application of a particular pesticide might lead to a MRL breach or not.

In order to address this issue, the regulator should be encouraged to develop a process whereby MRLs are established and published. This would allow growers and exporters to gauge whether the use of particular pesticides might be problematic from an export market compliance perspective. Linked to this it is understood that there is a lack of general compliance activity, due to financial and manpower/professional limitations, from the relevant regulatory agency, i.e., the Bureau of Plant Industry, who are mandated to monitor pesticide residues in agricultural crops.

7.3.2 Product Labels

The primary function of a pesticide label should be to communicate to users how to apply pesticides safely and efficaciously. In general terms they consist of sections providing information on the identity of the product, use patterns, i.e., circumstances in which the product should be used and how the product should be used, e.g., rate, timing, frequency and harvest intervals; otherwise known as good agricultural practise (GAP).

Unfortunately on a number of pesticide labels in the Philippines, particularly those for older generic products, can contain a degree of ambiguity in the information presented or inconsistencies between different labels containing the same active ingredient. This situation was exemplified in the designation of pre-harvest intervals (PHI) for some products. On a number of labels the PHI is provided as a range, e.g., thiram 14 to 21 days, there are differences in the PHI between products, e.g., mancozeb some labels show 5 days others 7 days, some have no PHI specified while others show a range, e.g., chlorothalonil had either no PHI specified or one of 7-14 days.

These difficulties, coupled with differences in rate expression and spraying intervals that were also noted, can make the task of correctly applying pesticides unnecessarily challenging. It is believed that such ambiguity on labels can be a significant impediment to the ability of industry stakeholders to manage pesticide residues.

7.3.3 Data generation

As previously indicated a requirement of registration in the Philippines is the provision of data from supervised residue trials. Unfortunately, given the geographical diversity of the Philippines often the data set that is available can, potentially be lacking, i.e., does not cover the breadth of climatic conditions under which a pesticide might be applied. As a consequence the behaviour of residues may vary considerably between different production regions or time of year. Unfortunately, there is little, if any, information either available or accessible on the likelihood of residues from pesticide use. This lack of information is a significant impediment to any attempt by the industry to meaningfully manage residues for exports.

8 Future concerns

8.1.1 Private standards

It is highly likely that export oriented fruit and vegetable industries in developing countries such as the Philippines will, increasingly have to address escalating private production and process standards[q] which will be linked to quality assurance schemes such as ISO 9000 and HACCP[r] as well as industry sector specific (e.g., GlobalGap[s]) quality schemes and codes of practice. Where the production standards will define specific commodity attributes associated with perceived quality and safety, e.g., acceptable residue levels, and where process standards will refer to the conditions under which the products themselves are produced, e.g., use of environmental or ethical practices, particularly with the application of the latter becoming increasingly common[t].

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[q] *World Bank. 2003. Standards and Global Trade: A voice for Africa. The World Bank, Washington, USA.*
[r] *Buzby, J.C. and Unnevehr, L. 2003. International Trade and Food Safety AER-828 Economic Research Service USDA.*
[s] *http://www.globalgap.org/cms/front_content.php?idart=3&idcat=9&lang=1*
t Gibbon, P. and Ponte, S. (2005. Trading Down – Africa, Value Chains and the Global Economy, Temple University Press, Philadelphia, USA.

As European and US retailers are increasingly requiring environmental and ethical production practices[u], export oriented industries in developing countries will need to address how they meet these requirements through the integration of social, environmental and agricultural objectives that can be linked to green certification, eco or Fair trade labelling[v]. As a consequence of this retailer focus supermarkets have become powerful actors in food production and in effect taken on the role of 'consumer protectors'. Leading to, for example, European retailers implementing pesticide residue reduction policies and mandating what they deem to be acceptable pesticide use[w] coupled with their own residue monitoring programs.

As increasingly stringent standards are developed and applied it is likely that exporting industries in many developing countries are unlikely to have the capacity to comply. A possibility supported by this study in that it was apparent that much of the Philippine mango industry, other than corporate production, had little experience with formal international trade.

9 Strategies

The underlying assumption within and beyond this project is that returns achieved from export markets are high value and would provide sufficient incentive for stakeholders to include residue management for exports into their production systems, i.e., export GAP. On the basis of the study undertaken the authors believe that to address the constraints identified changes are needed in both commercial and regulatory policy to improve the sectors focus on compliance and ability to meet standards internationally.

To develop an effective residue management system it is believed that a broad two step approach would need to be followed. The first step would be the generation of the required information, i.e., determination of appropriate export GAP for priority pesticides. Integral to this would be the initial pesticide prioritisation process and the generation of residue profile data for the nominated pesticides.

Following from this would be the implementation phase where the export GAP information is provided to stakeholders and incorporated into either existing or developing quality systems. Allied to this would be the need to verify, through residue monitoring, that the information is being correctly applied. Detailed comments with regard to options that have been outlined are provided below.

9.1 Information

It is believed that three elements need to be addressed in the area of information. Firstly, mechanisms need to be developed to ensure easy access to MRL information in export destinations. Secondly, information on how to achieve compliance is needed, i.e., export harvest intervals, and lastly, mechanisms to ensure dissemination of relevant information on market requirements is needed.

As a consequence it is believed that information needs to be provided that could form the basis for a residue management program through the development of export GAP proposals, i.e., recommendations on pesticide use practices to ensure compliance in export markets. Essentially information on residue decline, i.e., degradation over time, would allow the estimation of export harvest intervals, which are fundamental to the development of an export GAP. Once determined the information on export GAP would be provided to growers and exporters. Such information could then be incorporated into

[u] *GlobalGAP*
[v] *http://www.fairtrade.org.uk/what_is_fairtrade/fairtrade_certification_and_the_fairtrade_mark/default.aspx*
[w] *http://www.j-sainsbury.co.uk/files/reports/cr2005/?pageid=53*

extension programs or quality system being implemented. An example of the output of such an exercise is shown in Table 5.

Table 5 Example of export harvest intervals calculated on the basis of currently available residue trial data

Pesticide	Rate g ai/hL	Harvest Interval	Japan MRL mg/kg	Possible EHI
Buprofezin	5-10	15 days	0.5	15 days
Carbaryl	187-280	1 day	3	>14 days
Difenoconazole	7.75-15.75	17 days	1	17 days
Dimethoate	50	14 days	1	14 days

Availability of relevant and valid residue trial data is also seen as crucial in the development of international standards. It will be important that data generated be of a standard suitable for submission to regulatory or risk assessment bodies for the establishment of international MRLs, e.g., as import tolerances, ASEAN MRLs or Codex MRLs.

Assistance could be provided through technical and financial support to link the information generated with Integrated Pest Management research programs and extension programs being provided by the Philippines government, the pesticide manufactures or ACIAR.

9.2 Priority chemicals

In order to determine which pesticides should be investigated it is proposed that a priority list of chemicals be developed and distributed for feedback from stakeholders. The planned process to be followed is outlined below.

The initial step in developing a priority list is to identify pesticides where relevant data already exists, i.e., where sufficient residue trial data allows the estimation of an export harvest interval. For example, pesticides recently reviewed by JMPR from which Codex MRLs in mangoes have been established, e.g., difenoconazole and cyromazine[x].

The remaining pesticides would then be ‘screened’ against an agreed set of criteria which will include such factors as level of industry use or importance, existence of Codex MRLs for other commodities, Codex nomination, manufacturer support and previous submissions to other jurisdictions, i.e., use patterns in mangoes elsewhere. Manufacturer support and or inclusion in Codex are seen as critical to ensure that information is available that would be required to satisfy risk assessment bodies, e.g., JMPR or MHLW in Japan where the establishment of import tolerances may be an option.

For that reason, pesticides would be excluded where there is no manufacturer support or where requisite data may either be scant or not available. This would serve to maintain the credibility of the final list. Upon completion, the priority list would be circulated to stakeholders for input and endorsement. This list would then form the basis for any trial work undertaken in subsequent ACIAR mango projects.

9.2.1 Data generation

It is proposed that the field component of any future residue trial data program funded by ACIAR should be based upon current FAO guideline[y]. This would involve the development

[x] *2007 Pesticide Residues in Food - Report of the JMPR*
[y] *Guidelines on Producing Pesticide Residue Data from Supervised Trials: Food and Agriculture Organization of the United Nations, Rome, 1990.*

of a data set that includes the investigation of residue decline, geographical spread covering a number of growing regions and a sufficient number of trials to meet JMPR requirements for MRL setting. It is proposed that trial sites could be incorporated within any IPM or allied research being undertaken in mangoes funded either through ACIAR or PCCARD.

The analytical phase of the studies would need to be conducted at laboratories, which would either be recognised as complying with either the OECD principles of good laboratory practise (GLP) or through the application of suitable validated performance-based methodology. The analytical capacity of laboratories could have an impact on which pesticides are chosen for inclusion in the residue trial program, i.e., only pesticides for which appropriate analysis can be undertaken could be included. Where a proprietary product is identified as a priority the relevant manufacturer could be approached to take responsibility for the analysis.

It is critical that data generated from any supervised residue trials meets these requirements. Primarily as a good quality data set can be used by exporting countries to seek to have international MRLs established, i.e., at Codex, or by requesting the establishment of an import tolerance. This being particularly important given the low number of MRLs currently set for mangoes internationally.

Residue analysis

Under current circumstances it is unlikely that private or government analytical laboratories would invest to develop their facilities in the short term. In the longer term should residue testing become an integral part of a mango export quality system their development could become economically viable. In the interim consideration should be given by ACIAR to facilitating an enhancement in capacity through either the provision of additional resources, i.e., hardware, or by providing targeted funding to aid in the achievement of suitable laboratory accreditation.

9.2.2 Agribusiness Linkage

Assistance

The level of effort required to prepare supporting scientific documentation for the probable entire final list of pesticides is likely to be substantial and be beyond the scope of future project funding. In order to extend the scale of any work undertaken it is proposed that prospects for greater collaboration between the chemical industry and producers be explored. Specifically what opportunities might exist for financial or in-kind assistance from affected pesticide manufacturers should be investigated, i.e., those whose pesticides are nominated for trial work?

As a result it is recommended that representatives of ACIAR should seek to involve pesticide manufacturers in the event that the development of export GAP is to be pursued, i.e., to explore what opportunities exist to leverage ACIAR funding. Preliminary discussions with a number of manufacturers indicated that such partnerships may receive favourable consideration. However, this would be on a case-by-case basis and possibly involve proprietary pesticides only.

Communication

Pesticide manufacturers in the Philippines currently use extensive communication channels to provide information on pesticide use and company sponsored pest management programs to mango growers. Enlisting the participation of key pesticide manufacturers into the development of export GAP would also provide a twofold benefit in terms of communication. Firstly, having manufacturers supportive of the program would help limit the likelihood of growers and exporters receiving contradictory messages.

Secondly, the involvement of manufacturers in the development of any export GAP recommendations would provide an additional information dissemination channel, i.e., manufacturer publications or initiatives such as the CropLife Mango – Safe Use project, thereby increasing strength of the message.

9.3 Regulatory reform

9.3.1 Off-label approvals

The regulatory system within the Philippines ostensibly has one mechanism by which an approval for the use of a pesticide can be granted. It is understood that this involves an application for registration linked to a pesticide registrant and a specific product. While this is not dissimilar to the approaches followed elsewhere, unlike Australia there does not appear to be a mechanism by which approvals can be sought for what is termed an off-label or minor use, i.e., where approval is sought for the use of a pesticide where the use does not appear on a product label. In Australia such off-label uses must meet specific criteria and undergo risk assessments by the appropriate authority. The major distinction is that the approval can be sought by individuals or industry associations for an active ingredient rather than an individual product.

It is believed that there would value in the Philippines considering the introduction of such a system. In terms of export commodities it could potentially provide a mechanism to address situations where no MRL or lower MRLs exist in an export destination and in the short-term data generation is not a consideration. In such cases it may be possible to explore opportunities to access alternative products, based on approvals or MRLs in importing countries or Codex, i.e., domestic approval sought on the basis of market access.

The objective, in the short-term, would be to gain local off-label approvals to allow the use of export MRL compliant pesticides so as to maintain market access. For example, the Japanese MRL for cypermethrin in mangoes is 0.03 mg/kg whereas the MRL for bifenthrin, a pesticide with a similar spectrum of control, in mangoes is 0.5 mg/kg over 15 times higher. At present bifenthrin is not approved for use in mangoes in the Philippines and approval could only be gained if a manufacturer were to seek and gain registration, the cost of which would be economically unattractive given its generic status. The FPA should be encouraged to consider the development of a mechanism that could potentially provide access to pesticides that ensure compliance with importing country standards. To facilitate such a review it is recommended that ACIAR explore what opportunities might exist to develop linkages between the FPA and the APVMA, i.e., for FPA staff to gain exposure to and an understanding of how the minor use scheme is structured and administered in Australia.

9.3.2 Label reform

Pesticide labels are important as they are meant to communicate and inform users how to use pesticides safely and efficaciously. If the label is read, understood and its directions followed, the likelihood of pesticides causing unwanted effects are remote. Coherent labels are therefore a fundamental part of any considered approach to pesticide management.

A number of studies have identified that lack of clarity can inhibit correct interpretation of labels and impair grower efforts to follow GAP ensuring unwanted consumer, user or environmental pesticide exposures do not occur (US EPA 1986, Petre 1994 and Venema *et al.* 1997). Farmers want to use pesticides correctly and need to have labels that contain relevant information that is presented in a clear, consistent and understandable manner. As a result it is suggested that some level of label reform needs to be considered. It is understood that some reform has already occurred in harmonising rate expression (to also include standardization of label information); however, it was apparent from the study that further efforts are needed. To this end it is recommended that the FPA consider conducting a label review to ensure product labels are, in the least, consistent in the information provided.

9.4 Quality Systems

During the study it was apparent that mango exporters in the Philippines view standards essentially as market requirements, i.e., a specification that must be met in order to sell into a particular market. From interviews and meetings it was apparent that few people, if any, see compliance with standards as potential opportunities for commodity differentiation, i.e., to redefine the industries competitive advantage. As a consequence ACIAR should give consideration to facilitating the development of an overarching quality system for export fruit that not only ensures compliance but potentially provides a platform from which the industry can build export markets and increase returns.

Ultimately, the development and implementation of a quality system will be fundamental to the success of Philippine mango industry in either maintaining or indeed growing mango exports into the future. Any quality system will need to not only ensure good agricultural practices are being applied that comply with both domestic and international requirements but also demonstrate and document that fact. From a residue management perspective, consideration must be given to what initial elements are needed to avoid MRL breaches in key export markets, e.g., levels of residue monitoring, appropriate field sampling protocols, pesticide use management guidelines and traceability documentation.

It is believed that to implement a residue management system, in the first instance, will require leadership by the exporter packhouses. It was found that a number of exporters to Japan are working towards certification of specific farms and requiring these growers to provide records of pesticides applied to the mangoes they supply. It is suggested that this initiative could form the basis for an industry wide quality system incorporating a residue management component (export GAP) to ensure compliance and risk mitigation.

This could be facilitated by ACIAR through the incorporation of a residue management component into a broader mango project. It is believed that a consequence of successfully implementing such an approach would be to enhance returns to mango producers, packers and exporters, improve industry growth and sustainability. Through industry growth small-holder mango growers, in the long-term, would then have an opportunity to access higher returns and improved living standards.

The provision of such information could be linked via existing government initiatives, e.g., the High Value Commercial Crops program run within the Philippine Department of Agriculture. Such market linked technical assistance, if properly targeted, would increase information flows, update MRL requirements in a demand-driven environment and would increase the sectors technical capacity to meet global market quality requirements.

10 Conclusions and recommendations

In reviewing potential strategies for residue risk management it was noted that a range of options need to be considered. These include the determination of export pre-harvest intervals, upgrading of analytical capacity, regulatory reform, adoption of IPM techniques and the advancement of quality systems. Allied with these strategies would be the need to ensure effective information flow and training to key stakeholders.

Of these options it is believed that the generation of residue trial data, to allow the determination of export harvest intervals, is the critical first step as this would have the greatest immediate impact. The generation of residue data from supervised trials would then allow the industry to begin the development of a residue management program.

In order to ascertain which pesticides will require residue trial data generation it is proposed that the list of pesticides currently approved for use in the Philippines be subject to a set of criteria including information collated on pesticide usage and available residue trial data to determine for which pesticides significant data gaps exist. From this a list of candidate pesticides could be produced which could form the basis for a phase of data generation. The location of residue trials could be based upon current ‘worse-case’ use patterns, to determine relevant residue decline.

Linked with this data generation consideration should be given to increase resourcing and the provision of scientific and technical expertise, where needed, in the areas of residue management and pesticide analysis. As it is believed changes will be needed to enable domestic production methods to be aligned with importer requirements.

The rapidly changing regulatory environment with regard to pesticides and increasingly stringent MRLs is raising concerns that export oriented industries in developing countries, such as the Philippine mango industry, will be disadvantaged in gaining and maintaining market access. As a consequence it is suggested that thought should also be given to initiating some level of reform in the area of pesticide labels and approvals to provide a degree of increased flexibility allowing industries to potentially respond at a greater pace to change.

The focus of this study was primarily to assess the capacity of the Philippine mango industry to respond to the challenges posed by regulatory change in its export markets. At this moment efforts at the private sector, institutional and regulatory levels to improve the capacity of the industry to manage pesticide residues are some what fragmented and limited. It is believed that a more coordinated approach is needed where the generation of residue trial data and the development of residue management guidelines should be priority.

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12 Appendices

12.1 Appendix 1: Terms of Reference

12.1.1 To investigate and develop a profile of the current Philippine approach to pesticide use and residue management.

Activities:

- Examine current pest management systems at farm level, i.e., range of approaches being implemented via liaison with industry stakeholders and HORT/2003/071project members
- Identify and assess current approaches to residue management in supply chain, i.e., growers, packers and exporters
- Assess capacity and expertise of analytical laboratories within the Philippines
- Undertake an analysis of the Philippine regulatory system for pesticide control.

12.1.2 To assess the effectiveness of current MRL violation response systems within the Philippine mango industry

Activities:

- Preparation of profiles of previous MRL breaches
- An analysis of import requirements and violation response expectations for major export markets for mangoes, e.g., traceback.

12.1.3 Identify constraints to achieving MRL compliance in export markets.

Activities:

- Assess current organizational arrangements and linkages between stakeholder bodies, specifically with regard to violation response and prevention, i.e., pesticide use and residue management (gap analysis)
- Identification of key data gaps
- Identification of opportunities for collaboration between counterparts
- Identification of gaps in technical expertise.

12.1.4 Outline potential research activities to address the identified constraints.

Activities:

- Make proposals regarding areas where it is believed targeted research would aid the Philippine mango industry proactively manage MRL compliance
- Provide an assessment of likely training and or extension needs.

12.2 Appendix 2: Summary of identified constraints and suggested strategies

Issue	Constraint	R&D Activity	Comment
Data/Information	1.1 Lack of knowledge of MRLs in markets	MRL gap analysis & dissemination of results to relevant stakeholders	Objective would be to provide the mango industry with export guidelines for MRL compliance.
	1.2 Lack of knowledge of critical GAP of main pesticides used	Comprehensive pesticide use survey to identify critical GAP	Elements of this have already been completed in other projects, i.e., mango IPM.
	1.3 Lack of information on pesticide residues	Residue decline trials	Candidate chemicals would need to be prioritised. This could be done via 1.2 above.
	1.4 Lack of international MRLs	Generate residue data to establish import tolerances or Codex MRLs	Base trials on FAO guidelines to ensure international acceptance of data.
Supply chain	2.1 Lack of a system for product traceability	Facilitate development of suitable scheme w.r.t. pesticide residues.	Systems for product traceability currently under discussion with a focus on Japan.
	2.2 Lack of information on implications of pesticide use	Develop information package on MRL setting and implications w.r.t. market access	Link with existing training – information delivery initiatives, e.g., Mango GAP Manual from BPI.
	2.3 Lack of a system for validation w.r.t. residues	Development of a residue monitoring program	Currently done ad hoc by exporters. A more rigorous sampling and testing regime is required.
Regulatory	3.1 Inconsistent/vague label statements with regard to pesticide use	Facilitate harmonization of labels	Many chemicals are generic & large number of products available. Label differences have occurred as well as vague label statements, e.g., PHI 3-7 days.
	3.2 Lack of domestic MRLs, i.e., no means of assessing domestic use pattern w.r.t. export market compliance.	Generation of sufficient residue data based on critical GAP as per 1.3 above.	Purpose is to fill identified data gaps so that export guidelines can be developed.
	3.3Lack of compliance activity	Aid in the development of government agency based testing regime.	Linked with 2.3 above.
	3.4 Currently limited local residue data required for product registration.	Aid in the revision of data requirements to enable relevant risk assessments can be completed.	Long-term objective predicated on relevant agency accepting the need to amend current data requirements.
Pesticide use	4.1 Poor level of understanding in industry w.r.t. of MRL implications	Link with existing training programs to ensure relevant information provided	Currently GAP training being undertaken by BPI.
	4.2 Potentially poor understanding of importance of correct application techniques.	Link with manufacturers on the provision of data on correct application of pesticides	Link with training being provided by manufacturers and safe use program from FPA.
	4.3 Lack of approved pesticides for minor pests, e.g., thrips, ants & termites.	Identify suitable options and generate efficacy and residue data.	Link with existing R&D programs to ensure IPM compatibility.

Analytical	5.1 Capacity of laboratories test a broad enough range of pesticides to a suitable level of sensitivity	Assess and aid in equipment upgrade where necessary and provide necessary training of staff.	NPAL labs current focus primarily on cypermethrin and chlorpyrifos. However, testing regime should be focused on any problematic chemicals identified in 1.2 above.
	5.2 Laboratory accreditation	Facilitate the development analytical systems that meet international standards	NPAL currently has accredited by Japan alone. Accreditation needed for broader acceptance of locally generated monitoring data, i.e., as per 2.3 & 3.3 above.

12.3 Appendix 3: Persons met during survey

Persons met during survey

Place	Name	Position	Office
UPLB	Virginia R. Ocampo	Director	CPC-UPLB
	Celia dR. Medina	Researcher/Asst. Prof.	CPC UPLB
	Oscar Opina	Professor	CPC UPLB
	Valeriana Justo	Researcher	NCPC-CPC, UPLB
	Elda Esguerra	Professor	PHRTC UPLB
Los Banos	Jocelyn Eusebio	Director, Crops Research Division	PCARRD
	Lito Carpio	Tech. Asst. Crops Research Division	PCARRD
	Merle Palacpac	Chief	PQS, BPI Los Banos
	Maximo Obusan	Executive Director	CPAP
	Aris Filipino	President and CEO	CPAP and Arysta Philippines
Alabang	Florence Vasquez	President Croplife Phis. Regulatory Affairs Mgr	Bayer
	Jojo Criador	Regulatory Affair Mgr	Dow
	Jean Medina	Regulatory Affairs Mgr	FMC
	Henry Pahuyo	Regulatory Affairs Mgr	Aldiz
	Nenita Denila	VHT Chief	Hilas Marketing
Manila	Hernani Golez	Chief	NMRDC
	Larry Lacson*	Chief	BPI PQS
	Robero Amores*	CEO	Hilas Marketing and President Philexport
Palawan	Luisito B. Eleazar	Asst. Supt.	DA, ROS-PAES
	Melissa U. Macasaet	City Agriculturist II	LGU DA
	Romar M. Cayanan	Agric. Tech. II, part time mango grower	LGU DA
	Danilo S. Jimenez	Agriculturist II	LGU DA
	Nelson S. Saavedra	Provincial Agriculturist	PAO-DA
	Roy A. Magbanua	Agric. Tech., Part time mango grower	LGU DA
	Fredelito C. Valdez	Mango Grower	PPC
	Chita A. Sandahan	Supervising Agric. HVCC	DA RFU
	Marilyn S. Bienes	Suervising Agric.	DA RFU
	Elsie O. Ricablanca	Agriculturist II	DA RFU
	Peping M. Laderao	Mango Grower	PPC
	Wilfredo Diaz	Farmer	PPC
	Alma and Joselito Padon	Farmers	PPC
	Ben Dayao	Agric Tech, Farmer	SALT, DA LGU PPC
	Roberto Sebido	Asst City Agric., Farmer	DA LGU PPC
	Mr. Malihok	Farmer	PPC
	Mr dela Cruz	Farmer	PPC
Cebu City	Marina C. Viniegas	Agriculturist II	NSQCS-7, Mandaue City
	Ernesto M. Domagas	Sr. Agriculturist	NSQCS-7, Mandaue City
	Bernadette A. Ibarra	Chemist	PAL, Cebu
	Gerry P. Valerio	FPA Regional Officer	MES DA

	Francis Dave Soria	Asst. Manager	Felvina Farms
	Butch Soria	Manager	Felvina Farms
	Lou G. Cabalde	VCMIMPC	Cor. Cabahug/Urot Sts. NRA CC
	Wilberto Castillo	Chief	RCPC-DA
	Ernesto Domagas	Senior Agriculturist	BPI-NSQCS
	Virginia dela Fuente	Chairman, VCMIMPC	Cor.Cabahug/Urot Sts. NRA, CC
	Jorge Paculba	OIC Crops Div.	DA-RFU 7
	Eduardo Alama	Regional Technical Director	DA RFU-7
	Roque Diaz	Vice-Chairman	VCMI-MPC
	Norma B. Repol	Agriculturist	RCPC-DA 7
	Ernesto Zabate	Spraying contractor	Cebu City
	Marina Herman	Chief	DA RFU 7
	Robert G. Chua	Proprietor, Mango Trading Business	Cebu City
Iloilo City	Larry Nacionales	Regional Executive Director	DA RFU
	Joyce Wendam	Regional Technical Director for Research	DA RFU
	Ronnie Sangatanan,	FPA	DA RFU
	Leah Gella	PQS	DA RFU
	Ms. Maria Victoria Pacificador	HVCC	DA RFU
	Ildefonso T. Toledo,	Acting Provincial Agriculturist	DA
Guimaras	Marciano Etondo	Pres. Mango Growers Association	Jordan, Guimaras
	Felipe Z. Gamarcha	Guimaras Mango Grower and Producer	
	Gilbert Jardiolin	Production Supervisor.	Marsman ORO Verde
	Leon G. Gabaton	Pres. Mango Growers Assn.	Nueva Valencia, Guimaras
	Diviña D. Elida	Agricultural Technician	DA LGU Jordan
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	Yonder J. Yondre	OIC, NMRDC	BPI-NMRDC
	Sofia A. Concha	Senior Agriculturist	BPI-NMRDC
	Rhod Orquia	Agric. I	BPI-NMRDC
	Ruth B. Flor	Agri. II	BPI-NMRDC
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	Lorna T. Morante	Agri. II	POAS, Guimaras
	Nenita F. Zamora	Agri. II	POAS, Guimaras
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	Merlinda N. Castillo	Agric. II	DA-Agribusiness

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	Anastacia G. Notarte	Supv. Agriculturist	Davao del Norte
	Antolin M. Pills	Board of Trustees	SMMIDC, IGACOS
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	Melinda M. Castillo	Agriculturist	DA-Agribusiness
	Imelda R. Rasay	Provincial Officer-Davao del Sur	FPA
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	Antonio Teh	Chairman/President	DA-AMAD, SMMIDCI
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	Noel T. Provido	Info. Officer	DA DFU XI
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	Jimmy J. Cutin	Trustee	SMMIDC
	Godofredo V. Berdow	Trustee	SMMIDC
	Melani Provido	HVCC Coordinator	DA-HVCC
	Jorge L. Tagawa	Treasurer	SMMIDCI
	Julen C. Mejos	Trustee	SMMIDC , JC Mejos Agri Venture
	Susan U. Vistar		Davao City
	Jennifer B. Tangonan	Admin. Aide	HVCC, DA RFU-XI
Digos, Davao del Sur	104. Julie Sagolili	HVCC, Davao del Sur	DA-PAO
	105. Erwin John V. Comilang	Project coordinator ACIAR	DA-BPI
	106. Yolanda Camilo	Entomologist, ACIAR IPM mango	DA-PAO
Persons met by UPLB collaborator following the survey			
Manila	Dr. Norlito Gicana Dr. Dario Sabularse Aida Ordas	Director Deputy Director for Pesticides Chief, Registration	FPA
	Malou de Mata	Chief	NPAL
	Dr. Rodel Maghirang	National program coordinator	HVCC-DA

12.4 Appendix 4: MRL Comparison

	Philippines	Codex	Hong Kong	Japan	Korea	Singapore	Switzerland	UK (EU)
Insecticides								
acephate		x	x	1?	x	x	x	0,02*
acetamiprid		x	x	1	x	x	x	0,01*
beta cyfluthrin		x	x	0,02	x	x	0,02	0,02*
buprofezin		x	x	0,5	x	x	x	x
BPMC (fenobucarb)								
carbaryl		x	x	3	x	x	1	0,05*
carbosulfan								
cartap		x	x	3	x	x	x	x
chlorpyrifos		x	x	0,05	0,5	x	0,05	0,05*
cypermethrin		x	x	0,03	2	x	0,05	0,05*
clothianidin		x	x	1	x	x	x	x
cyfluthrin		x	x	0,02	x	x	0,02	0,02*
cyromazine		0.5[z]						
deltamethrin		x	x	0,5	x	x	0,05	0,05*
diazinon		x	x	0,1	0,5	0,5	x	0,02*
dimethoate		1	Codex	1	x	Codex	0,5	0,02*
dinotefuran		x	x	0,7?	x	x	x	x
Esfenvalerate/fenvalerate		x	x	1	1	x	x	0,02*
etofenprox		x	x	x	x	x	x	x
fenthion		x	x	5	x	x	x	0,01*
imidacloprid								
lambda cyhalothrin		x	x	0,5	0,5	x	x	0,02*
malathion								
methiocarb		x	x	0,05	x	x	x	x
permethrin		x	x	5	5	x	x	0,05*
phenthoate		x	x	0,1	x	x	x	x
profenofos								
pymetrozine		x	x	0,1	x	x	0,02	0,02*
spinosad		x	x	0,3	x	x	x	x
thiamethoxam		x	x	1	x	x	x	0,5
trichlorfon		x	x	0,5	0,5	0,1	0,5	x
Fungicides								
azoxystrobin		x	x	2	x	x	x	0,2
captan		x	x	5	5	2	0,1	2
Carbendazim/benomyl Thiophanate methyl		2	Codex	2	2	Codex	x	0,1*
chlorothalonil		x	x	0,5	x	x	0,01	0,01*
copper				Exempt				
difenoconazole		0.07[b]	x	1	x	x	x	x
dithiocarbamates								
flusilazole								

[z] *Codex MRL proposed by 2007 JMPR*

Fosetyl Al								
iprovalcarb		x	x	x	x	x	x	0,05*
tebuconazole		x	x	1	x	x	x	x
triforine		x	x	2	x	x	0,05	0,05*
Herbicides								
ametryne		x	x	x	x	x	x	x
atrazine		x	x	0,02	x	x	x	0,05*
glyphosate		x	x	0,2	0,2	x	0,1	0,1*
Codex - As at June 2007								
Hong Kong - Uses Codex but is currently reviewing legislation.								
Japan - As at May 2007								
Korea - As at January 2007								
Singapore - A at September 2006								
Switzerland - As at October 2006								
UK - As at June 2007 (thiamethoxam is a UK MRL)								

12.5 Appendix 5 Pesticide Use Analysis

Source	Cebu	Davao	Iloilo	Guimaras	Palawan	Researcher exporter
Fungicide						
Asoxystrobin	X	X	X	X	X	X
Benomyl	X	X			X	X
Captan					X	
Carbendazin	X					X
Chlorothalonil		X				X
Cu variants		X	X		X	
Difenoconazole				X	X	X
Irpovalicarb + propineb						
Mancozeb	X	X	X	X	X	X
Propineb	X			X	X	X
Tebuconazole		X				X
Thiophanate methyl	X			X	X	X
Thiram						
Triforine						
Flusilozole + carbendazim				X		
Insecticides						
Acephate					X	
Acetamiprid						
Bacillus Thuringensis						
Beta cyfluthrin					X	
Beta cypermethrin						
BPMC		X				X
Buprofezin		X		X		
Buprofezin +MIPC						
Carbaryl	X	X		X	X	X
Carbosulfan						
Cartap HCl	X	X		X	X	X
Chlorpyrifos + beta cyfluthrin				X		X
Chlorpyrifos + cypermethrin				X		
Clothiadinin						
Cyfluthrin	X			X	X	X
Cypermethrin	X	X	X	X	X	X
Cypermethrin + diazinon						X
Cyromazine		X				X
Deltamethrin				X	X	X
Diazinon		X				
Dimethoate						
Dinotefuran		X		X	X	X
Esfenvalerate						
Etofenprox						
Fenvalerate						
fenthion	X			X	X	X
Flufenoxuron						

Gamma cyhalothrin						
Imidacloprid		X		X	X	X
Imidacloprid + cyfluthrin		X		X	X	
Lambda cyhalothrin	X	X			X	X
Methiocarb						
Methyl eugenol						
Permethrin						
Phenthoate	X	X		X		
Pymetrozine		X		X	X	X
Spinosad						
Thiamethoxam		X		X	X	X
Trichlorfon						
Others*						
Malathion		X		X	X	
Profenophos		X		X		X
Dicarzole(formetanate HCl)						X
Metiram (dithiocarbamate)						X
Fruitfly attractant (Zoergen)		X				
Fenitrothion				X	X	
Fosetyl Al					X	
BLB stopper (bacterial leaf blight for rice)					X	
flusilazole				X		